FINANCIAL DEVELOPMENT AND MONETARY POLICY TRANSMISSION: THE CASE OF THAILAND

By

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ABSTRACT

This thesis aims to examine the channels of monetary policy transmission relating to the banking sector in Thailand (mainly the bank lending channel, firm balance sheet channel and the interest rate channel) and also to investigate the effect of financial development on these channels. We first examine the bank lending channel by introducing a micro data based study (bank panel-level data) and using panel data estimation (fix effect, 2SLS, and GMM estimation). The results show a negative effect of the policy interest rate on bank loans. We find that the higher the bank size, liquidity and capitalization, the weaker the effect of the policy interest rate via the bank lending channel. The second chapter investigates the firm balance sheet channel by examining the effect of firms' financial condition on their investment and using GMM estimation. We find the significant effect of firms' balance sheet condition on the firms' investment and also find that the less financial constraint of firms, the weaker the effect of monetary policy via the firm balance sheet channel than the more financially constrained ones. The third chapter examines the interest rate channel by focusing on interest rate pass-through. Our VECM results show the incomplete pass-through with a relatively high degree in the long-run than the short-run. We find that banking sector development, capital market development, financial liberalization, financial innovation and financial competition cause a weaker effect of the policy interest rate via the bank lending channel and the firm balance sheet channel. However, all of these different aspects of financial development (except banking sector development) have a stronger effect on interest rate pass-through and consequently strengthen the interest channel.

To my parents and the Lerskullawat family

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ABBREVIATIONS

ADF	Augmented Dickey-Fuller
ADRs	American Depository Receipts
AR	Autoregressive
ARCH	Autoregressive Conditional Heteroskedasticity
ARDL	Autoregressive Distribution Lag
ASEAN	Association of South-East Nations
ASSET	Automated System for the Stock Exchange of Thailand
BAAC	Bank for Agriculture and Agricultural Cooperatives
BATHNET	Bank of Thailand Automated High-value Transfer Network
BEX	Bond Electronic Exchange
BIBF	Bangkok International Banking Facilities
BOT	Bank of Thailand
CDs	Certificates of Deposits
CEECs	Central and Eastern European Countries
CML	Capital Market Line
CPI	Consumer Production Index
DOLS	Dynamic Ordinary Least Square
DR	Depository Receipt
ECM	Error Correction Model
ELCID	Electronic Listed Company Information Disclosure
EMU	European Monetary Union
Exim Bank	Export and Import Bank of Thailand
FD	Financial Development Indicator
FRA	Financial Sector Restructuring Authority

GDP	Gross Domestic Product
GHB	Government Housing Bank
GSB	Government Saving Bank
GMM	Generalised Method of Moments
IMF	International Monetary Fund
IFRS	International Financial Reporting Standard
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
LF	Loan frontier
LR	Likelihood ratio
MAI	Market for Alternative Investment
MBS	Mortgage Backed Securities
MLR	Minimum Lending Rate
M2	Broad money supply
NVDR	Non-Voting Depository Receipt
OECD	Organization for Economic Co-operation and Development
ORFT	On-line Retail Funds Transfer
OLS	Ordinary Least Square
OTC	Over-the-Counter market
PACAP	Sandra Ann Morsilli Pacific-Basin Capital Markets
PLMO	Property Loan Management Organisation
PRH	Panzar-Rosse H statistic
PRS	Price Reporting System
Repo rate	Repurchase market interest rate
SADC	South African Development Community countries
SET	Stock Exchange of Thailand
SFI	Specialised Financial Institutions

SMART	Electronic Retail Funds Transfer
SMC	Secondary Mortgage Corporation
SME Bank	Small and Medium Enterprise Development Bank
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TAMC	Thai Asset Management Corporation
TFEX	Thailand Future Exchange
TRIS	Thai Rating and Information Services
TSD	Thailand Securities Depository Company Limited
VAR	Vector Auto Regressive
VECM	Vector Error Correction Model
2SLS	Two States Least Square

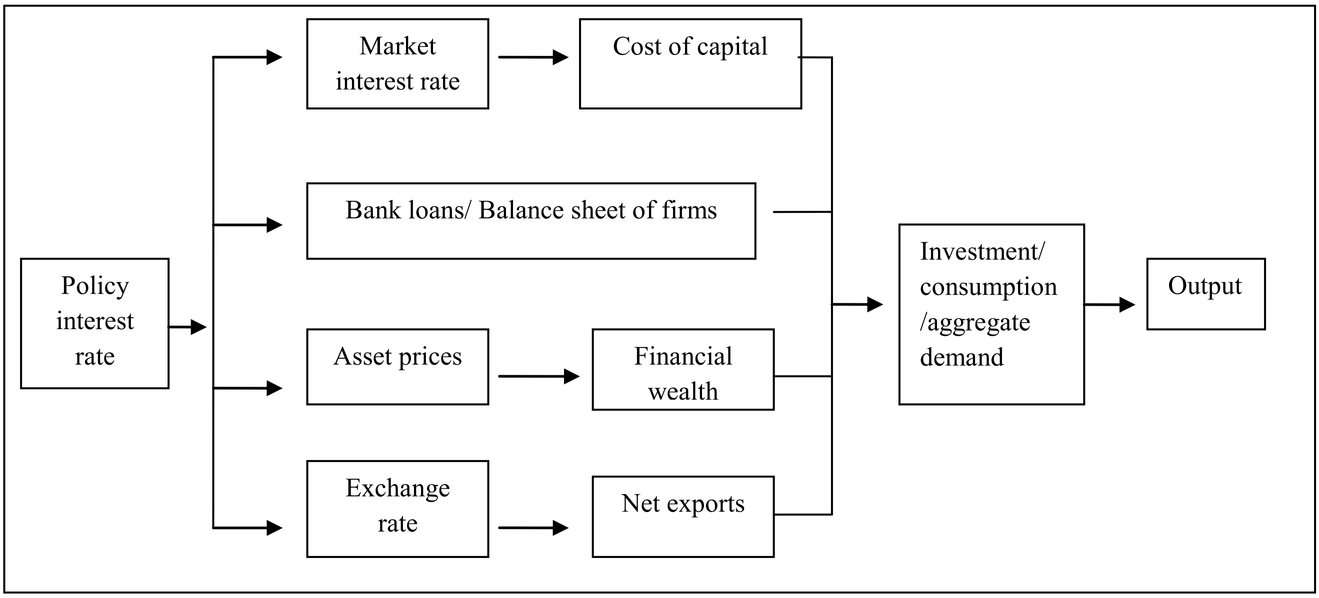
CHAPTER ONE

INTRODUCTION

1.1 Background and motivation

The topic of monetary policy transmission has been the subject of considerable research and is an interesting and controversial issue for policy makers. This is because of its importance in explaining the way in which monetary policy passes through to the real economy via different channels. There are four main ways which monetary policy affects the economy: (1) the interest rate channel, (2) the credit channel, (3) the asset price channel, and (4) the exchange rate channel. Figure 1.1 illustrates this monetary policy transmission mechanism.

Figure 1.1: Main channels of monetary policy transmission



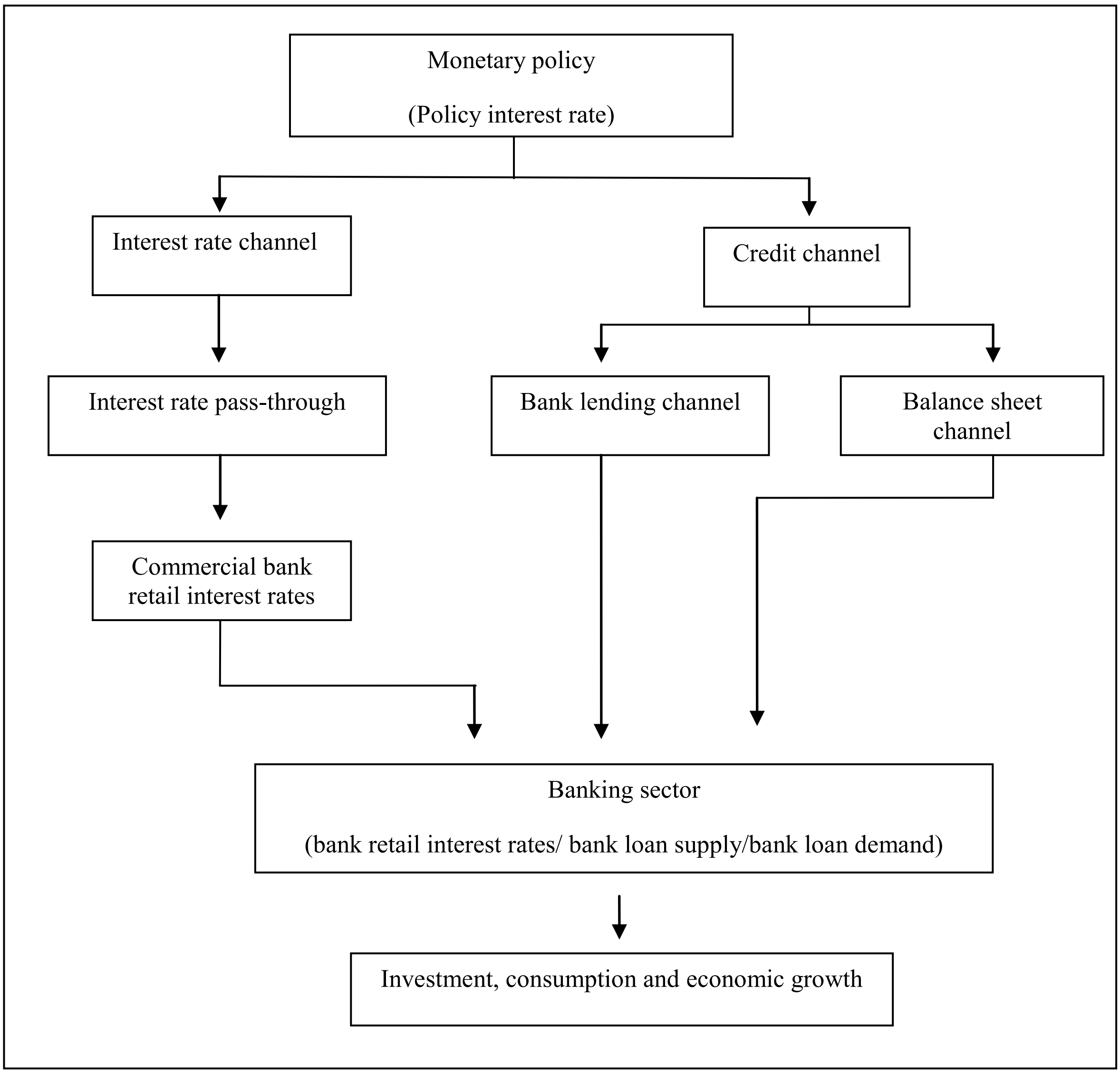
Source: Bank of England (1999) and Mishkin (1999).

In the interest rate channel of monetary policy transmission, monetary policy (policy interest rate) will have an effect on market interest rates and retail interest rates. This will affect the cost of capital, investment and consumption spending, and hence influencing on aggregate demand and output (Bank of England, 1999; Mishkin, 1999). The credit channel describes the way in which monetary policy passes through to the real economy via loan supply. A change in the policy interest rate will lead to an effect on loan supply, resulting in a change in the investment and consumer spending of firms and households, thus affecting the real economy (Mishkin, 1999; Hubbard, 1995). The effect of monetary policy via the credit channel also passes through to the balance sheet of firms as a change in policy interest rate will affect their cash flow and balance sheet strength (Bernanke and Gertler, 1995). The change in the financial condition of firms will influence on their investment spending, aggregate demand and output. Monetary policy can also affect the economy via the asset price channel. This channel explains that a change in the policy interest rate can lead to an effect on market interest rates as well as the market value or the return of bonds relative to equities. This influences on the demand for equities and equity prices. This condition can also lead to a change in the market value of firms or the q ratio (the proportion of firms' market value relative to the replacement cost of physical capital), hence affecting investment spending and aggregate output (Bank of England, 1999; Mishkin, 1996). A change in stock prices will also influence on the financial wealth of households and hence affecting consumer spending, which will pass through to a change in aggregate output and inflation (Ireland, 2006). Another channel of monetary policy transmission is the exchange rate channel. A change in the policy interest rate will also have an influence on the domestic interest rate relative to the foreign interest rate, affecting investment returns in foreign countries relative to the returns in the domestic country (Arestis and Sawyer, 2002; Mishkin, 1999). This condition causes a change in capital outflow and the exchange rate and influences on the net export and aggregate output in the economy (Bank of England, 1999).

The channels of monetary policy transmission relating to the banking sector and the credit view of the transmission have been considered to be an important issue in many studies of monetary policy in recent decades. The significance of this study derives from the important role of financial intermediaries (the banking sector and financial institutions) in the financial market. Banks play an important role in solving the asymmetric information problem by reducing agency, transaction and search costs between lenders (banks) and borrowers (firms and households) (Hall, 2001; Mishkin, 2013). This is due to the informational economies of scale in financial institutions, leading to the low cost of assessment of information on borrowers (Heffernan, 1996, 2005; Kashyap and Stein, 1993; Mishkin, 2013). Allen and Santomero (2001), Heffernan (1996, 2005), Mishkin (2013) and Hermes and Lensink (1996) explain the importance of banks in terms of the risk diversification approach, as banks can diversify and reduce risks in financial market transactions. This can be seen in risk management techniques, such as the use of options, swaps and other derivatives, the use of asset securitisation, and banks' off-balance sheet approach (mortgage backed securities and certificate of deposits) (Mishkin, 2013). Risk diversification also leads to an improvement in the saving allocation between economic agents, so financial institutions also play a significant role in supporting economic growth (Levine, 1997).

Therefore, the channels of monetary policy transmission related to the banking sector are considered to be an interesting and significant aspect of the study of this transmission due to the important role of the banking sector in the financial market and the economy. Berg et al. (2005) state that there are three main channels of monetary policy transmission which will pass through to the economy via the banking sector: (1) the interest rate channel, (2) the bank lending channel, and (3) the balance sheet channel. These are illustrated in figure 1.2.

Figure 1.2: Channels of monetary policy transmission relating to the banking sector



Source: Berg et al. (2005).

Berg et al. (2005) state that the interest rate channel of monetary policy transmission is related to the banking sector via the effect of interest rate pass-through. Thus, a change in the policy interest rate (monetary policy shock) will pass through to affect the banking sector via the money market rates and the commercial bank retail interest rates (retail interest rate). This results in a change in bank loan supply and demand and thus affects investment and the economy. The credit channel comprises the bank lending and balance sheet channels and they also show that the effect of the policy interest rate will pass through to influence bank loans as well as bank and firm balance sheets (their net worth and cash flow) respectively. In this way, the effect of monetary policy on these three channels also leads to a change in bank loan supply and demand and hence affects investment, aggregate demand and economic growth (Berg et al., 2005). Overall, the banking sector and bank credits play an important role via these three main channels of monetary policy transmission. This is because a change in monetary policy through these channels will affect the banking sector and bank credits (commercial bank interest rate, bank lending supply and bank lending demand) and hence affect investment, aggregate demand and the economy (Berg et al., 2005). Therefore, this thesis will focus on the study of these three channels in order to examine the role of monetary policy on the banking sector and the economy. This is due to the important role of the banking sector in the financial market and economy, as well as the significance of these three main channels, which explain the effect of monetary policy through the banks.

The idea of financial development is another important aspect of the study of monetary policy transmission. Development in the financial market can be seen in many different aspects, including banking sector and capital market development, financial liberalization, financial innovation, financial competition and financial deepening (Singh et al., 2008). These developments in the financial market can lead to important influences on the banking sector and credit market, as well as affecting the roles which the financial institutions and banking sector play in the financial market, economic agents (firms and households), and in the economy (Peek and Rosengren, 1995a; Kashyap and Stein, 1993; Walsh and Wilcox, 1995; Worms, 2001; Altunbas et al., 2009a; Smant, 2002). Therefore, it is also interesting and important to study the effect of financial development on the channels of monetary policy transmission relating to the banking sector. This is because of the importance of financial development on the banking sector and credit market. Thus, this area of study can give us significant insight into the way in which the monetary policy passes through to the economy via the banking sector, as well as the impact of the financial development on these channels. Study of this issue can also be used as policy implications by policy makers to control the economy during the financial development period.

There have been various past and recent studies of the channels of monetary policy transmission relating to the banking sector. However, studies which take into account the effect of financial development on monetary policy transmission relating to the banking sector are still limited and broadly focus on developed countries, such as the US and European ones. This results in a lack of studies focussing on developing countries. Consequently, it is interesting to study the effect of financial development by using a case study of a developing country. Because of this gap in the research, this thesis will examine the channels of monetary policy transmission relating to the banking sector as well as the effect of financial development on these channels by using Thailand as a case study of a developing country. Thailand was also the country of origin of the Asian financial crisis of 1997, which started with a highly speculative attack on the Thai baht, leading to a sharp devaluation of the currency, caused by the change from the fixed exchange rate system to the managed float system in July 1997 (Bank of Thailand, thereafter BOT, 1997; Supachet, 2005; Nidhiprabha, 1999). This situation caused a sharp fall in economic growth and investment in the capital market as well as mainly affecting the Thai financial sectors, before spreading to other Asian countries (BOT, 1997). As Thailand was the country of origin of the Asian financial crisis, there are several controversial issues concerning the cause of the crisis. One important cause was claimed to have been financial liberalization and the financial development which took place before the 1997 period (from 1990 to 1995). A relaxation of financial controls caused by financial liberalization and other financial development plans rapidly increased domestic and foreign debts, as well as jeopardizing risky investment projects and other less productive sectors (real estate and securities) (Sussangkarn and Vichyanond, 2007). This caused an asset price bubble and a low quality of financial institution and business sector balance sheets, leading to a weakness of the financial sector (Sussangkarn and Vichyanond, 2007)[1]. This condition consequently accelerated the financial crisis, when there was a speculative attack and collapse of the asset price bubble in the country during 1997. For this reason, it is worthwhile to conduct a case study of Thailand in order to explore how financial development affects the channels of monetary policy transmission relating to the banking sector. The results from this study will have important policy implications for the government and the Bank of Thailand, indicating how monetary policy affects the banking sector and also how financial development affects the sector and the economy. Consequently, policy makers can enact appropriate monetary policy during the period of financial development to prevent an ongoing financial sector and banking sector crisis in the future, as well as achieving the economic policy goals of the country (sustainable economic growth rate and price stability).

[1] The details of this will be described in chapter 3.

In addition, the financial institutions and economic agents (business sectors and households) in Thailand will have a better understanding of the way in which financial development and monetary policy shock affect their agents and the banking sector. This results in the benefit of being prepared for monetary policy shock and other changes which are a consequence of financial sector development.

1.2 Research objectives

The main aims of the thesis are to examine the channels of monetary policy transmission by focusing on those channels which relate to the banking sector (bank lending channel, firm balance sheet channel and the interest rate channel), as well as investigating the effect of financial development on these channels in Thailand. We will therefore divide the research objectives into three important areas, representing the study of three significant channels of monetary policy transmission relating to the banking sector (the bank lending channel, the bank balance sheet channel and the interest rate channel). The first area of the study aims to explore the bank lending channel and examines the effect of financial development on the channel in Thailand. Because of the lack of studies of the bank lending channel from the micro data based perspective which take into account a panel data based study as well as the effect of different bank characteristics (bank size, capitalization and liquidity) on the bank lending channel in developing countries (as discussed in chapters 2 and 4), we will investigate the bank lending channel in Thailand by focusing on a micro data based study. We also study the effect of financial development by dividing this effect on the bank lending channel into five different issues: financial liberalization, financial competition, financial innovation, capital market development and banking sector development. The first area of study is mainly discussed in chapter 4 of the thesis.

The second area of the thesis will focus on the second aspect of the channels of monetary policy transmission relating to the banking sector, namely the balance sheet channel. As this channel can be explored from two aspects, the lenders (bank balance sheet channel) and borrowers (firm balance sheet channel), various past studies have largely focussed on the lenders' approach, leaving a gap in the study of the borrowers' approach, especially in developing countries. Therefore, the second area of this study will examine the firm balance sheet channel in Thailand. This is carried out by studying the effect of firms' financial condition on their investment in order to prove the existence of their balance sheet channel. We will also investigate the effect of different financial constraints (firm size, leverage, dividend payout and cash flow) on firm investment in order to take into account the effect of different financial conditions of firms on the firm balance sheet channel. Furthermore, we will examine the effect of financial development on the firm balance sheet channel by examining the effect of different aspects of this development (as in the first area of study presented previously) on this channel. The second area of study is mainly discussed in chapter 5 of the thesis.

The third area of study explores another channel of monetary policy transmission relating to the banking sector which is the interest rate channel. This part of the study is conducted by investigating interest rate pass-through in Thailand in both the short- and long-run, in order to obtain an idea of how the monetary policy interest rate affects commercial bank retail interest rates. Furthermore, this area of study examines the effect of different aspects of financial development (the same aspects as presented previously) on interest rate pass-through in Thailand. This area of study is mainly discussed in chapter 6 of the thesis.

1.3 Research contribution

This thesis makes several main contributions, as summarized below.

(1) Previous studies of the channels monetary policy transmission relating to the banking sector have ignored the effect of financial development on these channels, especially in developing countries. This thesis fills this gap, as it not only aims to examine the channels of monetary policy transmission relating to the banking sector, but also studies the effect of financial development on these channels by using the case study of Thailand as a developing country.

(2) The effect of different aspects of financial development (financial liberalization, financial competition, financial innovation, financial deepening, and banking sector and capital market development) on the channels of monetary policy transmission relating to the banking sector will be investigated. The study therefore also fills another gap in past empirical papers, which only focus on a few aspects of financial development on monetary policy transmission, such as financial liberalization and financial competition.

(3) This thesis is the first study of Thailand which introduces the effect of different aspects of financial development on monetary policy transmission relating to the banking sector. In

addition, it is the first case study of Thailand to introduce different financial development indicators to examine the effect of financial development on the channels of monetary policy transmission relating to the banking sector. In addition, study of an individual country can also control for the different structures of economic and financial backgrounds, which can be a problem when investigating multiple countries.

(4) The study investigates the bank lending and the balance sheet channels by using a micro data based approach (study of bank and firm panel data). This also compensates for the lack of past empirical papers in this area, which mainly use time series data in their studies, especially in developing countries and Thailand.

1.4 Data sample and research methodology

Different methodologies and data sets will be used in this thesis depending on the different areas of study mentioned in the research objective section. The first area of study (chapter 4), which is the study of the bank lending channel and the effect of financial development on this channel in Thailand, will be conducted by making a panel data based study of commercial bank level data in Thailand from the period 1978 to 2008. These data are obtained from the Stock Exchange of Thailand (thereafter, SET) database and the Pacific-Basin Capital Markets (thereafter PACAP) database[2]. The financial development indicator in Thailand is obtained from Beck et al.'s (1999) database, the PACAP database, and the Bank of Thailand database. We use three main types of panel data estimations in this study: (1) fixed effect estimation, (2) two states least square estimation (2SLS estimation) and (3) dynamic panel data (Generalised

[2] The PACAP database is the database subscription which provided the balance sheet statement data of financial and non-financial institutions in countries in the Pacific-Basin market. We use this database for the balance sheet data of banks and firms in Thailand listed on the SET from 1978 to 1996.

Method of Moments Estimator, thereafter GMM estimation) in order to check for the robustness of the results. The econometrics package used in the first area of the study is STATA version 12.

The second area of study (chapter 5), which is the study of the firm balance sheet channel and the effect of financial development on the channel in Thailand, will be conducted by applying the annual non-financial firm balance sheet data from 1978 to 2008. The five different aspects of the financial development indicators are also applied in this study in the same period. The firm level data comes from the SET and the PACAP database, and the financial development indicator is obtained from the same database as in chapter 4. The methodology employed is the dynamic panel data approach (GMM estimation) by using both first difference GMM estimation and system GMM estimation to compare and confirm the robustness of the results. The econometrics package used is STATA version 12.

The final area of study (chapter 6) considers interest rate pass-through and the effect of financial development on the pass-through in Thailand. This study is made by using the quarterly time series data from the same period, 1978Q1 to 2008Q4, of the commercial bank retail interest rates in Thailand (the lending and deposit interest rates), as well as the policy interest rate (14 day repurchase market interest rate). The same financial development indicators as presented previously are used in this study. The methodology used in this section is the Johansen cointegration approach and the econometrics package used is Pcgives version 13.10. All the data sources in this study were obtained from the Bank of Thailand database.

The financial development indicator data were obtained from the Bank of Thailand and Beck et al. (1999) databases.

1.5 Organisation of the study

The remainder of this thesis is organised as follows. Chapter 2 is a literature survey of both the theoretical and empirical issues of the channels of monetary policy transmission relating to the banking sector, as well as the effect of financial development on these channels. Chapter 3 will discuss the economic conditions, the financial institutions and the financial development background of Thailand. The main empirical section will start in chapter 4, which examines the bank lending channel in Thailand by mainly focusing on a micro data based study of this channel. Subsequently, the different aspects of the financial development indicators will be introduced into the study to investigate the effect of different aspects of financial development on the bank lending channel. Chapter 5 will examine the firm balance sheet channel in Thailand as well as the effect of the five different aspects of financial development on the channel. Chapter 6 presents a study of interest rate pass-through in Thailand, in addition to the effect of different aspects of financial sector development on the pass-through. Chapter 7 comprises the conclusion of the thesis and its limitations and makes suggestions for further study.

CHAPTER TWO

LITERATURE SURVEY

2.1 Introduction

The main aim of this thesis is to examine the channels of monetary policy transmission related to the banking sector and to investigate the effect of financial development on these channels. Therefore, this chapter will review the literature on the channels of monetary policy transmission related to the banking sector as well as the impact of financial development on these channels. The literature survey will be organised as follows: Section 2.2 will review the theoretical concept of the channels of monetary policy transmission related to the banking sector. Section 2.3 will survey the empirical study of these channels. Section 2.4 will explain the financial development concept. Section 2.5 will review the literature on the effect of financial development on the channels of monetary policy transmission related to the banking sector and section 2.6 draws conclusions and makes suggestions for further research.

2.2 Monetary policy transmission related to the banking sector

This thesis will mainly focus on the study of the channels of monetary policy transmission which relate to the banking sector: (1) the interest rate channel, (2) the bank lending channel and (3) the balance sheet channel of monetary policy transmission. This section will explore the theoretical concept of these three main channels.

2.2.1 Interest rate channel of monetary policy transmission

The interest rate channel explains the effect of the policy interest rate, which will pass through to the market interest rate, retail interest rates and then affect the real economy (aggregate output). Kusmiarso et al. (2002) state that when the central bank uses a contractionary monetary policy via an increase in the policy interest rate, it will cause a rise in the short-term money market rate and then result in an increase in the short-term retail interest rate. Due to price stickiness, the increase in the short-term nominal interest rates will lead to a rise in the short-term real interest rates (Mishkin, 1996). In addition, because of the expectations hypothesis of the interest rate term structure, a rise in the short-term real interest rate will cause an increase in the long-term real interest rate, as the average expectation of future short-term interest rates is considered as the long-term interest rates (Mishkin, 1996; Kusmiarso et al., 2002; Fomum, 2011; Bangura, 2011). Thus, an increase in the real interest rate causes a rise in the cost of capital and hence decreases investment spending, aggregate demand and aggregate output (Kusmiarso et al, 2002; Pruteanu-Podpiera, 2007). Berg et al. (2005) and Markovic (2005) demonstrate the role of the interest rate channel on financial intermediation (the banking sector) and credit supply. This role is explained by interest rate pass-through, as an increase in the policy interest rate will affect the banking sector by increasing bank retail interest rates (deposit rate and lending rate) (Berg et al., 2005). This causes a reduction in loan demand and loan supply and thus decreases investment spending and aggregate demand.

An increase in the real interest rate will also affect consumer spending. This process is explained by the income effect and the substitution effect of the interest rate channel.

Kusmiarso et al. (2002) point out that an increase in the real interest rate can cause an increase in the return on saving as well as a reduction in the future costs of consumption. This results in the postponement of consumption and will therefore lower the consumption of non-durable goods and aggregate output (the substitution effect) (Kusmiarso et al., 2002). The income effect can explain the effect in terms of borrowers and creditors. If the economic agents are borrowers, an increase in the real interest rate can also lead to a decrease in consumption expenditure due to a reduction in future discounted income and the cash flow of consumers (Kusmiarso et al., 2002; Meltzer, 1995). However, if the economic agents are creditors, an increase in the real interest rate will cause an increase in their wealth and thus increase consumption expenditure (Kusmiarso et al., 2002; Egert and Macdonald, 2006). Therefore, if we consider the interest rate channel via the effect of monetary policy on consumption expenditure, the effect of the policy instruments through this channel will depend on which effects (substitution effect, income effect in term of borrowers, and income effect in term of lenders) have more influence on the interest rate channel.

Overall, the effect of monetary policy through the interest rate channel can represented as one of the channels of monetary policy transmission relating to the banking sector, as the effect of the policy interest rate (monetary policy shock) will pass through to the banking sector via the effect on the money market rates and the commercial bank retail interest rates (retail interest rate). This also results in an effect on bank loan demand and supply and thus affects investment and the economy.

2.2.2 Credit channel of monetary policy transmission

Four assumptions of this channel should be considered in order to study the credit channel theory: (1) the bank loan supply has been influenced by the central banks (Ghazali and Rahman, 2001; Gertler and Gilchrist, 1993); (2) banks are the main source of funds for borrowers and firms (Butkiewicz and Ozdogan, 2009; Ghazali and Rahman, 2001); (3) there is an imperfect substitution between loans and other sources of funds (such as bonds and other securities) (Brissimis and Delis, 2009; Favero et al., 1999; Butkiewicz and Ozdogan, 2009); and (4) there is a stickiness in the nominal price which causes an impact of the monetary policy on real economic activities via the credit channel (Peek and Rosengren, 1995b; Gupta, 2004).

The credit channel of monetary policy transmission can be divided into two channels: the lending channel (narrow credit channel) (2.2.2.1) and the balance sheet channel (broad credit channel) (2.2.2.2).

2.2.2.1 Lending channel (narrow credit channel)

The lending channel explains the impact of monetary policy shock on the economy through the effect on both the assets and liability of banks. According to Mishkin (1996), Hubbard (1995) and Kishan and Opiela (2000), the use of contractionary monetary policy by increasing reserve requirements will lead to a decrease in bank reserves and deposits (liability side), resulting in a reduction in the quantity of bank loans (asset side). This condition happens as a consequence of an imperfect substitution of loans and other sources of funds. Moreover, the central banks also use the policy interest rate as an instrument to conduct monetary policy. Mishkin (1996) states that contractionary monetary policy via an increase in the policy interest rate (usually the short-term money market interest rate) will lead to a rise in the market interest rate and a reduction in the money supply in the economy, thereby causing a reduction in bank loans. This leads to a decrease in the investment and consumer spending of household and firms due to the major dependence of borrowers and firms on bank funding, hence lowering aggregate demand and aggregate output (Mishkin, 1996; Ireland, 2006; Chakravarty, 1971; Haan, 2001).

2.2.2.2 Balance sheet channel (broad credit channel)

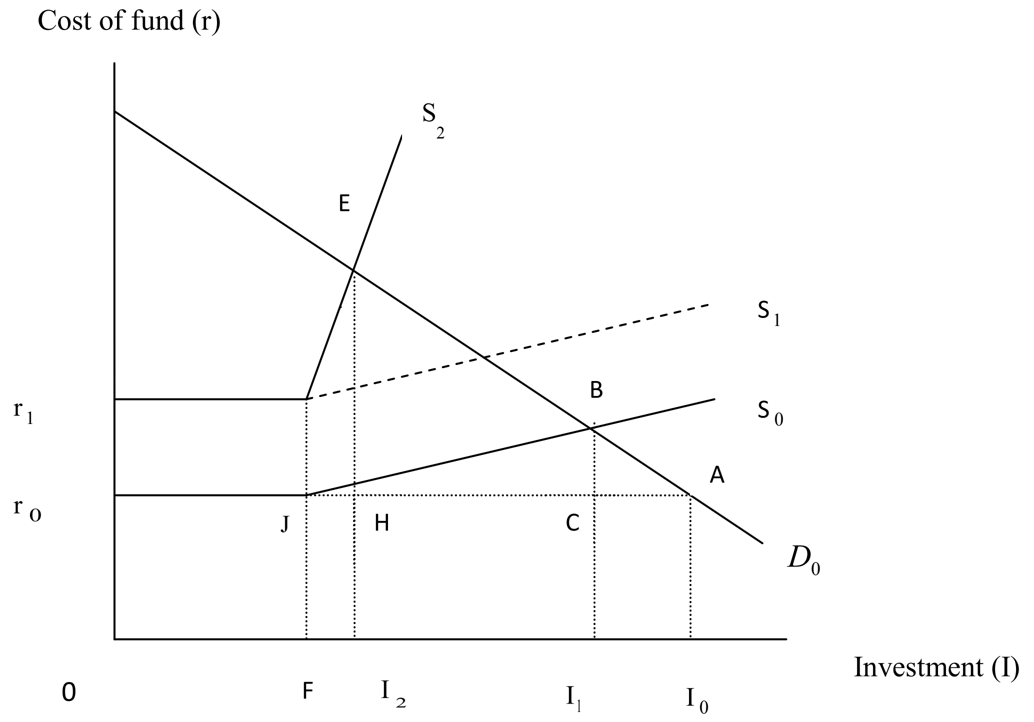
Monetary policy shock will affect the economy via the effect of loan supply in the bank lending channel. However, the external finance premium and the financial position of lenders and borrowers (their net worth and cash flow) are crucially focused on the effect of monetary policy shock through the balance sheet channel (Agung et al., 2002b; Engler and Macdonald, 2006). In this case, contractionary monetary policy (an increase in the policy interest rate) will result in a reduction in the net cash flows in the balance sheet of firms (Mishkin, 1996; De Oliveira and Ramos, 2008). This causes a decrease in firms' collateral value and thus lowers net worth and weakens the balance sheet condition (Bernanke and Gertler, 1995; Wesche, 2000; Kim, 1999; De Oliveira, 2006; Ireland, 2008; Mies and Tapia, 2003).

A weak firm balance sheet will result in the higher possibility of moral hazard and an adverse selection problem between banks and firms, as well as an increase in the monitoring and screening cost of lenders (Kadapakkam et al., 1998; Wesche, 2000; Mishkin, 2007; Loayza and Schmidt-Hebbel, 2002). This is due to the lower net worth, and a deterioration in firms' balance sheets will probably lead to the higher possibility of firms investing in risky investment projects, raising their default risk and thus increasing credit rationing (Simatele, 2004; De Oliveira, 2006; Agung, et al., 2002b). This situation creates the risk premium charged by lenders or banks to prevent the asymmetric information problem.

Consequently, an increase in the policy interest rate will weakens firms' balance sheet condition and increases the risk premium of banks, causing a higher increase in firms' external funding cost compared with internal funding cost and thus raising the external finance premium of firms (the wedge between the external funding cost and internal funding cost of firms) (Agung, 1999; Agung et al., 2002b; Ciccarelli et al., 2009; Cecchetti, 1995,1999; Peek and Rosengren, 1995b; Bernanke and Gertler, 1995; Bernanke et al.,1996). This condition will be followed by a drop in the loan demand of firms (their bank borrowing), hence reducing their investment spending, which will pass through to a reduction in aggregated demand, output, and inflation in the economy (Gómez-González and Grosz, 2007; Ogawa, 2000; Jiménez et al., 2009).

The graphical model shown in figure 2.1 explains the effect of monetary policy shock on the balance sheet channel via the external finance premium. This model is found in many studies, such as Oliner and Rudebusch (1996a), Hall (2001), Gertler and Rose (1996), Agung et al. (2002b), Hubbard (1998), and Gilchrist and Zakrajsek (1995).

Figure 2.1: Graphical explanation of the effect of monetary policy shock on the balance sheet channel via the external finance premium



Source: Oliner and Rudebusch (1996a).

In figure 2.1, D is the curve for demand for funds and S is the curve for the supply of funds by firms. Oliner and Rudebusch (1996a) explain that when there is perfect information in the credit market, there is the borrowers' internal fund (F), the borrowers' external fund (I_0-F), and the internal funding cost (r_0), which is the combination of the risk free interest rate (r^f) and the risk adjustment cost (θ). The equilibrium point in this case is at point A, which is the intersection between the flat supply of funds curve (r_0A) and demand for funds (D_0). In reality, the financial market is considered as a market with imperfect information, which causes lenders to charge the premium for external funding for borrowers (BC), hence resulting in an upward slope in the supply of funds curve (S_0) from the beginning point of J (Hall, 2001; Gilchrist and Zakrajsek, 1995; Agung 1999). This situation causes a change in the equilibrium from A (in the case of perfect information) to B and a drop in the investment level from I_0 to I_1. The higher the firms' borrowing, the greater the external finance premium, thereby representing the upward slope of the supply of funds curve (Agung et al., 2002b; Peek and Rosengren, 1995b; Agung, 1999). In addition, the higher the risk free rate (r^f), the greater the external finance premium. This is due to a reduction in the borrowers' collateral discount value caused by a rise in the risk free rate, thereby leading to a rise in the external finance premium to protect the moral hazard problem (Oliner and Rudebusch, 1996a). Therefore, we can write the external finance premium function as

$$\Omega = \Omega(r^f, \text{I-F}) \tag{2.1}$$

where firms' borrowing (I-F) and the risk free rate (r^f) have a positive effect on the external finance premium (Ω).

According to Oliner and Rudebusch (1996a) and Agung et al. (2002b), the function of the total cost of funds can be written as

$$r = r_0 + \Omega(r^f, \text{I-F}) \tag{2.2}$$

A contractionary monetary policy will cause a rise in the risk free rate (r^f) according to the broad credit channel, thus leading to a rise in the total cost of funds (r) equal to $\frac{\partial r_0}{\partial r^f} + \frac{\partial \Omega}{\partial r^f}$ (Oliner and Rudebusch, 1996a). This condition causes a decrease in the supply of funds, shown by the upward shift in the supply of funds curve from S_0 to S_1, which reflects the change in the risk free rate. Additionally, the contractionary monetary policy will cause a drop in the net worth and collateral value of borrowers as well as a higher possibility of moral harzard and adverse selection problem.This leads to a rise in the external finance premium of firms and thus causes a change in the supply of funds curve from S_1 to S_2 (Gertler and Rose, 1996; Gilchrist and Zakrajsek, 1995). Therefore, this causes a total effect, represented by an upward shift in the supply of funds curve from S_0 to S_2 (with a steeper curve in S_2). This leads to a rise in firms' external funding premium from BC to EH and a reduction in the investment level of firms from I_1 to I_2.

We already stated previously that a decrease in firms' net worth and a rise in the external finance premium will eventually have an effect on the economy (a reduction in firms' investment and output). Bernanke et al. (1996), Bernanke (2007), Lunnemann and Matha (2001), Georgopouls and Hejazi (2009), and Angelopoulou and Gibson (2007) state that this process is called the financial accelerator effect, as the financial conditions (cash flow, net worth and balance sheet status of borrowers, and the external finance premium) have a pro-cyclical effect on the real economy (firms' investment).

2.3 Empirical studies of monetary policy transmission relating to the banking sector

This section will be divided into two main sub-sections: empirical studies of the macro data based aspect (2.3.1) and those of the micro data based aspect (2.3.2).

2.3.1 Empirical studies of the macro data based aspect of the channels of monetary policy transmission relating to the banking sector

The empirical studies of the macro data based aspect mainly use time series data in their studies. Walsh and Wilcox (1995) examine the lending channel in the USA by applying the VARs technique. Their results show the negative effect of the policy interest rate on the industrial production index, aggregate bank loans and CPI, as well as the positive effect of bank loans on output variables. Their findings support the theoretical view of the lending channel. Using the VARs technique, Kashyap et al. (1992), Kashyap and Stein (2000), Oliner and Rudebush (1996b), Romer et al. (1990), Haan (2007), Den Haan et al. (2007), and Aslanidi (2007) also found a negative impact of monetary policy shock on bank loans in the USA. Other studies of the lending channel in developed countries which also apply aggregate data (short-term money market rate, bank loans, GDP and CPI) include those of Küppers (2001), Holtemoller (2002), Hulsewig et al. (2005), and Ehrmann and Worms (2004) in Germany, Garretsen and Swank (2003) and Kakes (1998) in the Netherlands, Giannone et al. (2009) and Barran et al. (1996) in European countries, and Kim (1999) in Korea. Their findings are also in line with the theoretical aspect of the lending channel as they mainly found the negative effect of the policy interest rate on bank loans.

Bernanke and Blinder (1992) investigate both the bank lending and the balance sheet channels in the USA and their VARs results show a negative effect of the Fed fund rate on the bank balance sheet variables (aggregate commercial bank loans, deposits and securities), hence supporting the theoretical view of the credit channel. Similar results are also reported by Gertler and Gilchrist (1993), Bernanke and Gertler (1995), Weber et al. (2009), Cechetti

(1995), Carpenter and Demiralp (2009), Kashyap and Stein (1994a), and Sousa (2009) from VARs studies of the US balance sheet channel. Bacchetta and Ballabriga (2000) examine the bank lending and the balance sheet channels in 14 European countries and find a reduction in the bank balance sheet variables (deposits and loans) and output variables (CPI and industrial production) after the shock of the short-term interest rate. Macro aspect studies of the balance sheet channel in developed countries include those by Gupta (2004) and Chakravarty (1971) in India, Smant (2002) in Germany, Ferri and Kang (1999) in Korea, Wesche (2008) in Austria, and Dale and Haldane (1995) in the UK.

Angeloni et al. (2002), Bory et al. (2009), and Dale and Haldane (1995) examine the interest rate channel in the Euro area, Czech Republic, and UK respectively and their VARs results confirm the interest rate channel theory, as they show that the policy interest rate has a positive effect on the money market interest rate and a negative effect on GDP and investment. Supporting evidence for the interest rate channel is also found in the studies by Chong et al. (2006) in Singapore. Several studies in developed countries also examine the interest rate channel by investigating interest rate pass-through (Lowe and Rohling, 1992; Hansen and Welz, 2011; Liu et al., 2005; Bolt and Labondance, 2011; Belke et al., 2012; Toolsema et al., 2002; Mojon, 2000; Karagiannis et al., 2011; De Bondt, 2002; Crespo-Cuaresma et al., 2006). Their findings also show the positive effect of the policy interest rate on retail interest rates and hence support the theoretical aspect of the interest rate channel. Aleem (2009) found that the policy interest rate has a positive effect on the money market rate and a negative effect on aggregate credit, hence supporting the theoretical view of both the bank lending and interest rate channels. Studies using aggregate data to examine both the bank lending channel and interest rate channel include studies of the Euro area (Héricourt, 2006; Weber et al., 2008; Angeloni and Ehrmann, 2003), of Korea (Pobré, 2003), of Poland (Lyziak et al., 2008) and of Singapore (Weber et al., 2009).

In a study of developing countries, Gupta (2003) shows the negative response of the aggregate credit and output variables on the shock of the monetary policy instrument in Brazil and Turkey. Agung (1998) uses the SVARs method and his results confirm the theory of the balance sheet and lending channels in Indonesia, as the bank balance sheet variables (aggregate bank loans, deposits and securities) and macroeconomic variables (real GDP and GDP deflator) have a negative response to a shock of the short-term money market interest rate. Other studies in developing countries which also support the theoretical view of the credit channel include those by Raghavan and Silvapulle (2012) and Kassim and Abdul-Manap (2008) in Malaysia; Gupta (2004) in Pakistan; Sheng and Wu (2009) in China; Islam and Rajan (2009) in India; Younus (2005) in Bangladesh,; Zulverdi et al. (2006) in Indonesia; Krstevska (2008) in Macedonia; Jayaraman and Choong (2008) in Fiji; Alam and Waheed (2006) in Pakistan; Robinson and Robinson (1997) in Jamaica; and Boughrara (2009) in Morocco and Tunisia.

Raghavan and Silvapulle (2012) and Fung (2002) study monetary policy transmission in Malaysia and East Asian countries during the pre-and post-financial crisis periods and they conclude that there is a stronger effect of the policy interest rate on the output variables during the post-crisis period. Kuijs (2002), Mohanty (2012), Samkharadze (2008), and Carrasquilla et al. (2008) found a significant effect of policy interest rate shock on aggregate output and prices in the Slovak Republic, India, Georgia, and Columbia respectively. This confirms the existence of the interest rate channel. Study of the interest rate channel can be made by examining interest rate pass-through; this can be widely seen in several evidence studies in developing countries (Fomum, 2011; Amarasekara, 2005; Acheampong, 2005; Chirlesan and Aposstoaie, 2012; Bogoev and Petrevski, 2012; Kusmiarso et al., 2002; Aydin, 2010; Tai et al., 2012; Scholnick, 1996). Uanguta and Ikhide (2002) support the theoretical view of the lending and interest rate channels in Namibia, as there is a significant negative effect of the repo rate on aggregate bank credit, CPI and private investment, as well as an effect of the policy rate on the short-term lending rate and output variables. Supporting evidence for the bank lending and interest rate channel can be found in Afandi (2005), Bhattacharyya and Sensarma (2008), and Butkiewicz and Ozdogan (2009) in their case studies of Indonesia, India, and Turkey respectively. They found a significant effect of policy interest rate on aggregate credit, output and money market interest rates. Studies of developing countries concerning both the interest rate and credit channels can be seen in Hung and Pfau (2008) in Vietnam, Pobré (2003) in the Philippines, and Aslanidi (2007) in Georgia.

For the studies in Thailand, Atchariyachanvanich (2004) examines the lending channel in the ASIA-5 countries (including Thailand) and the results from the VAR technique mainly indicate a negative effect of the short-term interest rate on the aggregate bank lending rate and output variables, thus confirming the lending channel theory. Kubo (2008) studies the credit channel in Thailand and his SVARs results indicate a negative response of the credit and real economic variables (CPI, PPI and the industrial production index) on the monetary policy instrument, supporting the lending channel theory. Similar results from Thailand are obtained by Jayaraman and Choong (2008). Disyatat and Vongsinsirikul (2003), Sriphayakand and Vongsinsirikul (2007) and Subhanij (2000) examine the Thai lending and interest rate channels and their outcomes also confirm the theoretical aspect of the lending channel, as they found a negative effect of the policy rate on GDP, CPI and bank loans. Their Engle-Granger 2 step procedure also shows a positive degree of pass-through of policy interest rate on bank retail rates, supporting the interest rate channel theory. Charoenseang and Manakit (2007) and Pobré (2003) focus on the study of the bank lending and interest rate channels in Thailand and their VECM results show a negative effect of the policy rate on commercial bank loans, as well as the long-run pass-through of the policy rate on the bank lending rate.

2.3.2 Empirical studies of the micro aspect of the channels of monetary policy transmission relating to the banking sector

The empirical studies of the macro aspect presented previously only employ aggregate time series data (aggregate bank balance sheet variables and aggregate macroeconomic variables) to examine monetary policy transmission related to the banking sector. Many researches point out that there is an identification problem associated with the use of aggregate data (the study of the macro aspect) due to the lack of distinction between the effect of monetary policy shock on the supply side (bank loan supply) and on the demand side (the demand for loans from firms and households), which is called the supply-versus-demand puzzle (Wibowo, 2005; Chatelain et al., 2001; Agung et al., 2002a; Gupta, 2004; Kakes, 1998). This problem is frequently found in studies of the lending and the balance sheet channels. Garretsen and Swank (2003), Hosono (2006), Altunbas et al. (2009b) and Hernando and Martinex-Pagés (2001) state that the credit channel should be examined in micro data based study by using panel level data (bank and firm panel level data) in order to distinguish between the supply and demand effect of bank loans. The characteristics of lenders and borrowers (bank and firm size, liquidity and capitalization) are also used in micro data based study in order to control for the banks' and firms' heterogeneity. Therefore, this section will review the empirical literature on the micro data based aspect of monetary policy transmission relating to the banking sector.

By applying bank characteristics such as size, liquidity and capitalization, Kishan and Opiela (2000) and Altunbas et al. (2002) found a weaker effect of the policy interest rate on bank loans via the bank lending channel in highly capitalized and large banks, compared with the low-capitalized and small ones, in the USA, and the Euro area respectively. They conclude that the larger the bank size and capitalization, the weaker the effect of policy interest rate via the bank lending channel. The studies of the lending channel in European countries by Favero et al. (1999) and Ehrmann et al. (2001) conclude that there is a weaker effect of policy interest rate on bank loans in large and highly liquid banks. In addition, the studies of European countries by Matousek and Sarantis (2009), Haan (2001) and Altunbas et al. (2009b) found a weakening of the bank lending channel in large, highly liquid and well capitalized banks. Other studies of developed countries which apply the bank characteristic variable include Hosono (2006) in Japan; Topi and Vilmunen (2001) in Finland; Pruteanu-Podpiera (2007) in Czech Republic; Loupias et al. (2002) in France; and Farinha and Marques (2001) in Portugal. Studies of developing countries include that of Agung et al. (2002a), who found that poor bank capitalization results in a greater effect of the policy rate on bank loans in Indonesia. De Oliveira and Ramos (2008) conclude that there is a weaker effect of policy interest rate via the bank lending channel in large and highly liquid banks in Brazil. Sichei (2005) and Alfaro et al. (2003) investigate both the bank lending and balance sheet channels in South Africa and show that higher bank size and capitalization can lead to a weaker effect of the policy rate on bank loans and securities. In a study of Thailand, Piyavongpinyo (2002) found that monetary policy will have less effect on large banks than small ones.

For the study of firm characteristics, studies of developed countries by Oliner and Rudebusch (1996a) and Gertler and Gilchrist (1993, 1994) in the USA; Gaiotti and Generale (2001) in Italy; Wesche (2000) and Valderrama (2001) in Austria; Yamashiro and Uesugi (2006) and Kuwayama (1997) in Japan; and Butzen et al. (2001) in Belgium, investigate the firm balance sheet channel and show that large firms can access other sources of funds more easily than small ones. This results in a less dependence of firms on their internal finance and a weaker effect of the policy interest rate through the firm balance channel in large firms. Guariglia (1999) shows that the effect of monetary policy via the firm balance sheet channel in the UK will be considerably higher in high leverage ratio firms than low leverage ones due to the more dependence of high leverage firms on the internal finance. Fazzari et al. (1988), Kaplan and Zingales (1997) and Angelopoulou and Gibson (2007) show that there is a weaker balance sheet channel in high dividend firms than low dividend ones in the USA and UK respectively. For developing countries, the studies by Carrasquilla (1998) in Columbia, Héricourt and Poncet (2007) in China, and Yalcin et al. (2004) in Turkey show that large firms can access external funding sources more than small ones and thus there is a weaker effect of policy interest rate via the firm balance sheet channel in the large firms. Agung (1999) found that monetary policy shock has less effect on large firms with high leverage and high dividend payout ratios in Indonesia and thus these firm characteristics will weaken the firm balance sheet channel. The same results are also found in the studies by Agung et al.

(2002b) in Indonesia and Ber et al. (2002) in Israel. Rungsomboon (2005) shows that large and highly liquid firms will have less dependence on their internal finance as these firms can obtain other external source of funds. Thus, policy shock in Thailand will weaken the firm balance sheet channel in the large and highly liquid firms than the small and low liquid ones.

Overall, most of the empirical studies of monetary policy transmission related to the banking sector have focused on macro data based studies. This leaves a gap in micro data based study in relation to the panel level data and the characteristic data of banks and firms. In addition, this micro data based aspect is mainly focused on developed countries, leaving a lack of studies of developing countries, especially of Thailand (Rungsomboon, 2005; Piyavongpinyo, 2002). Therefore, it would be interesting to study the micro aspects of the lending and balance sheet channels in Thailand as a case of a developing country. Moreover, the micro data based study of developing countries (including studies of Thailand) mainly focus on the size characteristic of firms and banks and do not consider other characteristics (for example, the capitalization and liquidity of banks, and the dividend payout ratio and leverage of firms). It would therefore be of interest if studies of the micro aspects in the future include different types of characteristic variables.

2.4 The financial development concept

One of the main aims of this thesis is to study the effect of financial development on monetary policy transmission relating to the banking sector. Thus, it is necessary to discuss the different perspectives of financial development on which this research focuses. Demirguc-

Kunt and Levine (2008) state that financial development is the condition in which there is development in financial intermediaries, markets, instruments and sectors. This condition will lead to an improvement in risk management, trading and allocation of capitals; a reduction in information costs; better savings and investments mobilization; and efficiency in the exchange of goods and services (Demirguc-Kunt and Levine ,2008). Sen (2010) states that financial development is also shown by financial sector efficiency (better mobilization and productive use of resources), a development in financial intermediaries, and financial deepening. Singh et al. (2008) explain that financial development is the process of financial market development, which comprises financial liberalization, deepening, innovation, competition, and structural change in the financial system. Therefore, based on these definitions of financial development, our discussion will be divided into five main perspectives: financial liberalization (2.4.1), financial competition (2.4.2), financial deepening (2.4.3), financial innovation (2.4.4) and other structural change (2.4.5).

2.4.1 Financial liberalization

According to Ranciere (2013) and Ucer (1997), financial liberalization involves the process of financial sector and market deregulation. The process of financial liberalization which is commonly mentioned is interest rate deregulation. Interest rate liberalization includes the relaxation of bank lending, deposit rates and other financial interest rate control, and is usually referred to as the abandonment of the interest rate ceiling (Jbili et al., 1997; Ucer, 1997). The liberalization of capital accounts is also involved in the financial liberalization process and this is manifested by the deregulation of domestic and foreign capital control, deregulation of restrictions on capital inflows-outflows, relaxation of the restrictions on financial institutions' offshore borrowing and a reduction in transaction taxes (Arestis and Caner, 2004; Johnston, 1998). Other financial liberalization processes are mainly shown by the removal of banking portfolio restrictions, the deregulation of stock market trading restrictions, bank and financial institution privatization, the relaxation of monetary and credit control and foreign exchange control liberalization (Baswir, 2013; Arestis and Caner, 2004; Ucer, 1997; Kaminsky and Schmukler, 2003).

2.4.2 Financial competition

Financial competition refers to the competition in financial markets and financial institutions, which leads to an increase in the number of financial institutions, a rise in the range of financial market instruments, and greater opportunity for consumers to access a variety of providers, financial services and financial products (International Monetary Fund, 2005). According to Beck et al. (1999), The World Bank (2010) and The International Monetary Fund (2005), financial competition also refers to the market structure, the efficiency of the financial market and the performance of the financial system. A higher level of financial competition can lead to higher efficiency in the financial market and hence results in a higher degree of financial development. This is because the greater extent of financial competition will lead to a lower cost of providing financial products and services, hence increasing the efficiency of the financial market and financial sector development (International Monetary Fund, 2005). Johnston and Pazarbasioglu (1995) and Singh et al. (2008) state that financial competition is also caused by the financial liberalization processes, such as deregulation of geographic and product restrictions and relaxation of the barriers to the entry of financial institutions. This therefore shows that financial competition will represent one of the components of financial development.

2.4.3 Financial deepening

Financial deepening is the condition when there is an increase in the quantity, quality and range of specialized and organized financial market products and investment, and also an increase in financial intermediary activities, functions and specialization (Fritz, 2013; Shaw, 1973). Financial deepening can refer to financial disintermediation, as borrowers and investors have more opportunity to invest in other funding sources, such as capital markets (equity and bond markets, unit trusts and mutual funds), instead of mainly depending on the banking sector as the main financial intermediary (Singh et al., 2008). In other words, development in the capital markets and other types of capital market instruments (bonds, securities, equities and mutual funds) can also be referred to as financial deepening. Goyal et al. (2011) state that financial deepening also refers to greater opportunity for financial sectors to access the financial market, a high level of financial market liquidity and a greater range of the assets with the purpose of hedging or diversification. According to King and Levine (1993a), Rajan and Zingales (1998) and Goyal et al. (2011), financial deepening means the situation where a broad range of financing and risk management instruments are allowed for investment and are widely chosen by investors. Overall, financial deepening will result in the development of financial markets and institutions in the economy, hence showing financial development.

2.4.4 Financial innovation

Financial innovation involves situations where new financial instruments, financial services, financial technology and regulations are introduced and developed in markets and financial sectors (Kogar, 1995; Mishkin, 2013). Llewellyn (1992) defines the meaning of financial innovation as when (1) new financial instruments, techniques and markets are created and (2) the separate characteristics and the risks of individual instruments are unbundled and reassembled into different combinations. Financial innovation can be classified into four categories, namely (1) risk-transferring innovations (which aim to diversify the risk of particular instruments), (2) liquidity-enhancing innovations (with the aim of increasing the liquidity of the financial market and instruments, such as the securitization of financial assets), (3) credit-generating innovations (which aim to create a rise in credit volume and an increase in credit market assessment), and (4) equity-generating innovations (aiming to increase the role of equity characteristics in financial assets, such as the debt-equity swap technique) (Llewellyn, 1992). The example of financial innovation includes the securitization of financial market instruments (mortgage-backed securities and certificates of deposit), the introduction of banking off-balance sheet business, the creation of secondary market trading (interest rate, currency swap and over-the-counter market), new market proliferation, new capital market product issuing (financial futures and derivatives), and new technologies in financial market trading and payment (ATMs, credit cards, electronic money) (Llewellyn, 1992; Singh et al., 2008; Allen and Santomero, 1999).

2.4.5 Other structural change

The financial development process also includes the situation in which there is a structural change in the financial markets and sectors. Singh et al. (2008) point out that this situation involves monetary policy operating framework reform as well as legal and institutional structure changes which create financial development in the country. Beck and Levine (2003) show that changes in the legal system also encourage financial development due to deregulation policies and legal changes which aim to improve the financial system. In practice, structural change in many countries will be different depending on the economy, government, financial conditions and the reasons why those countries are improving their financial development.

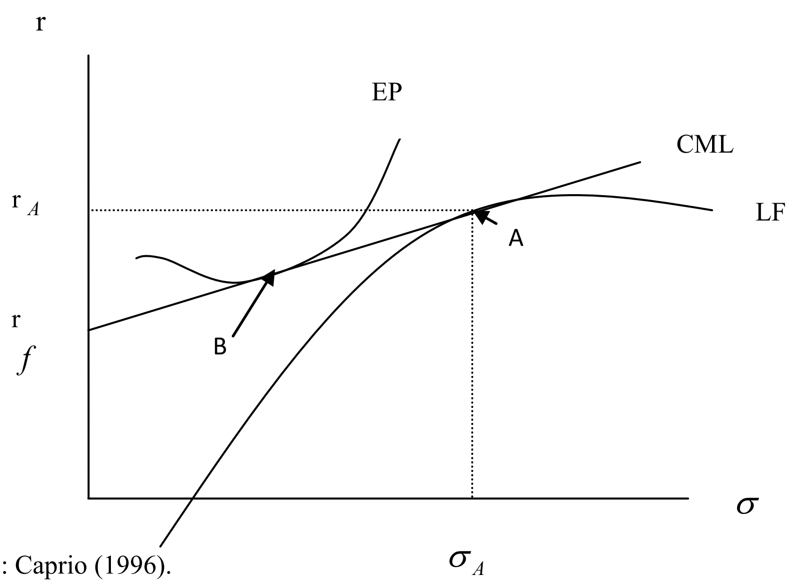
2.5 Literature concerning the effect of financial development on the channels of monetary policy transmission related to the banking sector

We are now reviews the literature involving the effect of financial development on the channels of monetary policy transmission related to the banking sector. This section will discuss the literature on the effect of financial development on the financial sectors, with the associated implications for the channels of monetary policy transmission related to the banking sector (2.5.1), and the empirical studies of the effect of financial development on these channels (2.5.2).

2.5.1 The effect of financial development on the financial sectors and the implications for the channels of monetary policy transmission related to the banking sector

Caprio (1996) highlights that financial development can cause changes in the portfolio choice of banks and he explains this by introducing the bank portfolio choice model shown in figure 2.2. In this model, banks have to trade off between the expected return on loans (r) and the loan risk (loan return standard deviation: σ).This is indicated by the loan frontier (LF), which is a concave curve due to the assumption that banks are risk averse. This means that when the expected return on loans increases, banks will accept a higher risk than a rise in the expected return due to a higher possibility of default (Caprio, 1996). This results in a downward sloping LF curve from point A. The capital market line (CML) illustrates the overall combination of riskless assets (treasury bills) and risky loans in an efficient portfolio (Mittra and Gassen, 1981). This combination is chosen by banks and will be illustrated by an efficient investment portfolio curve (EP) (Caprio, 1996).

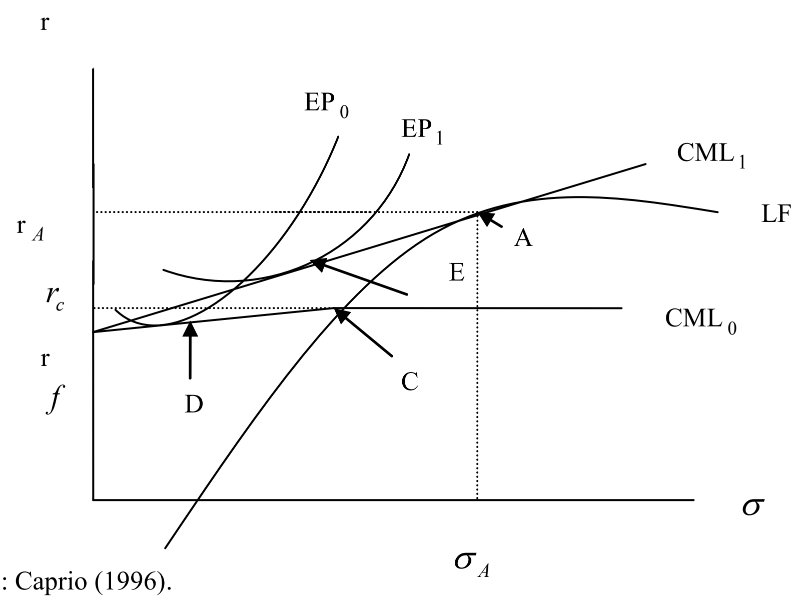
Figure 2.2: Model of the portfolio choice of banks



Source: Caprio (1996).

Figure 2.2 shows that r_f is the risk-less interest rate (treasury bill interest rate), r_A is the risky interest rate (interest rate of risky loans), and point B is the point which shows the chosen portfolio of banks holding riskless assets and risky loans (Caprio, 1996).

Figure 2.3: Model of the portfolio choice of banks when there is an abolition of the interest rate ceiling



Source: Caprio (1996).

Figure 2.3 shows the portfolio choice model when there is an interest rate ceiling at r_c with the CML_0. The portfolio choice of banks will be indicated at point D, with the intersection of the EP_0 line and CML_0 line (banks will not choose a portfolio in the area to the right of point C, as the same return will give them higher risk) (Caprio, 1996).

Caprio (1996) uses this model to explain the effect of financial liberalization on banks' portfolio choice. He explains that when there is an abolition of the interest rate ceiling at r_c there is a change in the EF curve from EP_0 to EP_1 and CML_0 to CML_1 thus altering the portfolio choice of banks from point D to point E and raising the loan supply compared with the pre-banking liberalization period (Caprio, 1996).

This model has implications for the channels of monetary policy transmission related to the banking sector, especially for the bank lending and balance sheet channels. In this portfolio choice model, financial liberalization (interest rate ceiling abolition) will cause an increase in the loan supply of banks (Caprio, 1996). Thus, this development will dampen the effect of the policy interest rate on bank lending and the balance sheet condition of banks compared with the pre-liberalization period. Iacoviello and Minetti (2008) also explain that deposit interest rate abolition will cause a rise in the deposit interest rate, thus increasing bank deposits. The increase in bank deposits will cause a substitution effect of the effect of policy interest rate on bank loans, lowering the effect of policy rate on the loans and thus weakening the bank lending channel.

Nevertheless, it can be argued that interest rate abolition can lead to a strengthening of the credit channel. This is because the change in bank loan supply also depends on banking behaviour towards the risk environment (Capiro, 1996). If banks are more risk averse, an increase in the lending rate will lead to a decrease in the loan supply due to the rise in risky borrowers, raising moral hazard and the adverse selection problem of banks and increasing the external finance premium of banks and borrowers (Caprio, 1996). This condition lowers the bank loan supply compared to the period before banking deregulation. Hence, during the financial liberalization period the effect of the policy interest rate through the bank lending and balance sheet channels will be considerably higher compared to the pre-financial liberalization period, thus strengthening the effect of monetary policy shock via the credit channel.

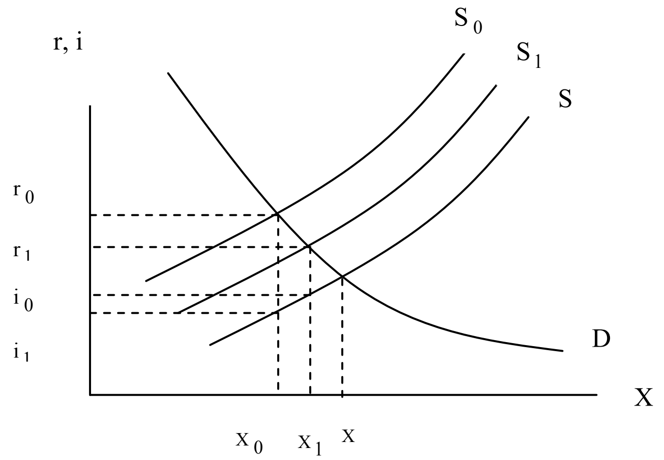
Guinigundo (2008), Johnston and Pazarbasioglu (1995) and Simatele (2004) point out that financial market liberalization will also involve the relaxation of financial institution and market restrictions (removal of banking portfolio restrictions, extension of banking sector business and deregulation of stock market trading restrictions). This condition affects the increase in financial institution business (issuing securities and investing in capital markets). It also causes a rise in the opportunities for banks and firms to obtain more sources of funding, hence strengthening their balance sheet condition (Sodsrichai, 1993; Caprio, 1996). This consequently leads to a weaker effect of the policy interest rate on bank loans and firms' net worth, weakening the lending and balance sheet channels. Hanson (1996) and Singh et al. (2008) point out that capital account and capital control liberalization will lead to a rise in the opportunities for banks and firms to access international funding sources and to invest in the capital market. This will dampen the effect of the policy interest rate on bank lending and the balance sheet channel, thus weakening the credit channel. However, Demirguc-Kunt and Detragiache (1998) argue that capital account liberalization can lead to an increase in foreign exchange and credit risk. This is because capital liberalization can result in the movement of foreign capital flow in the domestic economy and a rise in the capital funding of banks in terms of foreign currency. Therefore, the higher risk (exchange rate risk and credit risk) associated with capital account liberalization will lead to a reduction in the ability of banks to issue loans to borrowers and a decrease in equity investment, thus strengthening the effect of the policy rate through the bank lending and balance sheet channels.

Singh et al. (2008) and Aziakpono and Wilson (2010) state that interest rate deregulation (abolition of the interest rate ceiling) and financial liberalization will result in an increase in the degree of transmission of the policy interest rate on the bank retail rate, causing a strengthening of the interest rate channel. This is because when there is an abolition of the interest rate ceiling, banks will have the possibility to adjust the rates which are not now fixed at the ceiling and hence the pass-through of policy interest rate to retail interest rates will be greater (Singh et al., 2008). This causes an increase in interest rate pass-through and hence strengthens the interest rate channel. Other deregulation policies can be seen during a financial liberalization period in a country (deregulation of capital control, foreign exchange control relaxation and a relaxation of foreign transaction control). These policies can cause an increase in capital inflows, a higher volume of foreign exchange transaction, a rise in international lending, and more financial openness in the country (Singh et al., 2008; Fomum, 2011; Bangura, 2011; Kazaziova, 2010). Fomum (2011) states that more openness in the financial market will cause an increase in alternative sources of investment for bank customers. This leads to more competitive retail interest rates and thus increases the extent of interest rate pass-through and leads to a stronger interest rate channel.

Hanson (1996) mentions that financial competition will result in a rise in financial efficiency, and an increase in financial institutions' branches and networking, thus leading to a better portfolio selection for banks and borrowers. Northcott (2004), Angelini and Cetorelli (2000) and Petersen and Rajan (1995) state that an increase in market power in banking will encourage relationship lending and cause a rise in bank efficiency and stability, with an increase in firms' credit. Claessens (2009) highlights that financial competition in the financial sector will result in financial intermediation efficiency, an improvement in financial product innovation and a higher degree of assessment of financial services. The issue of the effect of financial competition on the financial market and financial sectors has an implication for monetary policy transmission related to the banking sector. A rise in the degree of financial competition will encourage an increase in the range of financial market instruments and greater opportunities for consumers to access a variety of providers, financial services and financial products (International Monetary Fund, 2005). This situation also weakens the effect of monetary policy through the lending and balance sheet channels, as banks and firms can outweigh the effect of the policy interest rate by using other funding sources. Moreover, Cottarelli and Kourelis (1994) and Fomum (2011) point out that a more competitive environment will lead to a higher degree of interest rate pass-through than a less competitive one. This is because in the more competitive environment, profit-maximizing banks will tend to reduce interest margins and this situation results in a reduction in interest rate stickiness and an increase in the size of pass-through (Bredin et al., 2001; Horváth et al, 2004) This situation results in a stronger effect of the transmission of the policy interest rate to the retail interest rate and the economy, thus strengthening the interest rate channel.

Gertler and Rose (1996) state that an increase in financial efficiency and intermediation caused by financial development will lead to a reduction in the external finance premium faced by borrowers and firms, increasing bank loans as well as firms' net worth and borrowing. In addition, the development in financial intermediation also results in an improvement in financial market liquidity and portfolio diversification and a reduction in financial costs and idiosyncratic risk (Gertler and Rose, 1996). This condition can increase bank loans, capital and firms' net worth, and reduce the external finance premium faced by firms. Therefore, financial development will dampen the effect of the policy rate on bank loans and firms' net worth, weakening the bank lending and firm balance sheet channels. The World Bank (1990) shows that the development of financial intermediaries will cause a reduction in borrowing and lending transaction costs. This will decrease the bank spread (the wedge between borrowers' costs and lenders' returns), thus increasing the credit supply. This explanation is illustrated in figure 2.4 .

Figure 2.4: Credit supply and demand curve



Source: The World Bank (1990).

Figure 2.4 shows a graph of credit supply (S) and credit demand (D). r is the borrowing cost (lending rate) and i is the lending return (deposit rate). Supposing there is no transaction cost, the borrowing cost will be equal to the lending return and X is the credit supply (The World Bank, 1990). In practice, there is a transaction cost in the financial market and this brings the credit supply curve to the S_0 line, where the transaction cost equals the distance between r_0 and i_1. According to The World Bank (1990), greater development of financial intermediaries will lead to a reduction in the borrowing and lending transaction costs and thus cause a rise in the supply of funds. This is shown by the rightward shift of the supply of credit curve from S_0

to S_1, causing a decrease in the transaction cost from $r_0 i_1$ to $r_1 i_0$, and a rise in the credit supply from X_0 to X_1. Therefore, the development of financial intermediaries will lead to a reduction in the interest rate spread of banks, thus raising credit supply and lowering the external finance premium faced by firms. This will dampen the effect of the policy interest rate on bank loans and the balance sheet of firms, meaning a weaker effect on the bank lending and balance sheet channels (Singh et al., 2008; Jbili et al., 1997). However, financial development in terms of a rise in financial intermediation activities and functions such as an extension of the scope of banking business and a rise in the degree of financial intermediation can lead to a weakening of the interest rate channel. This is because greater financial intermediation can increase the influence of banks on borrowers and firms, causing a lower elasticity of demand for loans and deposits and thus leading to a lower degree of pass-through (Horváth et al., 2006).

Gertler and Rose (1996) and Goyal et al. (2011) also point out that capital market development (financial deepening) will encourage investors to invest in the capital market and to obtain other funding sources. This increases financial market liquidity as well as firms' external funds. Thus, capital market development will lower the effect of the policy interest rate on the lending and balance sheet channels, as borrowers and banks can compensate for the change in loans by investment in other funding source (equities, bonds and other securities) (Singh et al., 2008; Thornton, 1994; Tan and Goh, 2007; Disyatat and Vongsinsirikul, 2003). Therefore, this weakens the effect of the lending and balance sheet channels. Horváth et al. (2006), Sellon (2002) and Singh et al. (2008) also highlight the fact that a rise in the degree of capital market development, financial deepening and efficiency will consequently cause a quick adjustment of the retail interest rate to prevent bank customers from investing in other funding sources (higher elasticity of the demand for deposits and loans from bank customers), thus resulting in a greater and faster effect of the policy interest rate on bank retail rates and a strengthening of the interest rate channel.

Llewellyn (1992) points out that financial innovation is seen largely in the development of bank and capital market sectors in terms of the introduction of new financial instruments and techniques (securitization of financial market instruments, introduction of banking off-balance sheet business, an increase in secondary market trading, and the introduction of new capital market products and new technologies in financial market trading and payment). This leads to an improvement in the risk diversification of banks and firms, causing a rise in financial market liquidity and a rise in credit supply. Financial innovation can have an effect on the channels of monetary policy transmission related to the banking sector. The securitisation technique introduced by financial market innovation will lead to a lower impact of monetary policy on the bank lending channel, as the effect of monetary policy shock on bank loan supply can be subsituted by these new instruments (Ghazali and Rahman, 2001; Mishra and Pradhan, 2008; Van den Heuvel, 2002; Singh et al., 2008). This therefore leads to an increase in bank liquidity, thereby lowering the impact of the policy interest rate on loan supply and weakening the bank lending channel (Altunbas et al., 2009b). Moreover, Mishra and Pradhan (2008), Altunbas et al. (2009b) and Singh et al. (2008) also point out that many securitisation and derivative instruments, as well as other securitisation techniques introduced by financial innovation, can lead to a reduction in liquidity risk, credit risk and the risk of the asymmetric information problem faced by banks. This results in a higher net worth of firms and a lowering of the external finance premium, and consequently a weaker effect on the balance sheet channel (Gertler and Rose, 1996). Singh et al. (2008) and Gropp et al. (2007) highlight that the wider sources of finance for investors and savers brought about by the innovation of financial market instruments will increase the demand elasticity of deposits and loans when the policy interest rate changes, as investors have many choices for investment. This leads to a greater degree of interest rate pass-through due to the higher elasticity of demand for loans and deposits and therefore to a strengthening of the interest rate channel.

2.5.2 Empirical studies of the effect of financial development on the channel of monetary policy transmission related to the banking sector

Empirical studies of the effect of financial development on the channels of monetary policy transmission related to the banking sector can be divided into two aspects: (1) the macro and (2) the micro data based aspects, as presented previously in section 2.3.

Several studies have been conducted on the the macro data based aspect of the impact of financial sector development on the channels of monetary policy transmission related to the banking sector.

Ghazali and Rahman (2001) used the VARs technique and found a weaker effect of the lending channel in Malaysia during the post-financial market development period as there was an insignificant effect of the monetary policy instrument (money supply (M1) and aggregate reserve) on aggregate bank lending after financial market development. However, Simatele (2004) indicates a stronger impact of the lending channel compared with the pre-development period in Zambia due to the relatively high effect of the policy interest rate on aggregate commercial bank lending and real GDP and CPI in the post-development period. By studying the effect of financial development on both the bank lending and balance sheet channels, Wibowo (2005) shows a weaker effect of these channels in the period of institutional development in Indonesia, as there is a significant positive effect of the policy interest rate on the bank balance sheet variables during this period compared with the pre-development period. In Thailand, Klinhowhan (1999) finds a weaker effect of the lending channel after the liberalization period, as the VAR outcome shows a positive response of the aggregate credit and private investment index on the shock of the monetary policy instrument. A similar conclusion is drawn by Sirivedhin (1997), who also found a weaker effect of the policy interest rate on the lending channel after the financial liberalization period in Thailand.

In a study of the interest rate channel and interest rate pass-through, Weber et al. (2009) conclude that the establishment of the EMU, which encourages financial development in the EU countries in terms of financial innovation and banking sector development, will have a stronger effect on the interest rate channel due to the higher response of output to the shock of monetary policy during the pre-EMU period. Tan and Goh (2007) found that financial disintermediation in Malaysia can lead to a stronger effect of the policy interest rate on the interest rate channel. This is because the VARs estimation shows a greater negative effect of the inter-bank rate (the policy instrument) on aggregate bank loans, GDP and the external finance premium during the post-financial disintermediation period than in the pre-financial period. Singh et al. (2008) found a positive correlation between interest rate pass-through and financial development, including capital market development (measured by the capital market securities to GDP ratio), financial competition (Panzar-Rosse H statistic) and banking sector development (private bank credit to GDP ratio), in developed and developing countries (including Thailand). This result confirms the notion that financial development can lead to strengthening of the interest rate channel. Van Leuvensteijn et al. (2006), Sander and Kleimeier (2005, 2006), Gudmundsson (2008) and SØrensen and Werner (2006) found that financial competition causes greater interest rate pass-through in European countries, thus confirming that financial competition will have a stronger effect on monetary policy through this channel. Other studies of developed countries also conclude that financial development has a stronger effect on the interest rate channel (Mojon, 2000; De Bondt, 2005, De Bondt et al., 2005; Chong, 2010). In studies of developing countries, Mies and Tapia (2003) found a stronger effect of monetary policy shock on output and inflation when including the capital market development indicator (stock market capitalization to GDP ratio) in the VAR model, thus supporting the evidence of a stronger interest rate channel caused by financial development. Aziakpono and Wilson (2010) and Aziakpono et al. (2010) found a higher degree of interest rate pass-through after financial deregulation in South Africa, thus supporting the notion that financial liberalization will lead to a stronger interest rate channel. Dickinson and Liu (2007) examine both the interest rate and lending channels in China and found that monetary policy shock had a weaker effect on the bank lending channel and a stronger one on the interest rate channel after the structural changes in the financial sector in China.

For the study of the micro data based aspect of the effect of financial development on the channels of monetary policy transmission related to the banking sector, Li (2009) considers the bank lending channel in ten Asian and ten Latin America countries by using the banking sector competition indicator (Panzar-Rosse H statistic (PRH)) and concentration indicator (the three largest banks' share of total assets). His results from the panel data estimation indicate that bank competition can weaken the bank lending channel as this indicator will dampen the effect of policy interest rate on bank loans. Other studies have also found that financial competition will lead to a weakening effect on the lending channel (Brissimiss and Delis, 2009; Gunji et al., 2009). Altunbas et al. (2009b) investigate the effect of financial innovation (securitization) on the bank lending channel in 12 Euro area countries and their GMM estimation shows that securitization (measured by the bank securitization to total asset ratio) can cause less impact of monetary policy shock on bank loans, hence dampening the bank lending channel.

Amongst borrower side studies, Gallego and Loayza (2000) employ GMM estimation and examine the firm balance sheet channel by using firm balance sheet data in their study (firms' investment to capital ratio and firms' cash flow). They conclude that banking sector development (bank assets to GDP ratio) and capital market development (stock market capitalization to GDP ratio) will weaken firms' balance sheet channel in Chile as these developments will make them less dependent on their internal funds (a reduction in the investment-cash flow sensitivity and investment-leverage ratio sensitivity). Gelos and Werner (2002) estimate the balance sheet channel by using firm balance sheet data (firms' investment to capital ratio, firms' cash flow and firms' leverage ratio) in Mexico. The results from the OLS and GMM estimations show that financial liberalization will weaken the balance sheet channel as it causes the firms to be less dependent on their internal funding. Harris et al. (1994) and Koo and Shin (2004) show that financial liberalization can have a weakening effect on the balance sheet channel of firms in Indonesia and Korea respectively. The same result can be seen in Arbeláex and Echavarria (2002) in Columbia, Hermes and Lensink (1996) in Chile, Bhaduri (2005) in India and Jaramillo et al. (1993) in Ecuador.

To sum up, both the theoretical and empirical studies of the effect of financial development on the financial sectors and on the channels of monetary policy transmission related to the banking sector mainly find that financial development will weaken the credit channel (bank lending and balance sheet channels) and strengthen the interest rate channel. However, some empirical studies found different results, in that the effect of financial development can lead to a stronger effect on the credit channel. This different result can be explained by the fact that studies in different countries are based on different financial sector structures and economic environments.

There are few micro data based empirical studies of the effect of financial development on the channels of monetary policy transmission related to the banking sector, especially of the lending and firm balance sheet channels. In addition, studies of this aspect, particularly of the interest rate and bank lending channels, mainly focus on developed countries, leaving a gap in the studies of developing ones. There is no empirical study of the effect of financial development from the micro data based aspect which uses Thailand as a case study. In addition, many studies of this aspect mainly focus on the effect of financial liberalization on the channels of monetary policy transmission relating to the banking sector. This shows the lack of studies on various aspects of financial development, such as financial innovation and financial deepening.

Therefore, future studies of the channels of monetary policy transmission relating to the banking sector should be focused on the micro data based aspect. In addition, the effect of financial development on these channels should concentrate on the effect of different aspects of financial development (financial liberalization, financial competition, banking development, capital market development and financial innovation). Therefore, it is interesting to study this issue by introducing a case study of a developing country such as Thailand.

2.6 Conclusion and suggestions for further research

This chapter reviews both theoretical and empirical aspects of monetary policy transmission related to the banking sector, the financial development concept, and the effect of financial development on the financial sector and on the channels of monetary policy transmission related to the banking sector. The conclusion and suggestions for further research are summarised below.

(1) Studies of the channels of monetary policy transmission related to the banking sector, particularly the credit channel, mainly focus on macro data (time series data), leaving an opportunity for micro data based study. Therefore, it is important that future research on the credit channel of monetary policy transmission (lending and balance sheet channels), should investigate the micro data based aspect. There is also a gap in the studies of the micro data based aspect of the credit channel, especially in developing countries, as many studies focus on the US and Europe. Only a few studies of Thailand introduce the micro data based aspect,

so future research should also fill this gap by making a case study of Thailand as an example of a developing country. This individual country study can reduce the bias in results caused by different economic structures and financial backgrounds, which can happen when making multi-country studies. In addition, the micro data based studies of developing countries (including those of Thailand) mainly focus on the size characteristic of firms and banks, ignoring other characteristics (the capitalization and liquidity of banks, the dividend payout ratio of firms, and leverage of firms). Therefore, study of the micro aspects in the future should include different types of characteristic variables.

Concerning the gaps in past studies, this thesis will attempt to fill these by conducting a micro data based study of both the bank lending channel (chapter 4) and firm balance sheet channel (chapter 5) and by using the case study of Thailand. In addition, different characteristic variables will be included for the study of the bank lending channel (the size, capitalization and liquidity of banks) and the firm balance sheet channel (firm size, cash flow, leverage and dividend payout ratio). In addition, we also study interest rate pass-through in Thailand (chapter 6) to obtain the full effect of monetary policy via the banking sector.

(2) There is a lack of studies which introduce the effect of financial development on the channels of monetary policy transmission relating to the banking sector in developing countries, particularly in relation to the interest rate channel (interest rate pass-through) and the bank lending channel. In addition, there are few studies of this issue from the micro data based aspect, especially of the credit channel. There has been no empirical study of the effect of financial development on the micro data based aspect by using Thailand as a case study.

Therefore, in order to fill the gap in the past literature, this thesis will not only investigate the channels of monetary policy transmission relating to the banking sector, but will also examine the effect of financial development on these channels. We will also use a case study of Thailand and investigate the effect of financial development on the micro data based aspect of the lending channel (chapter 4) and balance sheet channel (chapter 5). The effect of financial development on interest rate pass-through in Thailand is also investigated in chapter 6 to fill the gap in the study of this area in relation to a developing country.

(3) Many studies of the effect of financial development on the channels of monetary policy transmission relating to the banking sector mainly focus on just a few aspects of financial development, such as financial liberalization or financial competition. This shows there is a lack of studies of the various aspects of financial development, such as banking sector development, capital market development, financial innovation and financial deepening.

Therefore, this thesis will fill this gap by using the effect of different aspects of financial development (financial liberalization, financial competition, banking development, capital market development and financial innovation) on the channels of monetary policy transmission related to the banking sector in Thailand.

CHAPTER THREE

ECONOMIC BACKGROUND AND FINANCIAL DEVELOPMENT IN THAILAND

3.1 Introduction

As we will focus on a case study of Thailand, it is therefore important to review the economic background, institutional and financial market structure, and financial development background of the country. This chapter comprises three main parts: (1) an overview of the economic conditions; (2) the financial market and institutional background; and (3) financial development.

3.2 Overview of economic conditions in Thailand

Economic growth in Thailand decreased from 6.9% in 1978 to about 2.5% in 2008 (IMF, 2009; Office of the National Economic and Social Development Board, 2009a). Real GDP in the country increased from 39 billion USD in 1978 to 547 billion USD at the end of 2008 and GDP per capita showed a steady increase from 883 USD in 1978 to 8,239 USD in 2008 (IMF, 1999, 2009). Despite the increase in real GDP in the country, the economic growth rate still showed a relative decrease compared with growth in 1978. This was possibly due to the effect of the financial crisis on the country in 1997, which mainly affected the financial sector and the economy and therefore prevented a further increase in economic growth in Thailand compared with the previous 30 years. As seen in table 3.1, this growth was relatively low compared with other developing Asian countries and also comparatively low compared with the average of 5.17% among the overall Asain developing countries in 2008. Real GDP in the country was also relatively low compared with the average of developing Asian countries, at 560 billion USD. However, GDP per capita in Thailand was comparatively high relative to the average of the developing Asian group, at 5,797 USD, which is still low compared with Malaysia.

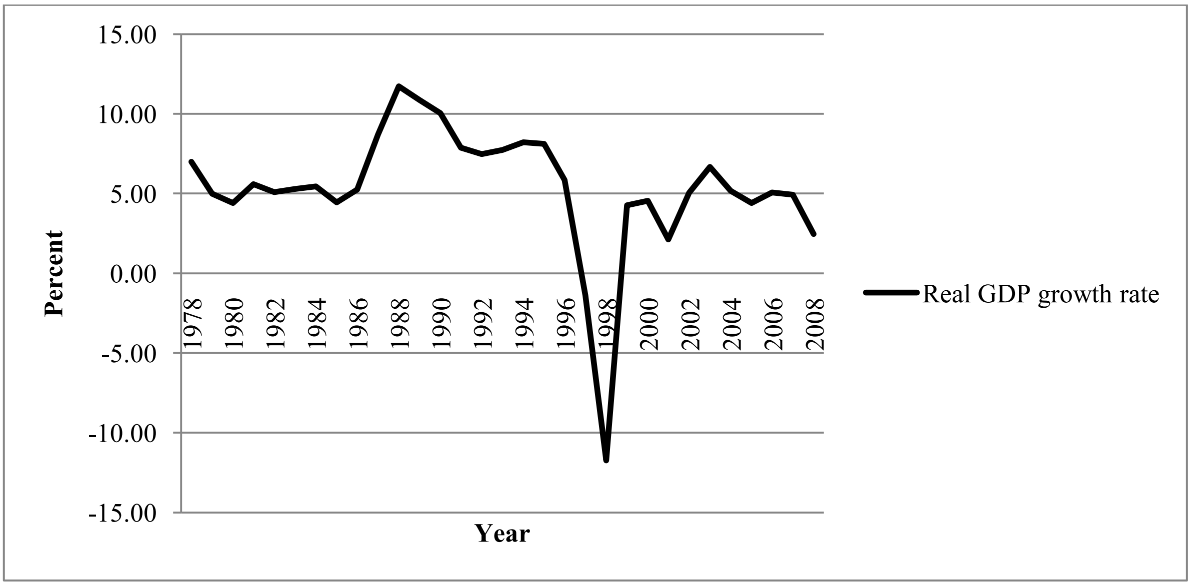
Table 3.1: The Thai economy compared with other developing Asian countries in 2008

Country	Real GDP growth (percent)	Real GDP (Billion USD)	Real GDP per capita (USD)
China	9.01	7,926.50	5,970.29
India	7.34	3,297.84	2,797.91
Indonesia	6.06	909.73	3,980.00
Malaysia	4.63	384.39	14,081.50
Pakistan	2.04	422.39	2,624.04
Philippines	3.83	317.96	3,515.98
Thailand	2.59	547.06	8,239.17
Vietnam	6.13	240.75	2,793.76
Average of developing Asian countries	5.17	560.64	5,797.64

Source: IMF (1999).

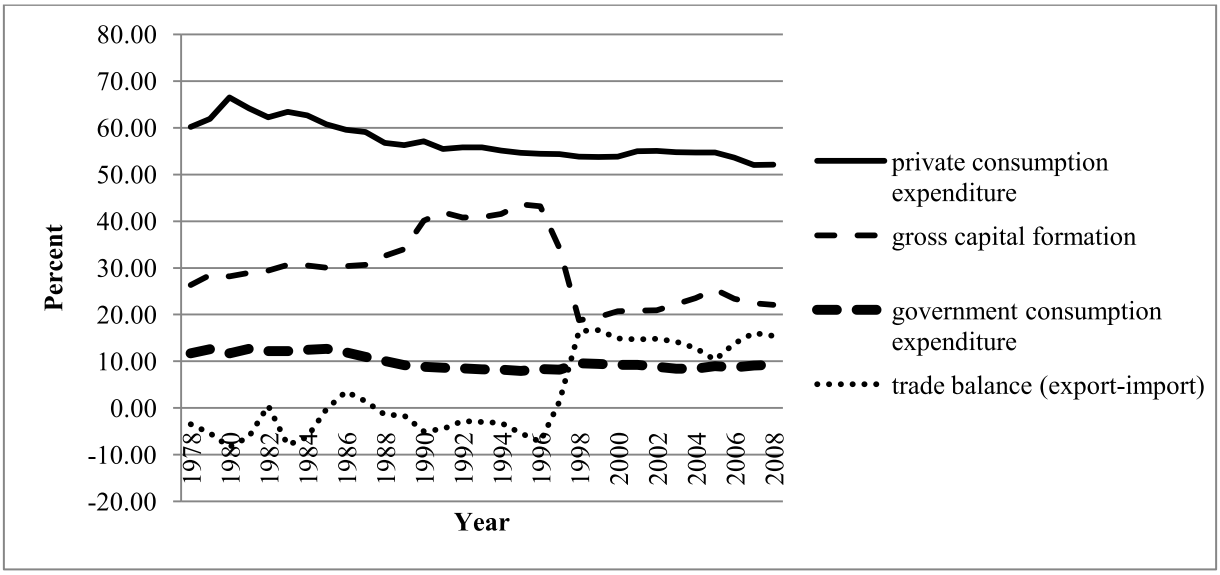
We will explain Thai economic conditions by grouping them into three different periods (from 1978 to 1989; 1990 to 1996; and 1997 to 2008). The period from 1978 to 1989 is a period of strong economic performance, characterized by a gradual rise in the real GDP growth rate from around 6.9% in 1978 to a peak of about 12% in 1988 (see figure 3.1). The Thai National Economic and Social Development Plan in this period principally aimed to decentralize development to the regional areas, thus the steady increase in economic growth in this period mainly comes from a rise in domestic expenditure, especially an increase in the gross capital formation in the country (from around 26% of real GDP to about 34% in 1989) (see figure 3.2) (BOT, 1980). This was due to an increase in the number of investment projects (the natural gas pipeline project and the railway line project) in order to develop the country's infrastructure (BOT, 1980, 1982, 1985, 1989). In addition, the introduction of several investment promotion policies (for example, the corporate and business income tax reduction policy) and a rise in manufacturing industries during this period are considered to be factors supporting the strong economic performance (BOT, 1983, 1987, 1989). Figure 3.3 shows that the manufacturing sector presents a gradual expansion in this period, from around 22% of real GDP in 1978 to 26% in 1989, compared with other industrial sectors. At the same time, the trade balance showed a deficit due to an increase in investment projects, which led to high imports of capital goods, especially machinery and parts (BOT, 1989).

Figure 3.1: Real GDP growth rate at 1988 constant prices from 1978 to 2008



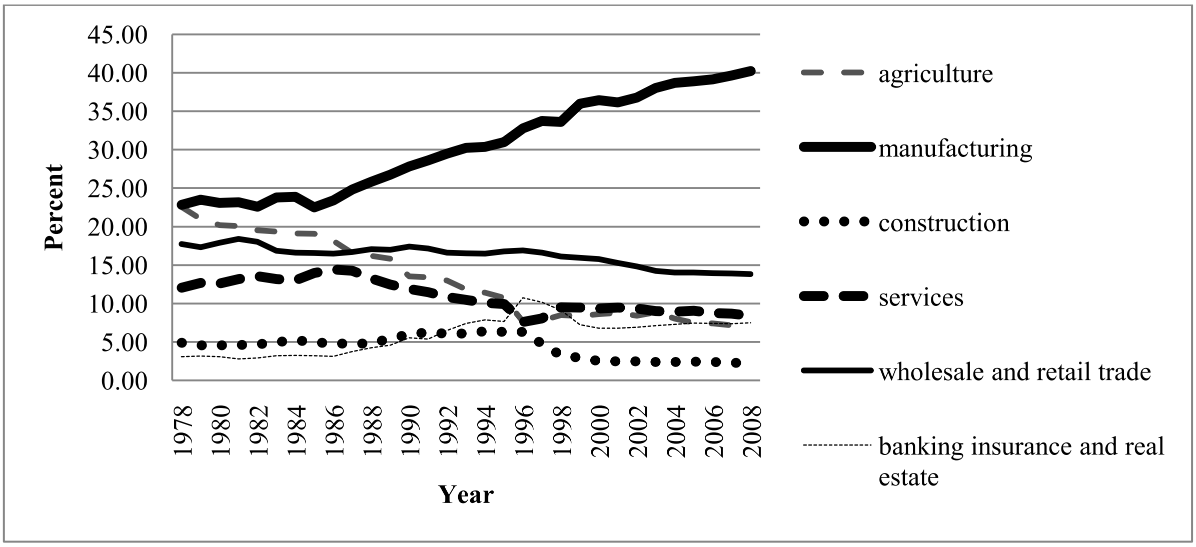
Source: BOT (2008b).

Figure 3.2: Private consumption expenditure, gross capital formation, and government consumption expenditure as a percentage of real GDP from 1978 to 2008[3]



Source: Office of the National Economic and Social Development Board (2009a).

Figure 3.3: Main industries as a percentage of real GDP from 1978 to 2008



Source: Office of the National Economic and Social Development Board (2009a).

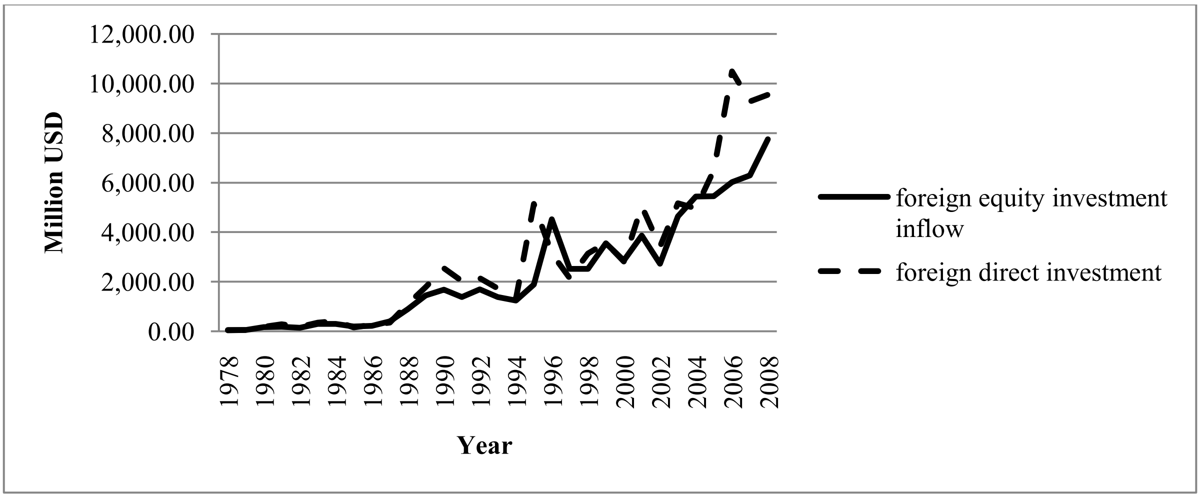
[3] According to the Office of the National Economic and Social Development Board (2009b), the definitions of these components are as follows: private consumption expenditure is the goods and services consumption value of households and non-profit institutions serving households. Gross capital formation is the public and private sectors' expenditure on production, including gross fixed capital formation and change in inventories. Government consumption expenditure is the administration and provision of public services spending. Import and export are the value of international transactions of goods and services.

From 1990 to 1996, there was a reduction in the economic growth rate from 10% in 1990 to 5.8% in 1996 (see figure 3.1). This was due to the delay in construction projects in the second half of the previous period (1985-1989), a decrease in agricultural product prices and outputs resulting from negative weather conditions, the impact of the Persian Gulf crisis, and the political problems in 1991 (BOT, 1991, 1992a). This condition is shown in figure 3.3. There was a gradual decrease in agricultural production (from 13.5% to 7.6% of real GDP), in wholesale and retail trade industries (from around 17% to 16% of real GDP), and in the service sector (from around 11% to 7.5% of real GDP) from 1990 to 1996. Private consumption expenditure also shows a gradual decrease, from about 57% to 54% of real GDP during this period (see figure 3.2).

Although there was a reduction in economic growth, the average growth rate of real GDP was still at a high level, with an average of around 7.9%. This is because there were some positive factors during the second half of the period, leading to a slight rise in economic growth, from 7.7% in 1993 to 8.1% in 1995 (see figure 3.1). This was the result of an increase in government expenditure on some of the ongoing government projects in rural areas and the industrial liberalization policy in 1993, which stimulated the level of Thai industrial competitiveness and technological development (BOT, 1993, 1994a). This condition is shown by a rise in gross capital formation, from 40.8 % of real GDP in 1993 to 43.2% in 1996 (see figure 3.2). Also, the financial liberalization which took place in the country during 1990 also led to a growth in the banking and real estate sectors (from 5.5 % of real GDP in 1993 to 7.7% in 1996) (see figure 3.2), thus causing a rise in economic growth, especially in the second half of the period. The details of the financial development in Thailand will be discussed in the following section. Therefore, the economy in this period can be considered as the period of medium economic growth or the financial liberalization period.

Thai economic conditions between 1997 and 2008 are considered to represent a post-financial crisis period. This is because the financial crisis which occurred in 1997 caused a sharp fall in the real GDP growth rate, especially in 1997 and 1998 (from -1.3% to -11.7%). Sussangkarn and Vichyanond (2007) and BOT (1997) state that one of the main factors that accelerated the crisis was a relaxation of financial controls caused by the financial liberalization initiated in 1990 (the relaxation of control of financial institutions, capital accounts and foreign exchange rates, and the relaxation of fund mobilisation). This led to a gradual increase in short-term foreign capital inflow from 1990 to 1996, shown by a dramatic increase in equity investment (from 1,689 to 4,518 million USD) and also a rise in foreign direct investment in the country (from 1,780 million USD in 1990 to 5,142 in 1995) (see figure 3.4). According to BOT (1997), financial deregulation in the country also caused a gradual rise in domestic and foreign debts, as well as a rapid increase in investment, particularly in risky investment projects and other less productive sectors (real estate and securities). This was shown by a gradual rise in real estate industries as a percentage of real GDP from 3.7% of real GDP in 1990 to 7.7% in 1996 (see figure 3.3). Sussangkarn and Vichyanond (2007) point out that there was also a rise in bank loans during this period, which were particularly used to invest in risky investment projects and less productive sectors (for example, real estate). This situation caused an increase in the default risk of banks and led to the weakness of the financial institutions (Sussangkarn and Vichyanond, 2007). Therefore, these conditions resulted in an asset price bubble, a maturity mismatch problem and the low quality of financial institution and business sector balance sheets (Sussangkarn and Vichyanond, 2007). This resulted in the weakness of the financial sectors and was consequently one of the factors which caused the financial crisis in the country.

Figure 3.4: Inflow of foreign equity and debt securities investment, and foreign direct investment in Thailand from 1978 to 2008

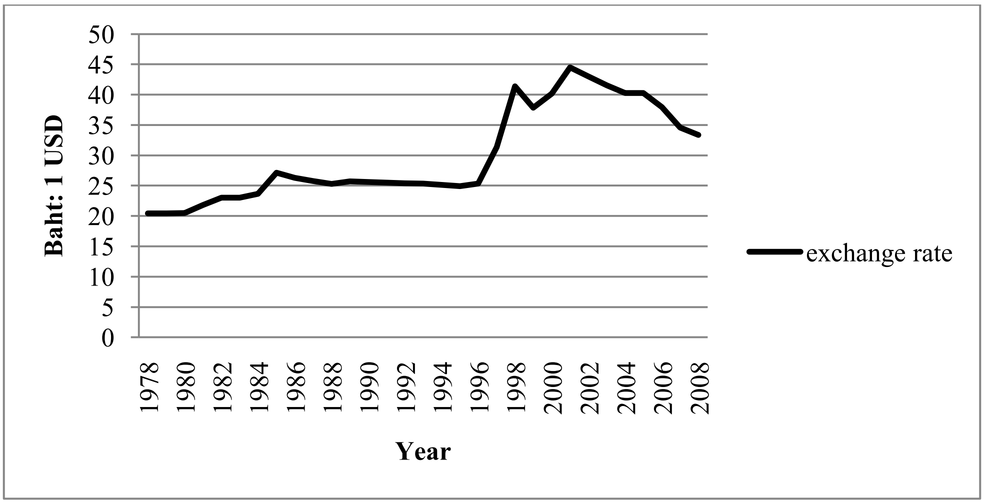


Source: BOT (2008b).

Another major cause of the crisis was the speculative attack on the Baht from the end of 1996, resulting in a substantial decrease in Thai foreign exchange reserves in order to maintain the fixed exchange rate (BOT, 1997). Consequently, Thailand had to announce a change in the exchange rate system, from the basket system pegged to the US dollar to the managed float system in July 1997[4] (Warr, 1999; Sussangkarn and Vichyanond, 2007). This led to the sharp depreciation of the Baht from 25 Baht/US dollar in 1996 to 45 Baht/US dollar in 1998 (see figure 3.5).

[4] BOT had to change the monetary policy regime from the fixed exchange rate regime to the monetary targeting one (BOT adjusted the policy interest rate to achieve a controlled level of domestic money supply, M2, instead of controlling the exchange rate, which had been done previously) (BOT, 2010c). As a result of the problems in the monetary target regime (the unstable relationship between money supply and output growth, as well as the credibility and transparency problem of the monetary targeting caused by decision making not published to the public), the inflation targeting regime has been in force from 23 May 2000 until now (BOT, 2010c).

Figure 3.5: Baht/dollar exchange rate in Thailand from 1978 to 2008



Source: BOT (2008b).

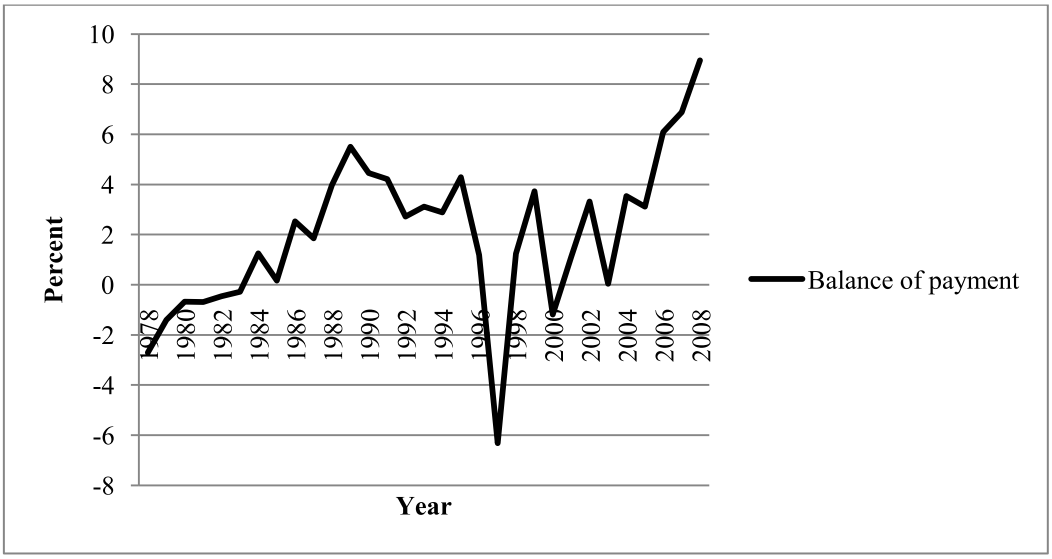
As there was an asset price bubble as well as a rise in real estate investment and short-term debt in the Thai economy between 1990 and 1996, the huge increase in the exchange rate led to a substantial loss for many business sectors and financial institutions, especially those lending and investing in foreign currencies, resulting in a high default rate and a liquidity problem for financial institutions (BOT, 1997). This caused the closure of many institutions (58 finance company operations were suspended) and a relatively high non-performing loan problem, leading to sluggish economic conditions (BOT, 1997). This was shown by a reduction in the production of almost all industrial sectors (see figure 3.3), a fall in domestic expenditure (see figure 3.2), tight liquidity conditions in the financial market, and a reduction in investor and consumer confidence (BOT, 1997, 1998a).

After the crisis period, there was a recovery in the Thai economy, as shown by an increase in the real GDP growth rate, from 4.2% in 1999 to 6.6% in 2003 (see figure 3.1). This was due to the IMF rescue plans and the economic support policies from the government; for example, the industrial restructuring plan at the end of 1998, the agricultural promotion plan in 1998-

2002, and corporate debt restructuring in 2003 (BOT, 1998a, 1999, 2002a, 2004). The trade balance in Thailand also showed a huge surplus from 1997 to 2008 as a result of the devaluation of the baht (see figure 3.1). The economic growth rate showed a slight reduction, with a decrease in the real GDP growth rate from 5.2% in 2004 to 2.5 % in 2008 (see figure 3.1). This was mainly due to the uncertain political situation in the country throughout this period as well as the decrease in the export caused by the global economic down turn in 2008, causing a further reduction in consumer and investor confidence and consequently a lowering of the growth rate of investment expenditure (from around 22.13% to 22% of real GDP) and private consumption expenditure (from around 54.20% to 52% of real GDP) (BOT, 2006a, 2008a).

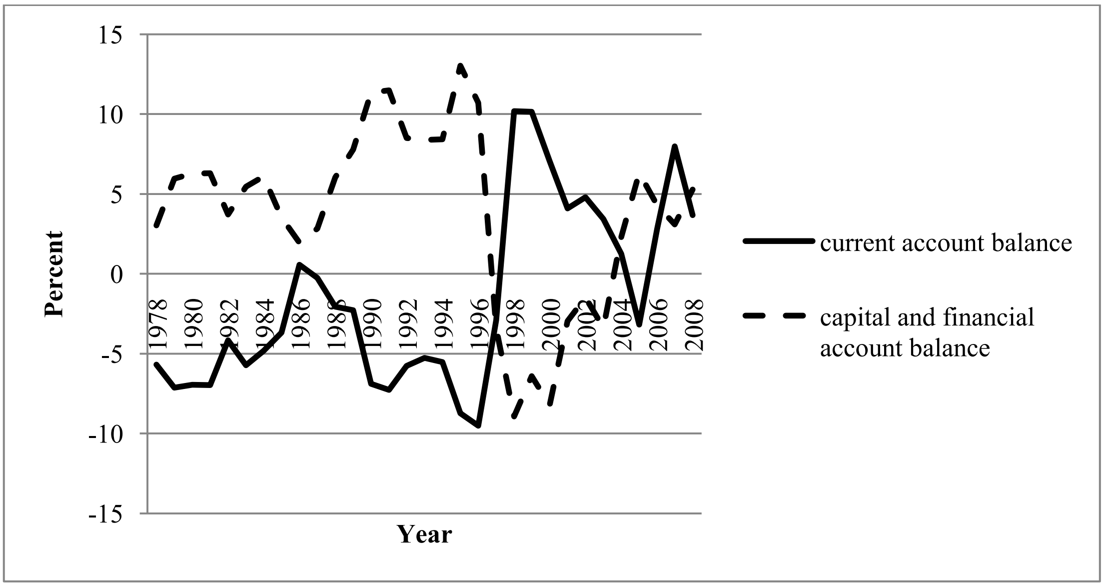
On an international level, the balance of payments during the period of strong economic performance (1978-1989) showed an improvement, with an increase from -2.7% of GDP in 1980 to reach its peak at 5.5% in 1989 (see figure 3.6), thus strengthening economic growth in the country. The reason for this was mainly the increase in the capital and financial account balance, which saw an increase in the surplus from 3.1% in 1978 to 7.8% in 1989 (see figure 3.7), caused in particular by a rise in foreign direct investment in many government projects and portfolio investment (BOT, 1989). Nevertheless, the current account balances showed a deficit throughout the period, with an improvement from -5.7% to -2.3% of GDP from 1980 to 1989 (see figure 3.7). The deficit in the current account was the result of the protectionist policies, especially from 1983 to 1985, of the industrialized trading partners, and of a rise in the import of petroleum products and capital goods for the government's development projects (BOT, 1983, 1985, 1986, 1989).

Figure 3.6: Balance of payments in Thailand from 1978 to 2008 as a percentage of GDP



Source: BOT (2008b).

Figure 3.7: The current account balance and capital and financial account balance as a percentage of GDP from 1978 to 2008



Source: BOT (2008b).

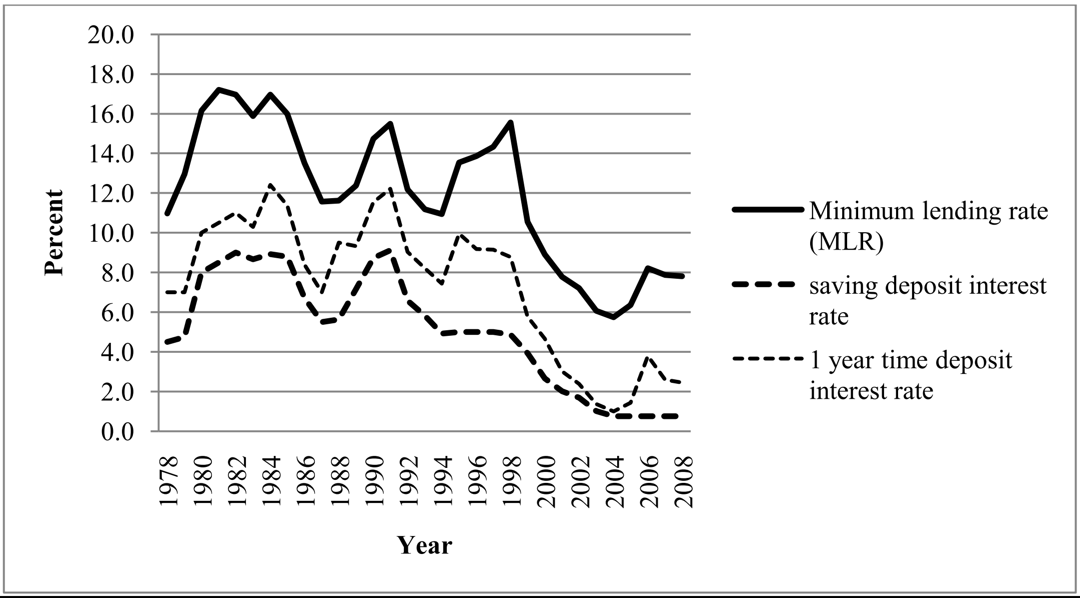
During the period from 1990 to 1996, the balance of payments continued to show a surplus, with an average of 3.3% of GDP (see figure 3.6). This was mainly caused by a dramatic 3.12% increase in the capital and financial surplus from 1990 to 1996 (see figure 3.7) resulting from the financial development plans introduced during this period. These led to higher levels of foreign capital inflow, foreign direct investment and portfolio investment, as shown in figure 3.4 (BOT, 1990, 1991, 1992a).

During the period from 1997 to 2008, the financial crisis in 1997 led to a substantial balance of payments deficit in 1997 of about -6.3% of GDP, compared with a surplus in the previous year (see figure 3.5). The main reason for this was the large deficit in the capital and financial account balance, shown by a rise in the deficit from -3.4% of GDP in 1997 to the highest level of -8.9% in 1998 (see figure 3.6). The deficit continued throughout this period until 2003. This mainly resulted from the huge private capital outflow and the decrease in foreign investor confidence (BOT, 1997, 2001). However, the current account balance showed the opposite movement, from a deficit of -2.9% in 1997 to a surplus of 7.0% of GDP in 2000 (see figure 3.7). This was due to the depreciation of the baht, which increased the competitiveness of export goods relative to other trading partners, and a relative decrease in imports caused by the economic downturn (BOT, 1997, 1998a).

After the crisis (1998-2008), numerous government bailout plans led to an increase in foreign direct investment and foreign capital inflows into the stock market, as well as a reduction in capital outflow (BOT, 2001, 2002a, 2006a). As shown in figure 3.4, there were improvements in foreign direct investment and foreign equity inflow from 2003 to 2008. This was because of the decrease in the external debt repayment of financial institutions and IMF loans (BOT, 1998a, 2001, 2002a, 2006a). As a result, there was an improvement in the capital and financial account from 2004 to 2008, with an average surplus of 4% of GDP (see figure 3.7), thus leading to a recovery of the balance of payments from 1.2% in 1998 to the highest level of 8.9% in 2008 (see figure 3.6). Despite the slowdown of the current account balances from 4% of GDP in 2001 to -3.2% in 2005 and from 7.9% in 2007 to 3.6% in 2008. (see figure 3.7), which was mainly caused by a rise in imports following the government economic recovery plans, a decrease in the demand for export casued by the political turmoil from 2004 to2008 and tunami in 2005, and the reduction in the export caused by the global economic downturn in 2008; the current account balance still showed a surplus, with an average of 4.8% of GDP from 2006 to 2008. This was a consequence of the expansion of the value of exports caused by the recovery in the economies of trading partners (BOT,2006a, 2007).

The period from 1978 to 1989 saw high liquidity in banking and the financial market. This was due to the introduction of monetary policy measures, particularly between 1983 and 1986, in order to stimulate the Thai economy (BOT, 1983, 1985, 1986). This policy led to the downward adjustment of the lending and deposit interest rates, especially in 1983, 1984 and 1986. As a result, retail interest rates in Thailand experienced a downward trend, particularly between 1980 and 1988, with a 4.5%, 3%, and 2.3% reduction of the loan interest rate (MLR), time deposit interest rate and saving deposit interest rate respectively (see figure 3.8). The higher liquidity condition also led to an increase in commercial bank credits, from 22% to 24%, and in commercial bank deposits, from 13% to 22%, between 1980 and 1989 (see figure 3.9), thus stimulating economic growth in the country. The expansion of bank credits and deposits also resulted from the government credit policy, which supported many investment projects in the regional areas, and the strong economic performance throughout this period.

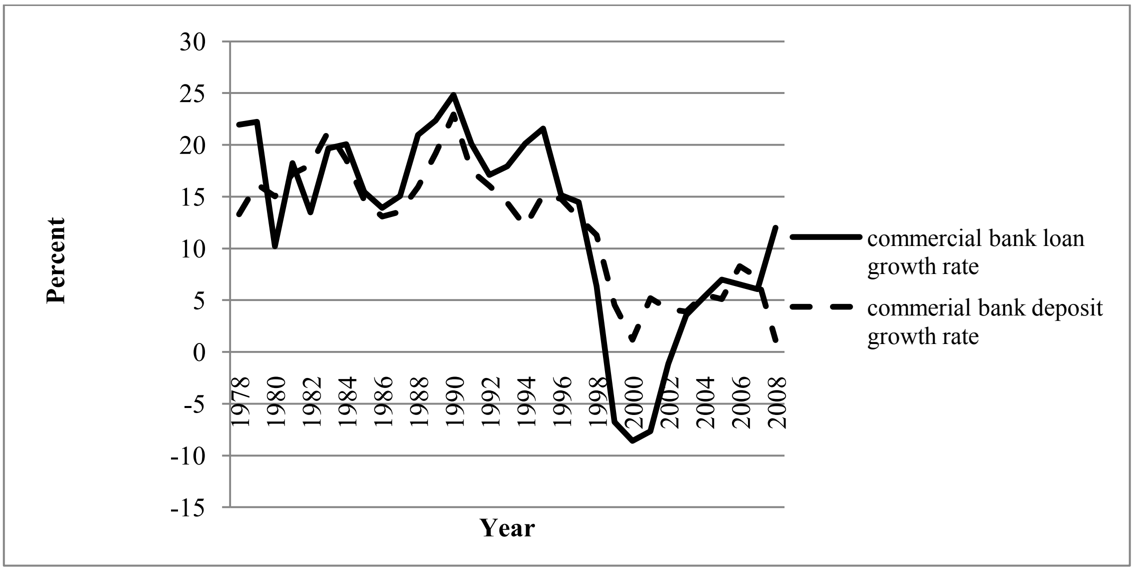
Figure 3.8: The major interest rates in the financial market, comprising Minimum Lending Rate (MLR), 1 year time deposit interest rate, and saving deposit interest rate, from 1978 to 2008



Source: BOT (2008b).

Despite the increase in both the loans and deposits of commercial banks, there was a slight decrease in the growth rate of commercial bank loans (a 6% reduction) and deposits (a 7% reduction), especially from 1983 to 1986 (see figure 3.9), mainly due to the commercial banks' credit controls on imports and low quality customers, as well as the downward trends in the deposit interest rates (BOT, 1984, 1985, 1986).

Figure 3.9: The growth rate of commercial bank loans and aggregate commercial bank deposits from 1978 to 2008



Source: BOT (2008b).

The capital market conditions in this period showed an increase on the Index of the Stock Exchange of Thailand (hereafter, the SET index[5]), from 182.38 in 1978 to 200.21 in 1989 (see figure 3.10). This was due to an increase in the share and debenture public offerings and an introduction of new types of securities in 1988 caused by the capital market development policies, the high liquidity condition resulting from the downward trend of loan interest rates, an improvement in the performance of the listed companies which invested in the securities market, and a rise in investor confidence due to the strong economic conditions throughout the period (BOT, 1982, 1985, 1986, 1987).

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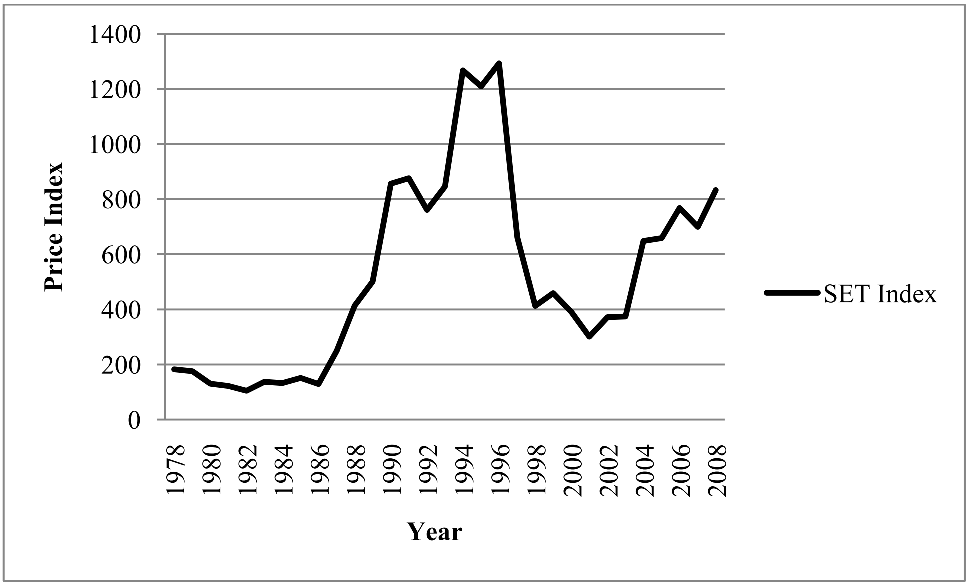
[5] According to the Stock Exchange of Thailand (SET) (2010a), the movement in the price of the SET common stocks is defined as the SET index and this is calculated by the percentage of the ratio of current market value and base market value of stocks.

Figure 3.10 The SET index from 1978 to 2008



Source: DataStream (2010).

From 1990 to 1996, the financial liberalization policies introduced at the beginning of the period led to a relatively high liquidity condition in the financial market compared with the previous period. This is shown by a 3%, 6.26% and 3.9% decrease in the MLR, time deposit interest rate and saving deposit interest rate respectively from 1990 to 1993 (see figure 3.8) (BOT, 1992a, 1993). There was a slowdown in the rise in volume of loans and deposits, particularly during the first half of this period. This is shown by 6.9% and 8.53% reductions in the growth rate of commercial bank loans and deposits respectively (see figure 3.9), caused by the economic downturn in this period, commercial banks' cautious lending policy and the relative decrease in the deposit interest rate (BOT, 1990, 1991, 1992a, 1993 1994a). Nevertheless, there was an increase in bank loans and deposits throughout the second half of the period (1994-1996) due to the introduction of the Bangkok International Banking Facilities (BIBF) in 1993, which allowed the mobilization of foreign funds to the domestic financial market, and the liberalization of the regulations for regional bank branches (BOT, 1993, 1994a). This led to a relatively high volume of loans and deposits in the country.

The capital market in this period presents a better condition compared with the previous period, as shown by the dramatic increase in the SET index, from 855.97 in 1990 to 1,292.61 in 1996 (see figure 3.10). This mainly resulted from the introduction of the financial development plans in 1990, a rise in the economic growth rate during the second half of the period, and the strong performance of the listed companies (BOT, 1990, 1994a).

In the period from 1997 to 2008, the financial crisis in 1997 led to low liquidity in the financial market. This is shown by a gradual increase in the loan and deposit interest rates from 1994 to 1998 (figure 3.8) (from 10.9% to 15.6%, 7.4% to 8.7% and 4.6% to 5% for the MLR, 1 year deposit and saving deposit rates respectively), as well as a sharp fall in loans and deposits (see figure 3.9) (22% and 7.15% decreases in the growth rate of loans and deposits respectively from 1997 to 2001). Furthermore, there was a tight liquidity condition in the capital market, with a sharp fall in the SET index, from 661.29 in 1997 to the lowest point of 300.63 in 2001 (see figure 3.10). The major reasons for the sluggish performance of the financial market at the beginning of this period were the liquidity problem in the financial insitutions, a decrease in the creditworthiness of borrowers caused by non-performing loan problems, the slowdown of investor confidence, and the ongoing Asian currency crisis (BOT, 1997, 1998a, 1999).

The recovery of the financial market began in 2002, with an increase in bank loans and deposits (an 8.4 % increase in loans from 2002 to 2008 and a 4.2% increase in deposits from 2002 to 2006). This was mainly a result of the Thai economic recovery stimulated by the numerous IMF and BOT financial recovery measures, which led to an improvement in financial institutions' portfolios and confidence and consequently improved the liquidity condition in the financial market (BOT, 1997, 1998a, 2002a, 2006a; Chotigeat and Lin, 2001; Menkhoff and Suwanaporn, 2007; Sussangkarn and Vichyanond, 2007). However, the slowdown in the rise in deposits, particularly from 2007 to 2008, was due to the effect of the reduction in deposit rates and the rise in alternative saving options (bonds and other securities) (BOT, 2006a, 2007, 2008a). Furthermore, many financial crisis bailout plans after the crisis period and a rise in investor confidence played important roles in the recovery of the stock market, shown by an increase in the stock price index from 371.42 in 2001 to 832.45 in 2008 (see figure 3.10).

Overall, although there were some downward trends in the Thai economy, particularly in 1997, which prevented further increases in economic growth in Thailand compared with 1978, it can be concluded that the Thai macroeconomic and capital market condition continued to improve and show a good performance after the crisis to the end of 2008. This was due to many financial and economic recovery plans after the crisis period which aimed to improve economic conditions in the country.

3.3 Financial market and institutional background in Thailand

This section will be divided into two main sub-sections: (1) the institutional sector in Thailand and (2) the financial market in the country.

3.3.1 The institutional sector in Thailand

Institutions in Thailand can be divided into two main categories: financial and non-financial.

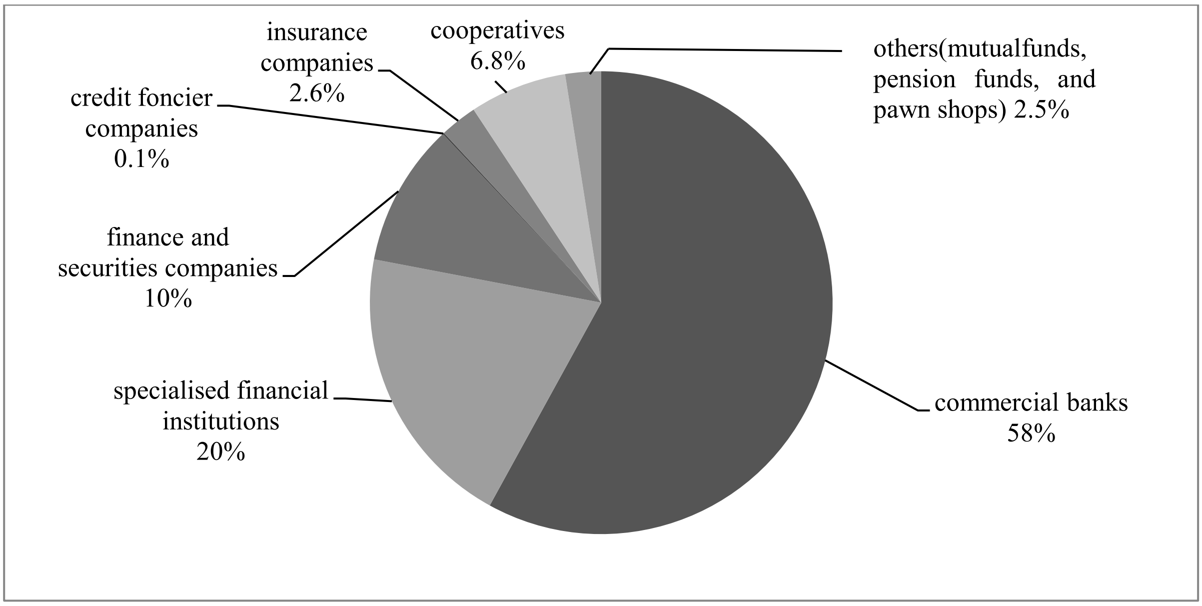
3.3.1.1 Financial institutions

Financial institutions can also be divided into two sections: banking and non-banking.

(1) Banking financial institutions

Banking financial institutions in Thailand perform banking business and consist of commercial banks and specialized financial institutions (hereafter, SFIs). Figure 3.11 shows that banking financial institutions constitute the main proportion of Thai financial institutions, with total assets making up 78% of overall financial institution assets. They mainly comprise commercial banks, which also have the highest proportion of the total assets of financial institutions (58%, as shown in figure 3.11). The fund mobilization of commercial banks mainly derives from deposits, as well as domestic and foreign loans, while the use of funds comes from securities transactions and lending (Skully, 1984; Yananda et al., 1992). Another group of banking financial institutions are the SFIs established by the government, which have their own specialized businesses and legal system (Dasree, 1985). The SFIs consist of (1) the Government Saving Bank (GSB), established in 1947, whose main business is as a saving institution, using saving deposits, time deposits and premium saving certificates as the main sources of funds, and using government and enterprise securities, and individual loans as the use of funds (BOT, 1987; Yananda et al., 1992); (2) the Bank for Agriculture and Agricultural Cooperatives (BAAC), established in 1966, whose main business purpose is lending to farmers and agricultural cooperatives, and obtaining funds from commercial bank deposits (BOT, 1987; Lee and Jao, 1982); (3) the Government Housing Bank (GHB), established in 1953, which plays a major role in housing and real estate lending for low and middle income groups, with a high proportion of funds from deposits, foreign and domestic lending, and bond issuing (Yananda et al., 1992); (4) the Export and Import Bank of Thailand (Exim Bank), established in 1993, whose main business is to support lending to import and export investors, obtaining funds from securities transactions (BOT, 1994b); (5) the Small and Medium Enterprise Development Bank of Thailand (SME Bank), established in 2002, aimed to support lending to small and medium Thai businesses (long-term and short-term loans by using promissory notes) (Loungpitak, 2005); and (6) the Islamic bank, established in 2002, which performs banking business in parallel with the Islamic religion for Muslims (Loungpitak, 2005). Figure 3.11 shows that the SFIs have 20% of the total assets of all financial institutions.

Figure 3.11: Percentage of the assets of Thai financial institutions from 1978 to 2008



Source: BOT (2008c, 2010d).

(2) Non-banking financial institutions

Non-banking financial institutions comprise finance and securities companies, insurance companies, cooperatives and other sectors (mutual funds, pension funds and pawn shops). Their main sources of funds for the finance and securities companies are promissory note issuing and commercial bank borrowing, with securities investment and commercial lending as the main uses of these funds (Yananda et al., 1992; Skully, 1984). The financial companies can also perform both finance business and securities business[6]. As seen in figure 3.11, the total assets of these companies are 10% of overall financial institution assets. The credit foncier companies'[7] main business is in mortgage and securities lending, as well as property purchase services (BOT, 1987; Yananda et al., 1992). This is the smallest sector in the field, with 0.1% of the total assets of all financial institutions. The cooperatives sector includes

[6] Securities brokerage, dealership, underwriting and investment management are known as securities business; on the other hand, consumer and housing finance, commercial finance and development finance are examples of financial business (Lee and Jao, 1982; BOT, 1987).
[7] Since 2006, the credit foncier companies have not been operating (BOT, 2008c).

agricultural and savings cooperatives, with 6.8% of overall assets. The agricultural cooperatives lend to farmers and agricultural businesses and obtain funds from BAAC and members' capital accounts (BOT, 1987; Skully, 1984). The saving cooperatives lend to salary earners and members and they obtain funds from the members' paid up share capital (BOT, 1987; Skully, 1984). 2.6% of other non-banking financial institutions are insurance companies and another 2.5% are pawn shops, mutual funds and pension funds.

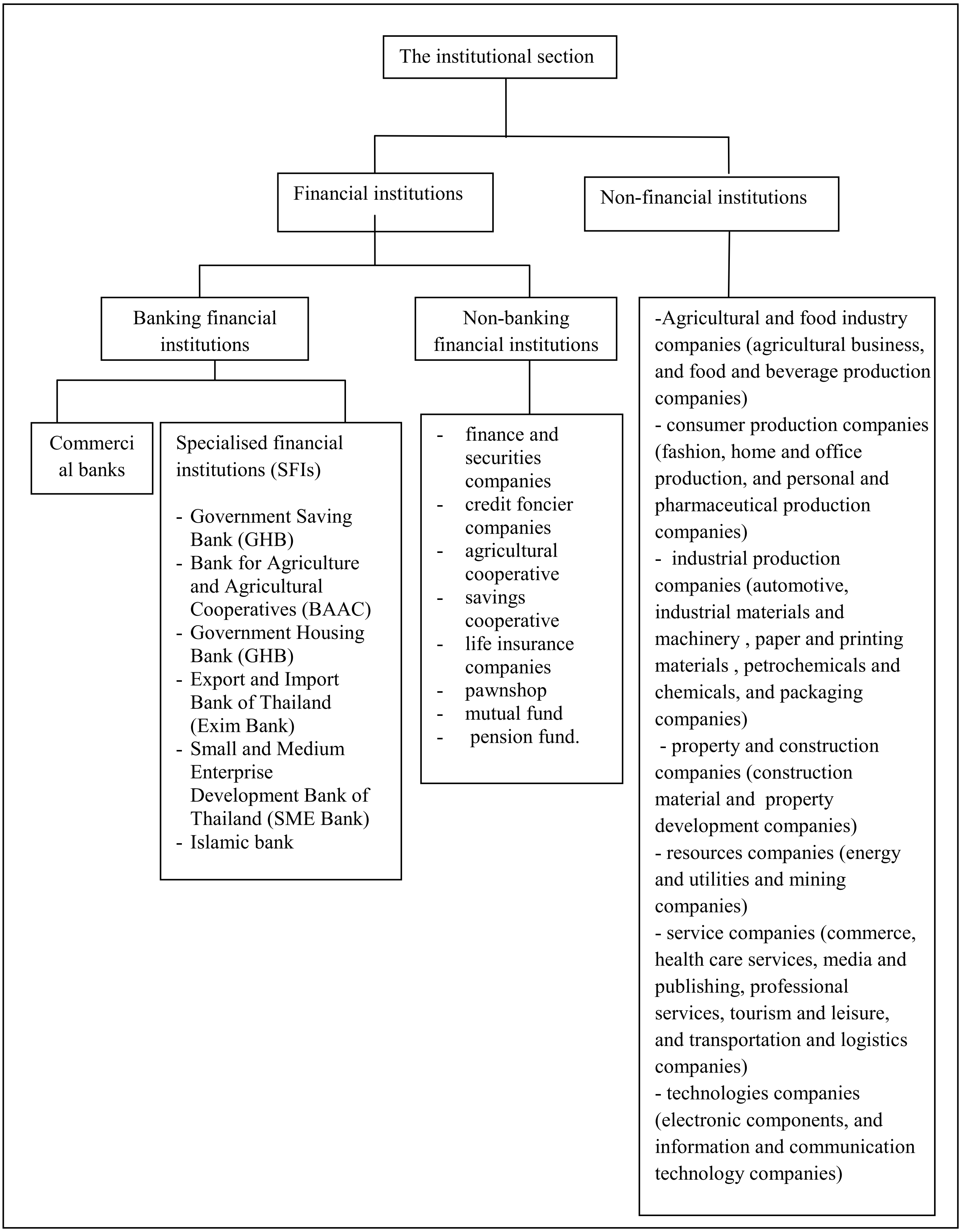
3.3.1.2 Non-financial institutions

Non-financial institutions in Thailand are the industrial companies listed on the SET (excluding all the financial institutions listed previously). These are categorised into different industrial sectors: (1) agricultural and food industry companies; (2) consumer production companies; (3) industrial production companies; (4) property and construction companies; (5) resources companies; (6) service companies; and (7) technology companies.

Overall, the average assets of the non-financial institutions from 1978 to 2008 account for around 60% of the total assets of the institutional sector, while for financial institutions it is around 40% (SET, 2010e).

A summary of the institutional sector in Thailand can be seen in figure 3.12.

Figure 3.12: Structure of the institutional sector in Thailand



Source : Settrade dot com (2010).

3.3.2 Financial market in Thailand

The financial market in Thailand includes three major markets: the money market, foreign exchange market and capital market.

3.3.2.1 Money market

The money market aims to perform short-term transactions (maturity within one year) and BOT itself is considered as an important participant in this market (BOT, 2010a). The important instruments traded on the money market include interbank market transactions (call and overnight transactions), government bond repurchase market transactions, treasury bill transactions, BOT bond market transactions, and other short-term trading instruments (commercial papers) (BOT, 2010a; Vichyanond, 1994). There is also a small amount of secondary market trading in treasury bills, certificates of deposits (hereafter CDs), commercial bills and government bond repurchase transactions (Skully, 1984).

3.3.2.2 Foreign exchange market

The foreign exchange market mainly carries out foreign market transactions (spot transactions, forward market transactions, foreign exchange derivatives and foreign exchange swaps) (BOT, 2010a). Trading is performed by using the OTC (over-the-counter market), with commercial banks and the Exchange Equalisation Fund as the major trading institutions (BOT, 2010a; Vichyanond, 1994).

3.3.2.3 Capital market

The capital market in Thailand is the market for long-term transactions (with maturity of more than one year) and is divided into the primary and secondary markets (BOT, 1994b). The primary market is for newly issued securities and initial public offering, while the secondary market deals with transactions of securities already issued in the primary market (SET, 2010b). The secondary market began trading on 30 April 1975 (SET, 2010b). The major roles of SET are as a listed securities trading centre, securities trading facilitation, clearing house activities, securities depository, securities register and securities listing (SET, 2010b).

There are four major SET groups: (1) the equity market; (2) the bond market; (3) the derivative market; and (4) the Thailand Securities Depository Company Limited (TSD).

(1) Equity market

The main equity market coverage is listed as companies' securities trading, including ordinary shares, preferred shares, warrants, unit trusts and Non-Voting Depository Receipt (NVDR) and Depository Receipt (DR) trading (SET, 2010a). There is one main index on the SET called the SET Index, which is the main composite index of the SET, and all common stock trading price movement is shown by this index (SET, 2010a). It comprises the index of all the companies listed on the SET, including financial institutions and non-financial ones. Another five indices on the SET are (1) the SET 50 Index and SET 100 Index (established in August 1995 and April 2005 respectively), which represent the top 50 and top 100 listed company stock prices respectively[8]; (2) the MAI Index (established in June 1999), which supports investors and innovative business in a wide range of alternative investments and new rising fund opportunities; (3) the FTSE SET Index, which is a SET and FTSE group collaborative index for measuring capital market performance[9]; (4) the FTSE/ASEAN Index (established in September 2005), which is the index that represents the cooperation between the SET and other ASEAN stock exchange markets (Bursa Malaysia, Jakarta Stock Exchange, the Philippine Stock Exchange and the Singapore Stock Exchange), comprising the FTSE/ASEAN Index (the benchmark index) and the FTSE/ASEAN 40 Index (the tradable index)[10]; and (5) the Total Return Index, which reports the performance indicators (dividends, capital gain/loss and right offering) of the SET, SET 50, SET 100 and MAI markets (SET, 2010a).

(2) Bond market

Bond market transactions can be performed in both primary (transactions through retail and institutional investors) and secondary (transactions through the OTC market and the Bond Electronic Exchange (BEX) markets) markets (BOT, 2010b)[11]. The bond trading products can be divided into corporate securities, which are corporation bonds, and government securities (treasury bills, debt restructuring bills, government bonds, government saving bonds, BOT bonds and state-owned enterprise bonds) (BOT, 2010a).

[8] The criteria for dividing the top 50 and top 100 listed companies on the SET are the level of market capitalization and liquidity, as well as the compliance of the minor shareholders' share distribution (SET, 2010a)
[9] This index also provides information about the major capital segments as it can categorize the index by different market capitalization (FTSE SET Large Cap Index, FTSE SET Mid Cap Index, FTSE SET Small Cap Index, FTSE SET All-Share Index, FTSE SET Mid Small Cap Index and FTSE SET Fledging Index) (SET, 2010a).
[10] The benchmark index has more than 0.5 per cent of its turnover relative to the tradable shares, while for the tradable index it is more than 20 percent of its turnover (SET, 2010a).

(3) Derivative market

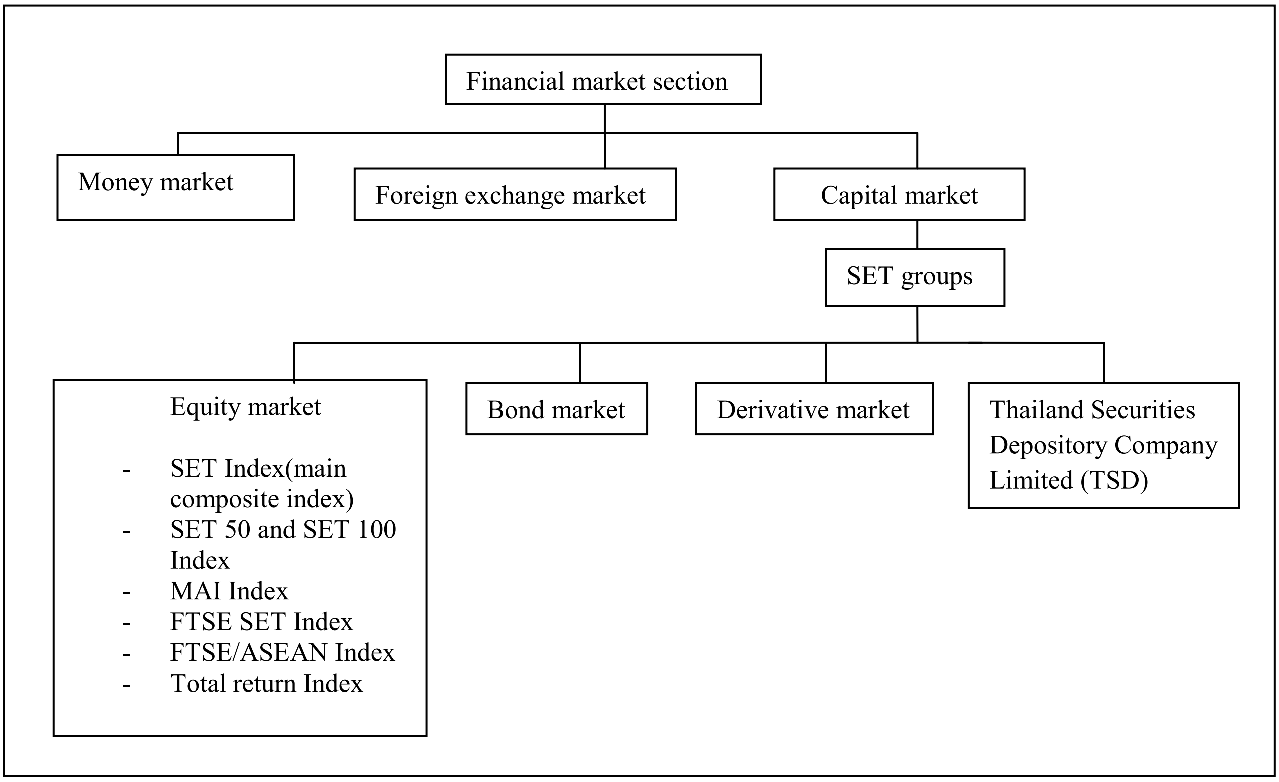
This market operates in derivative trading and aims to support the hedging and risk management (equity risk, interest rate risk, exchange rate risk and price risk) of the derivative instruments (future and option contracts) (BOT, 2010a). Derivative trading is operated by the Thailand Future Exchange (TFEX), which was set up on 17 May 2004 and deals with electronic trading for the derivative market (BOT, 2010a). Six instruments trade on this market: SET 50 Index futures (set up on 28 April 2006), the SET 50 Index option (set up on 29 October 2007), stock futures (set up on 24 November 2008), 5 year government bond futures (set up on 18 October 2010), 50 Baht gold futures (set up on 2 February 2009) and 10 Baht gold futures (set up on 2 August 2010) (Thailand Future Exchange, 2010).

(4) Thailand Securities Depository Company Limited (TSD)

TSD, which was established on 16 November 1994, plays a major role as the SET's subsidiary for the post-trade service of securities (securities depository service for stocks and bonds, securities clearing and settlement service, securities and fund registration service, and broker operation service) (SET, 2010d).

In addition to the four main groups on the SET, there are also other securities trading groups elsewhere on the SET, including mutual funds and property funds. A summary of the structure of the financial market in Thailand is shown in figure 3.13.

Figure 3.13: Structure of the financial market in Thailand.



3.4 Financial development in Thailand

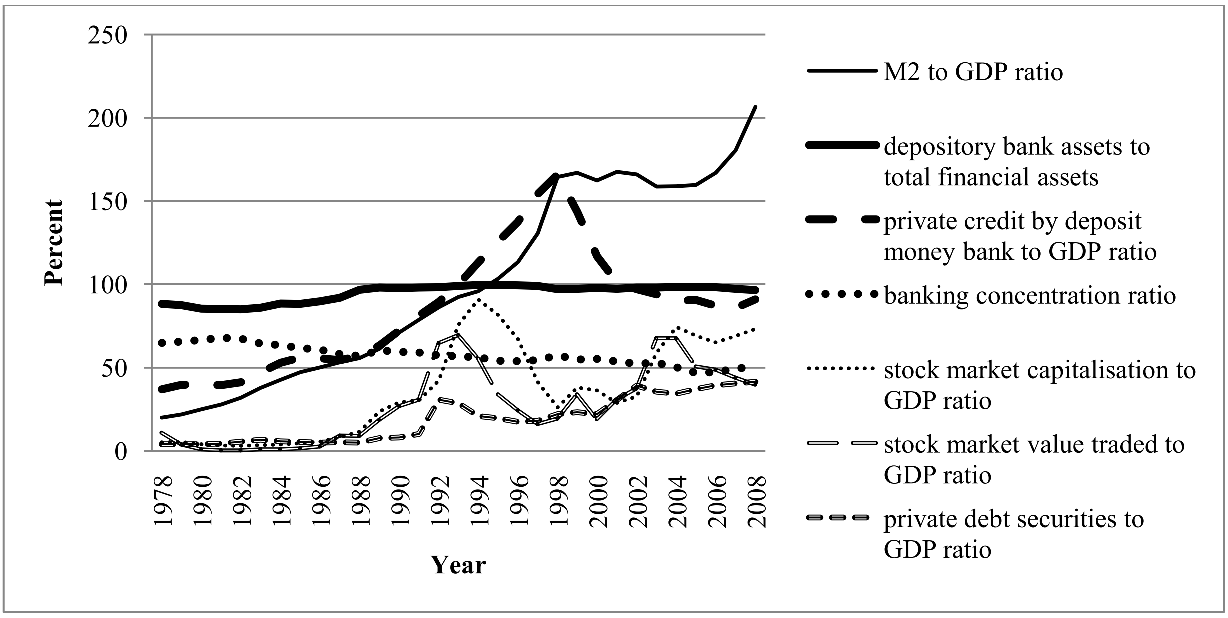
Having considered the structure of the financial system in Thailand, it is now important to explore financial development in the country. Since the establishment of the Stock Exchange of Thailand (SET), which began trading in April 1975, the financial market has shown continual development (SET, 2010c). During the period from 1978 to 1989, there was development in the financial institution and the capital market sector, as well as financial innovation, exemplified by the issuing of new financial instruments and new markets, and financial technologies. In April 1979, the repurchase market was established and in May 1979 there was authorization for commercial banks and finance companies to operate government bond repurchase transactions in order to improve money market liquidity for the bonds (BOT, 1992b). In December 1979, the Foreign Exchange Offices were opened to increase bank services and to support commercial bank foreign exchange systems, and telephone inter-bank transfers introduced to support liquidity in the banking system (BOT, 1979, 1992b). In January 1982, there was the establishment of the Bond Exchange Programme for the transaction of government bonds of different maturities and yields to develop the secondary market. During 1983, commercial banks extended their business, as they were allowed to transact public bonds to support development in the money and capital markets (BOT, 1983). Innovation in the financial security of commercial banks was shown in March 1984 by the introduction of transferable deposit certificates, with the purpose of mobilizing short-term deposits (BOT, 1984). Moreover, both financial and non-financial institutions were allowed by SET to make public offerings of shares and debentures in order to increase liquidity and trading on the exchange (BOT, 1984). There was also a relaxation of bank branch opening restrictions, as banks were given permission to open branches in districts without representation (Vichyanond, 1994). New financial instrument innovation was continued by the introduction of the BIBORS (interest rate set for interbank loans and deposits) in 1985, which was used for the government bond repurchase market, treasury bills and transaction of commercial papers (BOT, 1985). Development in financial technology and the banking system continued, as shown by the introduction of the SWIFT (Society for Worldwide Interbank Financial Telecommunication)[12], central credit centres and a computerized check

[12] According to SWIFT (2013), it is a cooperative whose members comprise financial institutions and corporations in different countries. Its business includes financial data and information exchange between financial institutions, as well as the provision of related services (SWIFT, 2013). SWIFT aims to support the reduction of operational risk, low cost financial transactions, and efficiency in the operation of financial institutions.

clearing system for the development of commercial bank data exchange between countries and for the transfer of international funds (Vichyanond, 1994). A further development in October 1987 was when commercial banks were allowed to carry out leasing activities, to provide mergers and acquisitions consulting services and to recommend clients to life insurance companies (BOT, 1987). Between 1987 and 1988, both SET and BOT continued to support the development of new securities by issuing ADRs (American Depository Receipts) in April 1987, as well as allowing both non-financial and financial institutions to increase the share and debenture public offerings in February 1988 in order to develop the capital market (SET, 2010e). In June 1989, BOT began its plan for financial liberalization in 1990, which started with the deregulation of interest rate ceilings, and it decided to abolish the long-term deposit interest rate ceiling (BOT, 1989).

Overall, financial development from 1978 to 1989 showed a continual increase. As seen in figure 3.14, the depository bank assets to total financial assets ratio (from 88% to 98%), the private credit by deposit money bank to GDP ratio (from 37% to 72%), the stock market capitalization to GDP ratio (from 5% to 23 %), the stock market value traded to GDP ratio (from 8% to 10%) and the private debt securities to GDP ratio (from 4% to 8%) all showed a gradual increase. This shows the increase in the size of the banking sector and its issue of credit, a rise in the size of the capital market and trading activities, and the innovation of financial market instruments throughout the period. This was due to the development of the banking sector (the extension of banking business), as well as the introduction of new financial market instruments to support capital market trading. Financial deepening (M2 to GDP ratio) also showed a steady rise, from around 20% to 61%, as a result of the development of capital market instruments and the rise in banking services. The banking concentration ratio in this period shows a slight drop, from around 64% to 60%. This was due to higher competition in the banking sector caused by the extension of banking business seen during this period.

Figure3.14: Financial development indicators in Thailand from 1978 to 2008



Source: Beck et al. (1999).

During the period from 1990 to 1996, institutional sector and financial market development, as well as financial innovation, continued to show positive trends. From 1990 to 1992, BOT announced an official financial reform plan, which mainly aimed to introduce financial system liberalization, as well as to support the development of financial instruments and services (Hataiseree, 1995). During this period, the full policies on financial liberalization were announced, exemplified by the abolition of deposit interest rate ceilings, including the abandonment of the ceilings on short-term time deposit interest rates (in March 1990), saving deposit interest rates (in January 1992), and lending interest rates (in June 1992) (Hataiseree, 1995; Sodsrichai, 1993). Foreign exchange liberalization was introduced in May 1990, including the abolition of international current account transaction payment and transfer restrictions, the authorization of commercial banks to make trade transaction payments, foreign loan repayment and capital remittance repayments, and an increase in the limits on the amount of foreign currency Thai travellers could purchase (Yananda et al., 1992; Sodsrichai, 1993). The second round of foreign exchange control relaxation was introduced in April 1991 and April 1992, including the abolition of foreign currency purchase limits[13] for travelling, lending, and portfolio investment; and a relaxation in the regulations on exporters for foreign transactions (BOT, 1991, 1992; Hataiseree, 1995). The overseas transfer of foreign currency deposits was now allowed, non-resident baht accounts could be used for exporters' payments and Thai nationals were now able to open foreign currency accounts (BOT, 1991; Sodsrichai, 1993; Hataiseree, 1995). A third round of foreign exchange control liberalization was introduced in January 1994, which allowed the transfer of foreign currency abroad and the lending of foreign currency to non-residents, as well as relaxation of the regulations on opening foreign currency accounts (Hataiseree, 1995; Vichyanond, 1994).

The financial liberalization policies introduced in 1990 were also extended to the institutional and financial market sectors. In May 1990, commercial banks were allowed to extend their business as authorisation was given for them to approve foreign loans and funds remittance of customers abroad (BOT, 1990). There was a reduction in the restrictions on the opening of new branches and on net foreign liability restrictions, and also on the foreign asset requirement of commercial banks in November 1990 (Sodsrichai, 1993). In addition, in August 1990, the minimum denomination requirements of promissory notes for finance companies, as well as the restrictions on the capital funds they could invest in securities, were

[13] The limitation of this foreign currency purchase appeared in some cases. Details of this can be found in BOT (1991).

abolished. There were further relaxations in the requirements for the opening of new bank branches in this year (Alba et al., 1999; BOT, 1990) and the establishment of provincial security trading offices in order to spread trading throughout the country (BOT, 1990). In 1992, financial institution business and the financial market continued to develop. Commercial banks were authorized to hold state enterprise bonds and debt instruments in May 1991 (BOT, 1992). In June 1991, financial portfolio management control was relaxed so that other securities could be used as the reserve requirement of commercial banks (liquidity ratio basis) instead of solely government securities (reserve requirement ratio basis) (BOT, 1992b). Commercial banks and finance and securities companies were allowed to operate as government and state enterprise debt instrument sales agents and financial advisors in March 1992 (BOT, 1992b). In addition, in October 1992, negotiable certificates of deposits (hereafter, CDs) issued by commercial banks and securities companies were introduced. There was also an extension of the provision for banks and finance companies to jointly establish mutual funds business in June 1992 (BOT, 1991, 1992b; Sodsrichai, 1993; Vichyanond, 1994).

From 1993 to 1995, BOT continued the process of financial liberalization in the country by issuing the second financial reform plan (BOT, 1992b). New deregulation policies for financial institutions and the market were introduced in this period to extend the development of banking and financial market business. In March 1993, Bangkok International Banking Facilities[14] (hereafter, BIBF) was established. This institution is an offshore banking unit facilitating commercial banks' international lending and deposit services, foreign currency

[14] Liberalization in this case included authorisation for commercial banks to operate the BIBF licence, which means that they could perform foreign exchange transactions and in foreign currencies (BOT, 1993). BOT also allowed the expansion of BIBF branches into rural area lending in May 1994 (Vichyanond, 1994).

transactions and financial information provision (BOT, 1993). It aims to increase banking system competition and bank domestic and foreign lending, reduce the cost of foreign funds borrowing, and increase transactions in the foreign exchange market (BOT, 1993). Other institutions were also established in this period, including the first Thai credit rating agency (Thai Rating and Information Services: TRIS), which aims to facilitate and increase the efficiency of the capital market (July 1993); the EXIM bank, which was to support the financial business of the trade sector (September 1993), and a bond dealers' club in 1994 to promote liquidity in debt instruments (Vichyanond, 1994; SET, 2010e). The liberalization policies introduced in this period included the abolition of the government securities requirement for the opening of commercial bank branches in May 1993; the relaxation of commercial banks' business investment requirements in September 1994; the separation of financial company and securities company business in August 1994; the relaxation of the limits of company equity held by banks and of equity investment in May 1994; the introduction of higher maturity (1 and 2 year) bonds traded on the financial market in March 1996 and authorization for finance companies to carry out foreign exchange operations in April 1996 (Sodsrichai, 1993; Alba et al, 1999; BOT, 1995, 1996, 1998b; Vichyanond, 1994; Hataiseree, 1995).

Innovations in the financial system continued to develop in this period (1990-1996). New financial technologies and systems included a payment system development in February 1991, with the aim of developing electronic transfer payments; the introduction of SET electronic securities trading (Automated System for the SET: ASSET) in April 1991; the development of an electronic small value transfer system (ATM pools) in 1993; the introduction of the Bank of Thailand Automated High-value Transfer Network (BATHNET), the electronic information report system (Price Reporting System: PRS) and the Electronic Listed Company Information Disclosure (ELCID) in 1995, which intended to facilitate real-time information for investors (BOT, 1991; BOT, 2002b; SET, 2010e).

Overall, the financial liberalization policies introduced in 1990 (the relaxation of interest rates, capital accounts, exchange rates and financial institution control), the extension of financial institution business, and the establishment of new institutions and financial technologies to develop financial market transactions contributed to the increase in the size of the banking sector and capital market, the innovation of financial market instruments, and financial deepening throughout this period (1990 to 1996). Figure 3.14 shows that the depository bank assets to total financial assets ratio, the private credit to GDP ratio, the stock market capitalization to GDP ratio, the stock market value traded to GDP ratio, the private debt securities to GDP ratio, and the M2 to GDP ratio showed a gradual increase from 1990 to 1996, therefore indicating that the development of the banking sector and the capital market, financial innovation and financial deepening continued to increase in this period. The banking concentration ratio showed a slight decrease, from around 59% to 53% from 1990 to 1996. This resulted from the higher competition in the financial institution sector due to the expanded services offered by financial institutions and from the relaxation of many financial institution controls. The abolition of the interest rate ceiling, the relaxation of exchange rate and capital account control, and the establishment of new institutions to support foreign currency and capital market transactions also led to an increase in the growth of credit and deposits, capital inflow, foreign direct investment, portfolio investment and the capital and financial account balances during this period, as explained in section 3.2.

Although a crisis occurred in 1997, development in Thailand continued to take place in both financial institutions and the financial market between 1997 and 2008. As the crisis affected the Thai economy, major development from 1997 to 2008 was introduced to help the financial sector, which had problems during the crisis, and to prevent ongoing financial crisis in the future. In August 1998, the financial sector restructuring plan was introduced (BOT, 1998b). This plan included collateral transfer fee and tax exemption and the introduction of a deposit insurance agency to solve the liquidity problem of financial institutions (Santiprabhob, 2003). There recapitalization policy was introduced from August 1998 to May 1999, which included the nationalization and merger of financial institutions from around May and August 1998 to 2002[15](Santiprabhob, 2003). Additionally, there was an injection of public funds to support financial institutions and the privatization of commercial banks from 1999 to 2000[16] (Santiprabhob, 2003). New institutions were established for the purpose of debt restructuring as well as improving the liquidity condition of financial institutions and markets. These included the Property Loan Management Organisation (PLMO) in 1997, which carries out property loan management business (the purchase of impaired property loans, the securitization of property loans, and the operation of property mutual funds) in order to solve the default debt problem and to support the property business; the Secondary Mortgage Corporation (SMC) in 1997, which operates as a liquidity support institution for mortgage loans; the Financial Sector Restructuring Authority (FRA) in October 1997, which manages and controls recapitalization plans for finance companies which have closed down; the Thai Asset Management Corporation (TAMC) in June 2001, which manages the assets of financial

[15] In May 1998, five financial companies merged with the Krung Thai Thanakit Finance Company (KTT) (Santiprabhob, 2003). In August 1998, Union Bank (UB) merged with seven other finance companies to form an enlarged KTT (this merger became the Bank Thai (BT)), the Laem Thong Bank (LTB) merged with Radhanasin Bank (RB), and Nakronthon Bank (NTB) with Standard Charter Bank (Santiprabhob, 2003). The mergers can be seen in April 2002 with the assets and liabilities transfer from Bangkok Metropolitan Bank (BMB) to Siam City Bank (SCIB) (BOT, 2002).
[16] RB, NTB, SCIB, and BMB were privatized during this period, with between 51% and 75% of their assets sold to strategic partners (Santiprabhob, 2003).

institutions in order to increase liquidity in the financial market; and the Credit Bureau in September 2002, which provides credit information to financial institution members during the loan approval process (BOT, 2002b; Santiprabhob, 2003; Charoenseang and Manakit, 2002). BOT also permitted the adjustment of the securities transaction commission in October 2000 in order to help increase the number of securities transactions (BOT, 2000). Furthermore, during 2000, BOT also gave permission for private repurchase transactions in listed companies, allowed the specialized financial institutions and others to extend agricultural, retail customer and long-term credit, and authorized securities companies to carry out some of the commercial bank business (for example, foreign exchange transaction business) (BOT, 2000, 2002b).

Innovation in technology and development of the payment system continued in this period. This was shown by the establishment of a Set-Trade dot com Public Company Limited and the Thai-NDVR Public Company Limited for the promotion of securities trading via the internet and for information support in January 2000 (SET, 2010e). Internet trading of securities was established in January 2000 and off-hour trading in May 2000 to facilitate transactions on the capital market (BOT, 2002b). Furthermore, there was the introduction of online retail funds transfer (ORFT) for ATM interbank transfer payments in June 2000 (SET, 2010e). In December 2001, BATHNET phase II was developed to support government securities transfer payments and Electronic Retail Funds Transfer (SMART) was introduced (BOT, 2002b). The International Financial Reporting Standard (IFRS) for development of the accounting standards of listed companies was also established in 2006 (BOT, 2002b; SET, 2010e; Federation of Thai Capital Market Organisation, 2009).

In 2003, the financial sector master plan phase I was introduced by BOT, covering the period from 2003 to 2008, in order to strengthen the Thai financial sectors, support an increase in the scope of business of commercial banks, and prevent the risk of financial crisis (BOT, 2006b, 2009). The Thai capital market master plan phase I (from 2003 to 2005), and phase II (from 2006 to 2010), were also introduced in order to support the financial master plan framework, innovation in the financial system, and competitiveness in the financial institutions (Federation of Thai Capital Market Organisation, 2009b). There was further development in financial institutions and the financial market, and innovation in the financial system during the period from 2003 to 2008. This development mainly comprised the creation of a micro finance system development committee in August 2003 to develop the financial sector in other provinces (for example, to extend loans and support co-operation to rural areas) (Federation of Thai Capital Market Organisation, 2009a). In July 2004, the establishment of more commercial banks as subsidiaries of foreign banks was allowed by the Ministry of Finance (BOT, 2004). There was also encouragement for SME business to operate retail transactions in the bond market and for exchange links between domestic and foreign derivative and bond markets from 2006 to 2008 (Federation of Thai Capital Market Organisation, 2009; BOT, 2006b). Moreover, from 2003 to 2008, new financial institutions were established to support the development of the financial market and institutional sectors. This can be seen in the establishment of the Bond Electronic Exchange (BEX) to support bond market electronic transactions in November 2003 and the establishment of Thailand Derivative Market Public Company Limited, which acted as the centre for derivative transactions, in 2004 (SET, 2010e, BOT, 2006b). In May 2004, the Thailand Future Exchange market (TFEX) was established for the development of the derivative market and instruments transaction (TFEX, 2010). From 2006 to 2008, the development of institutions and the financial market continued. This was shown by the authorization for commercial banks to carry out securities short sale transactions and securitization transaction in April 2006; the introduction of the SET 50 index for future trading in September 2006; the establishment of the SET 50 index for option trading in October 2007; and the establishment of the future trading market in November 2008 (TFEX, 2010; SET, 2010e; BOT, 2006b).

Overall, despite the financial crisis of 1997, financial development in Thailand from 1997 to 2008 continued to show positive trends compared to the previous period. Figure 3.14 shows that although there were downward trends, exemplified by drops in the depository bank assets to total financial assets ratio, the private credit by deposit money bank to GDP ratio, the stock market capitalization to GDP ratio, the stock market total value traded to GDP ratio and the market and private debt securities to GDP ratio, as well as slow growth in the M2 to GDP ratio between 1997 and 2001; the introduction of the financial restructuring plan and the financial development throughout this period contributed to the increase in the size of the banking sector and the capital market, and innovation of financial market instruments. This was shown by the increase of these indicators throughout this period. In addition, although the financial concentration ratio shows a positive trend from 1997 to 2001 due to the effect of the financial crisis and weak competition in the banking sector, this ratio shows a negative trend after 2001 to 2008, from 57% to 50%, showing the higher level of competition in the banking sector.

After the introduction of the financial master plan which covered the period from 2003 to 2008, the BOT announced it would extend this master plan by issuing the financial sector master plan phase II, which aimed to increase financial competition, support financial access and financial infrastructure, improve financial institutions' risk management systems, and reduce financial operating costs in the banking system (BOT, 2009). This plan is an on-going development plan for financial development in Thailand, covering the period from 2010 to 2014.

Table 3.2 shows the timeline of financial development in Thailand.

Table 3.2: Timeline of financial development in Thailand from 1978 to 2008

Year	Month	Financial development in Thailand
1979	April May December	- Establishment of the repurchase market. - Authorization for commercial banks and finance companies to make government bond repurchase transactions. - Opening of Foreign Exchange Offices in commercial banks. - Introduction of telephone inter-bank transfers.
1982	January	- Establishment of the Bond Exchange Programme.
1983		- Commercial banks allowed to make public bond transactions. - Relaxation of commercial bank branch opening restriction (authorization for the extension of bank branches into districts without branches and the outskirts of cities).
1984	March	- Introduction of transferable deposit certificates.
	December	- Financial and non-financial institutions allowed to make share and debenture public offerings.
1985		- Introduction of BIBORS for the government bond repurchase market, treasury bill and commercial paper transactions. - Introduction of SWIFT (Society for Worldwide International Funds Transfers), a central credit centre and computerized check clearing system.
1987	April October	- Issuing of ADRs (American Depository Receipts) for the development of the capital market and to increase capital. - Authorization for commercial banks to carry out leasing activities, mergers and acquisitions consulting services, and to make life insurance recommendations.
1988	February	- Authorization for non-financial and financial institutions to increase share and debenture public offerings.
1989		- Abolition of the long-term time deposit interest rate ceiling.
1990	January March May August	- Introduction of the financial reform plan (the full system of financial liberalization in the country now began). - Abandonment of the short-term time deposit interest rate ceiling. - Introduction of foreign exchange liberalization (acceptance of the IMF agreement in articles VIII). - Abolition of international current account transaction payment and transfer restrictions. - Authorization for commercial banks to make trade transaction payments, capital remittance repayments and foreign loans. - Increase in Thai travellers' level of foreign currency purchases. - Authorization for commercial banks to make foreign loan approvals and approvals for overseas customers' remittances of funds. - Abolition of the promissory note minimum denomination requirement for finance companies. - Abolition of restrictions on companies' capital funds invested in securities. - Establishment of provincial area security trading offices.

Table 3.1 (cont'd): Timeline of financial development in Thailand from 1978 to 2008

Year	Month	Financial development in Thailand
1990	September November	- Relaxation of bank branch opening restrictions (1.5 per cent reduction in government bond requirements for bank branch opening). - Reduction in bank branch opening, foreign asset requirements, and net foreign liability position restrictions (a 6.5 per cent reduction in government bond requirements for bank branch opening and a 5 per cent increase in the net foreign liability position of commercial banks).
1991	February April May	- Development of electronic transfer payments. - Introduction of a second round of foreign exchange control relaxation. - Abolition of foreign currency purchase limits (purchase of foreign currency for travelling, lending and direct and portfolio investment). - Introduction of SET's electronic securities trading (ASSET). - Authorization for commercial banks to hold state enterprise bonds and debt instruments.
1992	January February March April June October	- Abandonment of the saving deposit interest rate ceiling. - Relaxation of bank branch opening restrictions (a 1.5 per cent reduction in government bond requirements for the opening of bank branches). - Authorization for commercial banks and finance and securities companies to operate as government and state enterprise debt instrument sales agents, financial advisors and as an information service. - Relaxation of exporter regulations on foreign transactions (non-resident baht accounts could now be used for exporter payments). - Transfer of overseas debt payments for foreign currency deposits now allowed. - Fund withdrawals for overseas payments freely approved for commercial banks. - Abandonment of the lending interest rate ceiling. - Relaxation of financial portfolio management control. - Extension of provision for banks and finance companies to jointly establish mutual funds. - Introduction of CDs.
1993	 March May	- Establishment of the second financial reform plan, with the aim of continuing to develop financial liberalization policies and the banking and financial markets. - Establishment of the BIBF. - Abolition of all commercial bank opening requirements regarding the holding of government securities. - Introduction of an electronic small value transfer system (ATM pools).
1994	January July September	-Third round of foreign exchange control relaxation to support the flow of foreign exchange transferred abroad and non-resident foreign exchange lending. - Relaxation of the regulations on the opening of foreign currency accounts. - Establishment of the Thai Rating and Information Service (TRIS). - Establishment of the Export and Import Bank of Thailand (EXIM bank). - Establishment of a bond dealers'club. - Relaxation of the limits on company equity held by banks and equity investment.
1995		- Introduction of the Bank of Thailand Automated High-value Transfer Network (BATHNET), the Electronic Information Report System (PRS), and Electronic Listed Company Information Disclosure (ELCID).
1996	March April	- Introduction of higher maturity bonds (1 and 2 year bonds). - Authorization for finance companies to carry out foreign exchange operations.

Table 3.1 (cont'd): Timeline of financial development in Thailand from 1978 to 2008

Year	Month	Financial development in Thailand
1997		- Establishment of the Property Loan Management Organisation (PLMO), the Financial Sector Restructuring Authority (FRA), and the Secondary Mortgage Corporation (SMC) for debt restructuring purposes and for improving liquidity conditions in the financial market and institutions.
1998	May August	- Merger of five finance companies with the Krung Thai Thanakit Finance Company (KTT). - Introduction of the financial sector restructuring plan. - Collateral transfer fees and tax exemption. - Introduction of the deposit insurance agency. - Increase in the investment limits and holding time period of foreclosed properties in order to facilitate debt-equity swaps. - Introduction of the recapitalization policy. - Merger of the Union Bank and seven other finance companies with KTT. - Merger of Laem Thong Bank (LTB) with Radhanasin Bank (RB). - Merger of Nakronthon Bank (NTB) with Standard Charter Bank.
1999		- Injection of public funds to support financial institutions. - Privatisation of RB, NTB, SCIB and BMB until 2000.
2000	January May June	- Authorization for private repurchase transactions in listed companies. - Authorization for specialized and other financial institutions to extend agricultural, retail customer and long-term credit. - Authorization for securities companies to carry out foreign exchange transaction business. - Establishment of the Thai-NDVR public company limited and set-trade dot com public company limited. - Commencement of internet trading in the capital market. - Introduction of off-hour trading. - Introduction of on-line retail funds transfer (ORFT) for interbank ATM transfer payments. - Authorization for the establishment of the securities transaction commission.
2001	June December	- Establishment of the Thai Asset Management Corporation (TAMC). - Introduction of BATHNET phase II. - Improvements in the government bond payment system.
2002	April September	- Merger of Bangkok Metropolitan Bank (BMB) with Siam City Bank (SCIB). - Establishment of the Credit Bureau.
2003	 March April August	- Establishment of the financial sector master plan phase I (from 2003 to 2008), and the Thai capital market master plan phase I (from 2003 to 2005), and phase II (from 2006 to 2010). - Development of the Credit Bureau. - Authorization for commercial banks to make forward bond, bond options and default swap transactions. - Extension of loans to rural areas and support for cooperation in these areas. - Establishment of the Bond Electronic Exchange (BEX).
2004	May	- Establishment of the Thai Future Exchange market (TFEX). - Establishment of the Siam DR company for the issuing of depository receipts to investors and the Thailand derivative market PLC.

Table 3.1 (cont'd): Timeline of financial development in Thailand from 1978 to 2008

2006	April September	- Authorization for commercial banks to make private repurchase market transactions, securities short sale transactions, and securitization transactions. - Introduction of SET 50 future index trading. - Introduction of the Electronic Retail Fund Transfer (SMART) and International Financial Reporting Standard (IFRS). - Encouragement for SME business, retail transactions in the bond market, exchange linkage between domestic and foreign derivative and bond markets from 2006 to 2008.
2007	October	- Introduction of SET 50 index option trading.
2008	November	- Introduction of stock future trading.
2010		- Announcement of the financial master plan phase II (2010-2014)

CHAPTER FOUR

FINANCIAL DEVELOPMENT AND

THE LENDING CHANNEL OF MONETARY POLICY TRANSMISSION:

EVIDENCE FROM THAILAND USING BANK LEVEL DATA

4.1 Introduction

The lending channel is one important issue of monetary policy transmission relating to the banking sector. We already described in chapter 2 that a micro data based study is considered to be the suitable way for the examination of this channel. Agung et al. (2002a), Wibowo (2005), Garretsen and Swank (2003), Gupta (2004) and Pruteanu-Popiera (2007) point out that the use of aggregate time series data in the model cannot distinguish whether the effect of monetary policy shock on loans comes from the supply side (the change in the bank loan supply generally presented in the lending channel) or the demand side (the change in the demand for loans explained by the interest rate channel), thus giving rise to the identification problem.

Many studies of the lending channel mainly use bank-level panel data (micro data based studies) which account for the bank characteristic variables (size, capitalization, and liquidity) to circumvent the above problem (Hosono, 2006; Li, 2009; Kashyap and Stein, 2000). As the different bank characteristics will have different effects on the loan supply, the use of these characteristic variables will control for the cross sectional differences in the effects of monetary policy on loan supply (Li, 2009; Agung et al., 2002a; Hernando and Martinez-

Pages, 2001). Thus, this shows that these characteristic variables are the indicators representing the supply side effect of monetary policy shock (bank characteristic variables mainly affect banks' loan supply) (Alfaro et al., 2003; Agung et al., 2002a; Kashyap and Stein, 2000; Li, 2009; Hernando and Martinez-Pages, 2001). Another advantage of bank-level panel data is that the bank characteristic variables can control for the lenders' heterogeneity as well as the difference in bank balance sheet strength (Li, 2009; Garretsen and Swank, 2003). Therefore, the micro data based approach, by introducing the bank characteristic variables, becomes the appropriate way to study the lending channel. This type of study has been applied in many bank lending channel studies (Kashyap and Stein, 1994a, 2000; Ehrmann and Worms, 2004; Peek and Rosengren, 1995b; Gambacorta and Mistrulli, 2004; Agung, 1998; Agung et al., 2002a; Horváth et al., 2006; Gambacorta, 2001; Ehrmann et al., 2001).

The studies of the effect of financial sector development on the lending channel, such as Li (2009), Altunbas et al. (2009b), Gambacorta and Mistrulli (2004) and Aysun and Hepp (2011) indicate only the effect of financial competition and financial innovation on the lending channel. However, they ignore other financial development issues (financial deepening and financial liberalization).

Furthermore, most of the micro data based studies have been carried out in countries with developed economies, such as the US (Kashyap and Stein, 1993, 1994a, 2000; Kishan and Opiela, 2000; Gunji et al., 2009; Adams and Amel, 2005); the Euro area (Altunbas et al., 2002; Ehrmann et al., 2001; Chatelain et al., 2003a; Matousek and Sarantis, 2009; Favero et al., 1999); Germany (Worm, 2001); Japan (Hosono, 2006); France (Loupias et al., 2002) and

Italy (Gambacorta and Mistrulli, 2004; Gambacorta, 2001), while relatively few papers have discussed developing countries, such as Indonesia (Agung et al., 2002a), South Africa (Sichei, 2005), Brazil (De Oliveira and Ramos, 2008), Colombia (Goḿez-Gonzaĺez and Grosz, 2007) and Chile (Fernandez, 2004; Alfaro et al., 2003). There is a lack of studies of this issue in Thailand; it appears that only Piyavongpinyo (2002) introduces this approach for the bank panel level data study of the lending channel. However, he still does not investigate the effect of financial development on the lending channel.

This chapter will make the following contributions concerning the gap found in the past literature: (1) it will examine a micro data based study by using bank-level panel data and introducing bank characteristic variables in order to circumvent the problem of using aggregate time series data in the bank lending channel; (2) other studies only focus on the effect of financial competition and financial innovation on the lending channel, so this chapter will expand this issue by also introducing the effects of financial liberalization, banking sector development and capital market development on the channel in order to investigate the effect of different areas of financial development on it, and (3) this chapter will also shed light on the study of the effect of financial development on the lending channel in order to fill the gap in previous empirical studies in Thailand, which do not focus on the effect of financial development on the bank lending channel. This individual country study can also control for the different structures of economic and financial backgrounds, which is generally the case when conducting multi-country studies.

The main objectives of this chapter are as follows: (1) to examine the lending channel from the micro data based perspective, with the aim of analyzing the effect of different bank characteristics, which include bank characteristic variables (size, capitalization, liquidity and ownership structure) on the lending channel of monetary policy transmission, and (2) to investigate the effect of financial development (financial liberalization, financial competition, financial innovation, banking sector development, and capital market development) on the lending channel in Thailand, particularly at the micro based level. The study will examine this effect by using financial development indicators in the model to represent the effect of financial sector development.

Our results indicate the existence of the bank lending channel in Thailand in the period from 1978 to 2008 as we found a negative effect of the policy interest rate on bank loans. The results show that the higher the size, capitalization and liquidity characteristics of banks, the weaker the effect of monetary policy via the bank lending channels. This is due to the greater opportunity for these banks to obtain external sources of funding and they will therefore face a lower effect of the policy interest rate on bank loans The results of the effect of financial development indicate the significant effect of financial development indicators on bank loans in Thailand. The results show that banking sector development, banking competition, capital market development, financial innovation and financial liberalization have weakened the bank lending channel. This is because financial sector development can lead to development in both the size and activities of the banking sector and capital market, and development of new financial market instruments. This condition leads to wider opportunities for banks to access the financial market, as well as a higher level of financial market liquidity and capital, thus leading to a lower effect of monetary policy on bank loans.

The remainder of this chapter will be developed as follows: section 4.2 will present a theoretical literature review concerning the effect of bank characteristics on the lending channel, as well as the empirical literature related to the micro aspect study, including micro based study of the lending channel and the effect of financial development on the lending channel. Section 4.3 will discuss the data and methodology (data description, model specification and the methodology applied in this study). The empirical results and analysis will be presented in section 4.4, and finally the conclusion and suggestions for further research will be discussed in section 4.5.

4.2 Literature review

4.2.1 Effect of bank characteristics on the lending channel of monetary policy transmission

Bank characteristics can be considered as size, capitalization and liquidity. According to Kashyap and Stein (1994a, 2000) and Kakes (1998), a rise in the policy interest rate will be followed by a lower decline in large bank lending than in that of small banks. This is because large banks have greater opportunities to raise external funds than small ones. Furthermore, there is a lower level of asymmetric information problems in large banks relative to small ones (Kashyap and Stein, 1994a, 2000). This is due to their higher reputation, better risk diversification behaviour, and the higher liquid funds (Li, 2009; Bank of Korea, 1998; Favero et al., 1999; Kishan and Opiela, 2000; Sichei, 2005). This will reduce the external funding costs or securities issuing costs of large banks and thus incresing the opportunity for external funding (access to capital markets and commercial paper markets, and also the issuing of foreign bonds and other securities) (Ehrmann et al., 2001; Garretsen and Swank, 2003; Agung et al., 2002a; Loupias et al., 2001; Haan, 2001; Matousek and Sarantis, 2009). Therefore, when there is a monetary policy shock, large banks will show a lower sensitivity of their bank loans to the change in the policy interest rate than small banks, thus leading to the weakening of the lending channel.

For the capitalization characteristic of banks, monetary policy shock will have a lower effect on the loans of better capitalized banks than those of poorly capitalized ones (Peek and Rosengren, 1995b; Wu et al., 2007; Altunbas, 2009; Benkovskis, 2008). This is because the highly capitalized banks have a lower credit risk, as well as high creditworthiness (Piyavongpinyo, 2002; Pruteanu-Podpiera, 2007; Chavan and Vaidya, 2003; Brissimiss and Delis, 2009; Haan, 2001; Loupias et al., 2001). Consequently, the more highly capitalized banks will find external funding from the financial markets more easily and thus their loans will show a lower response to the monetary policy shock than the less capitalized ones (Worms, 2001; Engler et al., 2007; Hosono, 2006; Gambacorta and Mistrulli, 2004). In other words, the higher the bank capitalization, the lower the effect of monetary policy shock on bank loans and the weakening of the lending channel.

For the liquidity characteristic, the higher a bank's liquidity, the lower the effect of monetary policy shock on its loans. This is due to the high proportion of cash, liquid assets and securities of the more liquid banks compared with the less liquid ones (Favero et al., 1999; Schmitz, 2004). As a result, when the policy interest rate increases, the more liquid banks will have greater opportunities to offset the decrease in bank loans with their liquid assets and securities (Haan, 2001; Hernando and Martinez-Pages, 2001; Loupias et al., 2002; Ghosh, 2006; Brissimis and Delis, 2009). Therefore, the higher the banks' liquidity, the lower the effect of monetary policy shock on their loans and the weakening of the lending channel.

Therefore, concerning the previous theoretical review, higher size, capitalization and liquidity of banks are expected to weaken the effect of monetary policy shock on bank loans.

4.2.2 Studies of the micro data based aspect of the lending channel of monetary policy transmission

This section will discuss two aspects of the empirical micro data based studies: (1) studies of the bank lending channel of monetary policy transmission, and (2) studies of the effect of financial sector development on the bank lending channel of monetary policy transmission.

4.2.2.1 Studies of the bank lending channel of monetary policy transmission

Kishan and Opiela (2000) consider the lending channel in the US and their dynamic panel data results indicate a higher negative effect of the policy interest rate on the loans of small and undercapitalized banks, compared with those of large and well capitalized ones. This result supports the theoretical concept explained previously, as the smaller the bank size and capitalization, the higher the effect of the policy interest rate on bank loans. Instead of dividing banks into different groups, Engler et al. (2007) apply a bank characteristic variable to their model and use the GMM technique in a case study of Austria. They indicate the positive effect of the interaction of policy rate and capital characteristic of banks on bank loans, which means that the higher the capitalization of banks, the lower the effect of the interest rate on their loans. Similar results are also shown by Peek and Rosengren (1995b) in their study of the US. By using the GMM technique, they report that both the size and capitalization characteristics of banks will lead to a weakened effect on the bank lending channel.

Gambacorta and Mistrulli (2004) apply the GMM estimation to study the bank lending channel in Italy and they introduce the liquidity chracteristic into their model. They show a positive effect of the interaction term between money market interest rates and capitalization, as well as the liquidity characteristic, on bank loans. Consequently, this confirms that the higher the capitalization and liquidity of banks, the weaker the lending channel. A similar result is also reported by Topi and Vilmunen (2001), Ashcraft (2001), Gambacorta (2001), Haan (2001) in their bank lending channel studies of Finland, the US, Italy, and the Netherlands respectively.

Amongst studies of developing countries, Piyavongpinyo (2002) examines the lending channel in Thailand. Her panel data results confirm that the larger the bank, the weaker the effect of the policy interest rate via the lending channel. De Oliveira and Ramos (2008) and Sichei (2005) study the lending channel in Brazil and in Africa using GMM estimation and introducing the size and liquidity characteristics of banks in their studies. They conclude that the higher the size and liquidity characteristics of banks, the weaker the effect of the policy rate on bank loans and thus the weaker the effect of the policy interest rate through the lending channel. Similarly, Gómez-Gonzaĺez and Grosz (2007), using GMM on data from Argentina and Colombia, found that the higher the liquidity and capital of banks, the weaker the effect of the policy interest rate via the lending channel. Similar results are also reported by Brooks (2007), Aktas and Onur-tas (2007), Agung et al. (2002a), Gunji and Yuan (2010), Golodniuk (2006), and Wu et al. (2007) in their bank lending channel studies of Turkey, Indonesia, China, Ukraine, and various developing countries respectively. By introducing all of the bank characteristic variables (size, liquidity and capitalization) into the model, Ghosh (2006) and Karim et al. (2010), Alfaro et al. (2003), Lang and Krznar (2004), Fernandez (2004) and Boughrara and Ghazouani (2008) examine the lending channel in India, Malaysia, Croatia, Chile, and MENA countries (Morocco, Egypt, Jordan, Tunisia) respectively. Their results prove that an increase in bank size, capital and liquidity will weaken the bank lending channel.

The empirical studies presented previously have reported results in line with the theoretical expectation that a higher bank size, capital and liquidity will lead to a weaker effect of the policy interest rate via the bank lending channel. However, some empirical studies obtain results which contradict the theoretical prediction. Loupias et al. (2002), Jimborean (2009), and Hernando and Martinez-Pagés (2001) used the GMM technique and found that a higher bank size leads to a higher effect of monetary policy on bank loans in their lending channel studies of French, Euro area country, and Spanish banks respectively. They explain that this unexpected result comes from the higher liquidity and capital in small banks, which will dampen the effect of monetary policy on bank loans. The same result is also reported by Chatelain et al. (2003a) in a lending channel study of France, Germany, Italy and Spain and by Worms (2001) in Germany, Favero et al. (1999) in European countries, Pruteanu-Podpiera (2007) in Czech Republic and Çavuşoğlu (2002) in Turkey. Altunbas et al. (2002) and Farinha and Marques (2001), who investigate panel data in 11 EMU countries and Portugal, also argue that there is no clear explanation for the effect of bank size on bank loans; nevertheless, the capital characteristic of banks still supports the theoretical explanation.

Some studies also report an unexpected result for other bank characteristic variables. The GMM study in Central and Eastern European countries by Matousek and Sarantis (2009) found the insignificance of the capital characteristic in most countries (Hungary, the Baltic States and Slovenia), while the size and liquidity characteristics of banks show a significant positive effect on bank loans. They explain that this probably comes from the high proportion of capital in banks, which causes the independence of this characteristic from monetary policy shock. Similarly, Ehrmann et al. (2001), Hosono (2006), and Benkovskis (2008) not only found this insignificant effect of capital but also of the liquidity characteristic on bank loans in the Euro area countries, Japan and Latvia respectively.

4.2.2.2 The effect of financial sector development on the lending channel of monetary policy transmission

We can see previously that the few studies of the lending channel are concerned with the effect of financial development on the lending channel. Li (2009) examines this effect in Asia and Latin America countries. The results from his GLS and fixed effect estimation identify a positive effect of the interaction term of the competition indicator (the Panzar-Rosse H statistic) and policy interest rate on bank loans, showing that financial competition leads to a weakening of the bank lending channel. He explains that this is because a more competitive market will lead to a greater opportunity for customers to access a variety of funding sources, thus weakening the effect of the policy interest rate on bank loans. This supports the theoretical literature discussed in chapter 2. His bank characteristic studies also report that the loans of small, undercapitalized and low liquid banks have a stronger reaction to an increase in the policy rate than the loans of large, highly capitalized and highly liquid banks. Gunji et al. (2009) and Adams and Amel (2005) support the findings that bank competition has a positive effect on bank loans by using a US banking database, thus confirming that financial competition will lead to a weakening of the bank lending channel. Similarly, Brissimiss and Delis (2009) use GMM on bank level data in the US and 12 EU countries, showing that the higher the banking competition, the lower the effect of interest rates on bank loans.

Ferreira (2010) introduces the banking sector development indicators (bank deposits to GDP ratio and foreign assets to GDP ratio) as well as the capital market development ones (bonds and money market instrument to GDP ratio) into a study of the lending channel in the EU. The GMM estimation shows that these indicators weaken the effect of policy interest rate on bank loans, concluding that development in the banking sector will have a weaker effect on the lending channel.

Among studies on the effect of financial innovation on the lending channel, Altunbas et al. (2009b) show that securitization will lead to a rise in bank liquidity and securities holding and thus cause a weaker effect of the policy interest rate via the bank lending channel. Moreover, they report that all of the bank characteristic variables (size, capital and liquidity) also have a positive effect on bank loans. The same result was also found by Aysun and Hepp (2011), who show that an increase in securitization activity and the bank characteristics (size, capital and liquidity) will result in a weaker effect of policy interest rate via the lending channel in the US.

To sum up, most of the empirical studies of the micro data based aspect of the lending channel obtain results which support theoretical expectations. Most studies of developed and developing countries find that greater size, capital and liquidity of banks will lead to a weaker effect of the policy interest rate on bank loans, and thus weaken the lending channel. However, some studies obtain the unexpected result that large banks tend to have a stronger effect on the lending channel (Loupias et al., 2002; Jimborean, 2009; Chatelain et al., 2003a; Hernando and Martinez-Pagés, 2001; Worms, 2001; in Germany; Favero et al., 1999; Pruteanu-Podpiera ,2007; Çavuşoğlu, 2002; Altunbas et al., 2002; Farinha and Marques, 2001) and also find insignificant results of the effect of bank characteristics on the lending channel (Ehrmann et al., 2001; Hosono, 2006; Matousek and Sarantis, 2009; Benkovskis, 2008). We can also see that most of the studies of the micro data based have focused on developed countries.

For the effect of financial development on the lending channel, the previous empirical studies have found that this development will lead to a weaker effect on the lending channel. However, the empirical studies of this issue only focus on the effect of financial innovation (securitization) and financial competition on the lending channel, leaving a gap in the study of other issues of financial development (capital market development, financial liberalization, and banking sector development).

Therefore, concerning the gaps found in the previous literature, this study will examine the bank lending channel by using Thailand as a case study of a developing country and also investigate the effect of different aspects of financial development (financial liberalization, financial competition, financial innovation and banking and capital market development) on the bank lending channel.

4.3 Data and methodology

This section will be divided into three sub-sections: (1) data description, (2) model specification and (3) methodology.

4.3.1 Data description

Banking financial institutions in Thailand are discussed in this study in order to examine the lending channel, while non-banking financial institutions (investment banks, finance and securities companies, mutual fund and insurance companies, and credit cooperatives), are not included in the sample. Compared with the banking financial institutions, these non-banking financial institutions' major business does not significantly depend on the function of taking deposits and making bank loans and thus these institutions do not relate to the analysis of the lending channel (Schmitz, 2004; Wu et al., 2007; Hernando and Martinez-Pagés, 2001). Because of this, many studies only use a commercial bank sample in their papers (Gomez-Gónzalez and Grosz, 2007; Sichei, 2005; Pruteanu-Podpiera, 2007; Fernandez, 2004; Kishan and Opiela, 2000).

Following the merger treatment by Hernando and Martinez-Pages (2001), Gambacorta et al. (2001), Gambacorta (2001), Benkovskis (2008), Fernandez (2004), Kishan and Opiela (2000) and Horváth et al. (2006), backward aggregation is applied (treatment of the merged banks as a single bank throughout the sample period). This will take the absorbing banks out of the sample and maintain only the merged ones.

Before the above treatment, the overall sample is equal to 120, including both banking and non-banking financial institutions. After omitting the non-banking financial institutions and using the merger treatment for the reason explained previously, the sample was reduced to 22 banking financial institutions, including 16 commercial banks and 6 specialized financial institutions. However, the specialized financial institutions had to be omitted from our sample because they have different supervisory regulations compared with commercial banks[17] (Altunbas et al., 2009b; Ehrmann et al., 2001; Engler et al., 2007; Gambacorta, 2001). As a result, the total bank sample is equal to 16 commercial banks, covering the period from 1978 to 2008.

[17] According to the Thai banking act of legislation 2007, the specialized financial institutions (the Government Saving Bank, the Bank for Agriculture and Agricultural Cooperatives, the Government Housing Bank, the Export and Import Bank of Thailand, the Small and Medium Enterprise Development Bank of Thailand, and the Islamic bank) have been controlled by the Ministry of Finance instead of by the Bank of Thailand (BOT, 2008c). This means that policies introduced by the Bank of Thailand (a change in the policy interest rate or a monetary policy decision) mainly affect the commercial banks. This means that the specialized financial intuitions' activities (such as issuing loans) are independent from Bank of Thailand policies (Loungpitak, 2005). Therefore, in order to study the lending channel of monetary policy transmission in Thailand, the commercial banks are a suitable sample to be applied in this case.

We use the consolidated balance sheet data[18] as these data can capture the bank's financial constraints and the informational asymmetries through the subsidiary information (Gambacorta, 2001). Therefore, this will improve the data efficiency and deliberately examine the effect of monetary policy shock on bank loans. This type of data is also notably applied in other studies (Matousek and Sarantis, 2009; Haan, 2001; Schmitz, 2004). The sample is an unbalanced panel which is used to increase the observations and to investigate the effect of financial development which probably relates to the change in the number of financial institutions (an increase in banking concentration or the introduction of new financial institutions). All of the bank balance sheet data and the bank characteristic data (bank size, bank liquidity and bank capitalization) are obtained from the commercial banks' financial statements listed on the PACAP database for Thailand from the period 1978 to 1996, and from the SET database for the period 1997 to 2008. The 14 day repurchase market interest rate is used as the policy interest rate in Thailand and these data are obtained from the Bank of Thailand database[19].

We use the financial development indicators which are classified by Beck et al. (1999, 2008) and Singh et al. (2008). In this case, they will be grouped according to the different sectors of financial development as follows:

[18] Consolidated data means the data which also include the subsidiary banks in the balance sheet data (Ehrmann et al., 2001). If there is no consolidated data available from some banks and periods, the unconsolidated data is used instead.
[19] The Bank of Thailand database is available at the Bank of Thailand website: http://www.bot.or.th/English/Statistics/ContactPerson/Pages/Contact.aspx. If there is no data for the repurchase rate available, we use interbank overnight interest rate instead.

(1) Banking sector development

The banking sector development indicator is classified as the development in the size of the sector (size measure) and the development in its activity (activity measure). The development in the size of the banking sector is measured by the depository banks' assets to total financial assets (FD1). This indicator has been applied in several papers in the financial development area (Beck et al., 1999; Demirguc-Kunt and Detragiache, 1998; Nourzad, 2002; Da Silva, 2002) in order to present banking sector development, particularly in size. According to Beck et al. (2008) and Nourzad (2002), this indicator shows the development of the size of the banking sector compared with financial institutions and also represents the financial depth as well as the degree of financial intermediation in the banking sector. For the activity measure, we use the private credit by depository banks to GDP ratio (FD2). This indicator is used to represent the financial intermediary activities provided to customers (the channel by which banks provide loans and services to customers) (Beck et al., 1999; Levine et al., 2000). This indicator has also been applied in many financial development studies (Beck et al., 1999, 2008; Levine et al., 2000; Levine and Zervos, 1998). These banking sector development indicators are obtained from the Beck et al. (1999) database[20].

(2) Financial competition

We use the three largest bank assets to total bank assets (FD3), which is the bank concentration ratio, to represent financial competition. This indicator has been widely applied in several researches to represent financial competition in the banking sector, as greater

[20] This database is available via the World Bank website: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20696167~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

banking concentration will lead to a low competitive condition in the sector (Li, 2009; Claessens and Laeven, 2005; Cull and Effron, 2005; Beck and Demirguc-Kunt, 2009; Edirisuriya, 2007; The World Bank, 2010; Beck et al., 1999). We already stated in chapter 2 that a higher level of financial competition can lead to higher efficiency in the financial market in terms of the lower cost of providing financial products and services, thus leading to development in the financial market. Some studies also use Panzar and Rosses's H statistic, which is calculated by the banks' total revenue elasticity with respect to the input prices of banks, as a measure of financial competition (Claessens and Laeven, 2003; Li, 2009; Bikker and Haaf, 2000). However, it has been argued that the use of the H statistic can result in bias, as this indicator is valid only in the long-run equilibrium condition, which is difficult to achieve (Claessens and Laeven, 2003; Shaffer, 1983). Bikker et al. (2007) claim that there is misspecification of the calculation of the H statistic. They found that the use the ratio of total income to asset as the endogenous variable when calculating the H statistic will lead to an overestimation of the competition degree. In addition, Claessens and Laeven (2003) point out that this statistic tends to be biased when the bank sample size is very small (below 20 banks). Due to the above reasons and the small bank sample size in Thailand, we will use the bank concentration ratio to represent the financial competition measure in Thailand. These data are calculated from the commercial banks' balance sheet statement database in Thailand obtained from the SET and Beck et al.'s (1999) database.

(3) Capital market development

The capital market development indicator is also classified as development in the size of the capital market (size measure) and development in its activity (activity measure). The size measure is shown by the ratio of stock market capitalization to GDP (FD4) and the activity measure is represented by the ratio of stock market total value traded to GDP (FD5). These indicators have been widely applied by many papers to capture capital market development as they present the value of firms' listed shares and the value of shares traded in the market. They will therefore present the degree of financial deepening and disintermediation which shows development in the financial market (Beck et al., 2008; Beck and Rahman, 2006; Von Furstenberg and Fratianni, 1996; The World Bank, 2010; Krause and Rioja, 2006; Beck et al., 1999; De La Torre et al., 2006; Demirguc-Kunt and Maksimovic, 2000; Gallego and Loayza, 2000). These indicators are obtained from the Beck et al. (1999) database.

(4) Bond market development

We use the ratio of private domestic debt securities issued by financial institutions and corporations to GDP to measure bond market development. This indicator shows the development in size of the bond market and financial depth (Beck et al., 2008; Beck et al., 1999; Beck and Demirguc-Kunt, 2009; Gallego and Loayza, 2000). According to Singh et al. (2008), this measurement also represents financial innovation in the country, as a rise in debt securities also shows an increase in the other types of capital market instruments which represent innovation in financial instruments and risk diversification techniques. These data are obtained from the Beck et al. (1999) database and the Bank of Thailand website[21].

(5) Financial liberalization

We already explained in chapter 3 that the period of financial liberalization in Thailand mainly covers the period from 1990 to 1995. We use the financial liberalization dummy (FD7), which has the value 1 from 1990 to 1995 and 0 otherwise to capture this period. These data are obtained from the author's own calculations.

A summary of the financial development indicators used in this study are presented in table 4.1 and a summary of all variables used is shown in table 4.2.

The statistics of the observations are also presented in table 4.3, which shows the statistical value of bank balance sheet variables, bank characteristic variables and the financial development indicators during the period from 1978 to 2008.

[21] The Bank of Thailand database is available at: http://www.bot.or.th/English/Statistics/ ContactPerson/Pages/ Contact.aspx.

Table 4.1: Financial development indicators used in this research including their symbols, type of development indicators, and the researchers who also applied these indicators to their studies

Financial sector	Type of development	Financial sector development indicators	Symbol	Authors
Banking	Size	Depository banks' asset to total financial assets (depository banks' asset/ depository banks', central banks', other financial institution assets).	FD1	Beck et al., 1999, Demirguc-Kunt and Detragiache, 1998, Nourzad, 2002, Da Silva, 2002, Nourzad, 2002, and Beck et al. (2008).
	Activity	The ratio of private credit by deposit money banks to GDP	FD2	Beck et al. (1999, 2008), Levine et al. (2000), and Levine and Zervos (1998)
Banking	Competition	Three largest bank assets to total asset	FD3	Li (2009), Claessens and Laeven (2005), Cull and Effron, (2005), Beck and Demirguc-Kunt (2009), Edirisuriya(2007), The World Bank (2010), Beck et al.(1999)
Capital market	Size	The ratio of Stock market capitalization to GDP	FD4	Beck et al. (2008), Beck and Rahman (2006), Beck et al.(1999), and Andriesz et al.(2005)
	Activity	The ratio of Stock market total value traded to GDP	FD5	Beck et al. (2008), The World Bank (2010), Beck and Rahman (2006)
Bond market	Size/ financial innovation	The ratio of private domestic debt securities issued by financial institutions and corporations to GDP	FD6	Beck et al. (1999, 2008), Beck and Demirguc-Kunt (2009), Gallego and Loayza (2000), Singh et al. (2008)
Financial market sector	Liberalization	Dummy variable from year 1990 to 1995	FD7	Gelos and Werner (2002), Johnston and Pazarbasioglu (1995)

Table 4.2: List of all variables used in this study illustrated by type of variable, name of variable, variable's symbol, variable's definition and source of data

Type of variable	Variable	Symbol	Definition	Source of data
Balance sheet	Loan	L_{it}	Aggregate bank loans	SET bank balance sheet and PACAP database
	Deposit	D_{it}	Total bank deposits	SET bank balance sheet and PACAP database
	Securities	S_{it}	The sum of government securities and the investment in securities of banks	SET bank balance sheet and PACAP database
Monetary policy instrument	Short-term interest rate	r_t	14-day repurchase market interest rate	Bank of Thailand database
Banking characteristic	Size characteristic	$size_{it}$	The total bank assets to total asset ratio	SET bank balance sheet and PACAP database
	Capital characteristic	cap_{it}	Bank capital (cash, bank balances, interbank lending, and securities and investment in securities on the commercial banks' balance sheet) to total asset ratio	SET bank balance sheet and PACAP database
	Liquidity characteristic	liq_{it}	Total bank equity to total asset ratio	SET bank balance sheet and PACAP database
	Dummy variables			
		D1988	Dummy which captures the economic expansion in Thailand in 1988 which equals 1 in 1988 and 0 otherwise	Author's own calculation
		D1997	Dummy which captures the financial crisis in Thailand in 1997 which equals 1 in 1997 and 0 otherwise	Author's own calculation
		D2003	Dummy which captures the economic recovery period in Thailand in 2000 which equals 1 in 2003 and 0 otherwise	Author's own calculation
Financial development indicators	Banking size development	FD1	Deposit money banks' asset to total financial assets	Beck et al. (1999)
	Banking activity development	FD2	The ratio of private credit by deposit money banks to GDP	Beck et al. (1999)
	Banking concentration	FD3	The ratio of three largest bank assets to total assets	Beck et al. (1999) and SET database

Table 4.2 (cont'd): list of all variables used in this study illustrated by type of variable, name of variable, variable's symbol, variable's definition and source

Type of variable	Variable	Symbol	Definition	Source
Financial development indicators	Capital market size development	FD4	The ratio of stock market capitalization to GDP	Beck et al. (1999)
	Capital market activity development	FD5	The ratio of Stock market value traded to GDP	Beck et al. (1999)
	Bond market size development/ financial innovation	FD6	The ratio of private domestic debt securities issued by financial institutions and corporations to GDP	Beck et al. (1999) and Bank of Thailand database
Financial liberalization	Financial liberalization	FD7	Liberalization dummy which equal 1 from year 1990 to 1995 and 0 otherwise	Author owned calculation

Table 4.3: Summary statistics of all variables used in the estimation and the form they enter in the model

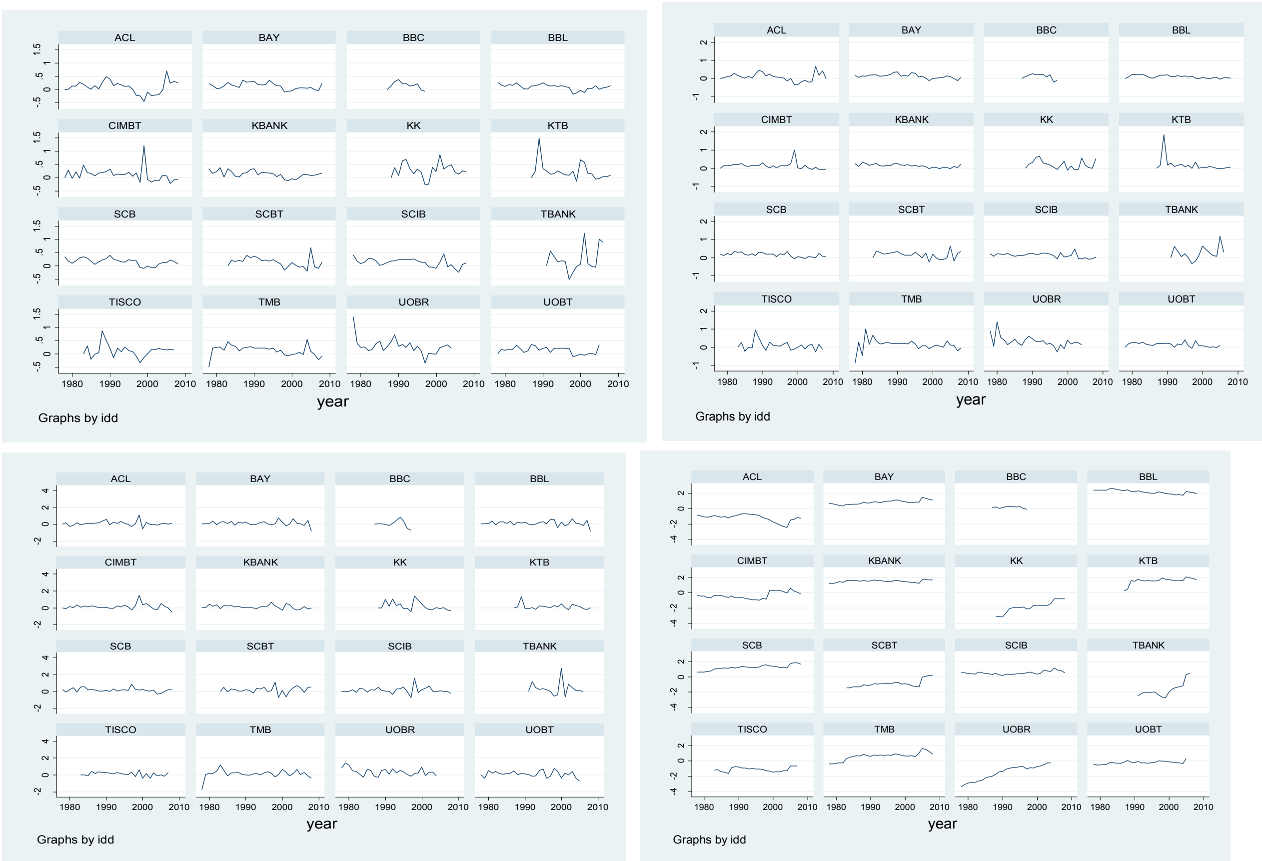
Variable	Obs	Mean	Std. Dev.	Min	Max
Total bank loan (L)(thousands of Bath)	428	173,839,094	240,507,106	238,030	1,124,272,080
The change of bank loans (ΔlnL)	428	0.1462	0.2267	-0.8262	1.4811
Total bank deposit (D) (thousands of Bath)	428	194,614,993	280,248,218	80,376	1,322,287,437
The change of bank deposits (ΔlnD)	428	0.1473	0.2185	-0.8791	1.8483
Total bank securities (S) (thousands of Bath)	428	25,067,076	37,428,320	7,561	186,047,996
The change of bank securities (ΔlnS)	428	0.1461	0.3715	-1.7896	2.7295
Bank size characteristic (size)	428	0.0048	0.5707	-1.4811	1.1421
Bank liquidity characteristic (liq)	428	0.00095	0.0565	-0.0699	0.4331
Bank capital characteristic (cap)	428	-0.0047	0.0636	-0.1029	0.5633
Policy interest rate (r)	496	8.3609	4.8536	1.4	17.25
The change of the policy interest rate (Δr)	496	-0.2833	3.1187	-11.71	5.89
Deposit money bank asset to total financial asset (FD1)	496	0.9469	0.5133	0.8491	0.9961
The change of FD1 (ΔFD1)	496	0.0027	0.0128	-0.0204	0.0478
Private credit by deposit money banks to GDP ratio (FD2)	496	0.8399	0.3536	0.3700	1.6596
The change of FD2 (ΔFD2)	496	0.0136	0.0978	-0.2676	0.1664
Three largest bank assets to total assets ratio (FD3)	496	0.4524	0.2019	0.1767	0.9021
The change of FD3 (ΔFD3)	496	0.0094	0.1441	-0.3088	0.7195
Stock market capitalization to GDP ratio (FD4)	496	0.3584	0.2839	0.0310	0.9095
The change of FD4 (ΔFD4)	496	0.0227	0.1149	-0.2572	0.3344
Stock market value traded to GDP ratio (FD5)	496	0.2710	0.2238	0.0031	0.6954
The change of FD5 (ΔFD5)	496	0.0095	0.1175	-0.2153	0.3402
Private domestic debt securities to GDP ratio (FD6)	496	0.1875	0.1335	0.0398	0.4149
The change of FD6 (ΔFD6)	496	0.0125	0.0468	-0.0771	0.2032
Financial liberalization dummy (FD7)	496	0.1935	0.3954	0	1

Figure 4.1 is a graph of all the variables listed in table 4.2. From the graph of the balance sheet variables (loans, deposits and securities), bank characteristic variables (size, capitalization and liquidity) and the financial development indicators, important changes in the series took place in some periods. The series illustrate the important change in 1988, which saw an increase in loans, deposits and securities. This is because this year saw the highest increase in the Thai economic growth rate (the GDP growth rate increased from 5.6% in 1978 to its peak in 1988 of 12%) as a result of the rapid expansion of production, investment, construction and consumption in the country (BOT, 1988). This strong economic performance led to a rise in the bank loan supply, deposits and securities. In addition, there was also the introduction of new types of securities (Thai Oil promissory notes, Industrial Finance Corporation of Thailand notes, and convertible debentures) as well as an expansion policy of new commercial bank branches in regional areas in this period. Consequently, this situation led to an increase in banks' securities, deposits and loans, as well as FD1 (development in the size of banks) and FD2 (banking concentration).

As the Thai economy was greatly affected during the financial crisis period of 1997, this caused a significant drop in the GDP growth rate and domestic expenditure, and sluggish conditions in the financial markets (as explained in chapter 3). This condition was the main reason for the drop in bank loans, deposits and securities, as well as the banking characteristic variables (size, capitalization and liquidity). There was also a steady decrease in almost all of the financial development indicators and an increase in the policy interest rate during this period.

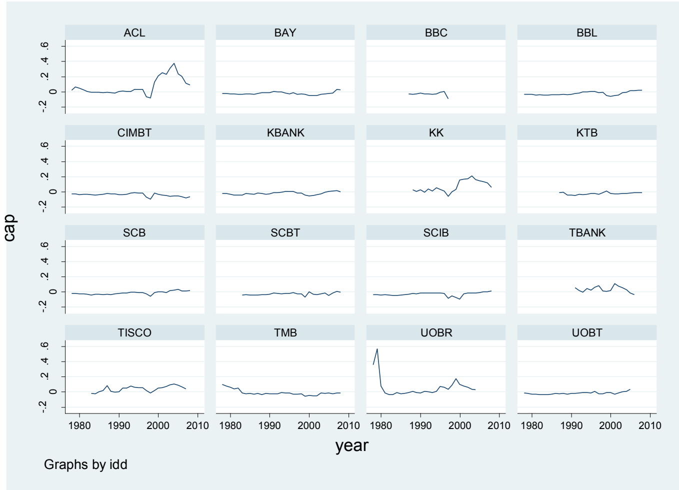
In addition, there was a rise in bank balance sheet variables, bank characteristic variables and the capital market development indicators (FD4 and FD5) during 2003. This was due to the recovery of economic conditions in Thailand after the financial crisis, thanks to many government bailout plans, such as the financial sector restructuring plan. This recovery led to an increase in the bank balance sheet and bank characteristic variables (as explained in chapter 3). The introduction of the financial master plans and capital market master plan during this period, which encouraged SME businesses to list on the capital market and supported retail transactions and trading in the capital market, also led to a rise in the FD4 and FD5 during this period.

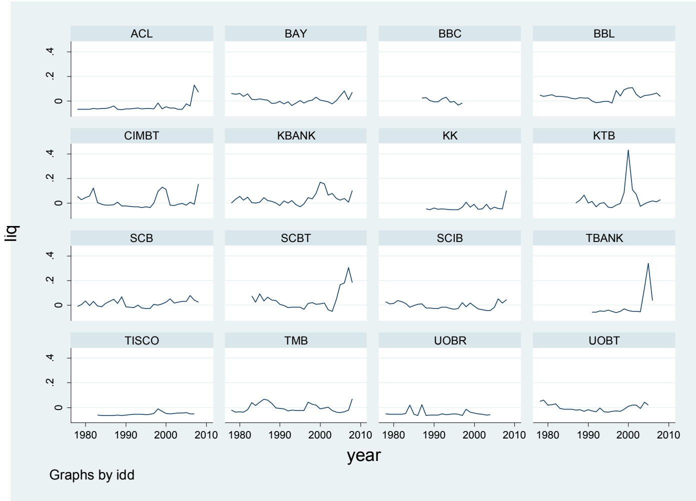
Figure 4.1: **The graphs of variables use in this study (bank balance sheet variables, bank characteristic variables, interest rate variable and financial development indicators)**

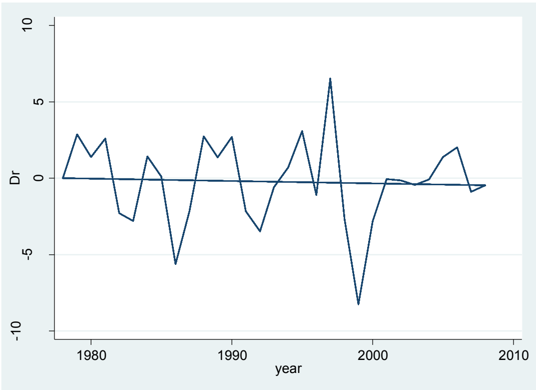


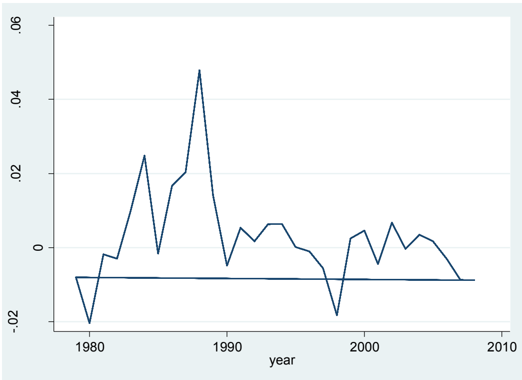
Note: In this case, we plot the graph according to our model specification form explained in section 4.4.2 in order to specify some important change in our model. The first difference of the log of loan, deposits and securities is Dlog(L), Dlog(D), and Dlog(S) respectively. The first difference of FD1 to FD6 is Dfd1 to Dfd6. The name of banks enter into equation is as follows: ACL (ACL bank PCL.), BAY (Bank of Ayudhya PCL.), BBC(Bangkok Bank of Commerce PCL.), BBL (Bangkok Bank PCL.), CIMBT (CIMBT Thai Bank PCL.), KBANK (Kasikornbank PCL.), KK (Kiatnakin Bank PCL.), KTB(Krung Thai Bank PCL.), SCB (Siam Commercial Bank PCL.), SCBT (Standard Charter Bank PCL.), SCIB (Siam City Bank PCL.) TBANK (Thanachart Bank PCL.), TISCO (TISCO Bank PCL), TMB(TMB Bank PCL.),UOBR(UOB Radanasin Bank PCL.), UOBT(United Overseas Bank Thai PCL.)

Figure 4.1(cont'd): The graphs of variables use in this study (bank balance sheet variables, bank characteristic variables, interest rate variable, and financial development indicators)









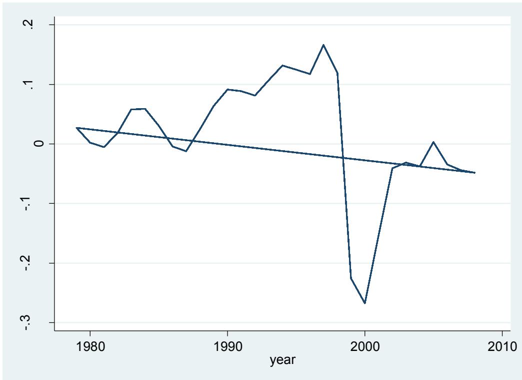
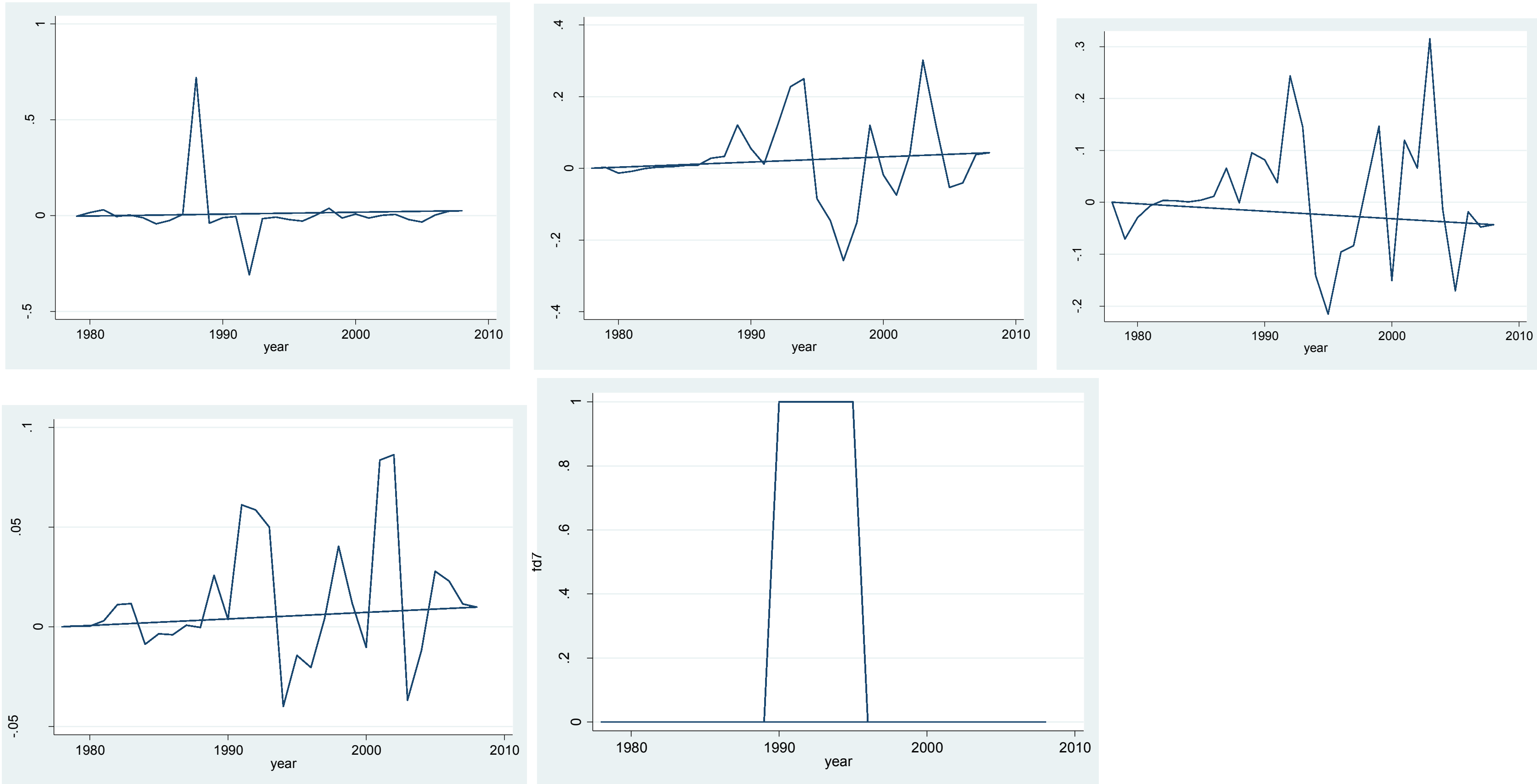


Figure 4.1(cont'd): The graphs of variables use in this study (bank balance sheet variables, bank characteristic variables, interest rate variable, and financial development indicators)



4.3.2 Model specification

The model specification considered in this study can be grouped into two models: (1) the baseline model of the lending channel and (2) the model of the effect of financial sector development on the bank lending channel.

(1) Baseline model of the lending channel

The baseline model is the micro data based model of the bank lending channel. This model specification has been used by many papers (Ehrmann et al., 2001; Aktas and Onur-Tas, 2007; Hosono, 2006; Wu et al., 2007; Altunbas et al., 2009b; Benkovskis, 2008; Topi and Vilmunen, 2001; Gambacorta, 2001)[22]:

$$\Delta \log L_{i,t} = \alpha_i + \sum_{s=1}^{k} \beta_1 \Delta \log L_{i,t-s} + \sum_{s=1}^{k} \beta_2 \Delta \log D_{it-s} + \sum_{s=1}^{k} \beta_3 \Delta \log S_{it-s} + \sum_{s=1}^{k} \beta_4 \Delta r_{t-s}$$
$$+ \sum_{s=1}^{k} \beta_5 X_{it-s} + \sum_{s=1}^{k} \beta_6 (\Delta r_{t-s} \times X_{it-s}) + \beta_7 d_t + \varepsilon_{it} \qquad (4.1)$$

where i is the index representing each individual bank (1,2,3,…).

t is the time period (1,2,3,…….t).

k is the number of lags.

α_i is the individual banks' fixed effect.

[22] For the number of lags, we use the second lag of both dependence and independence variables in the model. The use of this number of lags has been widely applied in many researches in micro based studies (Horvath et al., 2006; Peek and Rosengren, 1995; Jimborean, 2009; Pruteanu-Podpiera, 2007; Westerlund, 2003). At first, many lags are applied into the model in order to test for its suitability. However, the use of other lag variables (only first lag variables as well as the current and first lag variables) shows many insignificant results and also the rejection of the test statistic (Sagan test in GMM estimation and Hansen test in 2SLS model).

L_{it} is the total bank loans (loan supply of banks).

D_{it} is the total bank deposits.

S_{it} is the total bank securities holdings.

r_t is the 14 day repurchase market interest rate used as proxy of the monetary policy instrument in Thailand.

X_t is the vector of bank characteristic variables.

d_t is the dummy variable controlling for particular events that effect the bank loan (already analyzed in section 4.3.1, figure 4.1) as follows:

d1988 is the dummy variable which has a value equal to 1 in 1988 and 0 otherwise. This dummy is used to control for the rapid expansion of the economy.

d1997 is the dummy variable which has a value equal to 1 in 1997 and 0 otherwise. This dummy is used to control for the financial crisis period in Thailand.

d2003 is the dummy variable which has a value equal to 1 in 2003 and 0 otherwise. This dummy controls for the period of economic recovery in Thailand.

ε_{it} is the error term.

Deposits and securities variables (D_{it} and S_{it}) are introduced by Golodniuk (2006), Kashyap and Stein (1995), Kishan and Opiela (2000), Aktas and Onur-Tas (2007), Altunbas et al. (2002) and Westerlund (2003) for the control of loan demand cross-sectional difference (funding effect control or the individual banks' loan demand control). According to Agung et al. (2002a) and Kim (1999), the deposits variable represents the bank funds, and thus a rise in bank deposits will lead to a rise in bank loans. Hence, this effect highlights the positive effect of bank deposits on bank loans (β_2 > 0 in equation 4.1). For the securities variable, Westerlund (2003), Kim (1999) and Çavuşoğlu (2002) state that banks will tend to compensate for the loss of loans with their securities holding (bonds). Thus, bank securities will expect to have a negative effect on loan supply (β_3< 0). The r_t variable is expected to have a negative effect on bank loans (β_4<0) according to the lending channel theory.

The bank characteristic variables (X_{it}), which comprise size, capitalization and liquidity, have been considered in many micro data based studies of the lending channel (Farinha and Margues, 2001; Ehrmann et al., 2001; Matousek and Sarantis, 2009; Schmitz, 2004; Benkovskis, 2008; Gambacorta, 2001; Altunbas et al., 2009b). Following the calculation technique introduced in these papers, the normalization of the size, capitalization and liquidity indicators (calculations shown in (a) to (c)) is applied in order to make the sum of each indicator equal zero. This technique leads to the removal of unwanted trends (Horváth, 2006; Schmitz, 2004; Gambacorta, 2001; Altunbas et al., 2009b; Haan, 2001). These characteristics are defined as follows:

(a) Bank size is defined as total bank assets minus the average of total assets in the t period:

$$size_{it} = \ln A_{it} - \frac{1}{N_t}\sum_{i=1}^{N_t} \ln A_{it}$$

where A_{it} is the total bank assets of each bank.

N_t is the number of banks in the t period.

This definition can be seen in many micro data based studies of the lending channel (Li, 2009; Jimborean, 2009; Gambacorta and Mistrulli, 2004; Ehrmann et al., 2001; Gambacorta, 2001; Aktas and Onur-Tas, 2007; Chatelain et al., 2003a). We already stated in the literature review (section 4.2.1) that the higher the bank size, the higher the reputation, liquidity and external funding opportunities. This therefore leads to a greater opportunity for banks to issue loans and thus a weaker effect of the policy interest rate on these loans. Hence, the effect of this characteristic variable and its interaction with the policy interest rate on bank loans are expected to be positive (β_5, β_6 >0).

(b) Bank liquidity is defined as the ratio of bank liquid assets to total assets:

$$liq_{it} = \frac{L_{it}}{A_{it}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t} \sum_i \frac{L_{it}}{A_{it}} \right)$$

where L_{it} is the liquid assets of each bank. Following the definitions of Chatelain et al. (2003a), Gambacorta (2001), Aktas and Onur-Tas (2007), Loupias et al. (2002) and Gambacorta and Mistrulli (2004), this comprises cash, bank balance, interbank lending and securities in the commercial banks' balance sheet.

T is the length of time period.

This characteristic variable and its interaction with the policy interest rate should be positive (β_5, β_6 >0). We already mentioned that the higher the banks' liquidity, the greater the opportunity for them to obtain external funding sources and issue more loans and hence the weaker the effect of monetary policy shock on bank loans, with consequent weakening of the lending channel.

(c) Bank capitalization is defined as the total bank equity to total assets ratio:

$$cap_{it} = \frac{E_{it}}{A_{it}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t} \sum_i \frac{E_{it}}{A_{it}} \right)$$

where E_{it} is the total bank equity of each bank in the sample.

T is the length of the time period.

This definition is made by Li (2009), Hosono (2006), Gomez-Gonzalez and Grosz (2007), Golodniuk (2006), Brooks (2007), Schmitz (2004) and Wu et al. (2007). As mentioned in section 4.2.1, the higher a bank's capitalization, the greater its creditworthiness and external funding opportunities. Hence, this increases the opportunity for banks to issue more loans and leads to a weaker effect of monetary policy shock on these loans, and thus the weakening of the lending channel. Therefore, this variable, as well as its interaction term, are expected to be positive (β_5, β_6 >0).

For the dummy variables included in the model, it is expected that the effect of rapid expansion in the economy (d1988) and the economic recovery period in Thailand (d2003) will have a positive effect on bank loans ($\beta_7 > 0$). This is because these dummy variables represent the period of the rapid increase in the economic growth rate and the economic recovery in Thailand respectively, which are the factors which support the increase in bank loans. On the other hand, d1997, which represents the financial crisis period in the country, is expected to have a negative relationship with bank loans ($\beta_7 < 0$). This result is supported by the situation in Thailand after the financial crisis period of 1997, when there was a sharp decline in commercial bank loans (as shown in chapter 3) as a result of the economic downturn, non-performing loan problems and sluggish conditions in the financial market.

(2) Model of the effect of financial sector development on the bank lending channel

The model specification in this aspect will be similar to the model in section (1); however, it will also include the financial development indicators and the interaction term of these indictors and the monetary policy instrument. We follow the model specification of Li (2009), Brissimis and Delis (2009) and Altunbas et al. (2009b). In this case, each financial development indicator will be entered into the model separately in order to study the effect of each individual type of financial development indicator on the bank lending channel. The model is presented below:

$$\Delta \log L_{i,t} = \alpha_i + \sum_{s=1}^{k} \beta_1 \Delta \log L_{i,t-s} + \sum_{s=1}^{k} \beta_2 \Delta \log D_{it-s} + \sum_{s=1}^{k} \beta_3 \Delta \log S_{it-s} + \sum_{s=1}^{k} \beta_4 \Delta r_{t-s} + \sum_{s=1}^{k} \beta_5 X_{it-s}$$
$$+ \sum_{s=1}^{k} \beta_6 (\Delta r_{t-s} \times X_{it-s}) + \sum_{s=1}^{k} \beta_7 \Delta FD_{t-s} + \sum_{s=1}^{k} \beta_8 (\Delta FD_{t-s} \times \Delta r_{t-s}) + \beta_9 d_t + \varepsilon_{it} \tag{4.2}$$

where FD_t represents the different financial development indicators as previously represented in the data description section as follows:

$FD1_t$ is the ratio of depository banks' assets to total financial assets. We explained previously that this indicator has been applied to show banking sector development, particularly in size, and also represents financial depth as well as the degree of financial intermediation in the sector. An increase in this indictor will show an increase in bank size compared with other financial institutions, as well as a greater influence of commercial banks among depositors and investors (a rise in this indicator shows an increase in bank assets, compared with the total assets of financial institution) (Nourzad, 2002). As already explained in chapter 2, section 2.5.1, a rise in financial intermediation will lead to an improvement in financial market liquidity and portfolio diversification, an increase in the opportunities for external funding, as well as a decrease in financial costs. Thus, this results in an increase in bank loan supply. Therefore, a rise in this indicator will indicate a rise in the financial intermediation and size of the banking sector, and will have a positive effect on bank loans. In addition, the policy interest rate will probably have a weaker effect on bank loans due to the greater opportunity for banks to obtain external funding sources, an improvement in portfolio diversification and higher financial market liquidity. For the above reasons, the coefficient of this indicator, as well as its interaction term with the policy rate, is expected to have a positive effect on bank loans (β_7, β_8 >0 in equation 4.2).

$FD2_t$ is the ratio of private credit by deposit money banks to GDP, which represents the activity of banking sector development. We already discussed that this indicator is used to represent the financial intermediaries' activities provided to customers; an increase in this indicator will show an increase in banking activities in terms of the banking services provided to customers, such as loans and saving facilities (Beck et al., 1999; Levine et al., 2000). Consequently, an increase in this indicator will have a positive effect on bank loans and will also weaken the effect of the policy interest rate on them, as this indicator shows a rise in banking activities as well as the loans and services provided to customers. For the above reasons, the coefficient of this indicator, as well as its interaction term with the policy rate, is expected to have a positive effect on bank loans (β_7, β_8 >0 in equation 4.2)

$FD3_t$ is the ratio of the three largest banks' assets to total bank assets. This indicator shows the concentration measure of the banking sector and an increase in it represent more concentration of the institutional sector and a less competitive environment in the banking sector (Li, 2009; Beck and Demirguc-Kunt, 2009; Beck et al., 1999). We explained in chapter 2, section 2.5.1 that a more concentrated market with a higher proportion of large banks (high market share) will create more monopoly power in the market (low competition), making it difficult for other banks to access the financial services and products provided as well as other sources of funding. This situation leads to a stronger impact of the policy rate on bank loans, hence causing a stronger effect on the lending channel. Therefore, the higher the banking concentration (low competition), the lower the loan supply and the higher the impact of the policy rate on bank loans. Thus, the coefficient of this indicator and its interaction with the policy rate can have a negative effect on bank loans ($\beta_7, \beta_8 < 0$ in equation 4.2).

$FD4_t$ is the stock market capitalization to GDP ratio, which represents development in terms of the size of the capital market. As described in chapter 2, sections 2.4.3 and 2.5.1, development in the size of the capital market also shows an increase in financial deepening, which leads to greater opportunities for banks to obtain other funding sources as well as a rise in bank capital and liquidity. Hence, an increase in this indicator will result in a positive effect on bank loans and a weaker effect of policy interest rates on them. Consequently, the coefficient of this indicator and its interaction term should have a positive sign in our model ($\beta_7, \beta_8 > 0$ in equation 4.2).

$FD5_t$ is the ratio of stock market total value traded to GDP, which is used to represent the activity measure of capital market development. A rise in this indicator represents an increase in activities in the capital market (a rise in stock market trading) as well as an increase in liquidity in the capital market (Beck et al., 1999). Similar to FD4, this development also leads to greater opportunities for banks to obtain other funding sources and an increase in bank capital and liquidity. Therefore, an increase in this indicator will result in a positive effect on bank loans and a weaker effect of the policy interest rate on them. In this regard, the coefficient of this indicator and its interaction term should have a positive sign in our model ($\beta_7, \beta_8 > 0$ in equation 4.2).

$FD6_t$ is the ratio of private domestic debt securities issued by financial institutions and corporations to GDP. This indicator is applied to represent bond market development and also financial innovation. As explained in chapter 2, sections 2.4.4 and 2.5.1, a rise in this indicator shows a greater opportunity for the banking sector to access the financial market, a high level of financial market liquidity and capital, and an improvement in the risk diversification of banks. Thus, an increase in this indicator will result in a positive effect on bank loans and a weaker effect on the lending channel. Therefore, the coefficient of this indicator and its interaction term should have a positive sign ($\beta_7, \beta_8 > 0$ in equation 4.2).

$FD7_t$ is the dummy variable from 1990 to 1995, which has the value of 1 from years 1990 to 1995 and 0 otherwise. As explained in chapter 3, the financial liberalization period in Thailand mainly began between 1990 and 1995, starting with the announcement of the official financial reform plan, which mainly aimed to introduce financial liberalization, up to the period of the third round of exchange rate liberalization in 1994 to 1995. Concerning our explanation of the effect of financial liberalization on the lending channel in chapter 2 (section 2.5.1), this can either lead to a positive or negative effect on bank loans, and a weaker or stronger effect via the lending channel. This is because financial liberalization which involves relaxation of financial institution and market restrictions will cause an increase in financial institution business (issuing of securities and investing in capital markets) and also a rise in the opportunities for banks to obtain more sources of funding. This will dampen the effect of the policy interest rate on bank lending, thus weakening the lending channel. However, financial liberalization, such as capital account liberalization and deregulation of banking restrictions, can lead to an increase in foreign exchange and credit risk. These risks reduce the possibility of banks to issue more loans and invest in the capital market, thus reducing their loan supply and strengthening the effect of the policy interest rate via the bank lending channel. Therefore, the coefficient of this indicator and its interaction term should have either a positive or negative sign ($\beta_7, \beta_8 < 0$ or $\beta_7, \beta_8 > 0$ in equation 4.2).

The expected signs of the variables in equations 4.1 and 4.2 are indicated in table 4.4.

[Insert table 4.4 here]

Table 4.4: Summary of the expected signs for the model estimation

Dependence/ independence variable	Lag L	D	S	r	size	liq	cap	r* size	r* liq	r* cap	FD1	FD2	FD3	FD4	FD5	FD6	FD7
Loan	+	+	-	-	+	+	+	+	+	+	+	+	-	+	+	+	+ /-

Dependence/ independence variable	r*FD1	r*FD2	r*FD3	r*FD4	r*FD5	r*FD6	r*FD7	d1988	d1997	d2003
Loan	+	+	-	+	+	+	+/-	+	-	+

Note: the (+) sign indicates the positive effect of the independent variables on the dependent variable, while the (-) sign shows the negative effect.

4.3.3 Methodology

We apply panel data estimation for the micro data based study of the bank lending channel. Westerlund (2003) and Brooks (2007) point out that the panel data technique can deal with the identification problem caused by the supply-versus-demand effect on the lending channel. This is because the technique can estimate the model with the bank characteristic variables constructed from the bank level data. This will ensure that the effect of monetary policy is caused by the supply side effect, thereby confirming the assumption of the homogeneity of loan demand across banks. The panel data estimation can also deal with the individual heterogeneity of banks as well as the lack of observations in the dataset (Çavuşoğlu, 2002; Westerlund, 2003; Topi and Vilmunen, 2001).

We can see in the literature review (section 4.2) that almost all papers apply the panel data model, especially the dynamic panel data model, in their studies. In this respect, it is necessary to apply the dynamic panel data model which includes the lagged dependence variable. This is due to the lock-in effect of banks caused by their close relationship with customers (the high cost to customers to change banks) (Golodniuk, 2006; Westerlund, 2003; and Aktas and Onur-Tas, 2007). Moreover, Li (2009), Aktas and Onur-Tas (2007) and Sichei (2005) state that there is the possibility of a relationship between the bank characteristic and the balance sheet variables and consequently the lag of dependence and independence variables need to be included to solve the endogeneity problem of the model.

The dynamic panel data form is as follows (Baltagi, 2008; Arellano and Bond, 1991; Anderson and Hsiao, 1982; Judson and Owen, 1999):

$$y_{it} = \gamma y_{i,t-1} + \beta' x_{it} + \eta_i + v_{it} \qquad (4.3)$$

where i = 1,...,N and t = 1,…,T

y_{it} is the endogenous variable.

γ is a scalar (1 x 1) with $|\gamma| < 1$

x_{it} is the time-varying exogenous vector $(K_1 \times 1)$

β is the parameter vector.

$u_{it} = \eta_i + v_{it}$ when η_i is the fixed effect with IID$(0, \sigma_\eta{}^2)$ and v_{it} is the random disturbance with IID$(0, \sigma_v{}^2)$.

In order to select a suitable method to estimate the dynamic panel data model, it is now important to discuss some possible techniques. When estimating the dynamic panel data, many researchers report explicit bias when using the OLS estimator as a result of the endogeneity problem caused by the correlation between the lagged dependence variable ($y_{i,t-1}$) and the error term (v_{it}) (Worms, 2001; Benkovskis, 2008; Sichei, 2005; Çavuşoğlu, 2002; Baltagi, 2008; Bond, 2002).

For the fixed effect estimation, the Within estimator can transform equation 4.3 into the form below by subtracting equation 4.3 with the mean value of $y_i, y_{i,t-1}, \eta_i,$ and v_{it} (Judson and Owen, 1999):

$$y_{it} - \bar{y}_{it} = \gamma(y_{i,t-1} - \bar{y}_{i,t-1}) + \beta'(x_{it} - \bar{x}_{it}) + (v_{it} - \bar{v}_{it}) \tag{4.4}$$

From equation 4.4, although the unobservable individual specific effect (η_i) is taken out of equation 4.3, it is still a correlation between $y_{i,t-1} - \bar{y}_{i,t-1}$ and $v_{it} - \bar{v}_i$, thus causing bias when using the fixed effect estimation with the dynamic panel model (Baltagi, 2008). This correlation is caused by the correlation between $\frac{-y_{it}}{T-1}$ and v_{it} as well as between $\frac{-v_{i,t-1}}{T-1}$ and $y_{i,t-1}$(where $y_{i,t-1} - \bar{y}_{i,t-1} = y_{i,t-1} - \frac{1}{T-1}(y_{i1} + \ldots + y_{it} + \ldots + y_{i,T-1})$ and $v_{it} - \bar{v}_{it} = v_{it} - \frac{1}{T-1}(v_{i2} + \ldots + v_{i,t-1} + \ldots + v_{iT})$) (Bond, 2002; Hsio, 2003; Roodman, 2006; Baltagi, 2008). Therefore, bias is still found in the fixed effect estimation and even in the random effect.

This bias can be reduced when the time period (T) is large compared to the observation number (N) (Baltagi, 2008). Therefore, as our data have large T and small N properties[23], fixed effect estimation is considered to be a suitable technique in our case. However, Judson and Owen (1999) and Baltagi (2008) still argue that bias can be found even for T = 30 (the Monte Carlo experiments report that there is still approximately 20% bias in the true value of the coefficient in the fixed effect estimator).

[23] Our study considers data from 1978 to 2008 in Thailand (T = 31) with a total of 16 commercial banks (N=16).

Anderson and Hsiao (1982) suggest the use of 2SLS estimation (Two-Stage Least Squares estimation) to solve the above problem by first differencing equation 4.3 and adding the instrumental variables into the model to deal with the endogeneity problem. In this case, equation 4.3 can be written as follows:

$$y_{it} - y_{i,t-1} = \gamma(y_{i,t-1} - y_{i,t-2}) + \beta'(x_{it} - x_{i,t-1}) + (v_{it} - v_{i,t-1}) \tag{4.5}$$

where t= 2,…, T

In equation 4.5, the individual effect (η_i) is omitted from the model. The instrumental variable is the variable which is uncorrelated with the transformed error term (Δv_{it}), but correlated with the transformed lagged variables ($\Delta y_{i,t-1}$) (Baum, 2009; Bond, 2002; Roodman, 2006). From equation 4.5, Hsiao (2003) and Anderson and Hsiao (1982) state that the instrumental variable of $\Delta y_{i,t-1}$ are considered as $y_{i,t-2}$ or $(y_{i,t-2} - y_{i,t-3})$

By adding this instrumental variable in the above model, the estimation of the coefficient of the lag of dependence variables (γ) and independence variables (β) obtained from the instrumental-variable method is presented below (Anderson and Hsiao, 1982):

$$\begin{pmatrix} \hat{\gamma}_{iv} \\ \hat{\beta}_{iv} \end{pmatrix} = \left[\sum_{i=1}^{N} \sum_{t=3}^{T} \begin{pmatrix} (y_{i,t-1} - y_{i,t-2})(y_{i,t-2} - y_{i,t-3}) & (y_{i,t-2} - y_{i,t-3})(x_{it} - x_{i,t-1})' \\ (x_{it} - x_{i,t-1})(y_{i,t-2} - y_{i,t-3}) & (x_{it} - x_{i,t-1})(x_{it} - x_{i,t-1})' \end{pmatrix} \right]^{-1}$$

$$\times \left[\sum_{i=1}^{N} \sum_{t=3}^{T} \begin{pmatrix} y_{i,t-2} - y_{i,t-3} \\ x_{it} - x_{i,t-1} \end{pmatrix} (y_{it} - y_{i,t-1}) \right] \tag{4.6}$$

Or

$$\begin{pmatrix}\widetilde{\gamma}_{iv} \\ \widetilde{\beta}_{iv}\end{pmatrix} = \left[\sum_{i=1}^{N}\sum_{t=2}^{T}\begin{pmatrix}(y_{i,t-1}-y_{i,t-2})y_{i,t-2} & y_{i,t-2}(x_{it}-x_{i,t-1})' \\ (x_{it}-x_{i,t-1})y_{i,t-2} & (x_{it}-x_{i,t-1})(x_{it}-x_{i,t-1})'\end{pmatrix}\right]^{-1}$$

$$\times\left[\sum_{i=1}^{N}\sum_{t=2}^{T}\begin{pmatrix}y_{i,t-2} \\ x_{it}-x_{i,t-1}\end{pmatrix}(y_{it}-y_{i,t-1})\right] \quad (4.7)$$

Nevertheless, Bond (2002) and Baltagi (2008) argue that this method still shows inefficient parameter estimation due to the lack of further available moment conditions. Therefore, the GMM estimation by Arellano and Bond (1991) is introduced in order to solve these problems, as additional moment conditions in the first differenced equations are brought into this technique to improve model efficiency ("First-Difference GMM estimation") (Judson and Owen, 1996:5; Çavuşoğlu, 2002). Baltagi (2008) states that if one assumes that x_{it} are strictly exogenous variables[24] $E(x_{it}v_{it})=0$ for all t, s = 1,2,…,T), the valid instrument of equation 4.5 is defined as $[x'_{i1,}x'_{i2},...,x'_{iT}]$. Therefore, the instrument matrix is:

$$W = diag(y_{i1},...,y_{i,t-2},x'_{i1},x'_{i2},...,x'_{iT}) \quad (4.8)$$

In first difference GMM estimation, Blundell and Bond (1998) and Baltagi (2008) state that the orthogonality conditions of equation (4.5) are:

$$E(y_{i,t-s}\Delta v_{it})=0\text{, for t = 3,…,T and s} \geq 2 \quad (4.10)$$

$$E(x_{i,t-s}\Delta v_{it})=0\text{, for t=3,...,T and s} \geq 2 \quad (4.11)$$

---

[24] If x_{it} is a predetermined variable $E(x_{it}v_{it})\neq 0$ for s < t and 0 otherwise), the valid instrument will be defined as $[x'_{i1},x'_{i2},,...,x'_{i(s-1)}]$ and therefore the instrument matrix (W_i) is $W_i = diag(y_{i1},...,y_{i,t-2},x'_{i1},x'_{i2},...,x'_{i(T-1)})$ (Baltagi, 2008). In this case, the 1- and 2-step GMM estimators are estimated by the same procedure as when x_{it} is an exogenous variable, but we change the instrument matrix from W to W_i (Baltagi, 2008).

where Δv_{it} is $v_{i,t} - v_{i,t-1}$

For the above condition, first difference GMM estimation assumes that the dependence and independence variables are not correlated with the disturbances term and this thus solves the endogeneity problem explained previously (Blundell and Bond, 1998).

When multiplying W in equation 4.5, the equation is rewritten as (Baltagi, 2008; Hsiao, 2003):

$$W'\Delta y = W'(\Delta y_{-1})\gamma + W'(\Delta X)\beta + W'\Delta v \qquad (4.12)$$

where the ΔX is the N(T-2)×K matrix of observation on Δx_{it}

Δy is the dependence variables' vector 1× N(T-2)

W' is the instruments matrix $[W_1',...,W_N']'$

Equations 4.13 and 4.14 will show the (γ,β) in the 1- and 2- step GMM estimators respectively, as follows (Baltagi, 2008):

$$\begin{pmatrix}\hat{\gamma}_1\\ \hat{\beta}_1\end{pmatrix} = ([\Delta y_{-1},\Delta X]' W[V_{1N}]^{-1} W'[\Delta y_{-1},\Delta X])^{-1} \times ([\Delta y_{-1},\Delta X]'W[V_{1N}]^{-1} W'[\Delta y,\Delta X]) \qquad (4.13)$$

Where G = $\begin{pmatrix} 2 & -1 & 0 & ... & 0 & 0 & 0 \\ -1 & 2 & -1 & ... & 0 & 0 & 0 \\ 0 & -1 & 2 & ... & 0 & 0 & 0 \\ & & & & & & \\ 0 & 0 & 0 & ... & 2 & -1 & 0 \\ 0 & 0 & 0 & ... & -1 & 2 & -1 \\ 0 & 0 & 0 & ... & 0 & -1 & 2 \end{pmatrix}$

$$V_{1N} = \frac{1}{N}\sum_{i=1}^{N}(W'GW_i)$$

and for the 2-step estimator:

$$\begin{pmatrix}\hat{\gamma}_2 \\ \hat{\beta}_2\end{pmatrix} = ([\Delta y_{-1}, \Delta X]' W\hat{V}_N{}' W' [\Delta y_{-1}, \Delta X])^{-1}([\Delta y_{-1}, \Delta X]' W\hat{V}_N{}^{-1} W' \Delta y) \qquad (4.14)$$

where $V_N = \frac{1}{N}\sum_{i=1}^{N}\left(W_i' \Delta v_i \Delta v_i' W_i\right)$

Nevertheless, Agung (1999), Bond (2002) and Rungsomboon (2005) also state that in the first-difference equation of the GMM estimation, there is an instrument bias or a weak instrument of the level variables which causes finite sample bias in the model. Concerning some drawbacks in the first-difference GMM estimation, the system GMM estimator is introduced by Blundell and Bond (1998) to solve the above problem.

Blundell and Bond (1998) attempt to improve the efficiency of the GMM estimator by applying the additional moment conditions below:

$$E((\Delta y_{i,t-1})(\eta_i + v_{it})) = 0 \qquad (4.15)$$

$$E((\Delta x_{i,t-1})(\eta_i + v_{it})) = 0 \qquad (4.16)$$

In this case, they add the first difference of the lag of dependence and independence variables into the level equation. Thus, the new GMM estimator is calculated by using the additional restriction in equations 4.15 and 4.16, and the instrument matrix will change from W_i to W^+ as below (Baltagi, 2008):

$$W^{+} = diag(W, \Delta y_{i1}, ..., \Delta y_{i,t-2}, \Delta x'_{i1}, \Delta x'_{i2}, ..., \Delta x'_{iT}) \quad (4.17)$$

Following these additional moment restrictions, this new GMM estimator is called the system GMM estimator as it is the system estimator of (T-2) equations in the first differences and the (T-2) equations in levels from t = 3,…,T (Blundell and Bond, 1998). In other words, the system GMM estimator allows two kinds of instruments: (1) the lagged of y_{it} and x_{it} in the first differenced equation and (2) the lagged first difference of y_{it} and x_{it} in the level equation; this technique therefore causes a reduction in the finite sample bias seen in the first differenced equation and increases the precision of the parameter estimation (Baltagi, 2008; Rungsomboon, 2005; Agung, 1999; Bond, 2002; Blundell and Bond, 1998).

The 2-step system GMM estimator uses the same idea and technique as described above, but we change the G matrix in the 2-step first differenced GMM estimator to the $\widetilde{G}$ matrix, as follows (Blundell and Bond, 1998) :

$$\widetilde{G} = \begin{bmatrix} G & L \\ L' & \Gamma \end{bmatrix}$$

where $\Gamma = \begin{bmatrix} 1+\lambda & \lambda & \lambda & \ldots & \lambda \\ \lambda & 1+\lambda & \lambda & \ldots & \lambda \\ \lambda & \lambda & 1+\lambda & \ldots & \lambda \\ . & . & . & \ldots & . \\ \lambda & \lambda & \lambda & \ldots & 1+\lambda \end{bmatrix}$, $\lambda = \dfrac{\sigma_{\eta}^{2}}{\sigma_{v}^{2}}$, $\mathrm{L} = \begin{bmatrix} 1 & 0 & 0 & \ldots & 0 \\ -1 & 0 & 0 & \ldots & 0 \\ 0 & -1 & 1 & \ldots & 0 \\ . & . & . & \ldots & \\ 0 & 0 & 0 & \ldots & 1 \end{bmatrix}$

Despite the fact that the first difference GMM and system GMM estimations improve the efficiency of the fixed effect and 2SLS estimations by introducing the additional moment conditions into the equations to improve the model, Mileva (2007) and Roodman (2006) point out that this technique is suitable for a panel with large N and small T. As our sample is larger than the time period, we will apply the fixed effect and 2SLS estimation in our study and also apply the first difference GMM estimation as well as the system GMM estimation into the model in order to compare and check for the robustness of our results. For the 1- and 2- step GMM consideration, in spite of the 2-step estimation being more efficient due to a higher efficient standard error estimator compared with the 1-step estimation, the 1-step GMM estimation is applied in this study. This is because when we estimate the 2-step estimation in our studies, the empirical result indicates a drop in many variables in the regression due to the small sample size and thus this study will report only on the 1-step estimation. 1-step estimation is still preferred by many micro data based studies of the lending channel (Farinha and Marques, 2001; Haan, 2001; Ehrmann et al., 2001; Schmitz, 2004; Topic and Vilmunen, 2001; Engler et al., 2007; Hosono, 2006). All of the methodologies used in this chapter are estimated by using STATA 12.

4.4 Empirical results

4.4.1 Panel data unit root test

Baltagi (2008) points out that the large time series property for the panel data will probably generate the nonstationarity problem. Due to the large T panel data set (T= 31 from 1978-2008), it is important to first check for the non-stationary property of our data by performing the panel data unit root test. According to Maddala and Wu (1999), the panel data model is presented below:

$$\Delta y_{i,t} = \rho_i y_{i,t-1} + \varepsilon_{i,t} \tag{4.21}$$

where i = 1,2,…, N and t = 1,2,…,T. The null and alternative hypotheses of the panel unit root test are as follows:

$$H_0 : \rho_i = 0 \text{ for all i and } H_a : \rho_i \neq 0 \text{ for i = 1,2,…,N}$$

The rejection of the null hypothesis will show that the panel data series have the stationary property (Im et al., 2003; Maddala and Wu, 1999).

Due to the unbalanced panel data used in this study, the Im-Pesaran-Shin and Fisher-type tests need to be used to perform the panel data unit root test (Stata, 2011).

(1) Im-Pesaran-Shin test

Im et al. (2003) and Banerjee (1999) state that the Im-Pesaran-Shin model for the unit root test is as follows:

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \sum_{j=1}^{p_i} \rho_{ij} \Delta y_{i,t-j} + \varepsilon_{i,t} \tag{4.22}$$

where i = 1,2,…, N and t = 1,2,…,T, $\alpha_i = \mu_i \phi_i(1), \beta_i = -\phi_i(1), \phi_i(1) = 1 - \sum_{j=1}^{p_i+1} \phi_{ij}$, and

$\rho_{ij} = -\sum_{h=j+1}^{\rho_i+1} \phi_{ih}$.

The null and alternative hypotheses of this type of panel unit root test are as follows:

$$H_0 : \beta_i = 0 \text{ for all i} \tag{4.23}$$

$$H_1 : \beta_i < 0 \text{ for i = 1, 2,\dots,N, } \beta_i = 0, i = N_1 + 1, N_2 + 2, ..., N. \quad (4.24)$$

The rejection of the null hypothesis will show that the panel data series have the stationary property (Im et al., 2003; Maddala and Wu, 1999; Baltagi, 2008).

(2) Fisher-type test

Maddala and Wu (1999) argue that the Fisher-type test has some advantages over the Im-Pesaran-Shin test, as not only is the ADF test performance used, but also the PP test. Additionally, the sample size used in the test is not restricted and we can determine each sample's lag length separately (Baltagi, 2008; Maddala and Wu, 1999).

The Fisher-type test model is also a heteroskedastic panel, which takes the form below (Choi, 2001):

$$y_{it} = d_{it} + x_{it} \quad (4.30)$$

where i = 1,2,…, N and t = 1,2,…,T

$$d_{it} = \beta_{i0} + \beta_{i1} t + ... + \beta_{im_i} t^{m_i}, \quad x_{it} = \alpha_i x_{i(t-1)} + u_{it}$$

The null and alternative hypotheses of this type of panel unit root test are as follows:

$$H_0 : \alpha_i = 1 \text{ for all i} \quad (4.31)$$

$$H_1 : |\alpha|_i < 1 \text{for i = 1, 2,\dots,N,} \quad (4.32)$$

The rejection of the null hypothesis will show that the panel data series has a stationary property. The result of the panel data unit root test is presented in table 4.5.

Table 4.5: The result of panel unit root test for the series in the model

Variable	Im-Pesaran-Shin				Fisher							
					ADF				PP			
	t-bar	t-tile-bar	z-t-tilde-bar	W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
Loan	-3.6206***	-2.8561***	-7.3608***	-2.9329***	57.7907***	-2.9853***	-3.0359***	3.2238***	190.1486***	-9.9447***	-13.0163***	19.7686***
Deposit	-3.9131***	-3.0041***	-8.1192***	-4.5566***	125.6141***	-4.5426***	-7.4820***	11.7018***	225.0925***	-11.3758***	-15.4951***	24.1366***
Securities	-5.1193***	-3.4689***	-10.5004***	-6.6984***	125.6938***	-7.3879***	-8.3909***	11.7117***	403.4923***	-16.5480***	-27.7317***	46.4365***
size	-2.9114***	-2.2591***	-4.3022***	-2.2927**	62.6326***	-2.3125**	-2.5954***	3.8291***	183.8918***	-6.7048***	-10.8374***	18.9865***
cap	-2.1968***	-1.9230***	-2.5807***	-2.0936**	62.6326***	-2.3125**	-2.5954***	3.8291***	71.6098***	-3.5455***	-3.9172***	4.9512***
liq	-2.5145***	-2.2104***	-4.0529***	-1.3230**	46.6851**	-1.5069**	-1.5368*	1.8356**	84.8256***	-4.6227***	-5.3122***	6.6032***
Controlling for cross sectional dependence in the series												
Loan	-5.066***	-3.4959***	-10.6386***	-6.5381***	56.4328***	-3.1991***	-3.1858***	3.0541***	391.906***	-16.5438***	-27.1458***	44.9883***
Deposit	-4.9366***	-3.4488***	-10.3974***	-8.3064***	62.4657***	-3.6327***	-3.6807***	3.8082***	363.7879***	-15.8395***	-25.1939***	41.4735***
Securities	-5.4334***	-3.57***	-11.0183***	-8.2319***	54.1616***	-2.6392***	-2.8016***	2.7702***	473.6761***	-18.2904***	-32.6116***	55.2095***
size	-2.4360***	-2.1669***	-3.8303***	-1.7969**	51.3323**	--1.7339**	-1.8788**	2.4165***	78.388***	-4.4221***	-4.5895***	5.7985
cap	-2.3493***	-2.1180***	-3.5796***	-2.5448***	58.7948***	-2.5257***	-2.7986***	3.3494***	67.1891***	-4.0266***	-4.0569***	4.3986***
liq	-2.9212***	-2.5232***	-5.6552***	-2.5775***	56.328***	-2.986***	-3.1547***	3.041***	62.1665***	-3.4606***	-3.5176***	3.7708***

Note: *,**,*** indicates the significant level at the 10%, 5%, and 1%. Standard error and p-value are in (-) and [-] respectively. The AIC information criteria is used to determined the lag of ADF test.

The results from all the test statistics from both the Im-Pesaran-Shin and Fisher-type tests show the rejection of the null hypothesis of the unit root in the series. This confirms that our panel data series, including the bank balance sheet data and bank characteristic data, have a stationary property. To control for possible cross sectional dependence in the data, the demeaning procedure introduced by Levin et al. (2002) is also applied and still confirms the stationary property of the series.

Furthermore, the time series unit root test needs to be applied in this study with regard to the time series variables used in the model (policy interest rate and financial development indicators). The Augmented Dickey Fuller test (ADF test) is used in this case. From the simple time series model below:

$$\Delta y_t = \alpha y_{t-1} + \varepsilon_t \quad \text{, where t = 1,2,…,T} \tag{4.37}$$

the null and alternative hypothesis of the time series unit root test is:

$$H_0 : \alpha = 0 \text{ and } H_1 : \alpha < 0$$

Thus, the rejection of the null hypothesis shows that the series have no unit root (Brooks, 2008). The results from the time series unit root test are shown in table 4.6.

The results show that both the interest rate and financial development indicator variables have a stationary series property as the ADF test shows the rejection of the null hypothesis of the unit root.

Table 4.6: The result of time seires unit root test for the series in the model

Variable (in first difference)	ADF	KPSS
Policy Interest rate	-5.0950***	0.2701
FD1	-3.0758**	0.2347
FD2	-3.2044**	0.2011
FD3	-4.7046***	0.1111
FD4	-4.4221***	0.0605
FD5	-4.2097***	0.0629
FD6	-5.0961***	0.1891
FD7[25]	-	-

Note: *,**,*** indicates the significant level at the 10%, 5%, and 1%. Standard error and p-value are in (-) and [-] respectively.

4.4.2 The empirical results of the baseline model

Table 4.7 shows the baseline results of the bank lending channel in Thailand. Each column represents the four different methods of estimation (fixed effect model, 2SLS, first difference GMM and system GMM estimation).

[25] This series is the dummy variable represent the financial liberalization in Thailand and thus no unit root test required in this series.

Table 4.7: The result for the baseline model

Dependent variable (ΔL)		Fix effect(1)	2SLS (2)	1st difference GMM (3)	System GMM (4)
		Coeff.	Coeff.	Coeff.	Coeff.
ΔL					
	L1	0.1493*	0.1884**	0.2078***	0.2250*
		(0.0851)	(0.0953)	(0.0724)	(0.1196)
	L2	-0.0712	-0.1819	-0.0898	-0.0991
		(0.0742)	(0.1364)	(0.1134)	(0.0767)
ΔD					
	L1	0.1473	0.2739**	0.2694**	0.2517**
		(0.1402)	(0.1212)	(0.1253)	(0.1059)
	L2	0.2318*	0.1275	0.2595**	0.2601***
		(0.1155)	(0.1229)	(0.1064)	(0.0843)
ΔS					
	L1	0.0091	-0.0110	-0.0064	-0.0121
		(0.0304)	(0.0350)	(0.0358)	(0.0378)
	L2	-0.1263**	-0.1127***	-0.1285***	-0.1372***
		(0.0471)	(0.0362)	(0.0439)	(0.0455)
Δr					
	L1	-0.0129**	-0.0138***	-0.0151***	-0.0129***
		(0.0059)	(0.0038)	(0.0049)	(0.0042)
	L2	-0.0047	-0.0049	-0.0047	-0.0064
		(0.0044)	(0.0041)	(0.0043)	(0.0044)
size					
	L1	-0.0760*	-0.0489*	-0.0615*	-0.0535**
		(0.0412)	(0.0283)	(0.0317)	(0.0221)
	L2	-0.0549*	-0.0068	-0.0048	0.0624
		(0.0279)	(0.0286)	(0.0345)	(0.0490)
cap					
	L1	0.2552	0.0938	0.2758	0.2704
		(0.2116)	(0.2167)	(0.2121)	(0.2107)
	L2	-0.4337*	-0.4793*	-0.4425*	-0.4314*
		(0.2265)	(0.2455)	(0.2281)	(0.2261)
liq					
	L1	0.9025**	0.8459*	0.8353***	0.7512**
		(0.4095)	(0.4929)	(0.2990)	(0.3526)
	L2	-0.2359	-0.4690	-0.2569	-0.1772
		(0.2873)	(0.4607)	(0.2504)	(0.2950)
Δ r ×size					
	L1	-0.0033	0.0057	0.0043	0.0058
		(0.0062)	(0.0085)	(0.0086)	(0.0071)
	L2	0.0178***	0.0195**	0.0188*	0.0191***
		(0.0061)	(0.0081)	(0.0113)	(0.0054)
Δ r ×cap					
	L1	0.1489**	0.1072*	0.1243**	0.1350**
		(0.0649)	(0.0615)	(0.0617)	(0.0642)
	L2	0.0136	0.0458	-0.0156	-0.0008
		(0.0588)	(0.0522)	(0.0551)	(0.0007)
Δ r ×liq					
	L1	0.0717*	-0.0143	0.1045*	0.0794*
		(0.0355)	(0.1211)	(0.0579)	(0.0436)
	L2	0.0259	0.1116*	0.0056	0.0095
		(0.0350)	(0.0588)	(0.0602)	(0.0639)

Table 4.7: (cont'd) The result for the baseline model.

Dependent variable (ΔL)	Fix effect(1)	2SLS (2)	1[st] difference GMM (3)	System GMM (4)
	Coeff.	Coeff.	Coeff.	Coeff.
D1988	0.1566***	0.1938***	0.1626***	0.1581***
	(0.0568)	(0.0564)	(0.0581)	(0.0329)
D1997	-0.0933*	-0.0844*	-0.0875*	-0.0978*
	(0.0521)	(0.0474)	(0.0498)	(0.0514)
D2003	0.1194**	0.1215*	0.1542***	0.1218**
	(0.0513)	(0.0689)	(0.0493)	(0.0505)
AR(1)			-3.3926***	-3.4100***
			[0.0007]	[0.0010]
AR(2)			0.9104	1.0400
			[0.3626]	[0.2970]
Sargan statistic			336.6613	330.9700
			[0.3736]	[0.5670]
Hansen J statistic		11.2540		
		[0.4222]		
Underidentification test (Kleibergen-Paap rk. LM statistic)		29.5650***		
		[0.0032]		
Weak identification test (Cragg-Donald Wald F statistic)		13.0730*		
Hausman test	45.15***			
	[0.0056]			
F-test for fix effect model	7.63***			
	[0.0000]			

Note: We use lag1 and lag 2 in the model presented by L1 and L2 respectively. For the instrumental variable used in this model in 2SLS, first difference GMM and system GMM estimation, we apply the third lag to forth lag of the exogenous variables (deposits, securities, and policy interest rate) as well as the bank characteristic variables as suggested by several papers for the instrumental variable used in this model (Çavuşoğlu, 2002; Gambacorta, 2001; Gambacorta and Mistrulli, 2004; Worms, 2001; Loupias, 2001; Matousek and Sarantis, 2009; Benkovskis, 2008). *,**,*** indicates the significant level at the 10%, 5%, and 1%. Standard error and p-value are in (-) and [-] respectively.

The fixed effect estimation result (column 1) indicates that all variables in the equations have a significant effect on bank loans. Deposits and bank securities have the expected positive and negative effects on bank loans respectively. This result is also found by several other studies (Altunbas et al., 2002; Çavuşoğlu, 2002; Westerlund, 2003; Kim, 1999; Farinha and Marques, 2001; Wu et al., 2007; Agung et al., 2002a). The monetary policy instrument (r) has a significant negative effect on bank loans, confirming the existence of the bank lending channel in Thailand. For the effect of the characteristic variables, the bank liquidity characteristic has the expected positive effect on bank loans. This finding is in line with the theoretical expectation, which explains that highly liquid banks will have more cash, liquid assets and securities, and thus greater opportunities to issue more loans than the less liquid banks. Table 4.8 also shows a summary of the balance sheet variables of banks, which are divided according to size, capital and liquidity. We can see that the highly liquid banks have a higher average bank loan, securities, capital to total asset ratio and liquid assets to total assets ratio. This condition confirms that the more highly liquid banks will have a higher loan supply than the less liquid ones.

Table 4.8: summary of balance sheet variables of banks classified by their characteristics (size, capitalization, and liquidity)

Variable (average)	Large banks		Small banks		Well capitalized banks		Low capitalized banks		Well liquid banks		Low liquid banks	
	number	Mean	number	Mean	Number	Mean	Number	Mean	Number	Mean	Number	Mean
Loans (thousands of Baht)	6	312,378,181	10	52,660,061	5	32,310,081	11	231,568,034	9	229,784,816	7	79,119,861
Deposits (thousands of Baht)	6	350,917,691	10	58,443,914	5	34,011,966	11	260,124,023	9	248,908,760	7	76,777,188
Securities (thousands of Baht)	6	38,367,171	10	8,404,551	5	8,493,112	11	28,374,084	9	35,021,890	7	8,205,027
Liquid asset (thousands of Baht)	6	68,905,770	10	10,289,077	5	8,867,608	11	49,306,168	9	45,772,004	7	10,313,294
Total equity (thousands of Baht)	6	32,054,130	10	6,304,477	5	8,609,494	11	23,088,161	9	22,638,269	7	7,292,573
Total asset (thousands of Baht)	6	439,014,996	10	78,156,294	5	46,607,480	11	327,170,421	9	312,353,104	7	111,627,229
Loan to total asset	6	0.7115	10	0.6737	5	0.6932	11	0.7077	9	0.7356	7	0.7088
Deposits to total asset	6	0.7993	10	0.7477	5	0.7297	11	0.7950	9	0.7968	7	0.6878
Securities to total asset	6	0.0873	10	0.1075	5	0.1822	11	0.0867	9	0.1121	7	0.073
Liquid asset to total asset	6	0.1569	10	0.1444	5	0.1902	11	0.1507	9	0.1465	7	0.092
Capital to total asset	6	0.0730	10	0.0806	5	0.1847	11	0.0705	9	0.0724	7	0.065

Note: Regarding the criteria to classify the bank characteristics, banks which have total asset, capital to asset ratio, and liquid asset to total asset ratio more than the average of all banks will be classify as large banks, well capitalized bank, and well liquid banks respectively. Banks that have the average amount of total asset, capital to asset ratio (total equity to asset ratio), and liquid asset to total asset ratio less than the average of all banks will be considered as the small, low capitalized banks, and low liquid banks.

In contrast, the size and capital characteristic variables have a significant negative effect on bank loans. A similar effect of the size characteristic on bank loans is also found in many empirical results from micro based studies of the bank lending channel (Loupias et al., 2002; Worms, 2001; Topi and Vilmunen, 2001; Hernando and Martinez-Pages, 2001). The reason for this is due to the balance sheet structure of banks. If there is better capitalization in small banks than large ones, it will cause a negative effect of the size characteristic on bank loans (Loupias et al., 2002; Hernando and Martinez-Pages, 2001; Gambacorta, 2001; Ehrmann, 2001; Jamborean, 2009). Table 4.8 shows that there is a higher average of the capital to total asset ratio and securities to asset ratio in small banks than in large ones (small banks have a capital to asset ratio and total securities to total asset ratio which are 0.76% and 2.02% higher than large banks respectively). Thus, an increase in the size characteristic of banks can also mean a decrease in their capital and securities (large banks have a lower capital ratio). This leads to the smaller possibility of banks issuing loans and hence a greater the bank size can possibly lead to the lower the bank loans.

The unexpected negative effect of the capital characteristic variable on bank loans can be found in some empirical studies (Fernandez, 2004; Hernando and Martinez-Pages, 2001; Loupias et al., 2002). The reason for this can be explained by table 4.8, as we can see that the poorly capitalized banks have considerably higher average loans than the highly capitalized ones. This condition can cause a negative relationship between the capital characteristic of banks and bank loans.

The results for the effect of the interaction term between all the bank characteristic variables (size, capitalization and liquidity) and policy interest rate show the expected positive sign. The interaction term between the size characteristic and policy interest rate shows a significant positive effect on bank loans. This illustrates that monetary policy will lead to a weaker effect on bank loans in large banks than small ones and confirms our theoretical prediction in section 4.2.1 and other empirical studies on this aspect (Ghosh, 2006; Karim et al., 2010; Alfaro et al., 2003; Goḿez-Gozal̀ez and Grosz, 2007; Gambacorta and Mistrulli, 2004; Kishan and Opiela, 2000; Engler et al., 2007). Nevertheless, although we find a negative effect of the size characteristic variable on bank loans, this result will have little effect when it includes the interest rate variable. This is because large banks still have greater opportunities for external funding when the policy interest rate rises. This condition is shown by table 4.8, which illustrates that large banks also have a relatively high proportion of average bank securities, total equity, total liquid assets, and liquidity to total asset ratio compared with small banks (80.33%, 85.06%, and 78.09%, of the average total equity, liquid assets and securities of large banks are higher than in small banks, and the liquid asset to total asset ratio of large banks is 1.25% higher than that of small ones). Therefore, although the balance sheet structure of small banks in Thailand shows that the size characteristic causes a negative effect on bank loans, the relatively high ability of large banks to use external funding sources (a higher proportion of liquid assets) is the main factor which compensates for the effect of the policy interest rate on bank loans. Thus, a greater bank size will lead to a weaker effect of the policy interest rate via the bank lending channel.

The interaction term between the capital characteristic variable and policy interest rate also indicates a significant positive effect on bank loans. This result is supported by our expectation as explained in section 4.2.1 and is also found in many empirical studies on this issue (Fernandez, 2004; Jimborean, 2009; Westerlund, 2003; Hováth et al., 2006; Alfaro et al., 2003; Matousek and Sarantis, 2009; Gambacorta and Mistrulli, 2004; Sichei, 2005; Pruteanu-Podpiera, 2007). However, although we obtain an unexpected negative effect of the capital characteristic variable on bank loans, this finding has less influence on our result when the interest rate is included as the interaction term. This is possibly due to the greater opportunity for better capitalized banks to access external funding sources, resulting in a higher proportion of capitalization and liquidity compared to poorly capitalized banks. Table 4.8 shows that the capital to total asset ratio, the liquidity to asset ratio, and the securities to total asset ratio of better capitalized banks are a significant 11.42%, 3.95% and 9.55% higher than those of poorly capitalized banks. Therefore, despite the negative effect of the capitalization characteristic variable on bank loans, the higher capitalization and liquidity of well capitalized banks in Thailand can outweigh this negative relationship when the policy interest rate changes. Consequently, an increase in the capitalization characteristic of banks will weaken the effect of the policy interest rate on bank loans and thus weaken the bank lending channel.

The interaction term of the liquidity characteristic variable and policy interest rate shows a positive effect on bank loans, meaning that highly liquid banks will weaken the bank lending channel. This is because these banks have relatively higher securities and liquid assets to offset the decrease in bank loans when the policy interest rate rises. This is confirmed by our theoretical explanation as well as other empirical studies on this aspect (Pruteanu-Podpiera, 2007; Li, 2009; Farinha and Marques, 2001; Hosono, 2006; Wu et al., 2007; Haan, 2001; Hernando and Martinez-Pages, 2001; Topi and Vilmunen, 2001; Ehrmann et al., 2001; Gambacorta, 2001; Chatelain, et al., 2003a). Table 4.8 also confirms this result, as the capital to total asset ratio, the liquidity to asset ratio, and the securities to total asset ratio of highly liquid banks are 0.71%, 5.45% and 3.91% higher than banks with low liquidity.

For the dummy variables, the results indicate the same relationship as expected in section 4.4.2, as the coefficient of the dummy variables in 1988 and 2003 has a positive effect on bank loans, while in 1997 there is a negative effect. This confirms that the rapid expansion of the economy and the economic recovery in Thailand had a positive effect on bank loans; however, the financial crisis in Thailand had a negative impact.

The specification tests of the fixed effect estimation show that the F test in the fixed effect model displays rejection of the null hypothesis that every coefficient is equal to zero. The Hausman test also indicates a rejection of the null hypothesis of the consistency of the random effect estimator, ensuring that the fixed effect model is the appropriate model.

In addition, the robustness results obtained from the other three methods (2SLS, first difference GMM and system GMM) shown in columns 2, 3, and 4 of table 4.7 are similar to the results obtained from the fixed effect in column 1. The baseline results of these three methods also indicate a significant effect of all the variables on bank loans, as well as the existence of the bank lending channel in Thailand. The demand effect control variables (deposits and securities) still show the expected positive and negative effects on bank loans respectively. The size and capital of banks still have a negative effect on bank loans, while the liquidity characteristic has a positive effect. It can be concluded that large, better capitalized, and highly liquid banks will weaken the lending channel in Thailand. The consistency tests of these three methodologies still show that our model is well specified. The 2SLS method shows the validity of our instrument variables, as the Hansen J statistic test indicates the non-rejection of the null hypothesis of the instrument validity (our instruments used are exogenous and they are not correlated with the error term). The under identification test and the weak identification test also show a rejection of under and weak identification of our instrument variables, thus confirming that the model does not use the redundancy number of instruments. The Arellano-Bond second order serial correlation (AR(2)) test and the Sargan test show non-rejection of the null hypothesis of no autocorrelation in the equation and the null hypothesis of validity of the instruments respectively. These consistency tests confirm that our first difference and system GMM results have no autocorrelation of the equation and that the instruments used in the model are valid.

4.4.3 Empirical results of the effect of financial development on the bank lending channel

Table 4.9 presents the fixed effect results (columns 1-7) when including the different financial development indicators in the baseline model. The results from columns 1 to 7 indicate the existence of the lending channel in Thailand as the interest rate coefficient shows a significant negative effect on bank loans. The loan demand control variables (deposits and securities) show respectively positive and negative signs, as expected. The results in all models also show that large, well capitalized and highly liquid banks will weaken the bank lending channel in Thailand. Moreover, the dummy variables controlling for important events still show the expected effect on bank loans.

Table 4.9: The result for the effect of financial sector development on bank lending channel (fixed effect estimation)

Dependent variable (ΔL)	FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
ΔL							
L1	0.1444*	0.1560*	0.1565*	0.1591**	0.1465*	0.1474*	0.0718
	(0.0774)	(0.0932)	(0.0908)	(0.0617)	(0.0824)	(0.0696)	(0.0795)
L2	-0.0772	-0.1387*	-0.0783	-0.1114	-0.0966	-0.0873	-0.1245*
	(0.1168)	(0.0719)	(0.0755)	(0.1192)	(0.0746)	(0.1208)	(0.0729)
ΔD							
L1	0.1978*	0.1213	0.2422*	0.0668	0.2945**	0.0825	0.1653
	(0.1012)	(0.0847)	(0.1145)	(0.0978)	(0.1192)	(0.1034)	(0.1298)
L2	0.1961**	0.1919**	0.2257*	0.1638*	0.2420*	0.1942**	0.2131*
	(0.0869)	(0.0800)	(0.1192)	(0.0842)	(0.1144)	(0.0884)	(0.1188)
ΔS							
L1	0.0135	0.0082	0.0075	0.0062	-0.0179	0.0199	-0.0026
	(0.0356)	(0.0374)	(0.0418)	(0.0348)	(0.0416)	(0.0396)	(0.0440)
L2	-0.1488**	-0.1302**	-0.1283**	-0.1436**	-0.1414***	-0.1392***	-0.1472***
	(0.0549)	(0.0472)	(0.0446)	(0.0498)	(0.0479)	(0.0444)	(0.0482)
Δr							
L1	-0.0111	0.0016	0.00009	0.0159	0.0024	-0.0074	0.0062
	(0.0064)	(0.0070)	(0.0057)	(0.0159)	(0.0101)	(0.0064)	(0.0072)
L2	-0.0168***	-0.0159***	-0.0123**	-0.0206*	-0.0141*	-0.0116**	-0.0062*
	(0.0046)	(0.0054)	(0.0047)	(0.0104)	(0.0075)	(0.0049)	(0.0032)
size							
L1	-0.0650	-0.0703*	-0.1000**	-0.0366**	-0.0701*	-0.0845**	-0.0382
	(0.0458)	(0.0386)	(0.0472)	(0.0689)	(0.0394)	(0.0384)	(0.0318)
L2	-0.0277	-0.0521	-0.0265	0.0555	-0.0249	-0.0224	-0.0119
	(0.0491)	(0.0396)	(0.0518)	(0.0747)	(0.0324)	(0.0359)	(0.0443)
cap							
L1	0.5696	0.2137	0.5627	0.2938	0.3109	0.3309	-0.4301
	(0.4544)	(0.2966)	(0.4148)	(0.2019)	(0.2221)	(0.2127)	(0.6404)
L2	-0.2725	-0.3154	-0.0041	-0.6313***	-0.4087*	-0.5388**	0.5283
	(0.3276)	(0.3293)	(0.0332)	(0.2595)	(0.2350)	(0.2327)	(0.4513)
liq							
L1	1.0846**	0.8130*	0.7915*	0.9891**	0.9462**	0.8416*	0.9149**
	(0.4179)	(0.4121)	(0.4129)	(0.3791)	(0.4468)	(0.4162)	(0.4107)
L2	-0.2262	-0.2423	-0.0296	-0.2666	-0.6787	-0.1056	-0.2454
	(0.3073)	(0.3348)	(0.3068)	(0.3179)	(0.4364)	(0.3558)	(0.2762)
Δ r ×size							
L1	-0.0053	0.0032	0.0079	0.0074	0.0014	-0.0020	0.0027
	(0.0084)	(0.0063)	(0.0068)	(0.0057)	(0.0063)	(0.0056)	(0.0064)
L2	0.0231*	0.0172***	0.0166***	0.0163***	0.0165***	0.0206***	0.0169***
	(0.0117)	(0.0063)	(0.0055)	(0.0061)	(0.0057)	(0.0066)	(0.0057)
Δ r ×cap							
L1	0.0789*	0.1325**	0.1169*	0.1196**	0.1582*	0.1383**	0.1407**
	(0.0449)	(0.0625)	(0.0668)	(0.0606)	(0.0790)	(0.0656)	(0.0648)
L2	0.0214	0.01298	0.0068	-0.0554	-0.0204	-0.0401	-0.0201
	(0.0368)	(0.0529)	(0.0563)	(0.0563)	(0.1013)	(0.0612)	(0.0609)
Δ r ×liq							
L1	0.1326**	0.0403	-0.0238	0.1917	0.0369	0.1229**	0.1231*
	(0.0484)	(0.0609)	(0.0871)	(0.0825)	(0.0594)	(0.0507)	(0.0634)
L2	-0.0604	0.0932*	0.1120*	0.0734*	0.0949*	-0.0363	0.0121
	(0.0561)	(0.0534)	(0.0657)	(0.0429)	(0.0532)	(0.0434)	(0.0615)

Table 4.9 (cont'd): The result for the effect of financial sector development on bank lending channel (Fixed effect estimation)

Dependent variable (ΔL)	FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD							
L1	1.3359*	0.0861	0.3117	0.1314*	-0.0097	0.1279*	0.0893*
	(0.7652)	(0.0644)	(0.4248)	(0.0702)	(0.0853)	(0.0621)	(0.0475)
L2	1.1258	0.1062**	-0.1504	0.1113	0.2811*	-0.0022	-0.0378
	(0.7300)	(0.0464)	(0.3252)	(0.0942)	(0.1435)	(0.0014)	(0.0368)
Δ r× FD							
L1	0.3634**	0.1204***	-0.1176*	0.1074**	0.0207	0.0681**	0.0238**
	(0.1422)	(0.0332)	(0.0626)	(0.0468)	(0.0396)	(0.251)	(0.0092)
L2	0.1241	0.0243	-0.0363	0.0616*	0.0784*	0.0327	0.0026
	(0.1824)	(0.0290)	(0.0293)	(0.0311)	(0.0373)	(0.0227)	(0.0028)
D1988	0.0929	0.1414*	0.1343**	0.1115**	0.1015*	0.1101*	0.1114**
	(0.0619)	(0.0694)	(0.0568)	(0.0535)	(0.0516)	(0.0581)	(0.0550)
D1997	-0.0997*	-0.0728	-0.0919**	-0.1352*	-0.1012*	-0.1146**	0.1204*
	(0.0571)	(0.0539)	(0.0545)	(0.0702)	(0.0518)	(0.0527)	(0.0506)
D2003	0.1119**	0.1408***	0.1251**	0.1034	0.1344***	0.0775	0.1368***
	(0.0531)	(0.0492)	(0.0515)	(0.0826)	(0.0505)	(0.0482)	(0.0494)
Hausman test	78.16***	76.98***	51.28***	65.56***	64.79***	62.98***	61.90***
	[0.0000]	[0.0103]	[0.0032]	[0.0001]	[0.0000]	[0.0002]	[0.0001]
F-test	6.56***	6.81***	6.18***	7.82***	6.79***	6.69***	7.09***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]

Note: *,**,*** indicates the significant level at the 10%, 5%, and 1%. Standard error and p-value are in (-) and [-] respectively.

For the effect of banking sector development (size measure: FD1), the result from model (1) shows that the effect of this indicator on bank loans and its interaction term with the policy interest rate show the expected positive effect on bank loans. This result is supported by the theoretical explanation of Levine et al. (2000), Da Silva (2002), Beck and Demirguc-Kunt (2009), Beck et al. (2008) and Nourzad (2002), and the empirical study conducted by Ferreira (2010). This means that an increase in the development of the size of the banking sector, financial depth and degree of financial intermediation in the banking sector in Thailand will cause an improvement in financial market liquidity and portfolio diversification, as well as an increase in the opportunities for external funding. Thereby, this leads to a positive effect on loan supply and the policy interest rate will have a weaker effect on bank loans as they have more opportunity to obtain the external source of funds, which shows that banking size development will weaken the lending channel in Thailand.

The result from model (2) in table 4.9 still shows that development in the size of the banking sector in terms of an increase in banking activities will lead to a positive effect on bank loans. Also, the interaction term between this indicator and the policy interest rate shows a significant positive effect on bank loans. These results are in line with our expectation, as an increase in banking activities and services, such as loan facilities, will encourage an increase in bank loans and thus weaken the effect of the policy interest rate on bank loans via the bank lending channel.

The effect of banking concentration on the bank lending channel is shown in model (3) in table 4.9. The coefficient of the interaction term between the policy interest rate and the banking concentration indicator presents the expected negative sign. This result is supported by the theoretical explanation, as well as by several empirical studies (Li, 2009; Gunji et al., 2009; Adams and Amel, 2005). This means that the higher the banking concentration, the more monopoly power there will be and the greater the difficulty for other banks to access alternative sources of funding. Thus, an increase in the policy interest rate will have a higher impact on bank loans, and hence have a stronger effect through the lending channel. As more banking concentration represents a low competitive environment in the banking sector, we can conclude that banking competition will lead to a weakening of the bank lending channel.

The result in table 4.9 in models (4) and (5) clearly shows a significant positive coefficient of the effect of the interaction term between development in the size and policy interest rate on bank loans, and the interaction term between the activities of the capital market and the policy interest rate on bank loans. Our results are in line with our expectation, as an increase in the size and activities of the capital market will show a higher degree of financial depth (relatively high efficiency, trading activity and liquidity in the capital market). This therefore causes banks to have more opportunity to find other sources of funds, thus increasing bank loans, lower the effect of policy interest rate via the bank lending channel and thus weakening the bank lending channel.

Model (6) in table 4.9 also shows a significant positive effect of bond market development as well as financial innovation on bank loans. This result is in line with our expectation, as development of the equity and bond markets will lead to a rise in financial deepening, greater opportunities for the banking sector to access the financial market and invest in new financial instruments, a high level of financial market liquidity and capital, and a rise in assets for hedging and diversification purposes. Consequently, an increase in this indicator will result in a weaker effect of the policy interest rate on bank loans through the bank lending channel due to more opportunity of banks to obtain more source of fundings, which is shown by the positive sign of the interaction term between this indicator and the policy interest rate. This result is similar to other studies on the effect of financial innovation on the bank lending channel (Altunbas et al., 2009b; Aysun and Hepp, 2011).

Model (7) in table 4.9 shows the expected positive sign of the effect of the financial liberalization dummy during the period 1990 to 1995 on bank loans and also the interaction term between the policy interest rate and financial liberalization dummy on bank loans. This result shows that financial liberalization in Thailand leads to a weaker effect of the policy interest rate on bank loans. This result is in line with our expectation, as financial liberalization will tend to increase the bank loan supply in the market. This is supported by our portfolio choice model presented in chapter 2, section 2.5.1, as the liberalization policies (the relaxation of capital and foreign exchange control and the relaxation of bank branch opening requirements) will also cause a rise in capital inflow, deposits and bank loans. As explained previously in the overview of macroeconomic conditions in Thailand (chapter 3, section 3.1), the relaxation of foreign exchange and capital control (the establishment of BIBF in 1993) and other deregulation policies during the period of financial liberalization led to an increase in capital and financial surplus. This condition also shows the upward trend in both commercial bank loans and deposits from 1990 to 1996 (figure 3.9, chapter 3). Therefore, the effect of financial liberalization will cause a weaker effect of the policy interest rate on bank loans as banks have an opportunity to issue more loans and also to access more funding sources (capital and securities). In summary, our results in this case confirm that financial liberalization will weaken the bank lending channel in Thailand.

In addition, the robustness results obtained from the other three methods (2SLS, first difference GMM and system GMM in tables 4.10, 4.11, and 4.12 respectively) show similar results to the fixed effect estimation. The consistency tests of all of our methodologies still show that our model is well specified which is similar to the previous description in section 4.4.2. Therefore, we can confirm the consistency of our results on the effect of financial sector development on the bank lending channel in Thailand.

Table 4.10: The result for the effect of financial sector development on bank lending channel (2SLS estimation)

Dependent variable (ΔL)	FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
ΔL							
L1	-0.2151	-0.2015*	0.1548*	0.1943**	0.1615*	0.1607*	0.1613*
	(0.1389)	(0.1219)	(0.0931)	(0.0980)	(0.0953)	(0.0952)	(0.0886)
L2	0.1658*	0.1101	-0.1186	-0.0528	-0.2161	-0.2228	-0.1563
	(0.0972)	(0.0903)	(0.1587)	(0.1243)	(0.1415)	(0.1406)	(0.1413)
ΔD							
L1	0.4217***	0.2443*	0.2943**	0.3517**	0.2992**	0.2566**	0.2749*
	(0.1165)	(0.1414)	(0.1480)	(0.1380)	(0.1231)	(0.1213)	(0.1517)
L2	0.4258**	0.2645*	0.2145	0.2402	0.2160*	0.1676	0.3012*
	(0.1698)	(0.1440)	(0.1466)	(0.1721)	(0.1249)	(0.1293)	(0.1562)
ΔS							
L1	-0.2993	-0.006	-0.0042	-0.0212	-0.0102	-0.0017	-0.0202
	(0.0456)	(0.0520)	(0.0476)	(0.0509)	(0.0463)	(0.0546)	(0.0488)
L2	-0.1674***	-0.1355***	-0.1124**	-0.1370**	-0.1291***	-0.1191**	-0.1588***
	(0.0522)	(0.0528)	(0.0473)	(0.0564)	(0.0468)	(0.0525)	(0.0505)
Δr							
L1	-0.0003	-0.0111	-0.0005	-0.0022	-0.0080*	-0.0106**	0.0054
	(0.0088)	(0.0083)	(0.0062)	(0.0074)	(0.0048)	(0.0049)	(0.0060)
L2	-0.0239**	-0.0152**	-0.0119***	-0.0156**	-0.0117**	-0.0044	-0.0078**
	(0.0096)	(0.0074)	(0.0039)	(0.0064)	(0.0048)	(0.0044)	(0.0034)
size							
L1	-0.0505	-0.0468	-0.0480*	-0.0366	-0.0520*	-0.0489*	-0.0497*
	(0.0323)	(0.0296)	(0.0275)	(0.0334)	(0.0297)	(0.0283)	(0.0271)
L2	0.0029	-0.0027	-0.0152	-0.0141	-0.0159	-0.0068	-0.0176
	(0.0311)	(0.0284)	(0.0276)	(0.0316)	(0.0297)	(0.0286)	(0.0266)
cap							
L1	0.2768	0.5017	0.3791	0.4162	0.3849	0.2938	0.2461
	(0.2030)	(0.5120)	(0.2370)	(0.4236)	(0.2351)	(0.2019)	(0.3086)
L2	-0.6842***	-0.1131	-0.5795**	-0.0141	-0.5341**	-0.6313***	-0.2937
	(0.2288)	(0.4732)	(0.2718)	(0.0374)	(0.2588)	(0.2287)	(0.3089)
liq							
L1	0.9544*	0.7556**	0.9759*	0.6491*	0.6415*	0.8222*	0.8616***
	(0.5145)	(0.3226)	(0.5024)	(0.3372)	(0.3303)	(0.4266)	(0.3221)
L2	-0.6008	-0.1131	-0.5292	0.0091	-0.0465	-0.4662	-0.2224
	(0.4587)	(0.4732)	(0.4821)	(0.3362)	(0.3028)	(0.4214)	(0.2903)
Δ r ×size							
L1	0.0064	0.0074	0.0072	0.0025	0.0019	0.0053	0.0028
	(0.0089)	(0.0072)	(0.0084)	(0.0066)	(0.0059)	(0.0085)	(0.0085)
L2	0.0188**	0.0167*	0.0183**	0.0172***	0.0167***	0.0158*	0.0191**
	(0.0078)	(0.0091)	(0.0078)	(0.0054)	(0.0053)	(0.0093)	(0.0090)
Δ r ×cap							
L1	0.1025*	0.1116*	0.1002*	0.1127*	0.1282**	0.0947*	0.0975*
	(0.0620)	(0.0593)	(0.0574)	(0.0619)	(0.0599)	(0.0571)	(0.0588)
L2	-0.0611	-0.0069	-0.0283	-0.0359	-0.0423	-0.0375	-0.0286
	(0.0611)	(0.0585)	(0.0570)	(0.0571)	(0.0566)	(0.0552)	(0.0586)
Δ r ×liq							
L1	-0.0031	-0.0131	-0.0391	0.0452	0.0472	0.0413	0.1097*
	(0.1264)	(0.0726)	(0.1275)	(0.0752)	(0.0623)	(0.0615)	(0.0571)
L2	0.1458**	0.1039**	0.1393**	0.0719*	0.1293**	0.1153**	0.0297
	(0.0688)	(0.0519)	(0.0663)	(0.0385)	(0.0535)	(0.0511)	(0.0557)

Table 4.10 (cont'd): The result for the effect of financial sector development on bank lending channel (2SLS estimation)

Dependent variable (ΔL)	FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD							
L1	0.5897	0.2347***	0.1746	0.1989*	0.0129	0.1486**	0.0308
	(0.8190)	(0.0908)	(0.3993)	(0.1078)	(0.0981)	(0.0686)	(0.0556)
L2	1.3319**	0.2047***	-0.1849	0.0509	0.1973	0.0801	-0.0873
	(0.6654)	(0.0715)	(0.3178)	(0.1254)	(0.1521)	(0.0532)	(0.0547)
Δ r× FD							
L1	-0.0562	0.1370***	-0.1241**	0.1016***	0.0417	0.0571**	0.0256**
	(0.1848)	(0.0303)	.(0.0566)	(0.0346)	(0.0400)	(0.0241)	(0.0114)
L2	0.2965*	0.1066***	-0.0388	0.0481	0.0753*	0.0554***	0.0010
	(0.1757)	(0.0227)	(0.0354)	(0.0322)	(0.0399)	(0.0173)	(0.0078)
D1988	0.1175**	0.1173**	0.0904*	0.0895*	0.1118**	0.1439**	0.1947***
	(0.0501)	(0.0494)	(0.0481)	(0.0506)	(0.0451)	(0.0684)	(0.0420)
D1997	-0.1887***	-0.1569**	-0.1715*	-0.1005*	-0.1889***	-0.0562	-0.0815
	(0.0415)	(0.0642)	(0.0916)	(0.0557)	(0.0558)	(0.0606)	(0.0759)
D2003	0.1431**	0.1477**	0.1421*	0.0573	0.1394**	0.1439**	0.1591**
	(0.0708)	(0.0662)	(0.0731)	(0.0513)	(0.0698)	(0.0684)	(0.0709)
Hansen J statistic	8.3400	17.4670	20.8780	11.079	13.8010	16.6320	7.9350
	[0.6825]	[0.1788]	[0.0132]	[0.4367]	[0.2442]	[0.1193]	[0.7191]
Underidentification test (Kleibergen-Paap rk LM statistic)	36.8800***	33.7850***	27.2070***	32.420***	25.0510**	25.5050**	28.0640***
	[0.0002]	[0.0022]	[0.0024]	[0.0012]	[0.0146]	[0.0126]	[0.0054]
Weak identification test (Cragg-Donald Wald F statistic)	22.3750***	11.863**	17.311*	24.9330***	19.509**	19.8840**	24.8980***

Note: *,**,*** indicates the significant level at the 10%, 5%, and 1%. Standard error and p-value are in (-) and [-] respectively.

Table 4.11: The result for the effect of financial sector development on bank lending channel (1st difference GMM estimation)

Dependent variable (ΔL)		FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
		Coef.	Coef.	Coef	Coef.	Coef.	Coef.	Coef.
ΔL								
	L1	0.2153**	-0.0008	0.1382*	-0.0401	0.1912*	0.2038*	0.1886**
		(0.0918)	(0.0788)	(0.0828)	(0.0836)	(0.0985)	(0.1043)	(0.0871)
	L2	-0.0588	-0.1541**	-0.0759	-0.1583**	-0.1181	-0.1593*	-0.0859
		(0.0708)	(0.0716)	(0.0719)	(0.0713)	(0.0747)	(0.0846)	(0.0725)
ΔD								
	L1	0.1989	0.1616	0.1082	0.2372**	0.2322*	0.2041*	0.1859
		(0.1381)	(0.1001)	(0.0775)	(0.0978)	(0.1308)	(0.1088)	(0.1242)
	L2	0.1993*	0.2105**	0.2104*	0.2358**	0.2213**	0.2404**	0.2197**
		(0.1125)	(0.1057)	(0.1121)	(0.1021)	(0.1109)	(0.1101)	(0.0990)
ΔS								
	L1	0.0024	0.0132	0.0216	-0.0003	0.0054	0.0056	-0.0070
		(0.0369)	(0.0381)	(0.0378)	(0.0366)	(0.0347)	(0.0372)	(0.0378)
	L2	-0.1250***	-0.1239***	-0.1376***	-0.1400***	-0.1223***	-0.1351***	-0.1399***
		(0.0437)	(0.0425)	(0.0385)	(0.0378)	(0.0419)	(0.0407)	(0.0380)
Δr								
	L1	-0.0094*	-0.0382***	0.0023	0.0055	0.0001	-0.1140	-0.0171***
		(0.0055)	(0.0136)	(0.0052)	(0.0083)	(0.0075)	(0.0082)	(0.0058)
	L2	-0.0042	-0.0710***	-0.0104**	-0.0131**	-0.0182***	-0.0302***	-0.0066*
		(0.0038)	(0.0200)	(0.0045)	(0.0055)	(0.0054)	(0.0108)	(0.0035)
size								
	L1	-0.0741*	-0.0401	-0.0530	-0.4000	-0.0787*	-0.0676*	-0.0643*
		(0.0394)	(0.0376)	(0.0335)	(0.0427)	(0.0445)	(0.0397)	(0.0377)
	L2	-0.0703	-0.0397	-0.0165	-0.0184	-0.0366	-0.0271	-0.0404*
		(0.0478)	(0.0319)	(0.0301)	(0.0287)	(0.0316)	(0.0336)	(0.0244)
cap								
	L1	0.3983	0.2005	0.2067	0.2485	0.3259	0.5665	0.2447
		(0.2413)	(0.2119)	(0.2058)	(0.3448)	(0.2657)	(0.3655)	(0.2990)
	L2	-0.4959*	-0.5146**	-0.4131*	0.0031	-0.43985	-0.1258	-0.2140
		(0.2545)	(0.2441)	(0.2325)	(0.2665)	(0.2992)	(0.3094)	(0.3211)
liq								
	L1	0.7768**	0.7487**	0.7854**	0.6897*	0.6677*	0.7234*	0.9097***
		(0.3635)	(0.3700)	(0.0364)	(0.3541)	(0.3620)	(0.3754)	(0.3396)
	L2	-0.1597	-0.0375	0.0229	-0.2533	-0.0254	-0.0872	-0.0718
		(0.2814)	(0.3081)	(0.3143)	(0.3297)	(0.2987)	(0.3051)	(0.3046)
Δ r ×size								
	L1	0.0015	0.0051	0.0185*	0.0058	0.0035	0.0034	0.0039
		(0.0061)	(0.0060)	(0.0111)	(0.0066)	(0.0067)	(0.0061)	(0.0067)
	L2	0.0172***	0.0172***	0.0041	0.0169***	0.0174***	0.0168***	0.0177***
		(0.0061)	(0.0054)	(0.0083)	(0.0054)	(0.0054)	(0.0054)	(0.0055)
Δ r ×cap								
	L1	0.1412*	0.1485**	0.1152*	0.1116*	0.1181*	0.1454**	0.1384*
		(0.0800)	(0.0708)	(0.0635)	(0.0656)	(0.0652)	(0.0703)	(0.0776)
	L2	-0.0025	0.0351	-0.0375	-0.0169	-0.0041	0.0148	0.0101
		(0.0770)	(0.0955)	(0.0576)	(0.0876)	(0.0530)	(0.0871)	(0.0696)
Δ r ×liq								
	L1	0.0800	0.0166	0.0282	-0.0030	0.0139	0.0598	0.0088
		(0.0583)	(0.0421)	(0.0371)	(0.0653)	(0.0664)	(0.0457)	(0.0476)
	L2	0.0969*	0.0981***	0.1001***	0.0800*	0.0929*	0.1031***	0.0860***
		(0.0541)	(0.0333)	(0.0370)	(0.0454)	(0.0536)	(0.0335)	(0.0324)

Table 4.11 (cont'd): The result for the effect of financial sector development on bank lending channel (1st difference GMM estimation)

Dependent variable (ΔL)	FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD							
L1	1.3282**	-0.1780	0.3736	0.2042***	0.1261**	-0.1900	0.0865*
	(0.6243)	(0.8105)	(0.3406)	(0.0736)	(0.0599)	(0.1457)	(0.0480)
L2	0.1651	0.5662	-0.1709	0.0828	-0.0604	0.0830*	-0.0036
	(0.5521)	(0.7952)	(0.2263)	(0.0938)	(0.0826)	(0.0495)	(0.0448)
Δ r× FD							
L1	0.4122*	0.0472**	-0.1096*	0.0987**	0.0699**	0.0039	0.0140*
	(0.2347)	(0.0187)	(0.0591)	(0.0440)	(0.0306)	(0.0164)	(0.0078)
L2	0.0609	0.1191***	-0.0131	0.0568*	0.0472*	0.0518**	0.1328
	(0.0808)	(0.0361)	(0.0269)	(0.0310)	(0.0251)	(0.0221)	(0.0098)
D1988	0.1320***	0.1468*	0.1767***	0.1132**	0.1536***	0.1775***	0.1377***
	(0.0329)	(0.0836)	(0.0294)	(0.0553)	(0.0281)	(0.0691)	(0.0353)
D1997	-0.1053*	-0.0511	-0.1438***	-0.0656	-0.1029**	-0.0878**	-0.0754
	(0.0618)	(0.0495)	(0.0451)	(0.0517)	(0.0412)	(0.0414)	(0.0548)
D2003	0.1353***	0.1172**	0.1427*	0.1133**	0.1185**	0.1228**	0.1492*
	(0.0525)	(0.0487)	(0.0845)	(0.0530)	(0.0521)	(0.0521)	(0.0865)
AR(1)	-3.3542***	-3.2790***	-3.2638***	-3.1401***	-3.3089***	-3.2884***	-3.4397***
	[0.0008]	[0.0010]	[0.0011]	[0.0017]	[0.0009]	[0.0010]	[0.0006]
AR(2)	0.1232	0.7982	0.0805	0.5417	0.5155	-0.4414	1.237
	[0.9019]	[0.4247]	[0.9358]	[0.5880]	[0.6062]	[0.6589]	[0.2161]
Sargan test	337.3477	331.0860	332.0806	334.6085	340.3193	337.1387	326.9208
	[0.3637]	[0.4573]	[0.4421]	[0.4039]	[0.3220]	[0.3667]	[0.5064]

Note: *,**,*** indicates the significant level at the 10%, 5%, and 1%. Standard error and p-value are in (-) and [-] respectively.

Table 4.12: The result for the effect of financial sector development on bank lending channel (system GMM estimation)

Dependent variable (ΔL)		FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
ΔL								
	L1	0.0619	-0.0102	0.2312***	-0.0392	0.0319	-0.0057	0.2088*
		(0.0907)	(0.0882)	(0.0578)	(0.0894)	(0.0983)	(0.0883)	(0.0957)
	L2	0.1447*	-0.1699**	0.0605	-0.1672**	0.1306*	-0.1443*	-0.1236
		(0.0768)	(0.0745)	(0.0737)	(0.0735)	(0.0758)	(0.0741)	(0.1120)
ΔD								
	L1	0.3463**	0.2817*	0.1921	0.3195*	0.3693**	0.2658	0.0100
		(0.1421)	(0.1409)	(0.1295)	(0.1674)	(0.1376)	(0.1517)	(0.1194)
	L2	0.2803**	0.2664**	0.2295*	0.2645**	0.2910**	0.2542**	0.2275**
		(0.1059)	(0.0968)	(0.1156)	(0.0974)	(0.1063)	(0.1048)	(0.0972)
ΔS								
	L1	-0.0351	-0.0119	0.0066	-0.0221	-0.0273	-0.0196	0.0389
		(0.0469)	(0.0502)	(0.0447)	(0.0364)	(0.0428)	(0.0469)	(0.0505)
	L2	-0.1399***	-0.1344**	-0.1291***	-0.1345***	-0.1316***	-0.1454***	-0.1193***
		(0.0471)	(0.0469)	(0.0427)	(0.0441)	(0.0440)	(0.0440)	(0.0336)
Δr								
	L1	-0.0202***	-0.0245*	0.0004	-0.0084**	-0.0123**	-0.0104	-0.0207***
		(0.0054)	(0.0126)	(0.0061)	(0.0033)	(0.0052)	(0.0095)	(0.0053)
	L2	-0.0118**	-0.0575**	-0.0112**	-0.0084*	-0.0128***	-0.0355***	-0.0113**
		(0.0051)	(0.0219)	(0.0047)	(0.0041)	(0.0043)	(0.0113)	(0.0046)
size								
	L1	-0.0364*	-0.0259	-0.0451*	-0.0280	-0.0487**	-0.0452*	-0.0419*
		(0.0200)	(0.0188)	(0.0218)	(0.0240)	(0.0199)	(0.0239)	(0.0211)
	L2	-0.0235	-0.0205	-0.0156	-0.0361	-0.0155	-0.0026	-0.0053
		(0.0216)	(0.0229)	(0.0250)	(0.0252)	(0.0213)	(0.0269)	(0.0223)
cap								
	L1	0.2847	0.2741	0.3076	0.3101	0.3027	0.2771	-0.5478
		(0.2110)	(0.2129)	(0.2147)	(0.2915)	(0.2807)	(0.2596)	(0.6650)
	L2	-0.4021*	-0.4400*	-0.4688**	-0.4669	-0.4494	-0.4832*	0.5487
		(0.2314)	(0.2299)	(0.2315)	(0.3408)	(0.3193)	(0.2787)	(0.6661)
liq								
	L1	0.9800*	0.8653*	0.9241**	0.6938*	0.6298*	0.9017*	0.6714***
		(0.4838)	(0.4583)	(0.4538)	(0.3654)	(0.3502)	(0.4491)	(0.2378)
	L2	-0.6247	-0.4509	-0.4921	-0.2284	-0.1135	-0.4667	-0.2063
		(0.4468)	(0.4365)	(0.4468)	(0.3658)	(0.3209)	(0.4214)	(0.2653)
Δ r ×size								
	L1	0.0062	0.0063	0.0157***	0.0049	0.0064	0.0060	0.0108*
		(0.0063)	(0.0063)	(0.0057)	(0.0061)	(0.0070)	(0.0063)	(0.0059)
	L2	0.0148**	0.0159***	0.0061	0.0171***	0.0152***	0.0154***	0.0149**
		(0.0064)	(0.0056)	(0.0065)	(0.0054)	(0.0057)	(0.0056)	(0.0061)
Δ r ×cap								
	L1	0.1446*	0.1431*	0.1381**	0.1135*	0.1399*	0.1451*	0.1163**
		(0.0718)	(0.0763)	(0.0670)	(0.0619)	(0.0757	(0.0748)	(0.0590)
	L2	-0.0363	-0.0040	-0.0388	-0.0514	-0.0243	-0.0284	-0.0247
		(0.0984)	(0.1121)	(0.0627)	(0.0592)	(0.0922)	(0.1051)	(0.0599)
Δ r ×liq								
	L1	0.0591	0.0254	0.0560	0.0074	0.0287	0.0417	0.0135
		(0.0502)	(0.0432)	(0.0393)	(0.0422)	(0.0682)	(0.0482)	(0.0675)
		0.0776*	0.0973***	0.0861**	0.0757**	0.0953**	0.0980***	0.0930*
		(0.0398)	(0.0267)	(0.0369)	(0.0319)	(0.0433)	(0.0286)	(0.0547)

Table 4.12 (cont'd) The result for the effect of financial sector development on bank lending channel (system GMM estimation)

Dependent variable (ΔL)	FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD							
L1	1.2379**	-0.2424	-0.2754	0.1366*	-0.0175	-0.1997	0.0360
	(0.5705)	(0.1975)	(0.4576)	(0.0746)	(0.1144)	(0.1570)	(0.0369)
L2	0.7621	0.0550	0.1143***	0.1236	0.2575*	0.0808*	0.0332
	(0.5464)	(0.0730)	(0.0353)	(0.0943)	(0.1383)	(0.0493)	(0.0344)
Δ r× FD							
L1	0.3995*	0.0214	-0.1186*	0.0784	0.0135	0.0003	0.0178*
	(0.2399)	(0.0169)	(0.0641)	(0.0562)	(0.0294)	(0.0218)	(0.0086)
L2	0.0361	0.1228**	-0.0041	0.0719**	0.0629*	0.0593**	0.0137
	(0.1236)	(0.0385)	(0.0405)	(0.0278)	(0.0345)	(0.0229)	(0.0103)
D1988	0.1451**	0.1318***	0.1504***	0.1563***	0.1453***	0.1924***	0.1426
	(0.0615)	(0.0502)	(0.0376)	(0.0311)	(0.0337)	(0.0391)	(0.0879)
D1997	-0.0876**	-0.0485	-0.1286***	-0.0427	-0.0302	-0.1028**	-0.0604
	(0.0443)	(0.0508)	(0.0466)	(0.0751)	(0.0606)	(0.0428)	(0.0527)
D2003	0.1049**	0.1253**	0.1428***	0.0954*	0.1154	0.1348***	0.1199*
	(0.0521)	(0.0501)	(0.0534)	(0.0566)	(0.0933)	(0.0495)	(0.0586)
AR(1)	-3.24***	-3.34***	-3.26***	-3.24***	-3.27***	-3.32***	-3.40***
	[0.0010]	[0.0010]	[0.0010]	[0.0010]	[0.0010]	[0.0010]	[0.0010]
AR(2)	-0.04	0.6600	0.19	1.36	0.67	-0.24	1.04
	[0.9660]	[0.5070]	[0.8530]	[0.1740]	[0.5030]	[0.8080]	[0.2970]
Sargan test	336.70	334.51	336.04	344.24	336.25	340.82	333.09
	[0.4640]	[0.4970]	[0.4580]	[0.3520]	[0.4700]	[0.4020]	[0.5190]

Note: *,**,*** indicates the significant level at the 10%, 5%, and 1%. Standard error and p-value are in (-) and [-] respectively.

4.5 Conclusion

This study aims to examine the bank lending channel in Thailand from 1978 to 2008 from the micro data based perspective as well as to investigate the effect of financial sector development on this channel. The results obtained from different methods (panel data fixed effect estimation, 2SLS, first difference GMM and system GMM estimation) show the existence of the bank lending channel in Thailand during the period under consideration as there is a significant negative effect of policy interest rate on bank loans. Our results show that the large, well capitalized and highly liquid banks will have a weaker effect of the policy interest rate on bank loans and thus a weakening of the bank lending channel. However, we found that the size characteristic variables show an unexpected negative effect on bank loans due to the balance sheet structure of banks in Thailand, with small banks having higher capital to asset and securities to asset ratios. In addition, the capital characteristic variable shows an unexpected negative effect on bank loans, as the poorly capitalized banks have considerably higher average loans than the highly capitalized ones. Despite these unexpected findings, this result will have little impact when the effect of the policy interest rate variable is included. This is because the balance sheet structure of large and high capitalized banks in Thailand which still have the relatively high ability to obtain external funding. This will lead to a weaker effect of the policy rate on bank loans. In this case, large banks have a relatively high proportion of average bank securities, total equity, total liquid assets, and liquidity to total asset ratio compared with small banks. There is also the greater opportunity for better capitalized banks to access external funding sources, showing by a higher proportion of capitalization (capital to asset ratio) and liquidity (liquidity to asset ratio), compared to poorly capitalized banks. Therefore, we still conclude that greater bank size, capital and liquidity will weaken the effect of the policy interest rate on bank loans, and thus weaken the bank lending channel in Thailand.

The results of the effect of financial sector development on the bank lending channel indicate that banking sector development (both in size and activity), banking competition, capital market development (both size and activity), bond market development (financial innovation), and financial liberalization have weakened the bank lending channel. The development of the size of the banking sector causes a rise in the degree of financial intermediation and an increase in the bank size compared with other financial institutions. This leads to an improvement in financial market liquidity as well as an increase in the opportunities for external funding. In addition, the activities development of the banking sector leads to an increase in the banking activities in terms of the loans and services provided to customers. Thus, banking sector development can weaken the effect of the policy interest rate on bank loans due to more opportunity of banks to obtain more sources of funding and to issue bank loans. Financial competition can lead to higher efficiency in the financial market in terms of the lower cost of providing financial products and services, thus leading to development in the financial market. We find that financial competition (a lower concentration ratio) will leads to a more competitive environment in the banking sector and a lower cost for the banks in the market to access other sources of funds. This situation can therefore weaken the effect of the policy interest rate via the bank lending channel. Furthermore, capital market development, bond market development and financial innovation will result in a greater opportunity for banks to obtain other funding sources; such as securities and equity investment, and the development of new financial instruments and risk diversification techniques; thus weakening the effect of the policy interest rate on bank loans and the bank lending channel. In addition, financial liberalization in Thailand can cause a weakening effect on the bank lending channel due to the deregulation policies (capital account liberalization, the relaxation of financial institutions and market restrictions). This leads to a rise in financial institution business and more opportunities to obtain additional sources of funding, thus reducing the effect of the policy interest rate on bank loans.

Our empirical studies raise important issue for policy makers in Thailand. The results show the positive effect of financial development on bank loan supply. Thus, we found that financial development can be used in order to increase the loan supply and stimulate economic growth in the country. However, policy makers should be aware that if they do not carefully control financial development in the country, it will probably lead to a rise in the default risk of banks and a weaker balance sheet condition. This weak condition of banks may mean they experience increased non-performing loan problems in the future. For the effect of financial sector development on the bank lending channel, our findings indicate that financial development indicators show a weaker effect via the bank lending channel. Therefore, policy makers should consider the effect of financial development when controlling and regulating monetary policy and before issuing new financial development policy as these can cause a weakening effect via the bank lending channel and make it difficult for them to control the economy through this channel. However, the effects of financial development can also pass through to the economy via other channels of monetary policy transmission. Therefore, an adequate supervisory system and appropriate risk management techniques in the banking and financial sectors are also needed when carrying out financial development in the future (Sussangkarn and Vichyanond, 2007). Moreover, policy makers should examine financial and economic conditions before introducing financial development plans. In this case, reasonably stable macroeconomic condition is required, with stable conditions in the financial market, and the banking and capital market sectors should be well supervised and well versed in financial skills (Caprio et al., 1993).

This study uses data on the total loan supply of banks to study the bank lending channel in Thailand. Thus, further studies can be extended by examining the effect of monetary policy and financial development on the bank lending channel in terms of the effect on bank loans in specific sectors (for example, corporate and household sectors). However, data on these kinds of bank loans to specific sectors are not available in Thailand (bank balance sheet data in Thailand only report the data of total loans in each bank). Therefore, in the future, studies on this issue should be done in relevant case studies.

CHAPTER FIVE

FINANCIAL DEVELOPMENT AND

THE BALANCE SHEET CHANNEL OF MONETARY POLICY TRANSMISSION:

EVIDENCE FROM THAILAND USING FIRM LEVEL DATA

5.1 Introduction

The study of the bank lending channel in chapter 4 uses a micro-data based study (bank panel data study) to solve the identification problem caused by the macro-data based studies (the use of aggregate time series data). Therefore, it is important to explore another aspect of the micro-data based approach to the credit channel by focusing on the balance sheet channel of monetary policy transmission and using panel firm level data.

Wesche (2000), De Oliveira and Ramos (2008) and Ashcraft and Campello (2005) point out that a firm level data study can represent the effect of monetary policy shock on the demand side (borrower side), thus solving the identification problem caused by a macro based study. Chatelain et al. (2002,2003b), Butzen et al. (2001), Jiménez et al. (2009) and Gaiotti and Generale (2001) also state that the drawback of using aggregate time series data is that it cannot control for cross-sectional dimensions and firm specific effects. Therefore, a micro data based study of the credit channel by using firm panel data is considered as a more suitable approach for studying the balance sheet channel. This aspect will be focused on and considered in this chapter in the study of the firm balance sheet channel of monetary policy transmission.

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The financial market in reality is considered as a market with imperfect information. Therefore, there is a wedge between the external and internal funding costs of firms (external finance premium) caused by the asymmetric information in the financial market (Valverde and Del Paso, 2009; Fazzari et al., 1987; Kadapakkam et al., 1998; Valderrama, 2001). In this case, lenders will charge borrowers (firms) a risk premium to cover their monitoring and screening costs, as well as the risk possibly created by the borrowers (Kadapakkam et al., 1998; Wesche, 2000). As explained in chapter 2, the balance sheet channel describes that a rise in the policy interest rate will lead to a decrease in the firms' cash flow and net worth, thus weakening their balance sheet condition (Mishkin 1996; Wesche, 2000). A weaker balance sheet condition will pass through to a rise in the external finance premium and thus reduce their investment and output (Valderrama, 2001; Valverde and Del Paso, 2009; Wesche, 2000). From the balance sheet channel theory, it can be seen that firms' investment will depend on their balance sheet condition. Agung (1999) states that when there is a contractionary monetary policy (a rise in the policy interest rate), firms with more financial constraint (ones with a weaker balance sheet condition) will have a greater reduction in their investment due to the high external finance premium, compared with ones with low financial constraint (firms with a stronger balance sheet condition). Therefore, the study of the effect of the firms' balance sheet condition on their investment can also prove and support the theory of the firm balance sheet channel (Angelopoulou and Gibson, 2007; Agung, 1999; Butzen et al., 2001; Lunnemann and Matha, 2001; Bryson, 2009). In this aspect, the study can also shed light on the effect of firms' financial structure (internal finance/ external finance) on their investment decisions. As a result, the study of the firm balance sheet channel in this chapter will be investigated and refered by the study of the effect of firms' financial condition on their investment. Study of this issue can therefore support the theory of the firm balance sheet channel. The effect of the balance sheet condition/financial constraint of firms (cash flow, size, leverage and dividend payout ratio) on their investment has been widely investigated in many studies (Chatelain et al., 2002, 2003b; Bond et al., 1997, Chatelain and Tiomo, 2001; Hoshi et al, 1991; Oliner and Rudebush, 1996; Gertler and Gilchrist, 1994; Gaiotti and Generale, 2001; Kaplan and Zingales, 1997; Devereux and Schiantarelli, 1989; Gilchrist and Zakrajek, 1995; Kuwayama, 1997; Butzen et al., 2001).

Furthermore, it is not only the balance sheet condition of firms itself that has an effect on their investment, but also financial development. This is because development in the financial market will make firms less dependent on their internal finance as they can have alternative sources of funding (Galindo et al., 2007). This condition can lead to a weaker effect of the firm balance sheet condition on firms' investment, thus weakening the firm balance sheet channel. Therefore, the study of the effect of financial development on firms' financial condition and investment has become an interesting issue in recent studies (Leaven, 2003; Galindo et al., 2007; Koo and Shin, 2004; Love, 2003; Harrison et al., 2002; Islam and Mozumdar., 2002). Nevertheless, study of this aspect is quite limited and many papers only focus on the effect of financial liberalization (Gelos and Werner, 2002; Koo and Shin, 2004; Schiantarelli et al., 1992; Arbeláex and Echavarria, 2002; Bhaduri, 2005; Hermes and Lensink, 1996; Harris et al., 1994) and rarely consider other aspects of financial sector development, such as banking and capital market development, financial competition and financial innovation (Love, 2003; Laeven, 2003; Gallego and Loayza, 2000; Harrison et al., 2002). Therefore, this gap in the studies introduces the interesting issue of examination of the effect of different aspects of financial development on the study of the firm balance sheet channel.

The studies of this aspect of the firm balance sheet channel and those of the effect of financial development only investigate the effect of firms' cash flow and size on their investment (Chatelain et al., 2002, 2003b; Kalckreuth, 2001; Chatelain and Tiomo ,2001; Hsiao and Tahmiscioglu , 1997; Hall et al., 1998; Hoshi et al. ,1991; Lunnemann and Matha , 2001; Kuwayama , 1997; Bougheas et al., 2006; Butzen et al., 2001 ; Galindo et al., 2007; Love, 2003; Bond et al., 1997). However, few papers introduce the effect of other factors determining firms' financial constraint, such as their leverage and dividend payout ratios (Agung et al., 2002b; Angelopoulou and Gibson, 2007; Harris et al., 1994; Gilchrist and Himmelberg, 1995; Bhaduri, 2005; Kaplan and Zingles, 1997). Therefore, it is interesting to introduce the effect of other factors determining firms' financial constraint (leverage ratio and dividend payout ratio) on their investment to capture the whole effect of the balance sheet constraint on their investment.

In addition, most of the research only focuses on case studies of developed countries, especially the US and European countries (Chatelain and Tiomo, 2001; Guariglia, 1999; Kaplan and Zingales, 1997; Gilchrist and Himmelberg, 1995; Bond et al, 1997; Oliner and Rudebush, 1996; Agca and Mozumdar, 2008; Gilchrist and Zakrajsek, 1995). However, studies rarely focus on the case of developing countries (Rungsomboon, 2005; Agung, 1999;

Agung et al., 2002b; Gallego and Loayza, 2000; Bhaduri, 2005; Hermes and Lensink, 1996). In addition, concerning the study of Thailand, a past empirical paper by Rungsomboon (2005) did not focus on the effect of financial sector development on the firm balance sheet channel. Therefore, it is interesting to study the firm balance sheet channel as well as the effect of financial development on this channel by introducing Thailand as a case study of a developing country.

Consequently, due to the limits found in past papers, this chapter makes several main contributions. First, it will examine not only the firm balance sheet channel itself but also investigate the effect of different aspects of financial development (banking and capital market development, financial competition, financial innovation and financial liberalization) on this channel. This will fill the gap in past empirical studies, which only focus on the micro data based aspect of the firm balance sheet channel and only consider the effect of a few financial development aspects (for example, financial liberalization) on this channel. Second, this study will introduce the effect of other factors determining firms' financial constraint (their leverage and dividend payout ratios) on their investment in order to fill the gap in the past literature, which only focuses on the effect of firms' cash flow and size on their investment. Third, this study will fill a further gap in the past empirical literature, which mainly focuses on developed countries, by examining the firm balance sheet channel as well as the effect of financial development on this channel by using Thailand as a case study of a developing country. Finally, this is the first case study of Thailand which also investigates the effect of financial development on the firm balance sheet channel.

The main aims of this study are (1) to examine the firm balance sheet channel in Thailand by investigating the effect of firms' financial condition on their investment; (2) to investigate the effect of financial sector development on the firm balance sheet channel in the country; and (3) to study the effect of the different financial constraints (small/large firms and high/low dividend payout firms) on firms' investment. Our results support the theory of the firm balance sheet channel as we found an effect of the firm balance sheet condition (firms' cash flow and leverage) on their investment. In this case, a stronger firm balance sheet condition (higher cash flow and lower leverage ratio) will have a significant positive effect on firms' investment. When dividing firms according to their different financial constraints (size and dividend payout), the results show that the lower the financial constraint of firms, the less sensitive their cash flow and leverage will be to investment and thus the greater their opportunity to obtain external source of funds. This shows that the balance sheet condition (cash flow and leverage of firms) of the less financially constrained firms (large and high dividend ones) has less effect on their investment and thus means a weaker firm balance sheet channel, compared with the more financially constrained firms. Regarding the effect of financial sector development, our findings show that banking development, financial competition, capital market development, financial innovation and financial liberalization in Thailand lead to a lower effect of the firm balance sheet condition (cash flow and leverage) on firms' investment and hence weaken the firm balance sheet channel. This is because financial development can lead to a greater opportunity for firms to obtain bank loans and other sources of funds, reducing the dependence of their investment on internal finance and their balance sheet condition. We also found that this effect is more significant in the more constrained firms than the less constrained ones.

The remainder of the chapter is developed as follows. Section 5.2 will present the literature review of this study. Section 5.3 will discuss the data and methodology of this chapter, comprising the data description, model specification and the methodology employed. The empirical analysis will be presented in section 5.4, followed by the conclusion and suggestions for further research in section 5.5**.**

5.2 Literature review

5.2.1 Firms' financial constraint and investment and the firm balance sheet channel of monetary policy transmission

The financial market in reality is an imperfect information market and there is consequently a wedge between the external and internal funding costs of firms (external finance premium). This is caused by the asymmetric information problem as well as the transaction costs between lenders and borrowers (Koo and Shin, 2004; Fazzari et al., 1987; Leaven, 2003). The higher the financial constraint of firms, the higher the external finance premium, which therefore has an effect on investment decisions (Agca and Mozumdar, 2008; Hericourt and Poncet, 2007; Kaplan and Zingales, 1997; Kaplan and Zingales, 1995). As a result, firms' financial condition will have an effect on their investment (Butzen et al., 2001; Lunnemann and Matha, 2001; Bryson, 2009).

Therefore, if there is an effect of firms' balance sheet condition on their investment, it can prove and support the idea of the balance sheet channel of firms (Angelopoulou and Gibson, 2007; Agung, 1999; Agung et al., 2002b). This is due to the effect of the policy interest rate, which will pass through to firms' investment via the effect of the external finance premium explained previously (Agung, 1999). Hence, as the financial condition of firms has an influence on their external finance premium, it also has an effect on their investment and therefore shows the existence of the firm balance sheet channel.

There are many factors which affect the financial condition of firms (size, leverage, dividend payout, and cash flow). The cash flow of firms also presents their balance sheet condition as it shows their creditworthiness and thus has an effect on their investment spending. Angelopoulou and Gibson (2007), Agung (1999), Agung et al. (2002b), Bernanke et al. (1996), and Kaplan and Zingales (1997) state that a higher cash flow of firms represents larger firms' creditworthiness, hence increasing liquidity. A higher cash flow of firms also shows a higher level of internal funds, which will consequently increase the viability of investment projects (Butzen et al., 2001; Gelos and Werner, 2002). Therefore, this condition raises firms' investment as well as lowering the effect of monetary policy shock on their investment. To sum up, the higher the cash flow of firms, the lower the external finance premium and thus the weaker the effect of monetary policy via the firm balance sheet channel.

Another factor which determines the balance sheet condition of firms is their leverage (debt to capital ratio). In contrast to firms' cash flow, an increase in their leverage shows that firms will be more dependent on external funds and this causes the higher possibility of a rise in agency cost and default risk (Agung, 1999; Agung et al., 2002; Angelopoulou and Gibson, 2007). This leads to a rise in the risky behaviour of firms and the moral hazard problem caused by a higher value of their risky debt (Agung, 1999; Agung et al., 2002; Peek and Rosengren, 1995; Angelopoulou and Gibson, 2007; Harris et al, 1994). This situation results in a higher level of external finance premium charged by lenders and increases the external funding cost of firms. This therefore leads to a lower level of investment as well as the strength of the effect of monetary policy shock on firms' investment behaviour (Gomez-Gonzalez and Grosz, 2007; Agung et al., 2002). Therefore, the higher the firms' leverage, the stronger the effect of the policy interest rate via the firm balance sheet channel.

The size of firms can determine their financial condition (Angelopoulou and Gibson, 2007; Oliner and Rudebusch, 1996a; Gertler and Gilchrist, 1994; Leaven, 2003). Agung (1999), Hubbard (1995), Gelos and Werner (2002), Kadapakkam et al. (1998), and Oliner and Rudebusch (1996a) state that monetary policy shock will have less effect on large firms than small ones. This is due to the higher net worth, capital strength and liquidity condition of large firms (Kim, 1999; Valverde and Del Paso, 2009; Black and Rosen, 2007; Rungsomboon, 2005; Gaiotti and Generale, 2001). Large firms also have a better reputation than small ones due to their relatively stronger balance sheet condition (Hall, 2001; Rungsomboon, 2005; Kuwayama, 1997). This leads to the lowering of information and transaction costs as well as the lowering of the default risk of large firms (Hall, 2001; Gertler and Gilchrist, 1993, 1994; Kadapakkam et al, 1998; Arellano et al., 2009). These conditions also lead to the higher possibility for large firms to access external funding sources (commercial papers, bonds, public debt and equity funding) instead of mostly depending on internal funding sources, as in the case in small firms (Valverde and Del Paso, 2009; Wesche, 2000; Gupta, 2003; Gertler and Gilchrist, 1993; Agung, 1999; Yalcin et al., 2003). Therefore, large firms will face a lower external finance premium compared with small firms, reducing the dependence of their investment on internal finance, as well as reducing the effect of monetary policy shock on their loans and investments (Georgopoulos and Hejazi, 2009; Rungsomboon, 2005; De Oliveira, 2006; Kadapakkam et al., 1998; Gelos and Werner, 2002; Cooley and Quadrini, 2006). Thus, this leads to a weaker effect of monetary policy through the firm balance sheet channel.

Another factor determining the financial constraint of firms is their dividend payout ratio . Lünnemann and Mathä (2001), Angelopoulou and Gibson (2007) and Agung (2000) indicate that a higher dividend payout ratio presents less financial constraint for firms. This implies that firms with a higher dividend payout ratio will have a relatively lower external finance premium than those with a lower dividend payout ratio. Therefore, firms with a high dividend payout ratio will have a less dependence on their internal finance and thus be less affected by monetary policy. To sum up, the higher the dividend payout ratio of firms, the lower their financial constraint and thus the weaker the effect of monetary policy via the firm balance sheet channel.

In conclusion, the lower the financial constraint of firms, the lower the dependence of firms' investments on internal finance and the lower their external finance premium. Consequently, this condition weakens the effect of the policy interest rate on the firm balance sheet channel.

5.2.2 Empirical studies of the firm balance sheet channel and the effect of financial sector development on the channel

Several papers examine the effect of firms' financial condition on their investment. Studies of developed countries include Chatelain et al. (2002, 2003b), who apply the GMM technique and whose results show the significant positive effect of firms' cash flow on investment in Germany, France, Italy and Spain. This result supports the balance sheet channel theory as the balance sheet condition of firms has an effect on their investment. It also confirms the theoretical explanation, as the higher the firms' cash flow, the higher their investment. Shin and Park (1999) used the GMM technique and found a positive effect of firms' cash flow on investment in Korea. Hoshi et al. (1991) also found that the higher the cash flow of firms in Japan, the higher the investment spending. These results therefore support the firm balance sheet channel theory and confirm the theoretical expectation that the higher the internal finance of firms, the higher their investment. Similar results are also reported by studies in other developed countries, such as Bond et al. (1997) in Belgium, France, Germany, and the UK; Kalckreuth (2001) in Germany; Chatelain and Tiomo (2001) in France; Blundell et al. (1992) and Bond and Meghir (1994a, 1994b) in the UK; Hsiao and Tahmiscioglu (1997), Chirinko (1997), Chirinko and Schaller (1995), and Agca and Mozumbar (2008) in the US, and Harrison et al. (2002) and Kadapakkam et al. (1998) in groups of developed countries.

Oliner and Rudebusch (1996a) divide US firms according to their size and show from their pool OLS results that firms' cash flow has a positive effect on their investment and that this effect is shown only in small firms, with an insignificant effect on large ones. They conclude that the higher the financial constraint of firms (smaller firm size), the higher their dependence on internal finance (cash flow) and thus, small firms will show a higher sensitivity of investment to cash flow than large ones. Similarly, Gaiotti and Generale (2002) use GMM estimation and found that there is a positive effect of cash flow on the investment spending of firms in Italy and that this effect is larger in small firms than large ones. They explain that the investment of firms with higher financial constraint (small firms) will show greater sensitivity to cash flow than the less financially constrained ones (large firms) due to the greater dependence of the financially constrained firms on internal funding sources. This therefore confirms our theoretical expectation that the lower the financial constraint of firms (large firms), the weaker the firm balance sheet channel. The same results are also found in firm level studies by Lünnemann and Mathä (2001) in Luxemburg; Kuwayama (1997) in Japan; Bougheas et al. (2006) in the UK; Bryson (2009) in Jamaica; Wesche (2000) in Austria; and Butzen et al. (2001) in Belgium. Amongst studies of developing countries, Rungsomboon (2005) shows that small firms in Thailand have higher investment to cash flow sensitivity than large ones. This therefore shows that the lower the financial constraint of firms (higher firm size), the lower their dependence on internal funding sources, which consequently causes low investment to cash flow sensitivity. The results from these studies also support the balance sheet channel theory, as the lower the constraint of firms (large firms), the less they will depend on their internal fianance and thus they will face lower external finance premiums, which will reduce the effect of monetary policy shock via their balance sheet channel.

However, some studies obtain an unexpected result with regard to the theoretical view. Valderrama (2001) used the GMM technique in Austria and found that investment to cash flow sensitivity is greater in large firms than small ones. Devereux and Schiantarelli (1989) also found an unexpected result in their financial constraint study of firms in the UK, as the cash flow effect on investment is greater in the group of large companies than small ones. They explain that this unexpected case is probably due to the lower proportion of cash flow in large firms (the higher net worth of small firms compared to large ones), thus causing the higher dependence of the large firms' investment on their balance sheet condition.

Guariglia (1999) introduces the leverage ratio of firms as another factor determining their balance sheet condition. She found from her GMM study that a higher effect of the liquidity condition (firms' cash flow) on the investment of high leverage ratio firms in the UK compared to low leverage ratio ones. This result supports the theoretical expectation, as the higher leverage ratio will show the greater financial constraint of firms, causing the greater dependence of these firms on internal funds. This causes a higher sensitivity of investment to cash flow in the more highly leveraged firms. This result supports the firm balance sheet channel theory, as the higher the financial constraint of firms (high leverage ratio), the more they will depend on their internal funds, thus strengthening the effect of monetary policy shock via the firm balance sheet channel. The same result is also found by Gilchrist and Zakrajsek (1995) in their study of the firm balance sheet channel in the US. Amongst case studies of developing countries, Agung et al. (2002b) apply OLS and GMM methods and found a positive effect of cash flow and a negative effect of the leverage ratio on the investment level of firms in Indonesia and that this effect is higher in small firms. Their findings also support the theoretical expectation that the lower the financial constraint of firms (greater firm size), the lower the sensitivity of investment to cash flow and to leverage. This result also supports the firm balance sheet channel theory, that the lower the financial constraint of firms, the lower their dependence on internal source of funds and hence the weakening the firm balance sheet channel. A similar result is also found by Gallego and Loayza (2000) in a case study of Chile and Héricourt and Poncet (2007) in China.

Fazzari et al. (1988) and Van Ees and Garretsen (1994) introduce the dividend payout ratio of firms to represent their balance sheet constraint. They found a positive effect of firms' cash flow on their investment in the US and Netherlands respectively, with this effect greater in low dividend payout firms. This confirms that the greater the financial constraint of firms (low dividend payout firms), the greater the dependence of their investment on their internal finance and thus the stronger the effect of monetary policy on the firm balance sheet channel. Gilchrist and Himmelberg (1995) use GMM analysis and found a higher positive effect of cash flow on investment in small and low dividend payout firms than large and high dividend ones. This result confirms that the higher the financial constraint of firms (small firms and low dividend payout firms), the higher the sensitivity of their investment to cash flow, and thus the stronger the effect of monetary policy via the firm balance sheet channel. A similar result is also reported by Agca and Mozumdar (2008) in their study of the US. Angelopoulou and Gibson (2007) apply the GMM technique and found a positive effect of cash flow on firm investment and that this effect is stronger in small, high leverage and low dividend payout firms. However, a result contradictory to the theoretical prediction is found by Kaplan and Zingales (1997), who report that US firms' investment to cash flow sensitivity is greater in less financially constrained firms (high dividend firms) than in more financially constrained ones. In studies of developing countries, Agung (1999) uses the GMM technique and shows that the cash flow of small, high leverage and low dividend payout firms has a greater effect on their investment. This result shows that the higher the financial constraint of firms, the higher the investment to cash flow sensitivity. Hence, this result supports the firm balance sheet channel theory, that the higher the financial constraint of firms, the stronger the effect of monetary policy shock on the firm balance sheet channel. The same result is also found in Ber et al. (2002) in their firm balance sheet channel study of Israel.

To sum up, the numerous empirical studies of the firm balance sheet channel presented previously support the theory of the firm balance sheet channel as they found a significant effect of firms' balance sheet condition (firms' cash flow and leverage) on their investment. In addition, they found that the lower the financial constraint of firms (large size and dividend payout ratio), the lower the dependence of their investment on internal finance. Consequently, this condition will weaken the effect of the policy interest rate via the firm balance sheet channel. Also, most studies mainly focus on developed countries, leaving a gap in relation to the study of developing countries, especially on the effect of firms' dividend payout ratio and leverage on their investment. This gap is also found in past studies of Thailand (see Rungsomboon, 2005).

Some micro based studies of firms not only discuss the firm balance sheet channel in general, but also examine the effect of financial development on this channel. Gelos and Werner (2002) divide firms according to their size and show from both OLS and GMM results that investment to cash flow sensitivity decreased during the post-financial liberalization period in Mexico and that this sensitivity is relatively larger in small firms than large ones. Laeven (2003) conducted a case study of 13 developing countries (including Thailand) and indicates from the GMM results that the effect of cash flow or the liquidity condition of small firms on investment is weaker during the post-financial liberalization period. The same result is also reported by Koo and Shin (2004) in their panel data studies of the impact of financial reform and liberalization on Korean firm level data. Therefore, these findings support the theoretical aspect described in chapter 2, section 2.5.1, that financial liberalization in a country, which involves the relaxation of financial institution and market restrictions, will increase the opportunities of firms to obtain additional external funding sources. This leads to less dependence on their internal finance (cash flow) and hence this will weaken the firm balance sheet channel. Love (2003) and Islam and Mozumdar (2007) use the GMM technique and found that bank and capital market development will lead to a weaker effect of cash flow on firms' investment and that this effect is greater in small firms than large ones. This result confirms the theoretical expectation explained in chapter 2, section 2.5.1, that financial development will lead to lower financial constraint of firms, leading to a greater opportunity for them to obtain external finance, thus weakening the firm balance sheet channel.

Arbeláez and Echavarria (2002) introduce the leverage of firms as another firm balance sheet condition and employ OLS and GMM estimation in a study of Colombia. They conclude that financial sector development (financial liberalization dummy and the development of financial sector size and activity) will lead to a lower positive effect of firms' cash flow and a lower negative effect of leverage on investment spending, hence confirming that financial development will weaken the firm balance sheet channel due to the greater dependence of firms' investment on their external sources of funds. Harris et al. (1994) employ OLS and GMM estimation and their results from Indonesia confirm that the cash flow and leverage of firms will lead to positive and negative effects respectively on their investment spending, and that these effects are relatively large for small firms compared to large ones. Moreover, these effects during the financial liberalization period are weaker than in the pre-liberalization period. This result supports the idea that financial liberalization will lead to less dependence of firms on their internal finance and hence can weaken the effect of monetary policy shock on the firm balance sheet channel.

However, some papers do not find significant evidence to support the fact that financial development can reduce firms' financial constraint and weaken the firm balance sheet channel. Hermes and Lensink (1996) apply the GMM technique in Chile and show that the effect of cash flow on firm investment does not represent a significant change between pre- and post- reform periods in both small and large firm groups. Jaramillo et al. (1993) argue that there is no difference in the effect of the financial condition on investment in the pre- and post- liberalization period in Ecuadorian firms. They explain that this unexpected outcome is possibly due to the short period of observation. Bhaduri (2005) also found that the investment to cash flow and investment to leverage sensitivity is higher after the financial liberalization period. He explains that this conflicting result is possibly due to the unsuccessful government financial reform plan related to resource allocation in the country.

Most empirical studies of the effect of financial development on the firm balance sheet channel have found that financial development will lead to less dependence of firms' investment on their balance sheet condition (a lower sensitivity of investment to cash flow and to leverage). This effect is mainly evident in the more constrained firms (small and low dividend payout ones). Therefore, financial development can help the financially constrained firms to have more opportunities to obtain additional external funding and thus lead to less dependence of these firms on their internal funds.

Moreover, we can see that past empirical studies have focused on the firm balance sheet channel; however, few have examined the effect of financial development on the firm balance sheet channel. Most studies also only focus on the effect of financial liberalization on the firm balance sheet channel, ignoring the other effects of financial development (banking and capital market development, financial innovation and financial competition). Therefore, our study will fill this gap by not only examining the firm balance sheet channel but also the effect of different aspects of financial development on it.

5.3 Data and methodology

This section is divided into three parts: (1) model specification, (2) data and (3) methodology.

5.3.1 Data description

The sample data in this study include a total of 361 non-financial firms excluding financial companies (banks, finance and securities companies, and insurance companies) as well as companies which are under rehabilitation. The sample comprises unbalanced panel data in order to prevent the survival bias problem (Rungsomboon, 2005; Butzen et al., 2001; Prasad and Ghosh, 2005). Consolidated data[26] are used as the firms' balance sheet data in order to capture their branch and subsidiary information (Bond et al., 1997). Firm data are obtained from the PACAP database for Thailand from the period 1978 to 1996, and from the financial statements of non-financial companies listed on the SET (Stock Exchange of Thailand) for the period 1997 to 2008.

[26] If there are no consolidated data available, the unconsolidated data are applied instead.

We apply the same financial development indicators previously used in chapter 4. These comprise:

(1) Banking sector development indicators. These include the size measure (the ratio of depository bank assets to total financial assets, FD1) and the activity measure (the private credit by depository banks to GDP ratio, FD2).

(2) The financial concentration indicator (the three largest banks' assets to total bank assets, FD3).

(3) Capital market development indicators. These include the size measure (stock market capitalization to GDP ratio, FD4) and the activity measure (stock market total value traded to GDP ratio, FD5).

(4) The bond market development indicator (the ratio of private domestic debt securities issued by financial institutions and corporations to GDP). This measurement also represents financial innovation.

(5) The financial liberalization indicator (dummy covering the period from 1990 to 1995).

The listed of all variables used in this study is listed in table 5.1. The summary statistics of the variables applied in the model are also presented in tables 5.2 and 5.3. These statistics are shown in both the full sample presented in table 5.2 and the sample divided according to the firms' financial constraint presented in table 5.3 (small/large firms and low dividend payout/ high dividend payout firms).

Table5.1: List of all variables used in this study illustrated by type of variable, name of variable, symbol of variable, definition of variable and source

Type of variable	Variable	Symbol	Definition	Source
Balance sheet	Loan to capital ratio	I/K	The ratio of firms' investment (I) to the cost of capital (K)	PACAP database and SET bank balance sheet
	Sale to capital ratio	Δ S/K	The first difference of the ratio of firms' total net sale (S) to the cost of capital (K)	PACAP database and SET bank balance sheet
	Cash flow to capital ratio	C/K	The ratio of firms' cash flow (C) to the cost of capital (K)	PACAP database and SET bank balance sheet
	Total borrowing to capital ratio	D/K	The ratio of firms' debt (D) to capital ratio (K)	PACAP database and SET bank balance sheet
	Dummy variables	D1988	Dummy which captures the substantial economic expansion in 1988 which equals 1 in 1988 and 0 otherwise	Author's own calculation
		D1997	Dummy which captures the financial crisis in Thailand in 1997 which equals 1 in 1997 and 0 otherwise	Author's own calculation
		D2003	Dummy which captures the economic recovery period. This takes the value 1 in 2003 and 0 otherwise.	Author's own calculation
Financial development indicators	Banking size development	FD1	Deposit money banks' assets to total financial assets	Beck et al. (1999)
	Banking activity development	FD2	The ratio of private credit by deposit money banks to GDP	Beck et al. (1999)
	Banking concentration	FD3	The ratio of three largest bank assets to total assets	Beck et al. (1999) and SETdatabase
	Capital market size development	FD4	The ratio of stock market capitalisation to GDP	Beck et al. (1999)
	Capital market activity development	FD5	The ratio of stock market value traded to GDP	Beck et al. (1999)
Bond market development	Bond market size development/ financial innovation	FD6	The ratio of private domestic debt securities issued by financial institutions and corporations to GDP	Beck et al. (1999) and Bank of Thailand website
Financial liberalization	Financial liberalization	FD7	Liberalization dummy which equals 1 from year 1990 to 2005 and 0 otherwise	Author's own calculation

Table 5.2: Summary statistics of all variables from 1978 to 2008 (total sample, N=361)

Time period/ Variable	I/K	Δ S/K	C/K	D/K	FD1	FD2	FD3	FD4	FD5	FD6	FD7
1978-2008	0.24901	0.11258	0.26117	1.37310	0.94698	0.84004	0.57419	0.35849	0.27109	0.18751	0.19354
1978-1983	0.24355	0.05182	0.15746	1.47411	0.86187	0.40731	0.66084	0.04044	0.02953	0.04761	0
1984-1989	0.42229	0.11470	0.17795	1.26052	0.92203	0.56527	0.60265	0.09577	0.06998	0.05671	0
1990-1995	0.47219	0.17590	0.29303	0.69365	0.98709	0.97000	0.57108	0.58324	0.46847	0.88740	1
1996-2001	0.23501	0.03383	0.19101	1.86289	0.97847	1.36449	0.54925	0.39571	0.23941	0.22225	0
2002-2008	0.26699	0.17561	0.32942	1.67850	0.98014	1.03817	0.49959	0.63174	0.50850	0.38196	0

Note: all of the value presented in table 5.2 is the average value of the variables

Table5.3: Summary statistics of all variables from 1978 to 2008 (sub-sample)

Variable	Obs	Large firms	Obs	Small firms	Obs	High dividend payout firms	Obs	low dividend payout firms
I/K	74	0.2513	287	0.2499	118	0.2564	243	0.2497
ΔS/K	74	0.1080	287	0.0929	118	0.1379	243	0.0966
C/K	74	0.2715	287	0.2282	118	0.2929	243	0.2435
D/K	74	1.1525	287	1.5347	118	1.0071	243	1.6767

The summary statistics in table 5.2 show that the average of the data used in the model presents some important changes during the period from 1978 to 2008. From 1984 to 1995, there was an increase in the investment ratio, sale to capital ratio, and cash flow to capital ratio of firms, and other financial development indicators from 1978. This was mainly caused by a rapid expansion in production and investment in the country in 1988, which saw the highest increase in the Thai economic growth rate, as previously explained in chapter 3 (the GDP growth rate reached its peak in 1988 at 13.28 %) (BOT, 1988). During this year, there was also the introduction of a new type of securities and a significant expansion of new bank branches in regional areas, which led to a rise in the financial development indicators. The firms' balance sheet variables (investment, sales and cash flow to capital ratio) and financial development indicators show a reduction again from 1996 to 2001, mainly due to the effect of the financial crisis during 1997 and 1998, which caused sluggish conditions in both the financial and investment markets. There was an increase in the financial constraint of firms, shown by a steady increase in their leverage ratio in this period compared with the previous one. After this period, investment, cash flow, the sales to capital ratio, as well as the financial development indicators, show a gradual increase. This was a result of the economic recovery from 2003, especially in the manufacturing and construction sectors, which was due to the financial and industrial restructuring plan and many policies for the recovery of the economy, as explained in chapter 3 (BOT, 2003).

The sample, which is divided according to firms' balance sheet constraint, is shown in table 5.3. We can see that small firms and low dividend payout ones have a relatively low value of investment ratio, sales ratio, and cash flow ratio, as well as a relatively large value of leverage, compared with large and low dividend payout firms. This condition also supports our theoretical view that firms with high financial constraint (small firms and low dividend payout firms) will present a weak balance sheet condition and a higher agency cost and default risk possibility than those with low constraint.

5.3.2 Model specification

The model specification considered in this study can be grouped into two parts: (1) the baseline model and (2) the model of the effect of financial sector development on the firm balance sheet channel.

(1) Baseline Model

We described previously in the literature review section that we can study the broad credit channel of firms by examining the effect of their balance sheet condition on their investment spending. Many previous empirical papers use the Tobin q model of investment to study the effect of firm balance sheet condition on investment (Rungsomboon, 2005; Agung, 1999; Hoshi et al., 1991; Fazzari et al., 1987, Chirinko and Schaller, 1995; Blundell et al., 1992; Agca and Mozumdar, 2008; Koo and Shin, 2004). However, there are some problems in using the Tobin q model for investment. This is because the marginal q, which is the correct value used in the Tobin q model, is very difficult to measure in practice and thus the average q (the ratio of firms' market value to replacement of capital) is used instead. Using average q creates a measurement problem, as it is only the correct measurement for marginal q when there is perfect competition in the product market of firms, fixed capital homogeneity, and a non-relationship between firms' financial structure and investment decisions (Hayashi, 1982; Chirinko, 1997; Rungsomboon, 2005; Agung, 1999; Agca and Mozumdar, 2008; Hubbard, 1998). These assumptions are quite strong and thus average q will not be a suitable proxy for marginal q. Moreover, when the capital market is inefficient (volatility in stock prices), firms' fundamental value is not represented by the stock prices and this therefore causes a wrong measurement of Tobin q (Rungsomboon, 2005; Agung, 1999; Bhaduri, 2005). Due to the inaccuracy of measuring the q value in the Tobin q model, the Euler equation for investment has been used in past papers (Agung, 1999; Love, 2003; Leaven, 2003; Harrison et al., 2002; Bond and Meghir, 1994; Héricourt and Poncet, 2007). Nevertheless, some arguments have been raised over a misspecification problem of this equation. Oliner et al. (1995) study the performance of the Euler equation by estimating the Euler equation model compared with other traditional models (q model and accelerator model). They conclude that the Euler equation is missspecified as a result of an inability to forecast investment spending, as well as a poor forecast performance compared with other models. This misspecification problem of the Euler model is also stated in other literature (Rungsomboon, 2005; Agung et al., 2002). Therefore, the sale accelerator model is suggested by other papers for the study of the investment model and balance sheet channel of firms to circumvent the problems found in both the Tobin q model and Euler equation (Agung et al., 2002; Rungsomboon, 2005; Harris et al., 1994; Bhaduri, 2005; Arbela´ez and Echavarria, 2002). In addition, the empirical forecast performance study by Oliner et al. (1995) supports the notion that this model has a better performance than the previous two models[27]. For the above reasons, the sales accelerator model will be used in this study. Our model specification is based on the model specification in Agung et al. (2002b), Bhaduri (2005) and Arbeláez and Echavarria (2002). The model is presented as follows[28]:

[27] The mean square error of the sales accelerator model is lower compared with the q model and Euler equation (Oliner et al. 1995).
[28] As suggested by Agung (1999) and Agung et al. (2002b), we apply the second to third lags of the exogenous variable ($\Delta S/K$, C/K, and B/K) as well as the lag dependence variable as the instrumental variable.

$$\left(\frac{I}{K}\right)_{i,t} = \alpha_i + \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2\left(\frac{\Delta S}{K}\right)_{i,t-1} + \beta_3\left(\frac{C}{K}\right)_{i,t-1} + \beta_4\left(\frac{D}{K}\right)_{i,t-1} + \beta_5 d_t + \varepsilon_{i,t} \qquad (5.1)$$

where i is the number of individual firms (1,2,3,…N)

t is the time period (1,2,3,…T)

α_i is the individual firms' specific effect

$\frac{I}{K}$ is the firms' investment to capital ratio, which is the ratio of firms' investment (I) and the capital stock (K). According to Rungsomboon (2005), Agung (1999), Agung et al. (2002b), Bhaduri (2005) and Van Ees and Garretsen (1994), investment (I) is calculated by the formula below:

$$I_t = K_t - K_{t-1} + DEP_t$$

where K is the capital stock (fixed assets: property, plant and equipment) and DEP is the depreciation.

$\frac{\Delta S}{K}$ is the change in firms' total net sales to capital ratio.

$\frac{C}{K}$ is the firms' cash flow to capital ratio. The firm cash flow is the combination of the firms' after tax profit and depreciation (Agung et al., 2002b; Gallego and Loayza, 2000; Angelopoulou and Gibson, 2007; Butzen et al., 2001; Kalckreuth, 2001; Chatelain and Tiomo, 2001).

$\frac{D}{K}$ is the firms' debt to capital ratio.

d_t is the dummy variable which presents the particular events that effect the firms' investment (already described in section 5.4.1):

d1988 is the dummy variable which has a value equal to 1 in year 1988 and 0 otherwise. This dummy is used to control for the rapid expansion in the economy which has an effect on the firms' investment.

d1997 is the dummy variable which has a value equal to 1 in year 1997 and 0 otherwise. This dummy is applied to control for the financial crisis in Thailand, which caused sluggish conditions in both the financial and investment markets and impacted on the investment of firms.

d2003 is the dummy variable which has a value equal to 1 in year 2003 and 0 otherwise. This dummy reflects the economic recovery period, especially in the manufacturing sector and construction, which led to an improvement in firm performance and investment.

$\varepsilon_{i,t}$ is the error term.

In equation 5.5, the coefficient of the lag variable of $(\frac{I}{K})$ is expected to be positive ($\beta_1 > 0$). This is because the lag level of the endogenous variable should move in a similar way to the endogenous variable (Agung et al., 2002b; Butzen et al., 2001; Kalckreuth, 2001; Oliner and Rudebusch, 1996a). The coefficient of the change in the net sales to capital ratio $(\frac{\Delta S}{K})$ is added to the model to represent the accelerator effect in the sales accelerator-type model of investment function (Bhaduri, 2005; Agung et al., 2002b; Ber et al., 2002). This variable is also expected to have a positive sign ($\beta_2 > 0$); this is because higher output or sales by firms will directly lead to an increase in their investment spending (Agung, 1999; Ber et al., 2002; Arbeláez and Echavarria, 2002; Bond et al., 1997). The ratio of cash flow to capital stock ($\frac{C}{K}$) is used to represent the firm balance sheet condition as it presents the liquidity of firms (Rungsomboon, 2005). We stated previously in sections 5.2.2 and 5.2.3 that a higher cash flow of firms will lead to more internal funding and thus increase investment spending. Therefore, the coefficient of this variable is expected to have a positive sign ($\beta_3 > 0$). For the ratio of firms' debt and capital stock ($\frac{D}{K}$), this is applied to represent the firm balance sheet condition and it also presents the leverage of firms (Agung et al., 2002b; Harris et al., 1994; Arellano et al., 2009; Guariglia, 1999; Agung, 1999; Chatelain and Tiomo, 2001). We already discussed in the literature review in sections 5.2.2 and 5.2.3 that a higher leverage ratio of firms will show a higher financial constraint and thus lower the level of investment. This is because a rise in firms' leverage will increase the agency cost and the moral hazard problem and thus lead to a higher external finance premium for firms. Therefore, this situation causes a decrease in firm investment and as a result the coefficient of this variable is expected to have a negative sign ($\beta_4 < 0$).

For the dummy variables, it is expected that the coefficient of d1988 and d2003 will have a positive effect on the investment ratio ($\beta_5 > 0$). This is because these dummy variables represent the rapid expansion in the economy and the economic recovery in the manufacturing sector, which are the factors that support the increase in firms' investment ratio. However, the d1997 dummy, which captures the effect of the financial crisis, is expected to have a negative effect on firms' investment and thus the coefficient of this dummy should have a negative sign ($\beta_5 < 0$).

In addition, the theoretical and empirical literatures described in sections 5.2.2 and 5.2.3 show that there are other factors which determine firms' financial constraint and have an effect on the firm balance sheet channel (firm size and dividend payout ratio). Therefore, this paper will also study the effect of these firms' financial constraint on the firm balance sheet channel. This is achieved by dividing the firms into different sub-samples according to their size (small and large firms) and dividend payout ratio (low and high dividend payout firms). Following the studies by Gertler and Gilchrist (1994), Agung (1999), Agung et al. (2002b) and Rungsomboon (2005), we use the total assets of firms as the criterion to divide them into small firms which have total assets below the mean and large firms which have total assets above the mean value. This technique also applies when the firms are divided by low and high dividend payout ratio. We already described in the theoretical and empirical discussion in sections 5.2.2 and 5.2.3 that the higher the financial constraint of firms (small firms and low dividend payout firms), the higher the dependence of their investment on their financial condition (firms' cash flow and leverage) and hence the firm balance sheet channel will become weaker. Therefore, we expect the coefficient of $\frac{C}{K}$ and $\frac{D}{K}$ in equation 5.5 to be larger in the case of the more constrained firms (small and low dividend ones) than the less constrained ones (large and high dividend firms).

(2) Model of the effect of financial sector development on the firm balance sheet channel

Financial development is an important factor which also has an effect on the firm balance sheet channel and therefore it is important to study its effect on this channel. To study the effect of financial development, we add the interaction term between the firms' balance sheet condition ($\frac{C}{K}$ and $\frac{D}{K}$) and the financial development indicators, as presented by Leaven (2003), Gelos and Werner (2002), Koo and Shin (2004), Arbeláex and Echavarria (2002), Harrison et al. (2002) and Bhaduri (2005). The estimation model for the effect of financial development on the firm balance sheet channel is shown below:

$$\left(\frac{I}{K}\right)_{i,t} = \alpha + \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2\left(\frac{\Delta S}{K}\right)_{i,t-1} + \beta_3\left(\frac{C}{K}\right)_{i,t-1} + \beta_4\left(\frac{D}{K}\right)_{i,t-1} + \beta_5\left[\left(\frac{C}{K}\right)\times FD\right]_{i,t-1}$$

$$+ \beta_6\left[\left(\frac{D}{K}\right)\times FD\right]_{i,t-1} + \beta_7 d_t + \varepsilon_{i,t} \qquad (5.2)$$

where $\left(\frac{C}{K}\right)\times FD$ is the interaction term between firms' cash flow to capital ratio and financial development indicators.

$\left(\frac{D}{K}\right)\times FD$ is the interaction term between firms' total debt to capital ratio and financial development indicators.

For the interaction term variables, different financial sector development indicators are applied to each interaction term and the model in equation 5.2 has to be estimated separately regarding each different financial development indicator. The details of the indicators used in this study are presented below.

FD1 is the depository banks' assets to total financial assets (depository banks' assets/total financial assets). We already discussed in chapter 2, section 2.5.1 and chapter 4, section 4.3.2, that an increase in this indicator will show an increase in bank size, a significant role of banks among borrowers and firms and a higher degree of financial intermediation. A rise in financial intermediation will lead to an improvement in financial market liquidity, an increase in the opportunities for external funding, and a decrease in financial costs. Therefore, more development in the banking sector will lead to a greater opportunity for firms to obtain bank loans as well as a lowering of their external funding cost. Thus, this condition will reduce the external finance premium of firms as well as decrease their dependence on internal funds. Consequently, this condition will weaken the firm balance sheet channel. For this reason, the coefficients of $\left(\frac{C}{K}\right)\times FD1$ and $\left(\frac{D}{K}\right)\times FD1$ are expected to be negative and positive respectively ($\beta_5 < 0$ and $\beta_6 > 0$). This is because the higher the level of FD1, the lower the dependence of firms' investment on their internal finance (cash flow) and also the lower their external funding cost and agency cost, thus raising the debt finance of firms for investment (leverage) and weakening the firm balance sheet channel.

FD2 is the ratio of private credit by deposit money banks to GDP, which represents the activity of banking sector development. We already presented in chapter 4 that this indicator shows the activities provided to customers by financial intermediaries (banking services provided to customers). Consequently, an increase in this indicator will show the development of the banking sector in terms of a rise in banking activities as well as the loans and services provided to customers. This development results in a greater opportunity for firms to obtain bank loans as well as a lowering of their external funding cost. Thus, this condition will decrease the dependence of firms on internal funds (cash flow). Therefore, the coefficients of $\left(\frac{C}{K}\right) \times FD2$ and $\left(\frac{D}{K}\right) \times FD2$ are expected to be negative and positive respectively ($\beta_5 < 0$ and $\beta_6 > 0$). This is because the higher the level of FD2, the lower the dependence of firms' investment on their internal finance and the lower their financial cost, thus the weaker the firm balance sheet channel.

FD3 is the ratio of the three largest banks' assets to total bank assets. This indicator shows the financial concentration in the banking sector and is widely applied in several papers to represent financial competition (Claessens and Laeven, 2005; Beck and Demirguc-Kunt, 2009; Beck et al., 1999; Li, 2009). A more concentrated market can be presented as a higher proportion of large banks in the market, thus resulting in more monopoly power in the market. This leads to a difficulty for other banks to access borrowers' information and other sources of funding. For other smaller banks, this condition will possibly mean they need to charge a higher risk premium, thus increasing the external finance premium faced by firms and strengthening the firm balance sheet channel. As a result, firms will have difficulties in obtaining external sources of funds and will depend more on their internal sources. Therefore, the coefficients of $\left(\frac{C}{K}\right) \times FD3$ and $\left(\frac{D}{K}\right) \times FD3$ are expected to be positive and negative respectively ($\beta_5 > 0$ and $\beta_6 < 0$). This is because an increase in this indicator can cause a higher dependence of firms' investment on their internal funding source (cash flow) and also higher external financing costs, which increases the effect of firms' leverage on investment. This effect can therefore strengthen the firm balance sheet channel.

FD4 is the stock market capitalization to GDP ratio (listed share value to GDP ratio). This indicator is used by several papers to show capital market development, especially size development and financial depth (Love, 2003; Harrison et al., 2002; Beck et al., 2008; Gallego and Loayza, 2000; Islam and Mozumdar, 2002). We discussed previously in chapters 2 (section 2.5.1) and 4 (section 4.3.2) that development in the capital market will lead to the higher possibility of firms to obtain external funding sources and less dependence on internal funding (cash flow). This also results in lower external funding cost and agency cost of firms, thus increasing their opportunity to increase the debt for their investments. Therefore, this indicator will weaken the effect of the policy interest rate through the firm balance sheet channel and thus the coefficients of $\left(\frac{C}{K}\right) \times FD4$ and $\left(\frac{D}{K}\right) \times FD4$ are expected to be negative and positive respectively ($\beta_5 < 0$ and $\beta_6 > 0$).

FD5 is the ratio of stock market total value traded to GDP and is used to represent the activity measure of capital market development. We discussed previously in chapter 4 that a rise in this indicator represents an increase in activities and liquidity in the capital market. An increase in this indicator leads to a rise in financial market liquidity and activities, hence resulting in greater opportunities for firms to obtain other funding sources and less dependence on internal funding (cash flow). Thus, firms also reduce their external financing cost and have an opportunity to issue more debt to support their investment. An increase in this indicator will weaken the effect of the policy interest rate through the firm balance sheet channel. Thus, the coefficients of $\left(\frac{C}{K}\right) \times FD5$ and $\left(\frac{D}{K}\right) \times FD5$ are expected to be negative and positive respectively ($\beta_5 < 0$ and $\beta_6 > 0$).

FD6 is the ratio of private domestic debt securities issued by financial institutions and corporations to GDP. We already discussed in chapter 4 that this indicator is applied to represent bond market development, and particularly to show development in the size of the bond market and financial depth. Also, we already explained in chapter 2, (section 2.4.3), that the development of equity and the bond market will represent financial deepening and thus lead to less dependence of firms on the financial institutional sector and its internal finance (cash flow), as well as a lowering of the external funding cost of firms. Thus, an increase in this indicator, which shows an increase in the size of the bond market, will weaken the effect of the policy interest rate on the firm balance sheet channel. The coefficients of $\left(\frac{C}{K}\right) \times FD6$ and $\left(\frac{D}{K}\right) \times FD6$ are expected to be negative and positive respectively ($\beta_5 < 0$ and $\beta_6 > 0$).

In addition, according to Singh et al. (2008), this indicator also shows financial innovation in the economy. We already described in chapter 2 (section 2.4.4) that financial innovation leads to the development of new financial instruments (CDs, MBS and other derivative instruments), giving firms greater opportunity to obtain external funding sources and to be less dependent on their internal finance (cash flow). This higher liquidity of firms leads to a weaker effect of the policy rate on their net worth and investment, thus the weaker the effect of monetary policy on the firm balance sheet channel. Financial innovation also involves the development of new financial instruments and techniques, such as securitization techniques, which reduce liquidity and credit risk and the external funding cost of firms. Hence, this encourages firms to use debt finance for their investments. In light of this explanation, the coefficients $\left(\frac{C}{K}\right)\times FD6$ and $\left(\frac{D}{K}\right)\times FD6$ should have negative and positive signs respectively ($\beta_5 < 0$ and $\beta_6 > 0$).

FD7 is the dummy variable from 1990 to 1995, where the value of 1 is seen in years 1990 to 1995 and is 0 otherwise. We explained in chapter 3 that the financial liberalization period in Thailand began in 1990, and is mainly evidenced by domestic interest rate liberalization (the abandonment of the time and saving deposit interest rate ceiling) and relaxation of the foreign exchange rate control. Rajan and Zingales (1998) and Demirguc-Kunt and Maksimovic (1998) point out that financial sector liberalization will lead to a decrease in the external funding cost of firms, causing a reduction in the asymmetric information problem and firms' external finance premium. This condition will therefore lower the financial constraint of firms and reduce the dependence of their investment on internal funds (cash flow), thereby lowering the effect of monetary policy on the balance sheet channel (Galindo et al., 2007; Kohsaka and Enya, 2007; Arbeláez and Echavarria, 2002). Nevertheless, some studies argue that financial liberalization can lead to a strengthening of the firm balance sheet channel, as some financial deregulation policies, such as interest rate abolition and capital account liberalization, may encourage firms to invest in risky investment projects as well as increasing the credit risk. This leads to a high financial premium charged by banks to prevent the moral hazard and adverse selection problem, hence lowering the opportunity for firms to obtain external funding sources. This condition causes a higher sensitivity of firms' investment to their internal finance and more cost of debt finance, thus strengthening the firm balance sheet channel (Simatele, 2004; Demirguc-Kunt and Detragiache, 1998). Therefore, the coefficients of $\left(\frac{C}{K}\right)\times FD7$ and $\left(\frac{D}{K}\right)\times FD7$ may have either a positive or negative sign ($\beta_5, \beta_6 < 0$ or $\beta_5, \beta_6 > 0$).

There are other factors which determine firms' financial constraint and have an effect on the firm balance sheet channel (size and dividend payout ratio). Therefore, we will follow the technique of Bhaduri (2005), Harris et al. (1994) and Gelos and Werner (2002), who study this effect by dividing firms into different sub-samples depending on their financial constraint. In this case, we expect that financial development will have a greater effect on the more constrained firms (small firms and low dividend payout ones) than the less constrained ones (large firms and high dividend payout ones). This is due to the greater dependence of investment on the balance sheet condition (cash flow and leverage) of the more constrained firms, and therefore financial development will also affect these firms more (Bhaduri, 2005; Love, 2003; Leaven, 2003; Arbeláex and Echavarria, 2002; Islam and Mozumdar, 2007; Gelos and Werner, 2002). Moreover, the less financially constrained firms already have greater opportunities to obtain external funding sources (easy access to the capital market and bank loans) than the more constrained ones, which depend mostly on their internal funds. Therefore, the effect of financial development will have a greater effect on the more constrained firms, which have relatively difficult access to external sources of funds (Gelos and Werner, 2002; Leaven, 2003; Arbela´ex and Echavarria, 2002; Bhaduri, 2005).

Therefore, the coefficients of $\frac{C}{K}, \frac{D}{K}$, $\left(\frac{C}{K}\right) \times FD$ and $\left(\frac{D}{K}\right) \times FD$ are expected to be higher in the more constrained firms.

Table 5.4 below shows the expected signs of the variables in our model specification from equations 5.1 and 5.2.

Table 5.4: Summary of the expected signs for the model estimation where the (+) sign indicates the positive effect of the independent variables on the dependent variable, while the (-) sign shows the negative effect

Dependence/ independence variable	I/K	$\Delta S/K$	C/K	D/K	(C/K)*FD1	(D/K)*FD1	(C/K)*FD2	(D/K)*FD2	(C/K)*FD3	(D/K)*FD3
I/K	+	+	+	-	-	+	-	+	+	-

Dependence/ independence variable	(C/K)*FD4	(D/K)*FD4	(C/K)*FD5	(D/K)*FD5	(C/K)*FD6	(D/K)*FD6	(C/K)*FD7	(D/K)*FD7
I/K	-	+	-	+	-	+	+/-	+/-

5.3.3 Methodology

We already mentioned in section 5.2.3 that many papers have applied the dynamic panel data technique (GMM estimation) in their model (Agung, 1999; Agung et al., 2002b; Kalckreuth, 2001; Love, 2003; Chatelain and Tiomo, 2001; Valderrama, 2001; Chatelain et al, 2003b; Rungsomboon, 2005; Harris et al., 1994; Gelos and Werner, 2002; Bond et al., 1997; Aga and Mozumdar, 2008). Chatelain and Tiomo (2001), Agung (1999) and Harris et al. (1994) state that there is the possibility of correlation between dependence, lagged dependence and independence variables in the investment model, and correlation between the independence and the error terms. Thus, this leads to the problem of endogeneity in the model. As discussed in Chapter 4, section, 4.3.3, the OLS estimator will be biased and inconsistent due to the endogeneity problem caused by the correlation between the lagged dependence variable and the error terms in the model (Lünnemann and Mathä, 2001; Baltagi, 2008). In addition, when using fixed effects by applying the within transformation for the elimination of the firm-specific effect, there is still bias as there is a correlation between the transformed lag dependence variable and the transformed disturbance term (as explained in chapter 4, section 4.3.3, equation 4.4). Baltagi (2008) points out that this bias in the fixed effect estimation can be reduced when the time period (T) is larger than the observation number (N). However, the number of observations in the sample considered in this chapter is greater than the time period ($N = 410$ and $T = 31$), thus this bias will still be found when applying the fixed effect estimation. As shown in chapter 4, when using 2SLS estimation to solve the endogeneity problem by adding the instrumental variables in the model, there are still some drawbacks as this method continues to show inefficient parameter estimation. This is due to the lack of further available moment conditions (Baltagi, 2008).

Therefore, the first difference GMM estimation by Arellano and Bond (1991) is considered as the suitable method in this study as the additional moment conditions in the first differenced equations are brought into this technique to improve model efficiency. This technique uses the first differenced equation for the elimination of firm specific effects and uses the lag value of variables as the instruments to solve the endogenity problem (Bond et al., 1997; Agung, 1999; Gaiotti and Generale, 2001). Furthermore, Mileva (2007) and Roodman (2006) point out that this technique is suitable for a panel with large N and small T, which is similar to our panel sample. The detail and function forms which describe the first difference GMM estimation are already stated in chapter 4, section 4.3.3. In this case, the two-step first difference GMM estimator is used in our studies as this technique produces a higher efficient standard error estimator compared with one-step estimation (Windmeijer, 2005; Roodman, 2006; Gelos and Werner, 2002; Agung, 1999). Many papers which analyse the firm balance sheet channel by studying the investment equation of firms also widely apply this technique (Butzen et al., 2001; Kalckreuth, 2001; Valderrama, 2001; Chatelain et al., 2002, 2003b; Rungsomboon, 2005; Valverde and Del Paso, 2009; Gelos and Werner, 2002). Nevertheless, the two-step estimation also has some problems as there is a relatively large asymptotic t-ratio caused by relatively small asymptotic standard errors (Bond, 2002; Çavuşoğlu, 2002; Benkovskis, 2008). Therefore, we follow the technique suggested by Rungsomboon (2005) by using Windmeijer's (2000) technique of the two-step covariance matrix's finite sample correction in order to create robust standard errors.

Nevertheless, the first-difference GMM estimation may have instrument bias or a weak instrument for the level variables, thus causing finite sample bias and a poor precision problem (Rungsomboon, 2005; Agung, 1999; Alonso-Borrego and Arellano, 1999; Bond, 2002). Therefore, the system GMM estimator is applied by Blundell and Bond (1995, 1998) to solve the above problem. This is because this technique introduces the additional moments by using two kinds of instruments: (1) the lagged of dependence variable in the first differenced equation and (2) the lagged first difference of the dependence variable in the level equation. This technique therefore causes a reduction in the finite sample bias seen in the first differenced equation and increases the precision of the parameter estimation (Baltagi, 2008; Rungsomboon, 2005; Agung, 1999; Bond, 2002; Blundell and Bond, 1995, 1998). The detail and function form of the system-GMM estimation is already explained in chapter 4, section 4.3.3. Therefore, this study also uses two-step system GMM estimation in order to check for the robustness of our results, besides two-step first differenced GMM estimation.

5.4 Empirical results

5.4.1 Panel data unit root test

Baltagi (2008) states that a large time series used in panels will probably generate nonstationarity. Due to the large T panel data set (T= 31 from 1978-2008), it is important to first check for the non-stationary property of our data by performing the panel data unit root tests. Due to the unbalanced panel data used in this study, the Im-Pesaran-Shin and Fisher-type tests have to be used to perform the panel data unit root test for the unbalanced panel data set (Stata, 2011). The model specifications of these tests have already been discussed in chapter 4, section 4.4.1.

The results from all the test statistics from both the Im-Pesaran-Shin[29] and Fisher-type tests show the rejection of the null hypothesis of the unit root in the panel data series. This confirms that our panel data series has a stationary property. The demeaning procedure introduced by Levin et al. (2002) is also applied to control for possible cross sectional dependence in the data and still confirms the stationary property of the series.

The result of the panel data unit root test is presented in Appendix A, table A5.1 (total sample result) and table A5.2 (sub-sample result).

5.4.2 Empirical results of the baseline model

Table 5.5 shows the results from the first difference GMM estimation of the baseline model explained in section 5.3.2. For the total sample result (column 1), all variables in the equation show the significant and expected sign. The coefficient of the lag of investment to capital ratio presents a significant positive sign, which is supported by the theoretical expectation described previously (Agung et al., 2002b; Kalckreuth, 2001; Oliner and Rudebush, 1996a). The coefficient of sales to capital ratio of firms also shows a positive sign, which is in line with our expectation that the higher the sales of firms, the greater their investment spending. This result is also in line with other empirical studies (Gaiotti and Generale, 2001; Chatlain and Tiomo, 2001; Hall et al., 1998; Bond and Meghir, 1994; Héricourt and Poncet, 2007; Hermes and Lensink, 1996; Leaven, 2003). The firm balance sheet variables (cash flow and leverage ratio) indicate the significant expected positive and negative effect on firms' investment

[29] In the Im-Prasaran-Shin test, our result shows only the W-t-bar test, as the t-bar, t-tile-bar and z-tilde-bar tests cannot calculate when the number of samples is below 10. As we use the unbalanced panel data of firms, it may be the case that there are some firms which have fewer than 10 samples.

respectively. These results confirm the theoretical expectation, as higher firm liquidity (cash flow) shows an increase in firms' creditworthiness, thus increasing external funding source possibilities and investment spending. On the other hand, higher firm leverage will show the risky behaviour of firms (higher agency costs and default risk), raising the external finance premium and lowering investment. These results are also supported by past empirical papers (Agung, 1999; Agung et al., 2002b; Hoshi et al, 1991; Rungsomboon, 2005; Fazzari et al., 1987; Shin and Park, 1999; Ber et al., 2002; Oliner and Rudebusch, 1996a; Bond et al., 1987; Chirinko and Schaller, 1995).

Table5.5: the result for the baseline model (first difference GMM estimation)

Dependent variable (I/K)	Total sample (1)	Large firms (2)	Small firms (3)	High dividend firms (4)	Low dividend firms (5)
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
I/K $_{t-1}$	0.0489***	0.0730***	0.0427***	0.0612*	0.0376*
	(0.0186)	(0.0192)	(0.0089)	(0.0362)	(0.0192)
$\Delta S/K$ $_{t-1}$	0.0515***	0.0228**	0.0641***	0.0289*	0.0113*
	(0.1113)	(0.0094)	(0.0174)	(0.0160)	(0.0058)
C/K $_{t-1}$	0.2218*	0.2106**	0.3426*	0.1708*	0.3413**
	(0.1212)	(0.0917)	(0.1945)	(0.1027)	(0.1439)
D/K $_{t-1}$	-0.0021**	0.0020	-0.0054***	-0.0250	-0.0055***
	(0.0009)	(0.0121)	(0.0017)	(0.0226)	(0.0020)
D1988	0.3360***	0.2903	0.3603***	0.5279	0.2679**
	(0.1210)	(1.3588)	(0.1073)	(0.6780)	(0.1055)
D1997	-0.2484**	0.1219	-0.3385***	-0.1158	-0.3202*
	(0.1228)	(0.1656)	(0.1199)	(0.1499)	(0.1737)
D2003	0.3886**	0.1293	0.0953**	0.2338*	0.2146**
	(0.1689)	(0.1797)	(0.0375)	(0.1352)	(0.1055)
AR(1)	-4.10***	-2.51**	-1.40	-2.49**	-1.67*
AR(2)	-0.91	1.50	-1.20	-0.44	-0.86
Hansen test	415.50	315.60	438.38	301.30	282.60

Note: *,**,*** indicates the significant level at the 10%, 5%, and 1% respectively. (-) is the standard error.

For the sub-sample study, table 5.5 is divided into another four columns showing small and large firms, and high and low dividend payout firms. For the size sub-sample results (columns 2 and 3), we find that small firms' balance sheet condition (cash flow and leverage) has more effect on their investment, compared with large firms. The coefficient of the lagged investment and sales accelerator variable also indicates a significant positive sign in both small and large firms, supporting our theoretical expectation. For the balance sheet condition variables (cash flow and leverage ratio of firms), the cash flow ratio in both small and large firms shows a significant positive effect on their investment, with a relatively higher effect in small firms than in larger ones (the coefficient of the cash flow to capital ratio of small firms is 13% higher than that of large firms). This result explains the fact that small firms have more financial constraint (a lower reputation and net worth) than large ones. The summary statistic in table 5.3 also confirms this finding, as small firms have a relatively low level of cash flow and a higher leverage ratio than large firms (large firms have a 10.81% higher cash flow and a 38.22% lower leverage ratio compared with small firms). Also, as large firms have more reputation and higher creditworthiness than small firms, this condition will prevent small firms from obtaining external funding. Therefore, small firms' investment will depend more on their internal finance (cash flow). This result is also reported by extensive empirical literature for this sub-sample study (Agung, 1999; Kalckreuth, 2001; Shin and Park, 1999; Rungsomboon, 2005; Oliner and Rudebusch, 1996a; Gaiotti and Generale, 2001; Gilchrist and Himmelberg, 1995; Wesche, 2000; Butzen et al., 2001). On the other hand, the coefficient of leverage ratio shows a significant negative sign in small firms, while showing an insignificant positive sign in large ones. This is in line with the theoretical expectation, since small firms have a lower reputation and net worth, and higher external funding costs. Thus, they will have a higher possibility of default risk than large firms. Therefore, an increase in the leverage ratio of small firms will have a greater negative effect on investment spending compared with large ones. Our result shows that the leverage ratio of large firms has an insignificant positive effect on their investment. This may be the case since large firms have a greater reputation and net worth and a lower default risk than small ones (shown in table 5.3). This condition results in lower external funding costs for large firms. Therefore, these firms can raise investment spending even when there is a rise in the leverage ratio, resulting in a positive effect of the leverage ratio on the investment ratio. An insignificant result of the leverage ratio in large firms can be seen and supported by some empirical studies (Hermes and Lensink, 1996; Agung et al., 2002b; Bhaduri, 2005). This result explains why large firms tend to face less impact from financial constraint (firm leverage), as not only is there a lower effect of leverage on their investment, but additionally this does not have a significant effect on the investment (Bhaduri, 2005; Agung et al., 2002b).

When the sample is divided into high and low dividend ratio firms (columns 4 and 5), the result also supports the theoretical expectation. The coefficient of investment and sales to capital ratio also supports the theoretical expectation, with a significant positive sign in both cases. For the balance sheet condition effect, we find that the balance sheet condition of low dividend firms has more effect on their investment than for high dividend payout firms. The cash flow in both high and low dividend payout firms shows a significant positive effect on investment, with a relatively higher effect on firms with low dividend. This result reflects the theoretical predictions, since low dividend payout firms have more financial constraint than high dividend ones. The summary statistics in table 5.3 also confirm this result, as the high dividend payout firms have a 5.3% higher cash flow and 67% lower leverage ratio than low dividend ones. This condition in the low dividend firms prevents them from obtaining more external funding and thus their investment will depend more on their internal finance. A similar result is also obtained by other empirical studies, such as Fazzari et al. (1987), Van Ees and Garretsen (1994), and Angelopoulou and Gibson (2007). On the other hand, the coefficient of leverage ratio shows a significant negative sign in low dividend firms, while showing an insignificant negative sign in high dividend payout ones. This is in line with the theoretical expectation, since low dividend firms have lower external funding costs and financial constraint than high dividend ones. Thus, they will have a high possibility of default risk and a higher agency cost than high dividend firms. Therefore, an increase in the leverage ratio of low dividend payout firms will have a greater negative effect on investment spending compared with large firms. The insignificance of the effect of leverage on investment of the high dividend firms may be the case, since high dividend payout firms have a better financial condition and a lower default risk than small firms (shown in table 5.3). Thus, high dividend firms tend to face less impact from financial constraint (firm leverage) as not only is there a lower effect of leverage on the investment of large firms, but additionally this effect does not have a significant effect on investment (Bhaduri, 2005; Agung et al., 2002b).

The effects of the dummy variables are displayed in table 5.5 (columns 1-5). It is shown that the coefficient of dummy variable in the periods 1988 and 2003 has a positive effect on firms' investment, while the coefficient of the dummy in period 1997 presents a negative effect. This finding is in line with expectations. However, the insignificant effect of some of these dummy variables can be found in the large and high dividend firms. This is probably due to the strengthening of the balance sheet condition of these less financially constrained firms (large and high dividend ones), which can offset the effect of these particular events on their balance sheet condition, compared with the highly financially constrained ones.

Furthermore, our baseline result in table 5.5 also confirms and supports the theory of the firm balance sheet channel, as we find a significant dependence between the firms' financial condition (cash flow and leverage) on their investment. We found that the effect of financial condition on investment is higher in the more constrained firms (small and low dividend ones) compared with the less constrained ones (large and high dividend firms). The higher the financial constraint of firms (small and low dividend ones), the lower their creditworthiness and possibilities for them to obtain external funds, and the higher their dependence on internal finance (cash flow) for investment. Therefore, we can conclude that the firm balance sheet channel will become weaker in the less constrained firms. This is because when the policy interest rate increases, it will have an effect on the external finance premium and consequently on investment. This condition will lower the effect of the policy interest rate on the investment of these firms and hence weaken the firm balance sheet channel.

The specification test of the first difference GMM estimation of the baseline model, Arellano-Bond's second order serial correlation (AR(2)) test and the Hansen test of the instrument validity show a non-rejection of the null hypothesis of no autocorrection in the equation as well as the validity of the instruments respectively. Therefore, these tests confirm that our results have no residual correlation and that the instruments used in the model are valid ones.

Table 5.6 shows the result from the baseline model with the system GMM estimation in order to check for the robustness of our findings. The baseline result of the total sample and sub-sample cases is similar to that shown and explained previously in table 5.5. We also confirm from this robustness result that the investment of the more constrained firms (small and low dividend ones) has greater dependence on their internal finance than the less constrained ones (large and high dividend firms). The statistical result (AR(2) and Hansen test) also confirms that there is no residual correlation and the instruments used in the model are valid. Therefore, this finding shows the robustness of our results.

Table5.6: The result for the baseline model (system GMM estimation)

Dependent variable (I/K)	Total sample (1)	Large firms (2)	Small firms (3)	High dividend firms (4)	Low dividend firms (5)
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
I/K $_{t-1}$	0.0503**	0.0802***	0.0138**	0.0162*	0.04262**
	(0.0212)	(0.0300)	(0.0050)	(0.0089)	(0.0200)
$\Delta S/K_{\ t-1}$	0.0442***	0.0198**	0.0866*	0.0319*	0.0323***
	(0.0143)	(0.0098)	(0.0450)	(0.0165)	(0.0090)
C/K $_{t-1}$	0.2342**	-0.2977	0.1783***	0.2756	0.1168*
	(0.1083)	(0.2285)	(0.0567)	(0.9246)	(0.0617)
D/K $_{t-1}$	-0.0147**	-0.0028	-0.0064***	0.0185	-0.0059***
	(0.0067)	(0.0662)	(0.0012)	(0.0174)	(0.0015)
D1988	0.2381**	0.0254	0.2847***	0.2639**	0.2939**
	(0.0984)	(0.2233)	(0.0445)	(0.1103)	(0.1438)
D1997	-0.4884***	-0.2300	-0.3385***	0.2952**	-0.4125*
	(0.0824)	(0.9359)	(0.1199)	(0.1433)	(0.2029)
D2003	0.3742**	0.5310**	0.1009***	0.2534	0.2108**
	(0.1534)	(0.2059)	(0.0336)	(0.1551)	(0.1058)
AR(1)	-4.02***	-2.45**	-1.30	-2.54**	-1.71*
AR(2)	-0.92	1.52	-1.02	-0.08	-0.73
Hansen test	465.28	217.23	449.80	320.38	284.16

5.4.3 Empirical results of the effect of financial sector development on the firm balance sheet channel

Table 5.7 shows the first difference GMM result of the total sample when including the different financial development indicators in the baseline model to study the effect of financial sector development on the firm balance sheet channel. The results from columns 1 to 7 show that most of the variables in the equations have a significant effect on firms' investment. The lagged investment ratio and the sales accelerator variable show a significant positive sign, as expected. The balance sheet variable of firms (cash flow and leverage ratio) also shows a significant positive and negative effect on their investment respectively. These results confirm the theoretical expectation, as higher firm liquidity (cash flow) shows an increase in firms' creditworthiness, thus increasing external funding source possibilities and investment spending. On the other hand, higher firm leverage will show the risky behaviour of firms (higher agency costs and default risk), raising the external finance premium and lowering investment. Furthermore, most of the dummy variables controlling for the important events continue to show the expected relationship with investment. The coefficient of the dummy variable for the period 1988 and 2003 shows an expected positive sign and for the period 1997 shows the expected negative sign.

Table5.7: The result of the effect of financial sector development on the firm balance sheet channel (total sample) (first difference GMM estimation)

Dependent variable (I/K)	FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD7(7)
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
I/K_{t-1}	0.0658*	0.0678**	0.0605*	0.0605*	0.1119*	0.0145*	0.0292**
	(0.0346)	(0.0343)	(0.0310)	(0.0311)	(0.0598)	(0.0086)	(0.0147)
$\Delta S/K_{t-1}$	0.0208**	0.0370**	0.0351***	0.0307**	0.0314***	0.0329*	0.0349*
	(0.0103)	(0.0185)	(0.0113)	(0.0126)	(0.0092)	(0.0176)	(0.0107)
C/K_{t-1}	-0.0012	0.4188***	0.0124	-0.8467	0.4894***	0.3892***	0.9052***
	(0.00086)	(0.1269)	(0.1240)	(0.6351)	(0.1581)	(0.0828)	(0.1359)
D/K_{t-1}	-0.0633	-0.0048*	-0.0067	-0.0182**	-0.0026	-0.0431*	-0.1437**
	(0.1136)	(0.0024)	(0.0044)	(0.0087)	(0.0068)	(0.0241)	(0.0627)
(C/K)*FD_{t-1}	-0.0336**	-0.0309***	0.0011**	-0.0317***	-0.0607***	-0.0679**	0.6691***
	(0.0138)	(0.0091)	(0.00056)	(0.0093)	(0.0214)	(0.0274)	(0.1917)
(D/K)*FD_{t-1}	0.0411**	0.0050*	-0.0134*	0.0334*	0.0012*	-0.0176*	-0.0013**
	(0.0189)	(0.0026)	(0.0071)	(0.0172)	(0.0007)	(0.0104)	(0.0006)
D1988	0.4540***	0.40242***	0.3482*	0.4042**	0.3375*	0.5283***	0.4625***
	(0.1353)	(0.1612)	(0.2006)	(0.1836)	(0.1816)	(0.1755)	(0.1624)
D1997	-0.3157**	-0.3476***	-0.0684	-0.4120***	-0.4322***	0.1702*	-0.1628
	(0.1277)	(0.1224)	(0.2044)	(0.0589)	(0.0637)	(0.0940)	(0.1519)
D2003	0.4086***	0.4331***	0.6638***	0.3780**	0.2855*	0.3622**	0.2770**
	(0.1498)	(0.1584)	(0.1339)	(0.1599)	(0.1539)	(0.1737)	(0.1313)
AR(1)	-4.23***	-4.27***	-4.36***	-4.32***	-4.02***	-4.34***	-3.61***
AR(2)	-0.33	-0.31	-0.51	0.06	0.26	-0.68	-0.92
Hansen test	393.31	390.68	410.97	430.90	376.47	415.66	425.09

For the effect of the size measure of the banking sector development indicator (the depository bank assets to total financial assets: FD1), the result in the model (column 1) indicates a significant negative effect of the interaction term between the cash flow of firms and FD1 ($\left(\frac{C}{K}\right) \times FD1$) on their investment, while the interaction term between the leverage ratio and FD1 ($\left(\frac{D}{K}\right) \times FD1$) shows a significant positive effect. This finding is supported by other empirical studies of this aspect (Gallego and Loayza, 2000; Laeven, 2003; Love, 2003; Arbeláex and Echavarria, 2002) and also by the theoretical expectation presented previously in section 5.4.2. This is because banking development will show an increase in bank size, a significant role of banks among borrowers and firms and a higher degree of financial intermediation. A rise in financial intermediation will lead to an improvement in financial market liquidity, an increase in the opportunities for external funding, and a decrease in financial costs. This condition will increase the opportunity for firms to obtain bank loans and lower their external funding costs. This will reduce the dependence of the firms' investment on their internal funds (cash flow) and also lower the external funding cost and agency cost of firms, raising the debt finance of firms for investment (leverage). This condition can also weaken the firm balance sheet channel as firms have more opportunity to obtain external source of funds.

Similarly, the effect of the activity measure of banking development (the ratio of private credit by deposit money banks to GDP: FD2) shown in column 2 shows a significant negative effect of the interaction term $\left(\frac{C}{K}\right) \times FD2$ on the investment of firms, while the interaction term

$\left(\frac{D}{K}\right) \times FD2$ shows a significant positive effect. We have already explained that this indicator is used to represent the activities of financial intermediaries provided to customers. An increase in this indicator will show an increase in banking activities in terms of the banking services provided to customers. Consequently, development in the activities of the banking sector will increase the opportunity for firms to obtain bank loans and lower their external funding costs. This will reduce the dependence of firms' investment on their internal finance and hence weaken the firm balance sheet channel.

The effect of financial concentration is shown in column 3. We find that the coefficient of the interaction term between the financial concentration indicator (three largest banks' assets to total bank assets: FD3) and cash flow ($\left(\frac{C}{K}\right) \times FD3$) shows the expected positive sign and the interaction term of this indicator with the leverage ratio ($\left(\frac{D}{K}\right) \times FD3$) shows a negative sign. This confirms the theoretical expectation, as more concentration in the market will cause more monopoly power. This leads to a difficulty for other banks to access borrowers' information and other sources of funding, thus leading to higher risk and external finance premiums faced by firms. Therefore, firms will have difficulty in accessing external sources of funds. This means their investments will depend more on their internal finance (cash flow) and less on their external funds (leverage). Also, higher external financing costs for firms will increase the effect of leverage on investment. This effect can therefore strengthen the firm balance sheet channel.

Regarding the effect of the capital market development indicators on both the size and activity measures (stock market capitalization to GDP ratio –FD4 - and the ratio of stock market total value traded to GDP – FD5), the results in columns 4 and 5 show a similar result, as we find a significant negative effect of the interaction term between firms' cash flow and FD4 and FD5 ($\left(\frac{C}{K}\right)\times FD4$ and $\left(\frac{C}{K}\right)\times FD5$) and a significant positive effect of firms' leveragre ratio and FD4 and FD5 ($\left(\frac{D}{K}\right)\times FD4$ and $\left(\frac{D}{K}\right)\times FD5$) on firms' investment. This finding is in line with the expectation, as development in the size and activity in the capital market will lead to greater possibilities for firms to access external funding sources and less dependence on their internal finance (cash flow). This also results in lower external funding and agency costs, thus increasing the opportunity for firm to increase debt for their investments. Therefore, this kind of development leads to a weaker effect of the financial condition on the investment of firms and hence weakens the firm balance sheet channel. This result is also supported by other empirical studies on this area (Agca and Mozumdar, 2008; Hsiao and Tahmicioglu, 1997; Laeven, 2003; Love, 2003; Baum et al., 2006; Galindo et al., 2007; Gallego and Loayza, 2000; Arbelaéx and Echavarria, 2002).

The result in column 6 shows the effect of bond market development and financial innovation on firm investment. We find that the interaction term between firms' cash flow and leverage ratio with the bond market development indicator ($\left(\frac{C}{K}\right)\times FD6$ and $\left(\frac{D}{K}\right)\times FD6$) shows a significant negative effect on firms' investment and also a lower negative effect on investment respectively (the coefficient of the $\left(\frac{D}{K}\right)\times FD6$ is lower compared with the coefficient of $\frac{D}{K}$.)

This result is in line with the theoretical expectation, as greater development of the equity and bond markets will lead to less dependence of firms' investment on their internal finance. This indicator also presents financial innovation, which is involved in the development of new financial instruments (CDs, MBS and other derivative instruments), giving firms greater opportunities to obtain external funding sources and to be less dependent on their internal finance (cash flow). Financial innovation also includes the development of new financial instruments and techniques (securitization techniques) which reduce liquidity and credit risk and the external funding cost of firms. Hence, this encourages firms to use debt finance for their investment. Therefore, an increase in this indicator will also lead to a higher opportunity for firms to obtain external funding sources and thus weakening the balance sheet channel.

Column 7 shows the result of the effect of financial liberalization (FD7) on the firm balance sheet channel. The result indicates that the interaction term between firm cash flow and leverage with the financial liberalization dummy ($\left(\frac{C}{K}\right)\times FD7$ and $\left(\frac{D}{K}\right)\times FD7$) has a lower positive and lower negative effect on firms' investment, compared with before adding the financial liberalization indicator as the interaction term ($\left(\frac{C}{K}\right)$ and $\left(\frac{D}{K}\right)$). This finding is supported by the theoretical expectation explained previously, as financial sector liberalization in Thailand is mainly evidenced by domestic interest rate liberalization (the abandonment of the time and saving deposit interest rate ceilings) and relaxation of foreign exchange rate control. This will lead to a decrease in the external funding cost of firms, causing a reduction in the asymmetric information problem and firms' external finance premium (Rajan and Zingales, 1998; Demirguc-Kunt and Maksimovic, 1998) This condition will therefore lower the financial constraint of firms and reduce the dependence of their investment on internal funds, as well as increasing their dependence on external finance. This is shown by our finding, as the coefficient of $\left(\frac{C}{K}\right) \times FD7$ and $\left(\frac{D}{K}\right) \times FD7$ obtains results in a lower positive and lower negative coefficient respectively. We can thereby conclude that financial liberalization in Thailand will lead to a weaker effect on the firm balance sheet channel as we find less dependence of firms' investment on their financial condition.

The robustness result is shown in table 5.8 (system GMM estimation) and we reach a similar conclusion to that found in the first difference GMM estimation. The consistency test in both talbe 5.7 and 5.8 shows that our model is well specified and hence confirms the consistency of our results.

Table5.8: The result of the effect of financial sector development on the firm balance sheet channel (total sample) (system GMM estimation)

Dependent variable (I/K)	FD1 (1)	FD2 (2)	FD3 (3)	FD4 (4)	FD5 (5)	FD6 (6)	FD(7)
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
I/K $_{t-1}$	0.070**	0.0790**	0.0234**	0.0513**	0.0617**	0.0178*	0.0635**
	(0.0352)	(0.0346)	(0.0118)	(0.0230)	(0.0303)	(0.0103)	(0.0319)
$\Delta S/K_{t-1}$	0.0263**	0.0453**	0.0215*	0.0254***	0.0325***	0.0292**	0.0318***
	(0.0101)	(0.0202)	(0.0121)	(0.0064)	(0.0094)	(0.0147)	(0.0107)
C/K $_{t-1}$	-0.0774	0.4894***	0.4908	0.4463***	0.5097***	0.6604**	0.8760***
	(0.9506)	(0.1581)	(0.44913)	(0.1228)	(0.1556)	(0.2650)	(0.1225)
D/K $_{t-1}$	-0.0322**	-0.0136**	-0.0642	-0.0131*	0.0004	-0.0679**	-0.0450*
	(0.0162)	(0.0063)	(0.0625)	(0.0071)	(0.0018)	(0.0314)	(0.0262)
(C/K)*FD $_{t-1}$	-0.0349*	-0.0192*	0.0013**	-0.0148**	-0.0606***	-0.0238**	0.6374***
	(0.0211)	(0.0115)	(0.00063)	(0.0061)	(0.0213)	(0.7731)	(0.1675)
(D/K)*FD $_{t-1}$	0.0357**	0.0146**	-0.0148**	0.0011**	0.0334*	0.0228*	-0.0024***
	(0.0178)	(0.0068)	(0.0061)	(0.0005)	(0.0172)	(0.0117)	(0.0012)
D1988	0.4724***	0.5860***	0.4129***	0.3924***	0.4970***	0.1370	0.4170***
	(0.1426)	(0.1173)	(0.1260)	(0.1258)	(0.1752)	(0.1988)	(0.3182)
D1997	-0.3732***	-0.3497***	-0.1519	-1.3264	-0.3637***	-0.1545*	-0.3936***
	(0.0532)	(0.1236)	(0.1596)	(0.1748)	(0.0673)	(0.0911)	(0.0632)
D2003	0.5751***	0.4749***	0.3819**	0.6284***	0.4379***	0.3864**	0.4423***
	(0.2060)	(0.1492)	(0.1547)	(0.1343)	(0.1408)	(0.1678)	(0.1403)
AR(1)	-4.28***	-4.40***	-3.70***	-3.90***	-4.36***	-4.29***	-4.35***
AR(2)	0.01	0.05	-0.69	0.77	0.13	-0.05	0.09
Hansen test	447.27	431.99	424.32	389.50	435.57	351.09	318.21

In the case of the sub-sample estimation, tables 5.9 and 5.10 show the effect of financial development on the firm balance sheet channel when the sample is divided according to firm size (table 5.9) and dividend payout ratio (table 5.10). The results from columns 1 to 7 in tables 5.9 and 5.10 show that most of the variables in the equations have a significant effect on firms' investment. The lagged investment and the sales accelerator variables show a significant positive sign, as expected. We also find some negative effects of the lagged investment ratio on the investment ratio of firms, particularly small ones. This result is supported by Agung (1999) and Butzen et al. (2001). They explain that as small firms have a low investment to capital ratio relative to large firms, they will face difficulties in smoothing the investment level in the following year and thus the negative relationship between the lagged investment ratio and investment ratio in time t can be found in this case. The balance sheet variable of firms (cash flow and leverage ratio) also shows a significant effect on firms' investment, supporting the theory of the firm balance sheet channel. The results in both tables 5.9 and 5.10 show that there is higher sensitivity of investment to cash flow in small and low dividend firms than large and high dividend ones. This finding supports our theoretical prediction, as the small and low dividend payout firms have more financial constraint than large and high dividend ones. The summary statistic in table 5.3 also confirms this finding, as small and low dividend firms have a relatively low level of cash flow and a higher leverage ratio than large and high dividend ones. As a result, large and high dividend firms will have more reputation and higher creditworthiness than small and low dividend firms, and their investment will depend more on external funding and less on internal funds. We also find some insignificant effects of cash flow on their investment, especially in large and high dividend firms. This insignificant effect of the result explains why large and high dividend firms' investment tend to face less impact from cash flow as these less financially constrained firms have more ability to obtain external funding sources and depend less on their internal fund. Therefore, their cash flow will have a less significant effect on their investment or even an insignificant effect, as found in some of our results.

When consider the effect of firms' leverage ratio on the investment, table 5.9 shows that the leverage of firms shows a significant negative effect on small firms' investment, while showing a positive effect on the large firms. The result in table 5.10 shows that there is a higher negative effect of the leverage ratio on the investment of the low dividend payout firms than the high dividend ones. The insignificant effect of the leverage ratio on investment is also found, especially in the large and high dividend firms. These results are in line with the theoretical expectation, since small and low dividend firms have a lower reputation and net worth, and higher external funding costs. Thus, they will have a higher possibility of default risk than large and high dividend firms. As a result, an increase in the leverage ratio of small and low dividend firms will have a greater negative effect on investment spending compared with large and high dividend ones. Therefore, large firms can raise investment spending even when there is a rise in the leverage ratio, resulting in a positive effect of the leverage ratio on the investment ratio. Also, the insignificant effect of the result explains why large and high dividend firms' investment tend to face less impact from financial constraint (firm leverage) as not only is there a lower effect of leverage on their investment, but additionally this effect does not have a significant effect on investment. In other words, these less financially constrained firms have more ability to obtain external funding sources to fund their financial position and thus their leverage ratio will have a less significant effect on their investment or even an insignificant effect, as found in some of our results. This finding is supported by other empirical studies (for example, Oliner and Rudebusch, 1996a; Butzen et al., 2001; Harris et al., 1994; Laeven, 2003; Van Ees and Garretsen, 1994; Hermes and Lensink, 1996; Agung and Morena, 2002; Bhaduri, 2005).

Most of the dummy variables controlling for important events still show the expected relationship of firms' investment with the positive coefficient of the effect of the rapid expansion in the economy (d1988), the economic recovery period in Thailand (d2003), and the negative coefficient of the effect of financial crisis (d1997) on investment. In line with the baseline result, the insignificant effect of these dummy variables is also found in the large and high dividend firms. This is possibly due to the strengthening of the balance sheet condition in the less financially constrained firms, which can offset the effect of these particular events on their balance sheet condition.

Table 5.9: the result of the effect of financial sector development on the firm balance sheet channel (large/small firms) (first difference GMM estimation)

Dependent variable (I/K)	FD1 (1)		FD2 (2		FD3 (3)		FD4 (4)		FD5 (5)	
	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
I/K_{t-1}	0.0707**	0.0288**	0.0615*	-0.1517**	0.0650**	0.0612*	0.1638***	0.1321**	0.0688*	0.0414*
	(0.0347)	(0.0141)	(0.0363)	(0.0719)	(0.0244)	(0.0365)	(0.0738)	(0.0419)	(0.0379)	(0.0239)
$\Delta S/K_{t-1}$	0.0168**	0.0340**	0.0884**	0.0736**	0.0340***	0.0940**	0.0185***	0.0428***	0.0168**	0.0362***
	(0.0080)	(0.0134)	(0.0368)	(0.0353)	(0.0116)	(0.0134)	(0.0068)	(0.0133)	(0.0080)	(0.0125)
C/K_{t-1}	0.0864***	0.7198***	0.1756*	0.5861***	0.0393**	0.0719***	0.1250**	0.3636***	0.1067*	0.4889***
	(0.0254)	(0.1195)	(0.1049)	(0.1571)	(0.0180)	(0.0126)	(0.0518)	(0.1299)	(0.0616)	(0.1199)
D/K_{t-1}	-0.0134***	-0.00053**	-0.0599	-0.0084**	0.0283***	-0.00053**	0.0432**	-0.0017**	-0.0197	-0.0020***
	(0.0045)	(0.00021)	(0.0470)	(0.0042)	(0.0093)	(0.00021)	(0.0171)	(0.0007)	(0.0370)	(0.0003)
$(C/K)*FD_{t-1}$	-0.0393**	-0.0470***	-0.0285***	-0.1656*	0.0864***	0.1346***	0.0033	-0.0321***	-0.0080	-0.0098**
	(0.0180)	(0.0154)	(0.0076)	(0.0956)	(0.0254)	(0.0370)	(0.5097)	(0.0119)	(0.0049)	(0.0049)
$(D/K)*FD_{t-1}$	0.0283***	0.0293***	-0.0121	0.0090*	-0.0285***	-0.1340***	-0.0676**	-0.0044*	-0.0039*	0.0077**
	(0.0093)	(0.0102)	(0.0282)	(0.004)	(0.0074)	(0.0045)	(0.0282)	(0.0025)	(0.002)	(0.0031)
D1988	0.1781***	0.2653***	0.2043	0.5851***	0.1192	0.2997***	0.1540	0.3558**	0.3330	0.3007*
	(0.0313)	(0.0473)	(0.2359)	(0.1782)	(0.1754)	(0.0769)	(14.406)	(0.1597)	(0.2098)	(0.1706)
D1997	-0.9517	-0.4940***	-1.2343	-0.3634***	-0.9517	-0.3826***	-0.7931	-0.4243***	-1.9313	-0.4100***
	(2.8480)	(0.0893)	(5.8166)	(0.1162)	(2.8481)	(0.1171)	(6.6199)	(0.0690)	(7.5913)	(0.0606)
D2003	0.3260	0.4872***	0.2354	0.3765***	0.2852*	0.3748***	0.3640*	0.5271***	0.5447**	0.3780**
	(0.2418)	(0.1544)	(0.2768)	(0.1238)	(0.1491)	(0.124)	(0.2091)	(0.1532)	(0.2189)	(0.1599)
AR(1)	-2.49***	-3.90***	-2.93***	-3.88***	-2.93***	-3.87***	-2.51**	-3.95***	-2.49**	-4.33***
AR(2)	-0.37	-0.96	0.87	-0.65	1.62	-0.65	1.51	-1.12	1.67	-0.65
Hansen test	255.13	386.46	311.30	376.66	296.11	271.90	257.46	493.97	216.73	306.77

Table 5.9(cont'd): the result of the effect of financial sector development on the firm balance sheet channel (large/small firms) (first difference GMM estimation)

Dependent variable (I/K)	FD6 (6)		FD7 (7)	
	Large firms	Small firms	Large firms	Small firms
	Coeff.	Coeff.	Coeff.	Coeff.
I/K_{t-1}	0.0365*	-0.0255**	0.0912***	-0.1175**
	(0.02022)	(0.0111)	(0.0132)	(0.0590)
$\Delta S/K_{t-1}$	0.0010**	0.0784**	0.00098*	0.0267*
	(0.0004)	(0.0359)	(0.00053)	(0.0142)
C/K_{t-1}	0.05019**	0.4994***	-0.6274***	0.8774***
	(0.0211)	(0.1403)	(0.2182)	(0.1277)
D/K_{t-1}	-0.0931	-0.0321*	0.0010***	-0.0402**
	(0.0916)	(0.0185)	(0.0001)	(0.0176)
$(C/K)*FD_{t-1}$	-0.1177*	-0.0575***	-0.0046	-0.2143**
	(0.0691)	(0.0186)	(0.0542)	(0.1177)
$(D/K)*FD_{t-1}$	0.0113*	0.0914*	0.0205***	0.0394**
	(0.0065)	(0.0520)	(0.0023)	(0.0177)
D1988	0.1238	0.4687**	0.6995	0.4064***
	(6.9555)	(0.1821)	(14.587)	(0.0208)
D1997	-0.1681	0.1544*	-0.0136	-0.2229***
	(0.2312)	(0.0861)	(0.2529)	(0.0094)
D2003	0.3819	0.2981**	0.1864***	0.3093*
	(0.2343)	(0.1399)	(0.0129)	(0.1709)
AR(1)	-2.02**	-4.00***	-2.35**	-3.20***
AR(2)	0.11	-0.60	0.70	-2.15
Hansen test	182.82	283.15	212.99	341.18

Table5.10: the result of the effect of financial development on the firm balance sheet channel (high/low dividend payout firms) (first difference GMM estimation)

Dependence variable (I/K)	FD1 (1)		FD2 (2)		FD3 (3)		FD4 (4)		FD5 (5)	
	High dividend firms	Low dividend firms	High dividend firms	Low dividend firms	High dividend firms	Low dividend firms	High dividend firms	Low dividend firms	High dividend firms	Low dividend firms
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
I/K $_{t-1}$	0.2612***	0.1038**	0.1224**	0.1166***	0.2612***	0.0744*	0.2644***	0.1171**	0.2801***	0.1137**
	(0.0481)	(0.0491)	(0.0504)	(0.0410)	(0.0481)	(0.0401)	(0.0492)	(0.0537)	(0.0796)	(0.0543)
$\Delta S/K_{t-1}$	0.0280**	0.0299***	0.0164*	0.0231**	0.0210*	0.0274***	0.0168***	0.0292**	0.0221**	0.03042***
	(0.0120)	(0.0091)	(0.0098)	(0.0107)	(0.0120)	(0.0085)	(0.0037)	(0.0114)	(0.0101)	(0.0082)
C/K $_{t-1}$	-0.0014	0.3902**	0.3781	0.2893*	0.1080	0.4220*	0.0661**	0.7153***	0.6549*	0.7534***
	(0.3260)	(0.1331)	(0.6865)	(0.0150)	(0.0822)	(0.2551)	(0.0331)	(0.2096)	(0.3479)	(0.1321)
D/K $_{t-1}$	-0.00036*	-0.0430*	0.0263***	-0.0022*	-0.0177***	-0.2889*	-0.0012	-0.0261***	-0.0054***	-0.5713*
	(0.00021)	(0.0238)	(0.0090)	(0.0012)	(0.0055)	(0.1653)	(0.0010)	(0.0064)	(0.0136)	(0.3080)
(C/K)*FD $_{t-1}$	-0.0184***	-0.1216***	-0.0118***	-0.0605***	0.0020	0.0602**	-0.0028*	-0.0820**	-0.0108***	-0.0594***
	(0.0067)	(0.0298)	(0.0028)	(0.0081)	(0.0023)	(0.0341)	(0.0016)	(0.0327)	(0.0030)	(0.0161)
(D/K)*FD $_{t-1}$	0.0891**	0.1217**	-0.0284	0.0024*	-0.0344*	-0.0329***	-0.1010	0.0062*	-0.1350	-0.0056**
	(0.0353)	(0.0504)	(0.0291)	(0.0013)	(0.0199)	(0.0109)	(0.0022)	(0.0032)	(0.4037)	(0.0022)
D1988	0.1785	0.0583**	0.2544	0.4083*	0.2970*	0.3315***	0.2448	0.4295**	0.2536	0.3770**
	(0.6037)	(0.2581)	(0.2351)	(0.2090)	(0.1515)	(0.0911)	(0.1615)	(0.1898)	(0.3495)	(0.1740)
D1997	-0.0763	-0.5343***	-0.3427**	-0.3023*	-0.1965	-0.2034**	-0.0837	-0.3403*	-0.2976	-0.3108*
	(0.2090)	(0.0829)	(0.1477)	(0.1708)	(0.1462)	(0.1036)	(0.1992)	(0.1930)	(0.3062)	(0.1844)
D2003	0.1017**	0.7181***	0.2318	0.4165*	0.0993**	0.4646**	0.1054**	0.7086***	0.3446**	0.5801***
	(0.0475)	(0.1777)	(0.1453)	(0.2417)	(0.0474)	(0.1839)	(0.0481)	(0.1938)	(0.1596)	(0.1987)
AR(1)	-2.58***	-3.96***	-2.51**	-1.24***	-3.88***	-3.82***	-3.93***	-3.98	-2.51**	-3.94***
AR(2)	0.35	-0.50	-0.30	-0.65	0.41	-0.03	0.41	0.21	-0.47	0.13
Hansen test	302.37	331.85	298.39	314.33	310.64	373.60	302.21	318.81	283.55	315.20

Table 5.10(cont'd): the result of the effect of financial sector development on the firm balance sheet channel (high/low dividend payout firms) (1st difference GMM estimation)

Dependence variable (I/K)	FD6 (6)		FD7 (7)	
	High dividend firms	Low dividend firms	High dividend firms	Low dividend firms
	Coeff.	Coeff.	Coeff.	Coeff.
I/K $_{t-1}$	0.2284***	0.1335**	0.2403***	0.0129*
	(0.0645)	(0.0610)	(0.0675)	(0.0077)
$\Delta S/K_{t-1}$	0.0162**	0.0248**	0.0175**	0.0218*
	(0.0075)	(0.0114)	(0.0076)	(0.0124)
C/K $_{t-1}$	0.7041***	0.7577***	-0.0087	0.6306***
	(0.1417)	(0.1390)	(0.0057)	(0.1222)
D/K $_{t-1}$	-0.0034	0.0029	0.0012	-0.0481**
	(0.0018)	(0.0086)	(0.0018)	(0.0197)
(C/K)*FD $_{t-1}$	-0.1773***	-0.2387***	-0.4513***	-0.6807***
	(0.0417)	(0.0376)	(0.1353)	(0.1595)
(D/K)*FD $_{t-1}$	-0.2144	0.0187*	-0.1182***	0.0472**
	(0.1848)	(0.0101)	(0.0123)	(0.0198)
D1988	0.2049	0.4189*	0.3137*	0.4643*
	(0.1450)	(0.2205)	(0.1736)	(0.2396)
D1997	-0.4179***	-0.3281*	-0.0888	-0.5512***
	(0.0069)	(0.1748)	(0.0619)	(0.0874)
D2003	0.1538***	0.4256*	0.1821***	0.4230*
	(0.0349)	(0.2368)	(0.0339)	(0.2370)
AR(1)	-4.11***	-3.92***	-3.81***	-3.80***
AR(2)	0.30	0.03	0.53	-0.29
Hansen test	334.66	317.64	314.38	354.38

We now focus on the interaction term of the financial development indicator with the cash flow and leverage ratio. The sub-sample results of small and large firms in table 5.9 and of high and low dividend payout firms in table 5.10 shows that the coefficient of the interaction term between $\left(\frac{C}{K}\right)$ and $\left(\frac{D}{K}\right)$ with FD1 to FD7 shows a similar result to the total sample case explained previously. We found that these coefficients are significant higher in small and low dividend firms, while showing a lower coefficient in the large and high dividend ones. These results are in line with our expectation. This is because greater financial constraint of firms (small and low dividend payout ones) leads to greater dependence on their internal funds (see table 5.5). Also, the small and low dividend firms have higher agency and external financial costs, leading to a higher negative effect of leverage on their investment. Therefore, financial sector development is expected to have a greater effect on the more constrained firms (small and low dividend payout ones) than the less constrained ones (large and high dividend payout ones) due to the greater dependence of investment on the balance sheet condition (cash flow and leverage) of the more constrained firms, and therefore financial development will also affect these more financially constrained firms to a greater extent. As a result, we can see the higher coefficient of $\left(\frac{C}{K}\right) \times FD$ and $\left(\frac{D}{K}\right) \times FD$ in the more financially constrained firms compared with the less financially constrained ones. Moreover, we also found the insignificant effect of financial development on the sensitivity of investment to leverage and to cash flow, particularly in large and high dividend payout firms. This can be explained by the fact that the large and high dividend firms already have greater opportunities to obtain external funding sources and have relatively low external funding and agency costs than the small and low dividend ones, which depend mostly on their internal funds. Table 5.3 supports this, as the large and high dividend firms have leverage ratios 38.22% and 66.96%

respectively lower than the small and low dividend firms. Also, the large and high dividend firms have cash flows 4.33% and 4.94% respectively higher than the small and low dividend firms. This shows that the less financially constrained firms have a relatively low agency cost and default risk, as well as higher balance sheet strength than the more constrained ones. Therefore, the effect of financial development will possibly have no affect on these less constrained firms, which already can raise investment by obtaining funds from external sources and have relatively low agency costs, external cost of funds and low default risk, compared with the more constrained ones. Our empirical results are also supported by Love (2003), Islam and Mozumdar (2007), Leaven (2003), Bhaduri (2005), Gelos and Werner (2002), Harris et al. (1994), and Koo and Shin (2004), and Arbeláez and Echavarria (2002).

Therefore, we can conclude that financial development in Thailand (banking sector development, capital market development, financial competition, financial innovation, and financial liberalization) will lead to a rise in the opportunities to obtain external finance sources, resulting in less dependence of firms' investment on internal finance (cash flow). These developments also lead to a reduction in the external finance cost and agency cost, increasing debt finance for investment. The sub-sample results show that the higher the financial constraint of firms (small and low dividend payout ones), the more greatly they are affected by financial development. This is due to the greater dependence of the investment of these firms on their balance sheet condition (cash flow and leverage), compared with the large and high dividend firms. Therefore, financial development will affect the more financially constrained firms more, compared the large and high dividend ones, which have relatively easy access to external sources of funds. These results also raise implications for the firm balance sheet channel. We found that firms will be less dependent on their internal finance and more dependent on their external funds when there is financial development. Thus, this shows that the effect of monetary policy shock will have a lower effect through the firm balance sheet channel as firms can obtain external funding sources to offset the effect of monetary policy. Consequently, financial development can weaken the firm balance sheet channel and this effect is considerably higher in the less financially constrained firms (small and low dividend payout ones) than the more financially constrained ones (large and high dividend firms).

We also estimate the same model as in tables 5.9 and 5.10 with system GMM estimation to check for the robustness of our results. The results in tables 5.11 and 5.12 show a similar conclusion to the first difference GMM estimation. The consistency test still shows that our model is well specified and hence confirms the consistency of our results.

Table 5.11: the result of the effect of financial sector development on the firm balance sheet channel (large/small firms) (system GMM estimation)

Dependent variable (IK)	FD1 (1)		FD2 (2)		FD3 (3)		FD4 (4)		FD5 (5)	
	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms	Large firms	Small firms
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
I/K_{t-1}	0.1795**	0.0713*	-0.0470*	0.0713*	0.1795**	0.0728**	-0.0560**	0.1508**	0.0721**	0.0621*
	(0.0789)	(0.0385)	(0.0268)	(0.0385)	(0.0789)	(0.0357)	(0.0274)	(0.0735)	(0.0274)	(0.0338)
$\Delta S/K_{t-1}$	0.0171**	0.0817**	0.0251*	0.0817**	0.0100**	0.0277***	0.0132*	0.0269***	0.0208**	0.0271***
	(0.0084)	(0.0346)	(0.0129)	(0.0346)	(0.0042)	(0.0097)	(0.0068)	(0.0075)	(0.0088)	(0.0095)
C/K_{t-1}	0.3052	0.0077	0.0378	0.0856**	0.3052	0.7891*	0.1529*	0.4781**	0.0721**	0.7226***
	(0.4619)	(0.0014)	(0.0522)	(0.0339)	(0.4619)	(0.4763)	(0.0820)	(0.1978)	(0.0274)	(0.2543)
D/K_{t-1}	0.0071*	-0.0218*	-0.0459	-0.0218*	0.0100**	-0.0196**	0.0324**	-0.0128**	-0.0028	-0.0331***
	(0.0024)	(0.0113)	(0.0419)	(0.0113)	(0.0042)	(0.0084)	(0.0152)	(0.0064)	(0.0085)	(0.0126)
$(C/K)*FD_{t-1}$	0.0763	-0.0150*	-0.0150*	-0.0673**	-0.0637	0.0364***	-0.1943	-0.0176**	-0.0108	-0.0089**
	(0.0503)	(0.0078)	(0.0078)	(0.0302)	(0.9178)	(0.0122)	(0.1502)	(0.0083)	(0.0399)	(0.0044)
$(D/K)*FD_{t-1}$	0.0021**	0.0230*	0.0439	0.0230*	0.0020**	-0.0365**	0.0316*	0.0090*	0.0041**	0.0060*
	(0.0009)	(0.0122)	(0.0321)	(0.0122)	(0.0009)	(0.0163)	(0.0165)	(0.0049)	(0.0011)	(0.0031)
D1988	0.1819	0.4857***	0.1327	0.5750***	0.8242	0.4336**	1.1091	0.3747**	0.2708	0.5678***
	(0.1980)	(0.0780)	(0.2048)	(0.1257)	(0.6628)	(0.1695)	(0.8183)	(0.1466)	(0.2280)	(0.1548)
D1997	-0.2968**	-0.3653***	-0.5972	-0.3653***	-0.2800**	-0.2744***	-0.4529	-0.3800***	-0.4157***	-0.4100***
	(0.1162)	(0.0945)	(1.8543)	(0.0945)	(0.1085)	(0.0680)	(8.0321)	(0.0549)	(0.1558)	(0.0606)
D2003	0.5475*	0.4274***	0.3946	0.4274***	0.1769	0.4594***	0.34021*	0.5445***	0.2708	0.4651***
	(0.2829)	(0.1112)	(0.2543)	(0.1112)	(0.1877)	(0.1219)	(0.1851)	(0.5190)	(0.2280)	(0.13716
AR(1)	-2.51**	-4.02***	-2.49***	-4.02***	-2.51***	-3.97***	-2.51**	-3.71***	-2.64***	-4.31***
AR(2)	0.59	-0.29	1.22	-0.29	0.59	-0.34	1.51	0.56	1.70	-0.05
Hansen test	325.38	427.49	284.61	427.49	325.38	419.88	227.31	371.31	183.47	359.74

Table 5.11 (cont'd): the result of the effect of financial sector development on the firm balance sheet channel (large/small firms) (system GMM estimation)

Dependent variable (I/K)	FD6 (6)		FD7 (7)	
	Large firms	Small firms	Large firms	Small firms
	Coeff.	Coeff.	Coeff.	Coeff.
I/K $_{t-1}$	0.2711*	0.0269*	0.0534***	-0.0968*
	(0.0157)	(0.0154)	(0.0047)	(0.0575)
$\Delta S/K_{t-1}$	0.0014*	0.0700**	0.0017*	0.0559*
	(0.0007)	(0.0308)	(0.0008)	(0.0313)
C/K $_{t-1}$	0.0565***	0.7073***	-0.5357	0.5393***
	(0.0208)	(0.2465)	(0.8417)	(0.1290)
D/K $_{t-1}$	0.0089**	-0.0800*	0.0505	-0.0249
	(0.0036)	(0.0444)	(0.0748)	(0.0235)
(C/K)*FD $_{t-1}$	-0.1820*	-0.2600***	0.0392**	0.4697***
	(0.1074)	(0.2188)	(0.0166)	(0.1753)
(D/K)*FD $_{t-1}$	0.0882	0.2759*	0.0126***	0.0272***
	(0.2060)	(0.0159)	(0.0014)	(0.0103)
D1988	1.5331	0.2615***	0.3142	0.2751*
	(0.9081)	(0.0859)	(1.9799)	(0.1612)
D1997	-0.0029	-0.1603*	-0.0937	-0.1749
	(0.2427)	(0.0837)	(0.2227)	(0.1252)
D2003	0.2376	0.2882**	0.1577***	0.2313**
	(0.2247)	(0.1327)	(0.0190)	(0.1226)
AR(1)	-2.46**	-3.73***	-2.48**	-3.49***
AR(2)	0.41	0.69	1.11	-1.73
Hansen test	227.30	325.80	202.96	392.58

Table5.12: the result of the effect of financial sector development on the firm balance sheet channel (large/small firms) (system GMM estimation)

Dependent variable (IK)	FD1 (1)		FD2 (2)		FD3 (3)		FD4 (4)		FD5 (5)	
	High dividend firms Coeff.	Low dividend firms Coeff.	High dividend firms Coeff.	Low dividend firms Coeff.	High dividend firms Coeff.	Low dividend firms Coeff.	High dividend firms Coeff.	Low dividend firms Coeff.	High dividend firms Coeff.	Low dividend firms Coeff.
I/K $_{t-1}$	0.1348**	0.07928*	0.1185***	0.1173***	0.1184**	0.0744*	0.3302***	0.1350**	0.2400***	0.1467**
	(0.0675)	(0.0400)	(0.0382)	(0.0410)	(0.0588)	(0.0400)	(0.0616)	(0.0674)	(0.0612)	(0.0679)
$\Delta S/K_{t-1}$	0.0249***	0.0265***	0.0155*	0.0246**	0.1083*	0.0274***	0.0086**	0.0249***	0.0285***	0.0245**
	(0.0077)	(0.0083)	(0.0090)	(0.0112)	(0.0099)	(0.0085)	(0.0035)	(0.0078)	(0.0102)	(0.0118)
C/K $_{t-1}$	0.4250**	0.3704*	0.0019	0.0230**	0.2430	0.4220*	0.1036***	0.4274**	0.6317**	0.6939***
	(0.2097)	(0.2056)	(0.0093)	(0.0109)	(0.2379)	(0.2550)	(0.0281)	(0.2122)	(0.2885)	(0.1719)
D/K $_{t-1}$	-0.0162***	-0.0196**	-0.0043	0.1185***	-0.0785*	-0.0177***	0.0067	-0.0116**	-0.5766**	-0.007**
	(0.0066)	(0.0065)	(0.0033)	(0.0382)	(0.0398)	(0.0055)	(0.0044)	(0.0045)	(0.2667)	(0.0036)
(C/K)*FD $_{t-1}$	0.0067	-0.0202***	-0.0027	-0.0581***	-0.0805	0.0312**	-0.4233**	-0.0196***	-0.0160***	-0.0511***
	(0.0044)	(0.0058)	(0.0681)	(0.0106)	(0.1728)	(0.0123)	(0.1692)	(0.0066)	(0.0045)	(0.0152)
(D/K)*FD $_{t-1}$	0.0106***	0.0297**	0.0034*	0.0802**	-0.0566***	-0.2735	-0.0023*	0.0106***	-0.0093	0.0012*
	(0.0041)	(0.0130)	(0.0018)	(0.0359)	(0.0207)	(0.2496)	(0.0013)	(0.0041)	(0.0428)	(0.0006)
D1988	0.3096	0.5492***	0.2527	0.4678***	0.3218**	0.2970*	0.2972*	0.4764*	0.2893	0.4610**
	(0.3890)	(0.2075)	(0.2805)	(0.1384)	(0.1336)	(0.1515)	(0.1582)	(0.2528)	(0.2144)	(0.1799)
D1997	-0.1868	-0.5584***	-0.3685**	-0.2955**	-0.41063	-0.5489***	0.0260	-0.5589***	-0.0181	-0.5984***
	(0.1478)	(0.0895)	(0.1724)	(0.1381)	(0.2634)	(0.0807)	(0.0199)	(0.0865)	(0.3475)	(0.0893)
D2003	0.6046***	0.4775**	0.3526**	0.4060*	0.4731**	0.4312*	0.0912**	0.5985***	0.4095**	0.5326***
	(0.1950)	(0.2322)	(0.14322)	(0.2143)	(0.1862)	(0.2196)	(0.0452)	(0.1946)	(0.1665)	(0.2020)
AR(1)	-3.78***	-3.93***	-2.57***	-4.27***	-2.27***	-3.82***	-2.58***	-3.78***	-2.56***	-3.85***
AR(2)	0.56	0.03	-0.13	-0.86	-0.45	-0.03	0.38	0.56	0.23	0.38
Hansen test	323.50	373.48	265.28	355.87	265.84	373.60	303.11	323.45	314.38	335.94

Table 5.12 (cont'd) : the result of the effect of financial sector development on the firm balance sheet channel (high/low dividend firms) (system GMM estimation)

Dependent variable (IK)	FD6 (6)		FD7 (7)	
	High dividend firms Coeff.	Low dividend firms Coeff.	High dividend firms Coeff.	Low dividend firms Coeff.
I/K $_{t-1}$	0.2117***	0.1177*	0.2436***	0.1271*
	(0.0647)	(0.0578)	(0.0686)	(0.0676)
$\Delta S/K_{t-1}$	0.0152***	0.0257*	0.0183**	0.0232**
	(0.0056)	(0.0131)	(0.0078)	(0.0111)
C/K $_{t-1}$	0.4701**	0.7861***	-0.0081	0.7154***
	(0.2380)	(0.1591)	(0.0056)	(0.1033)
D/K $_{t-1}$	-0.0120	-0.0558**	0.00024	-0.0799***
	(0.0078)	(0.0275)	(0.0018)	(0.0298)
(C/K)*FD $_{t-1}$	-1.3717**	-1.5800***	0.6694***	0.6767***
	(0.6946)	(0.513)	(0.1571)	(0.2576)
(D/K)*FD $_{t-1}$	-0.2189***	0.0187*	-0.1172***	0.0795***
	(0.0277)	(0.0101)	(0.0122)	(0.0297)
D1988	0.1282	0.1435	0.2754**	0.4618*
	(0.1327)	(0.2392)	(0.1387)	(0.2371)
D1997	-0.1767**	-0.4994***	-0.1012	-0.1907**
	(0.0824)	(0.0728)	(0.0616)	(0.0831)
D2003	0.1455***	0.5801***	0.1532***	0.4080*
	(0.0362)	(0.2086)	(0.0496)	(0.2104)
AR(1)	-4.16***	-3.92***	-3.76***	-3.66***
AR(2)	0.13	0.30	0.49	-0.87
Hansen test	303.11	281.89	382.78	324.97

5.5 Conclusion

This study examines the firm balance sheet channel and also investigates the effect of financial sector development on this channel in Thailand from 1978 to 2008 by using firm panel data. The study was conducted by investigating the effect of firms' financial condition (their cash flow and leverage) on their investment in order to prove the existence of the firm balance sheet channel. We investigate this by using firm panel data and GMM estimation (first difference-GMM and system-GMM estimation) and the result from the baseline model confirms the existence of the firm balance sheet channel, as a higher cash flow and leverage ratio have a significant positive and negative effect on firms' investment respectively. These results confirm the theoretical expectation, as higher firm liquidity (cash flow) shows an increase in firms' creditworthiness and investment spending. On the other hand, higher firm leverage will show the risky behaviour of firms (higher agency costs and default risk), raising the external finance premium and lowering investment. Our sub-sample result (small/large firms and high/low dividend payout firms) still shows the positive effect of firms' cash flow on investment, with a relatively greater effect in small and low dividend payout firms than in larger and high dividend ones. This is due to the fact that small and low dividend firms in Thailand have more financial constraint (a lower reputation and net worth) than large and high dividend ones, thus this condition will prevent them from obtaining external funding. Therefore, their investment will depend more on their internal finance (cash flow). On the other hand, the leverage ratio shows a significant negative effect in small and low dividend payout firms' investment, while showing a lower insignificant effect in large and high dividend ones. This is in line with the theoretical expectation, since small and low dividend firms have a lower reputation and net worth, and higher external funding costs. Consequently, they will have a higher agency cost and higher possibility of default risk than large and high dividend firms. Therefore, the leverage ratio of small and low dividend firms will have more negative effect on investment spending compared with large and high dividend ones. An insignificant result of the leverage ratio in large and high dividend firms can explain why these firms tend to face less impact from financial constraint (firm leverage), as not only is there a lower effect of leverage on their investment, but additionally this effect does not have a significant effect on investment. We can see that our results can have an implication for the firm balance sheet channel, as monetary policy can cause a weaker effect via the firm balance sheet channel, particularly in the less financially constrained firms (large and high dividend ones) than the more constrained ones. This is due to their higher reputation and net worth, lower external funding costs and lower dependence on their internal finance. Thus, this will weaken the effect of the monetary policy compared with the more constrained firms.

For the effect of financial sector development, our findings show similar results, which are in line with our prediction that financial development in Thailand (banking sector development, capital market development, financial competition, financial innovation, and financial liberalization) leads to less dependence of firms' investment on their internal finance and more dependence on external funds. Banking sector development (both size and activity measures) results in an increase in bank size, a significant role of banks among borrowers and firms, a higher degree of financial intermediation and a rise in the activities of financial intermediation provided to customers. Therefore, this will lead to an improvement in financial market liquidity, an increase in the opportunities for external funding, and a decrease in financial costs. This will reduce the dependence of the firms' investment on their internal funds (cash flow) and also lower the external funding cost and agency cost of firms, thus raising their debt finance for investment (leverage). We find that financial competition (lower concentration ratio) results in less difficulty for other banks to access borrowers' information and other sources of funding, thus leading to lower risk, lower external finance premiums faced by firms and less difficulty in accessing external sources of funds. Therefore, the investments of firms will depend less on their internal finance (cash flow). Also, the decrease in external financing costs of firms will reduce the effect of leverage on their investment. Our results show that capital market development (both size and activity measures) will lead to a weaker effect of internal finance (cash flow) on investment and increase the debt finance (leverage) for investment. This is because development in the size and activity in the capital market will lead to greater possibilities for firms to access external funding sources and less dependence on their internal finance (cash flow). This also results in lower external funding cost and agency cost for firms, thus increasing their opportunity to increase debt for their investment. Similar results are also found for the effect of bond market development and financial innovation on firm investment, as greater development of the equity and bond markets will lead to less dependence of firms' investment on their internal finance and more dependence on their external finance. Financial innovation also includes the development of new financial instruments and techniques (securitization techniques), which reduce liquidity and credit risk and the external funding cost of firms. Hence, this encourages firms to use debt finance for their investments. Financial liberalization in Thailand also lowers the financial constraint of firms and reduces the dependence of their investment on internal funds, as well as increasing their dependence on external finance. This is because domestic interest rate liberalization (the abandonment of the time and saving deposit interest rate ceilings) and relaxation of the foreign exchange rate control will lead to a decrease in the external funding cost of firms, causing a reduction in the asymmetric information problem and firms' external finance premium.

The effect of financial development on our sub-sample estimation shows that all of these aspects of financial development have similar results to the total sample case, as banking sector development, capital market development, financial competition, financial innovation, and financial liberalization will lead to less dependence of firms' investment on their internal finance and more dependence on external funds. Also, the effect of all these aspects of financial development are significant and higher in the small and low dividend firms, while showing a lower effect on the large and high dividend firms. This is because more financially constrained firms (small and low dividend payout ones) have greater dependence on their internal funds and higher agency and external financial costs. This causes greater dependence of investment on the balance sheet condition (cash flow and leverage) of the more constrained firms, and therefore financial development will also affect these firms more. Moreover, we also found an insignificant effect of financial development on the sensitivity of investment to the balance sheet condition (cash flow and leverage) of firms, especially the less financially constrained ones. This can be explained that the large and high dividend firms already have greater opportunities to obtain external funding sources and have relatively low external funding and agency costs than small and low dividend ones, which depend mostly on their internal funds. Therefore, the effect of financial development will possibly have no affect on these less constrained firms, which have relatively low agency cost, external cost of funds and low default risk, compared with the more constrained ones.

The results of the effect of financial development on the sensitivity of firms' investment to the balance sheet condition (cash flow and leverage) also raise implications for the theory of the firm balance sheet channel. We found that firms will be less dependent on their internal finance and more on their external funds when there is financial development. Thus, this shows that the effect of monetary policy shock will have a weaker effect through the firm balance sheet channel, as firms can obtain external funding sources to offset the effect of the monetary policy. Consequently, financial development can weaken the firm balance sheet channel and this effect is considerably higher in the less financially constrained firms than the more financially constrained ones.

Our study raises some important issues for policy makers in Thailand. Our results show that financial development will increase the opportunity for firms to obtain bank loans and lower their external funding costs. This will reduce the dependence of the firms' investment on their internal funds (cash flow) and also lower the external funding and agency costs of firms, raising their debt finance for investment (leverage). Therefore, financial development in Thailand will increase the opportunity for firms to obtain external funding sources and possibly leading to an increase in their investment and economic growth. Thus, we found that financial development can be used in order to stimulate economic growth in the country. However, financial development can probably lead to a rise in the default risk of firms due to the higher possibility for them to obtain external funding sources and greater dependence on their debt finance (leverage). Our findings also raise implication for the firm balance sheet channel, in that financial development can lead to a weaker effect of monetary policy via the firm balance sheet channel as firms can outweigh the effect of policy shock by obtaining other external sources of funds. Thus, this possibly leads to a difficulty for policy makers to control the economy through this channel. Therefore, not only should monetary policy be controlled and regulated, but also the suitable level of financial sector development is an important issue which should be focused on by policy makers and central banks in order to prevent the problem of the default risk of firms, as well as the difficulties for policy makers to control the economy. However, the effects of financial development can also pass through to the economy via other channels of monetary policy transmission. Therefore, an adequate supervisory system, appropriate risk management techniques in the banking and financial sectors, and stable conditions in the financial market and the banking and capital market sectors are also needed when carrying out financial development in the future.

Furthermore, we found that financial development can have a stronger effect on the more financially constrained firms than the less financially constrained ones. Therefore, policy makers should consider the financial condition of firms in the market carefully before issuing policies, as the different financial condition of firms can lead to different effects of financial development. Firms should also be well prepared, with improved financial conditions and risk management, to face upcoming policies and developments.

This study examines the firm balance sheet and the effect of financial development on it in both the total sample cases and the sub-sample cases according to the financial constraint of firms. Further studies could focus on the effect of financial development on the different sectors of firms in order to examine the effect of financial development in more detail regarding different industrial sectors.

CHAPTER SIX

INTEREST RATE PASS-THROUGH AND THE EFFECT OF FINANCIAL DEVELOPMENT: EVIDENCE FROM THAILAND

6.1 Introduction

We have already explained that the interest rate channel is one of the monetary policy transmission channels which affect the banking sector. The literature on the interest rate channel of monetary policy transmission hypothesises that monetary policy will have an effect on the economy due to the policy interest rate, which will pass through to affect the money market rate and retail interest rates (Jobst and Kwapil, 2008; Chionis and Leon, 2005; Berg et al., 2005). This causes a change in credit supply, firms' investment spending and the real economy. Thus, this idea raises an important issue for the study of interest rate pass-through, which explains the effect of policy interest rates on bank retail interest rates. Moreover, a higher degree of interest rate pass-through will show the effectiveness of monetary policy in controlling the economy and achieving national policy targeting. Therefore, the study of interest rate pass-through also raises the important issue of policy implications.

The important issue of interest rate pass-through has become an interesting subject for many researchers in both developed (Hansen and Welz, 2011; Bredin et al., 2001; Singh et al., 2008; Lowe and Rohling, 1992; Kazaziova, 2010; De Bondt, 2002, 2005, De Bondt et al., 2005; Liu, et al., 2005; Mojon, 2000) and developing countries (Fomum, 2011; Bangura, 2011; Chirlesan and Aposstoaie, 2012; Bonga-Bonga, 2009; Charoenseang and Manakit, 2007; Amarasekara, 2005).

There are several factors which affect interest rate pass-through: credit rationing behaviour, asymmetric information, the risk sharing behaviour of banks, the costs faced by banks and investors (switching costs and adjustment costs) and the different national economic conditions. Moreover, financial sector development is also one of the important factors affecting interest rate pass-through. As financial development can be divided into different categories - financial liberalization, banking sector development, capital market development, financial competition and financial innovation - these developments can affect the financial market and banking sectors through the effect of the demand elasticity of the retail interest rates and the way banks adjust rates. Therefore, this results in a change in the degree of the interest rate pass-through. To account for this, many papers have introduced the effect of financial development into their studies of this area (Singh et al., 2008; Vel Leuvensteijn et al., 2006; Mojon, 2000; Sander and Kleimeier, 2005; 2006; Chionis and Leon, 2005; Aziakpono and Wilson, 2010; Cottarelli et al., 1995). However, the studies of the effect of financial development on interest rate pass-through focus mainly on developed European countries (Vel Leuvensteijin et al., 2006; Sørensen and Werner, 2006; Mojon, 2000; Cottarelli and Kourelis, 1994), with a lack of studies of developing countries (Aziakpono and Wilson, 2010; Aziakpono et al., 2010). In addition, many past studies have primarily focused on the effect of financial competition on interest rate pass-through (Sander and Kleimeier, 2005, 2006; Vel Leuvensteijn et al., 2006; Sørensen and Werner, 2006), leaving some gaps for the study of the effect of other aspects of financial development (financial liberalization, financial innovation and banking and capital sector development) on the pass-through.

The contribution of this chapter concerning the gaps in past papers is as follows. First, we will apply other aspects of financial development, including banking sector development, capital market development, financial competition, financial innovation and financial liberalization to our study of interest rate pass-through in order to fill the gaps of other studies, which only focus on the effect of financial competition on the pass-through. Second, we will fill the gaps of many studies of interest rate pass-through and the effect of financial development on it which only focus on developed countries; therefore, Thailand is used as a case study of interest pass-through in a developing country. Third, this paper will compensate for the lack of studies of the effect of financial development on interest rate pass-through in Thailand; none of the few which exist have introduced the financial development aspect into their work (Charoenseang and Manakit, 2007; Rehman, 2004; Tai et al., 2012).

This paper has two main objectives: (1) to investigate interest rate pass-through in Thailand and (2) to examine the effect of financial development on interest rate pass-through in the country. The study of these two aspects will be conducted by using the VECM technique and the quarterly data on interest rates in Thailand from 1978 to 2008. The baseline result of interest rate pass-through in Thailand confirms the interest rate pass-through theory, as the policy interest rate has a positive effect on retail interest rates in Thailand. The results indicate an incomplete degree of pass-through in the long- and short-run, with a relatively higher degree of pass-through in the long-run. The higher the maturity of the interest rates (different maturity of time deposit interest rates)[30], the higher the degree of pass-through in the long-run and the lower the degree in the short-run. The speed of adjustment in every short-run pass-through model indicates a significant negative coefficient of the speed of adjustment variable, confirming the equilibrium adjustment concept. For the effect of financial sector development, we conclude that capital market development, financial liberalization, financial competition, and financial innovation will cause a greater degree of interest rate pass-through, while banking sector development causes a lower degree of pass-through. This effect of the financial development indicator on interest rate pass-through is greater in the long-run pass-through model than the short-run one.

The following section in this chapter consists of five parts. The first will discuss the literature review relating to interest rate pass-through and the empirical literature (section 6.2). The second part will show the data, model specification and methodology used in the study (section 6.3). This section is followed by the empirical results (section 6.4) and the conclusion (section 6.5).

[30] The different maturity of time deposit interest rates considered in this paper are 3, 6, and 12 month time deposit interest rates, and the 2 year time deposit interest rate.

6.2 Literature review

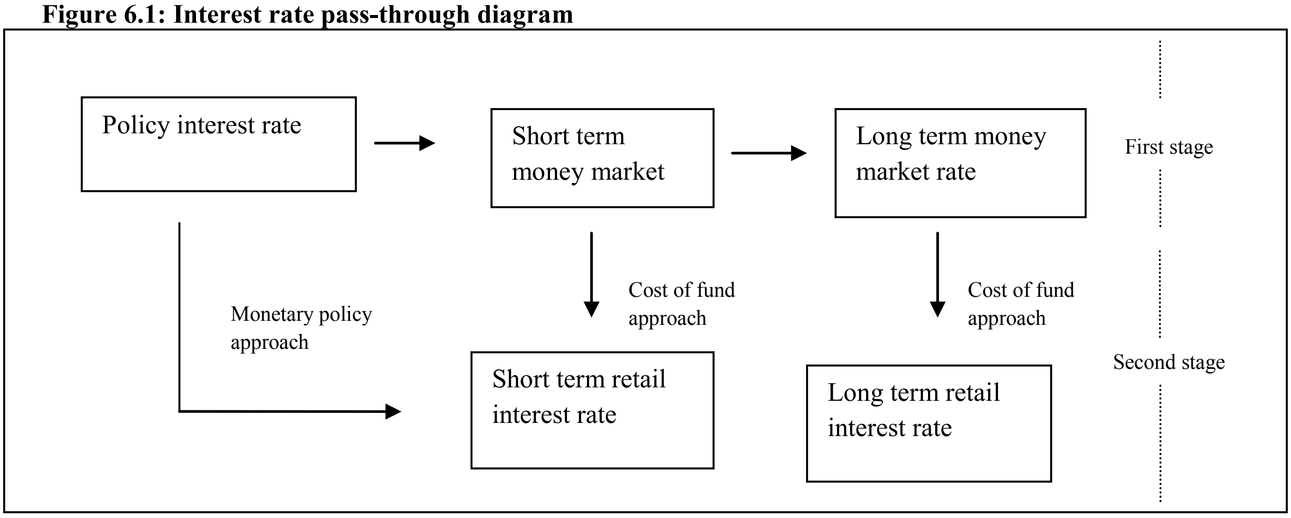
This section will review the literature relating to interest rate pass-through and comprises the theoretical aspects (section 6.2.1), the determinants of pass-through (section 6.2.2) and the empirical literature on the subject (section 6.2.3).

6.2.1 Interest rate pass-through

Interest rate pass-through explains the pass-through process of the effect of the monetary policy interest rate on the money market and retail interest rates (Lapinskas, 2011; Amarasekara, 2005). In other words, the degree of the effect of the policy interest rate on retail interest rates can be considered as the interest rate pass-through (Bangura, 2011).

Crespo-Cuaresma et al. (2006), Chirlesan and Appostoaie (2012), Fomum (2011) and Tai et al. (2012) point out that interest rate pass-through can be divided into two stages. The first stage is the pass-through effect of the policy interest rate on the money market interest rates (the inter-bank lending rate and the money market interest rates). If we consider the different maturity of interest rates, the pass-through of the policy interest rate can pass from the short term money market interest rates to the long term ones (Samba and Yan, 2010; Crespo-Cuaresma et al., 2006). The second stage is the pass-through effect of the money market rates on the retail interest rate (bank lending rates and bank deposit rates). This stage is known as the cost of funds approach. This is because bank lending and deposits need to be funded by money market sources of funds (equities, bonds and government securities) and therefore bank lending and deposit rates depend significantly on the money market interest rates (Crespo-Cuaresma et al., 2006; Tai et al., 2012; De Bondt, 2005; Bogoev and Petrevski, 2012). To sum up, interest rate pass-through is a part of the transmission process of the interest rate channel. This is because the process of the interest rate channel transmission can be summarised in two stages: (1) the effect of monetary policy instruments (policy interest rates) on the short and long term money markets and on retail interest rates, and (2) the effect of the retail interest rates on investment spending, consumption expenditure and aggregate output in the economy (Kazaziova, 2010; Lapinskas, 2011). Therefore, the concept of interest rate pass-through is considered as the first stage and is explained by the interest rate channel. The effect of the policy interest rate on retail interest rates is called the monetary policy approach of interest rate pass-through (Chirlesan and Appostoaie, 2012; Samba and Yan, 2010; Sellon, 2002). The explanation of interest rate pass-through is summarised in figure 6.1.

Figure 6.1: Interest rate pass-through diagram



Source: Crespo-Cuaresma et al. (2006).

The interest rate pass-through model can be explained by the marginal cost pricing model below (Bogoev and Petrevski, 2012; Tai et al., 2012; Lapinskas, 2011; De Bondt (2005):

$$br = \gamma_0 + \gamma_1 mr \qquad (6.1)$$

where br is the retail interest rate of banks

γ_0 is the constant markup

γ_1 is the size of interest rate pass-through

mr is the money market interest rate or the policy interest rate (marginal cost price)

If γ_1 is equal to one, this means that there is a complete pass-through of the interest rate (when there is perfect competition in the market) (Tai et al., 2011). An incomplete pass-through of the interest rate is when $0 < \gamma_1 < 1$, and there is an overshooting of the interest rate when $\gamma_1 > 1$ (Tai et al., 2011; Lapinskas, 2011; Bredin et al., 2001). Therefore, the higher degree of pass-through can indicate a stronger and more effective interest rate channel as the interest rate pass-through is the first stage of the interest rate channel (Singh et al., 2008).

De Bondt (2002) states that deposit and loan demand elasticity with respect to the deposit and loan interest rates also affects interest rate pass-through (γ in equation 5.1). Interest rate stickiness and an incomplete pass-through will take place (γ is below 1) when there is not full elasticity of deposit and loan demand (De Bondt, 2002, 2005; Bogoev and Petrevski, 2012).

6.2.2 Determinants of interest rate pass-through

After describing the interest rate pass-through concept in the previous section, it is now necessary to discuss the factors influencing the pass-through effect. The determinants of interest rate pass-through can be divided into two factors: (1) interest rate stickiness, and (2) financial development.

6.2.2.1 Interest rate stickiness

When the policy interest rate and money market interest rates change and when this is followed by a lower rate of change in the retail bank interest rates, this situation is considered as interest rate stickiness (Amarasekara, 2005; Cottarelli and Kourellis, 1994; Sellon, 2002). Interest rate stickiness depends significantly on the following four factors: (1) credit rationing and asymmetric information, (2) switching cost, (3) adjustment cost, and (4) risk sharing.

(1) Credit rationing and asymmetric information

Banks will have less information about borrowers' financial status, and firms' business and investment projects compared with the information known by borrowers and firms due to the asymmetric information in the financial market (Fomum, 2011; Bangura, 2011). This situation leads to the adverse selection and moral hazard problem in the financial market and leads to credit rationing by banks (Stiglitz and Weiss, 1981; Lowe and Rohling, 1992; Liu et al, 2005). Thus, when there is a rise in the policy interest rate, this will cause stickiness in the lending interest rates. This is because a rise in the bank loan rates will lead to a greater number of risky borrowers in the market (the adverse selection problem) (Fomom, 2011). This increases future default risk (the moral hazard problem) and causes a reduction in the banks' expected returns (Fomum, 2011; Samba and Yan, 2010; Bangura, 2011; Khawaja and Khan, 2008). Banks will tend to change their retail interest rates to a smaller degree than changes in the money market rate (the bank lending rate will be set below the market clearing rate) and decide to ration credit (De Bondt, 2002; Fomum, 2011). Therefore, the problem of asymmetric information in the financial market, as well as credit rationing by banks, will cause stickiness in interest rate pass-through.

(2) Switching cost

de Bondt (2002), Fomum (2011) and Lowe and Rohling (1992) state that the cost bank customers face when transferring their banking activities from one bank to another is known as the switching cost. Generally, banks will charge fees to customers due to the costs they face when obtaining customer information (borrowers' risk profile and customers' behaviour), and this fee is also known as the switching cost (Fomom, 2011). Because of this cost, bank customers prefer not to move their banking activities to other banks and continue to accept the retail interest rates set by their own (Bangura, 2011). This therefore causes a reduction in deposits and loan demand elasticity in the market, causing interest rate rigidity with a downward rigidity of loan rates and an upward rigidity of deposit rates (Liu et al, 2005).

(3) Adjustment cost

When the policy interest rate and market interest rate change, the decision of banks to adjust retail interest rates will depend on the difference between the interest rate adjustment cost and the cost of keeping the interest rate unchanged (Toolsema et al., 2002; Weth, 2002; Karagiannis et al., 2010; Kazaziova, 2010). The adjustment cost relates to the administrative, menu, agency and communicating costs of banks (Bangura. 2011). If the adjustment cost is high compared to the cost of keeping the interest rate unchanged, this causes an incomplete pass-through of interest rates, as banks do not want to face the cost of adjusting their retail interest rate when the policy rate changes (Fomum, 2011; Bangura, 2011; De Bondt, 2005). Therefore, a permanent change in the policy interest rate will cause a greater change in the bank retail interest rate than a temporary change in the policy interest rate (Liu et al., 2005). This situation affects the stickiness of the retail interest rate and thus causes an incomplete interest rate pass-through.

(4) Risk sharing

Fried and Howitt (1980) point out that the risks banks face will be shared between them and their borrowers, causing the stickiness of the bank retail interest rates. In this case, when the policy interest rate changes, a stable lending rate will be charged by the banks and additional fees have to be paid by risk adverse borrowers to compensate for the bank risk (Bangura, 2011; Fried and Howitt, 1980). This factor can be clearly explained by the case of an insurance contract, where there is higher risk adverse behaviour amongst the borrowers than the banks (Fomum, 2011). When the policy interest rate increases, banks will tend not to increase their retail interest rate to their risk adverse customers; however, this is compensated for by increasing the insurance premium for borrowers (Lowe and Rohling, 1992; Bangura, 2011; Toolsema et al, 2004).

6.2.2.2 Financial development

Financial sector development is an important factor affecting the size of interest rate pass-through. We already discussed in the literature review in chapter 2 (section 2.5.1) that financial development will lead to greater interest rate pass-through and hence lead to the strengthening of the effect of the policy rate via the interest rate channel. The interest rate ceiling abolition (deposit and loan interest rate ceiling abolition) which happened during the financial liberalization period in Thailand has led to to greater interest rate pass-through. This is because when the interest rate ceiling is abolished, banks will have the possibility to adjust the rates which are not now fixed at the ceiling and hence the pass-through process will become greater (Singh et al., 2008; Sellon, 2002; Aziakpono and Wilson, 2010). Other deregulation policies, such as the deregulation of capital control, foreign exchange control relaxation, and the relaxation of foreign transaction control, also lead to greater pass-through. These policies result in an increase in capital inflows, a higher volume of foreign exchange transaction, and a rise in international lending, increasing the alternative sources of investment for bank customers. This leads to a higher demand elasticity of loans and deposits and more competitive retail interest rates, thus increasing the degree of interest rate pass-through (Fomum, 2011).

Financial competition also results in a greater degree of interest pass-through. The more competitive environment will lead to a higher demand elasticity of retail interest rates and thus banks will tend to adjust their retail interest rates in a more competitive way (Cottarelli and Kourelis, 1994; Fomum, 2011; Borio and Fritz, 1995). This is because in a more competitive environment, profit-maximizing banks will tend to reduce interest margins, as they do not want to pass on bank costs to customers, which will lead to a fall in profits and number of customers (Bredin et al., 2001; Horva´th et al, 2004) This situation results in a reduction in the interest rate stickiness and an increase in the size of pass-through. According to de Bondt (2002) and Horváth et al. (2004), the size of interest rate pass-through (γ_1 in equation 6.1) depends on the market power. Horváth et al. (2004) explain that γ_1 will be equal to one in a perfect competitive market as the marginal cost is equal to the price. Therefore, the lower the competitive environment, the lower the elasticity of price with respect to marginal cost and γ_1 will decrease (below one), and thus the lower the size of the pass-through.

The higher degree of financial depth shown by the development in the capital market also leads to a higher degree of interest pass-through. This is due to the greater number of alternative sources of funding and investment for savers and investors caused by the development of trading and investment in other financial markets (equity and bond markets) (Sellon, 2002; Singh et al., 2008). Therefore, when the policy interest rate changes, banks will tend to adjust their deposit and loan rates to a greater extent as they will face higher competition from other financial markets (Sellon, 2002; Singh et al., 2008). This condition also leads to a rise in the demand elasticity of deposits and loans, causing a higher degree of pass-through when the policy interest rate changes (Sellon, 2002; Singh et al., 2008).

Financial innovation can also lead to wider sources of finance for investors and savers due to new financial market instruments. This increases alternative funding and investment sources for bank customers as well as increasing the demand elasticity of deposits and loans when the policy interest rate changes, thus causing a higher degree of interest rate pass-through (Singh et al., 2008; Gropp et al., 2007). Financial innovation also leads to a reduction in bank costs due to the development of financial technologies, hence reducing interest rate stickiness (Gropp et al., 2007).

However, the development of the banking sector will cause an increase in the financial intermediation activities and functions, such as an extension of the scope of banking business and a rise in the degree of financial intermediation. This leads to a greater influence of banks on borrowers and firms, causing a lower elasticity of demand for loans and deposits, and thus causing a lower degree of pass-through (Horváth et al., 2004).

6.2.3 Empirical literature on interest rate pass-through

This section will be divided into two sub-sections: (1) the literature on interest rate pass-through and (2) the literature on the effect of financial sector development on interest rate pass-through.

6.2.3.1 Literature on interest rate pass-through

The majority of interest rate pass-through studies have been conducted in developed countries. Bredin et al. (2001) examine interest rate pass-through in Ireland by studying the effect of the wholesale money market rate on the bank lending rates. Their Johansen VECM results show an incomplete pass-through with quite a high degree of short- and long-run pass-through, at around 0.73. A similar finding is also reported by Hansen and Welz (2011) in their study of the interest rate pass-through of the interbank market rate to lending rates in Sweden (around 0.5 in short-run and 0.9 in long-run pass-through), and by Becker et al. (2010) for the pass-through effect of the Bank of England base rate on the LIBOR rate in the UK (around 0.8 in short-run and 0.8 in long-run pass-through). Kwapil and Scharler (2007) introduce the pass-through effect on deposit rates and their ARDL results show an incomplete pass-through of the money market rate on lending rates and deposit rate in the US (an average lending rate pass-through of 0.57 and 0.32 for the deposit rate) and Euro area (an average lending rate pass-through of 0.48 and 0.22 for the deposit rate). A similar conclusion can be seen in the pass-through study in New Zealand by Liu et al. (2005), in the EMU countries by Bolt and Labondance (2011), Belke et al. (2012), Borio and Fritz (1995), Toolsema et al. (2002), Marrotaa (2007), Karagiannis et al. (2011), Mojon (2000), and Donnay and Degrase (2001), and in Belgium by Baugnet et al. (2007), who all find incomplete of pass-through of the money market rate on retail interest rates and also obtain a greater long-run pass-through than short-run one.

However, some studies of this issue not only find an incomplete pass-through, but also the overshooting of interest rate pass-through. Kazaziova (2010) analyses interest rate pass-through in the Czech Republic. Her OLS results show an incomplete effect of money market interest rates on retail lending and deposit interest rates. An overshooting of interest rates is also found and she explains that this is due to the introduction of the EMU, which supports financial disintermediation, capital market development, and financial competition in the EU financial market. Similarly, Frisancho-Mariscal and Howells (2010) examine interest rate pass-through in the UK by using the VECM method to study the effect of the policy interest rate on loan and deposit rates. They obtain a relatively high pass-through and also the overshooting of retail interest rates, especially in the long-run pass-through (around 0.50-1.10) compared to the short-run (around 0.20-0.90). The overshoot finding can be seen in de

Bondt (2002) and he explains that this overshooting result is possibly due to the introduction of the EMU. This increases the competitive environment in the banking system as well as reducing the cost of information asymmetry, hence increasing the degree of pass-through. The overshooting in the interest rate pass-through can be found in Espinosa-Vega and Rebucci (2004), Crespo-Cuaresma et al. (2006) and Jobst and Kwapil (2008) for the pass-through effect of the money market rate on the retail interest rates in EMU and developed countries.

In developing country studies, Fomum (2011) examines the effect of policy interest rate on deposit and lending rates in Cameroon and Nigeria and his VECM outputs show an incomplete degree of interest rate pass-through in both short-run and long-run pass-through, (around 0.7 in lending rates and 0.5 in deposit rates). Hanif and Khan (2012) employ the ARDL approach for their pass-through studies of Pakistan and find an incomplete pass-through of the effect of the interbank market interest rate on bank retail rates, especially in the short-run pass-through (a range of around 0.40-0.60) compared to the long-run (a range of around 0.70-0.90). A similar conclusion can be drawn from the VAR and ECM model studies by Kusmiarso et al. (2002), Chirlesan and Aposstoaie (2012), Rehman (2004) and Bonga-Bonga (2009) in Indonesia, Romania, ASEAN countries, and South Africa respectively. Espinosa-Vega and Rebucci (2004) show incomplete pass-through in Chile (an average of 0.50 pass-through in the short-run and long-run). They also report that the size of interest rate pass-through of the money market rate to the bank retail rates, especially in the short-run pass-through, will be lower when there is an increase in the maturity of deposit interest rates. Bangura (2011) use the cointegration technique and found an incomplete pass-through of the money market interest rate on retail bank interest rates, with a greater pass-through in the long-run than short-run in both lending rates (around 0.5-0.8 and 0.3-0.6 in long-run and short-run pass-through) and deposit rates (around 0.4-0.7 and 0.1-0.5 respectively) in West African countries. He also explains that the reason for this sluggish pass-through is because of the low degree of development in the financial markets of West African countries (lack of competition and limited alternative sources of finance) (Bangura, 2011). The low degree of pass-through in developing countries can be seen in the VECM and ARDL models by Amarasekara (2005), Acheampong (2005) and Bogoev and Petrevski (2012) in Sri Lanka, Ghana and South East European countries (Bulgaria, Croatia and Macedonia) respectively. They find a low degree of the effect of money market interest rates on retail interest rates, at around 0.40-0.70 in lending rates and around 0.03-0.10 in deposit rates. These sluggish results are caused by the low degree of competition (oligopolistic competition) and poor risk management behaviour, which lead to high bank management costs and an adverse selection problem (Amarasekara, 2005; Bogoev and Petrevski, 2012). Likewise, a low degree of interest rate pass-through is also found in the studies by Betancourt et al. (2005) in Columbia, Horváth et al. (2004) in Hungary, Aydin (2010) in Turkey, and Aziakpono et al. (2010) in South African Development Community countries (SADC). The overshooting of interest rates is also shown by Maskay and Pandit (2010). They use the OLS method study and obtain a pass-through range of around 0.7-1.05 for the saving deposit and lending rates in Nepal. They explain that the overshooting result is due to the financial development during the study period, which can increase alternative investment sources and the loan demand elasticity. The overshooting result of interest rate pass-through is also reported in Isakova (2008) for Central Asian countries (Kazakhstan, the Kyrgyz Republic and Tajikistan) and Lapinskas (2011) in Lithuania.

Amongst studies of Thailand, Rehman (2004) examines interest rate pass-through in the ASEAN countries (including Thailand). He uses the VECM technique and found an incomplete degree of pass-through for the effect of the interbank market interest rate on the bank lending and deposit rates in Thailand, with a relatively higher pass-through in the long-run (around 0.76 in lending rates and 0.7 in deposit rates) than the short-run (around 0.3 in lending rate and 0.4 in deposit rates). A similar result can be seen in Charoenseang and Manakit (2007), who also found that the higher the maturity of deposit interest rates, the higher the degree of pass-through, especially in the long-run.

Overall, the studies of both developed and developing countries mostly find incomplete interest rate pass-through from policy rate and market rate to bank retail interest rates. This finding is in line with the theoretical review explained in section 6.2.2.

6.2.3.2 Literature on the effect of financial sector development on interest rate pass-through.

Many researches point out the important effect of financial competition on interest rate pass-through. Sørensen and Werner (2006) study the effect of market concentration (three largest bank assets to total bank assets) on the speed of adjustment of the interest rate pass-through in European countries and their cointegration results show that the higher the banking concentration, the lower the speed of adjustment of the retail bank interest rates. This result shows the significant effect of financial competition on pass-through, as low market competition (high concentration) can lead to a reduction in the degree of interest rate pass-through. Cottarelli et al. (1995) applied the DOLS method in Italy and found that the higher the banking concentration ratio (less competitive condition), the lower the degree of pass-through of money market rates to bank loan rates. Vel Leuvensteijn et al. (2006) conclude from their panel cointegration results that financial competition can lead to a relatively faster pass-through of interest rates in both the long- and short-run in the Euro area. This result shows that competition will lead to a higher interest rate pass-through and thus a stronger interest rate channel of monetary policy transmission. Other studies of European countries also confirm that financial competition can result in a greater degree of interest rate pass-through (Tieman, 2004; de Graeve et al., 2007; Sander and Kleimeier, 2005; 2006).

Further studies of the effect of financial development can be seen in Singh et al. (2008) as they introduce the capital and bond market development indicator (bond and equity securities to GDP ratio) into their study of interest rate pass-through in Asian and European countries. The results from the Engle-Granger 2-step method indicate an incomplete pass-through from money market rate to lending and deposit rates in most countries, with a relatively higher degree in developed countries. There is also a positive correlation between the financial development indicators and the short- and long-run pass-through of interest rates. This study also shows that the higher the degree of financial development in countries, the greater the degree of interest rate pass-through and thus the stronger the interest rate channel. Mojon (2000) employs the panel data cointegration technique for his pass-through study of EMU countries and finds that the introduction of the EMU, which contributes to a higher degree of competition, financial integration and capital market development among the EMU countries, will lead to a higher degree of interest rate pass-through. Other papers in developed countries also conclude that financial sector development (more competition and development in the capital market) will result in greater interest rate pass-through in the economy (Cottarelli and Kourelis, 1994; Gropp et al., 2007; Lowe and Rohling, 1992).

Many studies also consider the effect of financial liberalization and deregulation on interest rate pass-through. De Bondt (2005) and De Bondt et al. (2005) investigate the effect of the money market interest rate on bank retail interest rates in the Euro area and their VECM results show that the introduction of the EMU, followed by the establishment of the Euro currency, a higher degree of competitiveness in the financial market and also the development of banks' alternative funding sources (money market mutual funds and capital market), will result in a higher pass-through in Euro area countries. The same conclusion is drawn by Chionis and Leon (2005) and Kleimeier and Sander (2007) in their studies of interest rate pass-through after the introduction of the EMU. Similarly, Chong (2010), using the Engle-Granger 2-step method, indicates that interest rate deregulation in Hong Kong can lead to a greater effect of the market interest rate on bank deposit rates, particularly in long-run pass-through. He also obtains the result that the higher maturity of deposit interest rates will cause a higher degree of pass-through, especially in the long-run. Among studies of developing countries, Aziakpono and Wilson (2010) employ the Engle-Granger 2-step technique to investigate the effect of financial reform on interest rate pass-through in South Africa. Their results show incomplete long- and short-run pass-through. The size of pass-through also becomes higher when considering the period of financial liberalization in the country. A similar result is also reported by Brouwer (1995). His correlation and ECM results show a stronger relationship between the money market rate and retail interest rate, as well as greater speed of adjustment after the financial deregulation in Western Pacific countries (including Thailand).

To sum up, the results from past studies mainly show that financial sector development, including capital market development, financial competition, financial innovation and financial liberalization, will significantly lead to higher interest rate pass-through. The greater the financial development, the higher the interest rate pass-through and thus the stronger the interest rate channel of monetary policy transmission. This is also confirmed by the theoretical literature review discussed in section 6.2.2. The empirical literature review discussed previously shows that the study of interest rate pass-through and the effect of financial development on the pass-through have been mainly conducted in developed and European countries. For the effect of financial sector development, many studies of this aspect have mostly focused on the effect of financial competition on interest rate pass-through, with few papers introducing all aspects of financial sector development into their models (capital market development). In studies of Thailand, past empirical studies only focus on the interest rate pass-through (Charoenseang and Manakit, 2007; Rehman, 2004) and the effect of financial liberalization on the pass-through (Brouwer, 1995). However, no papers discuss the effect of other financial development perspectives, such as the banking and capital market development, financial competition, and financial innovation, on interest rate pass-through in the country. Therefore, this chapter will fill this gap by examining interest rate pass-through in a case study of Thailand as an example of an Asian developing country. Moreover, it will examine the effect of several aspects of financial sector development (banking sector development, financial competition, capital market development, financial innovation and financial liberalization) on interest rate pass-through in Thailand.

6.3 Data and Methodology

This section will be divided into three sub-sections: (1) model specification, (2) data description and (3) methodology.

6.3.1 Model specification

The model specification in this study will be divided into two models: (1) the interest rate pass-through model and (2) the model of the effect of financial development on interest rate pass-through.

(1) Interest rate pass-through model

The model used to examine interest rate pass-through is divided into two types: (1.1) the long-run pass-through model and (1.2) the short-run pass-through model (short-run dynamic model or the equilibrium error correction model).

(1.1) Long-run pass-through model[31]

$$R_t = \beta_0 + \beta_1 MP_t + \varepsilon_t \tag{6.2}$$

Where R_t is the retail interest rate

MP_t is the policy interest rate

ε_t is the error term

[31] This long-run pass-through model has been used by other papers (Rehman, 2004; Cottarelli et al., 1995; Amarasekara, 2005; Chionis and Leon, 2005; Maskay and Pandit, 2010; Belke et al., 2012; Bogoev and Petreuski, 2012; SØrensen and Werner, 2006).

We described in section 6.2.1 that there are two stages of interest rate pass-through: (1) the effect of the policy rate on the money market rate (monetary policy approach) and (2) the effect of the money market rate on the retail interest rate (cost of fund approach). This chapter aims to focus on the overall process of interest rate pass-through, therefore it will consider it on the basis of the monetary policy approach. The retail interest rates used in this chapter (R_t) comprise: (1) bank lending rates (minimum lending rate and minimum retail rate) and (2) bank deposit interest rates (saving deposit rate, 3 month deposit rate, 6 month deposit rate, 12 month deposit interest rate and 2 year deposit rate). The 14 day repurchase market rate is used as the policy interest rate in Thailand (MP_t)[32].

In equation 6.2, β_0 is the intercept and β_1 is the degree of the long-run pass-through of the effect of policy interest rate on the bank retail rates. According to the theoretical literature in section 6.2.1, the β_1 coefficient is expected to have a positive sign because the change in the policy interest rate will pass through to the money market interest rates and then affect the retail interest rate in the same direction. The meaning of the β_1 coefficient is as follows: if β_1 is equal to one, there is a complete long-run pass-through; if β_1 is below one, there is an incomplete long-run pass-through; and if β_1 is bigger than one, there is an overshooting of the pass-through.

[32] If there is no data for the repurchase rate available, we use interbank overnight interest rate instead.

For the long-run pass-through model, a different model will be estimated based on each of the retail interest rates used in equation 6.2. Thus, a total of seven models need to be estimated.

(1.2) Short-run pass-through model[33]

$$\Delta R_t = \beta_0 + \sum_{k=1}^{n} \beta_1 \Delta R_{t-k} + \sum_{k=1}^{n} \beta_2 \Delta MP_{t-k} + \beta_3 ECM_{t-1} + \varepsilon_t \qquad (6.3)$$

where ECM_{t-1} is the error correction term which is calculated from $(R_t - \gamma_1 MP_t)_{t-1}$ The coefficients γ_1 and γ_2 are the long-run coefficients obtained from the estimation of the long-run pass-through model (model (5.2)).

k is the number of lag lengths (k = 1,2,3,...,n).

Other variables are also defined in the same way as in the long-run pass-through model described above.

In equation 6.3, β_0 is the intercept and β_1 is the coefficient of the effect of the pass -through value of retail interest rates on the retail interest rates at time t. β_2 is the degree of short-run pass-through. According to the theoretical and empirical literature discussed in section 6.2, the β_2 coefficient is expected to have a positive sign. The meaning of β_2 is the same as already explained in the long-run pass-through model. β_3 is the coefficient representing the speed of adjustment of the interest rate to the new equilibrium and this is expected to have a negative sign as it describes the equilibrium adjustment of the short-run model (Bangura, 2011; Rehman, 2004).

33 This short-run pass-through model can be seen in many papers (Fomum, 2011; Mojon, 2000; Marotta, 2007; de Bondt, 2005a, 2005b, Aziakpono and Wilson, 2010; Liu et al., 2005; Kusmiarso et al., 2002).

(2) Model of the effect of financial sector development on interest rate pass-through

This model will be divided into two types: (2.1) the long-run pass-through model and (2.2) the short-run pass-through model.

(2.1) Long-run pass-through model[34]

$$R_t = \beta_0 + \beta_1 MP_t + \beta_2 \left(MP_t \times FD_t\right) + \varepsilon_t \tag{6.4}$$

where FD_t are the financial sector development indicators, which are as follows:

$\mathrm{FD1}_t$ is the depository banks' assets to total financial assets. We described in chapters 4 and 5 that this indicator presents the size measure of banking sector development and also shows the degree of financial depth and financial intermediation. An increase in this indicator will show greater bank size and a rise in the degree of financial intermediation, as discussed in section 6.2.2. This shows a greater influence of banks on borrowers and depositors, hence reducing the demand elasticity of loans and deposits. Consequently, an increase in the development of the size of the banking sector will cause a lower degree of interest rate pass-through. Therefore, the coefficient of the interaction term between this indicator and the policy interest rate will have a negative effect on the bank retail interest rate $(\beta_2 < 0)$.

$\mathrm{FD2}_t$ is the private credit by deposit money banks to GDP ratio, which represents the activity of banking sector development. We discussed in chapters 4 and 5 that this indicator is used to represent the financial intermediary activities provided to customers. An increase in this indicator will show a rise in the banking services provided to customers, such as the issue of

[34] This long-run pass-through model has been used by Vel Leuvensteijn et al. (2006), Liu et al. (2005), and Mojon (2000).

loans and provision of saving facilities to customers, increasing the influence of banks on borrowers and depositors and thus lowering the demand elasticity of loans and deposits. This results in a lower degree of interest rate pass-through. For the above reasons, the coefficient of the interaction term of this indicator with the policy rate is expected to have a negative effect on bank retail interest rates ($\beta_2 < 0$).

$FD3_t$ is the ratio of the three largest banks' assets to total bank assets. We explained in chapters 4 and 5 that this indicator is the financial concentration measure and an increase in it shows a decrease in financial competition. This indicator has been used in many studies to study the effect of financial competition on interest rate pass-through (Singh et al., 2008; Sørensen and Werner, 2006; Gropp et al., 2007; Cottarelli and Kourelis, 1994). We previously discussed in section 6.2.2 that there is a higher demand elasticity of retail interest rates and a lowering of the bank spread (banks' interest margin) in a more competitive environment, causing a faster adjustment of retail interest rates when there is a change in policy interest rate. As financial concentration has a negative relationship with financial competition, an increase in the financial concentration indicator will therefore lead to a lower interest rate pass-through and thus the interaction term between the coefficient of this indicator and the policy interest rate will be expected to have a negative effect on retail bank interest rates ($\beta_2 < 0$).

$FD4_t$ is the stock market value traded to GDP ratio. This indicator is used to show the size development of the capital market as well as the financial depth. Several papers on interest rate pass-through also employ this indicator in their models to investigate the effect of capital market development on interest rate pass-through (Singh et al., 2008; Fomum, 2011; Gropp et al., 2007). We explained in section 6.2.2 that an increase in this indicator will show a higher degree of financial disintermediation and the development of trading and investment in other financial markets. A greater degree of capital market development leads to wider alternative sources of funding and investment for savers and investors, so banks tend to adjust their retail interest rates more significantly and quickly due to the higher demand elasticity of deposits and loans (Sellon, 2002; Singh et al., 2008). As a result, the coefficient of the interaction term between this indicator and policy interest rate will be expected to have a positive effect on the bank retail interest rates ($\beta_2 > 0$).

$FD5_t$ is the stock market total valued traded to GDP ratio, which is used to represent the activity measure of capital market development. We explained in chapters 4 and 5 that a rise in this indicator shows an increase in the activities and liquidity in the capital market. Similar to FD4, this development gives greater opportunities to banks to obtain other funding sources and leads to an increase in bank capital and liquidity. Therefore, banks tend to adjust their retail interest rates more significantly and quickly due to the higher demand elasticity of deposits and loans. Therefore, this causes a higher degree of pass-through and the coefficient of the interaction term between this indicator and policy interest rate will be expected to have a positive effect on the bank retail interest rates ($\beta_2 > 0$).

$FD6_t$ is the ratio of private domestic debt securities issued by financial institutions and corporations to GDP. This indicator shows bond market development, financial depth and financial innovation in the economy, as described in chapters 4 and 5. This indicator has been used in the studies by Cottarelli and Kourelis (1994), Cottarelli et al. (1995) and Gropp et al. (2007) to represent the effect of bond market development on interest rate pass-through. We stated in section 6.2.2 that an increase in this indicator will reduce interest rate pass-through stickiness due to the development of new financial market instruments, and trading and payment system technologies. This leads to an increase in the alternative sources of finance for borrowers and investors and a reduction in bank costs and therefore results in an increase in the demand elasticity of deposits and loans when the policy interest rate changes and causes a higher degree of interest rate pass-through. Consequently, the coefficient of the interaction term between this indicator and the policy interest rate will be expected to have a positive effect on bank retail interest rates ($\beta_2 > 0$).

$FD7_t$ is the dummy variable representing the period of financial liberalization in Thailand, where the value of 1 represents the years from 1990Q1 to 1995Q4 and 0 otherwise. We explained previously in section 6.2.2 that financial liberalization will lead to greater interest rate pass-through. This is because the financial liberalization policies will give banks more possibilities to adjust interest rates (the interest rate ceiling abolition policy), as well as leading to an increase in capital inflows, a higher volume of foreign exchange transactions, and financial openness in the country. This results in an increase in the alternative sources of investment for bank customers, leading to more competitive retail interest rates and thus increasing the extent of pass-through. Hence, the coefficient of the interaction term between this indicator and policy interest rate will be expected to have a positive effect on bank retail interest rates ($\beta_2 > 0$).

Other variables shown in model 6.4 will be described as in model 6.2. β_0 is the intercept and β_1 is the degree of long-run pass-through. The β_1 coefficient is expected to have a positive sign. The meaning of the β_1 coefficient was described in the long-run pass-through model 6.2.

For the long-run pass-through model, different models will be estimated based on each of the retail interest rates used in this equation and each of the financial development indicators.

(2.2) Short-run pass-through model

$$\Delta R_t = \beta_0 + \sum_{k=1}^{n} \beta_1 \Delta R_{t-k} + \sum_{k=1}^{n} \beta_2 \Delta MP_{t-k} + \sum_{k=1}^{n} \beta_3 \Delta\left(MP \times FD_t\right)_{t-k} + \beta_4 ECM_{t-1} + \varepsilon_t \quad (6.5)$$

where ECM_{t-1} is the error correction term which is calculated from $\left[R_t - \gamma_1 MP_t - \gamma_2 (MP_t \times FD_t)\right]_{t-1}$. The coefficients γ_1 and γ_2 are the long-run coefficients obtained from the estimation of the long-run pass-through model (model 6.4).

k is the number of lag lengths (k = 1,2,3,...,n).

Other variables are also defined as in the long-run pass-through model (model 6.4), described previously. β_0 is the intercept and β_1 is the coefficient of the effect of the pass-through on retail interest rates at time t. β_2 is the degree of short-run pass-through. We discussed previously in the short-run model (model 6.3) that the β_2 coefficient is expected to have a positive sign and the meaning of β_2 is the same as explained in model 6.3. β_3 is the coefficient representing the effect of financial sector development on interest rate pass-through. The meaning and the expected sign of this interaction term have already been presented in the long-run pass-through model above (model 6.4). β_4 is the speed of adjustment of the interest rate to the new equilibrium and this is expected to have a negative sign.

The expected sign of the variables for the interest rate pass-through model and the model of the effect of financial sector development on the interest rate pass-through are summarised in tables 6.1 and 6.2.

Table 6.1: Summary of the expected signs for the long-run and short-run interest rate pass-through model estimation where the (+) sign indicates the positive effect of the independent variables on the dependent variable, while the (-) sign shows the negative effect

Long run pass-through model	
Dependent variables/ independent variables	mp
mlr	+
mrr	+
3tdep	+
6tdep	+
12tdep	+
2ytdep	+
sav	+

Short-run pass-through model	
Dependent variables/ independent variables	mp
mlr	+
mrr	+
3tdep	+
6tdep	+
12tdep	+
2ytdep	+
sav	+

Table6.2: Summary of the expected signs for the long-run and short-run model of the effect of financial sector development on the interest rate pass-through where the (+) sign indicates the positive effect of the independent variables on the dependent variable, while the (-) sign shows the negative effect

Long run pass-through model								
Dependent variables/ independent variables	mp	mpfd1	mpfd2	mpfd3	mpfd4	mpfd5	mpfd6	mpfd7
mlr	+	-	-	-	+	+	+	+
mrr	+	-	-	-	+	+	+	+
3tdep	+	-	-	-	+	+	+	+
6tdep	+	-	-	-	+	+	+	+
12tdep	+	-	-	-	+	+	+	+
2ytdep	+	-	-	-	+	+	+	+
sav	+	-	-	-	+	+	+	+

Short-run pass-through model								
Dependent variables/ independent variables	mp	mpfd1	mpfd2	mpfd3	mpfd4	mpfd5	mpfd6	mpfd7
mlr	+	-	-	-	+	+	+	+
mrr	+	-	-	-	+	+	+	+
3tdep	+	-	-	-	+	+	+	+
6tdep	+	-	-	-	+	+	+	+
12tdep	+	-	-	-	+	+	+	+
2ytdep	+	-	-	-	+	+	+	+
sav	+	-	-	-	+	+	+	+

6.3.2 Data description

The sample data in this study are the quarterly interest rate data in Thailand from 1978Q1 to 2008Q4 obtained from the Bank of Thailand database. These interest rate data comprise the policy interest (14 day repurchase market interest rate) and retail interest rates, which include bank lending rates (minimum lending rate and minimum retail rate) and bank deposit rates (saving deposit rate, 3 month deposit rate, 6 month deposit rate, 12 month deposit rate and 2 year deposit rate). This chapter will still use the financial development indicators as stated in chapters 4 and 5. In addition, we use quarterly data; the database from Beck et al. (1999) cannot be applied in this case, as it only comprises yearly data. Therefore, the financial development indicators in this chapter have had to be obtained from the following alternative sources: FD1, FD2, and FD6 from the Bank of Thailand website; FD3[35], FD4, and FD5 from the SET database; and FD7 obtained from the author's own calculations.

A summary of all the variables in this study is shown in table 6.3.

The summary statistics of the observations are also presented in table 6.4, which shows the statistical value of the interest rate variables and the interaction term between the financial development indicators and policy interest rate during the period 1978Q1 to 2008Q4.

[35] We use the quadratic frequency conversion technique performed by Eviews 7 to convert the data of this indicator from the period that not have the quarterly data available.

Table6.3: List of all variables used in this study illustrated by type of variable, name of variable, variables' symbol, variable's definition and soure

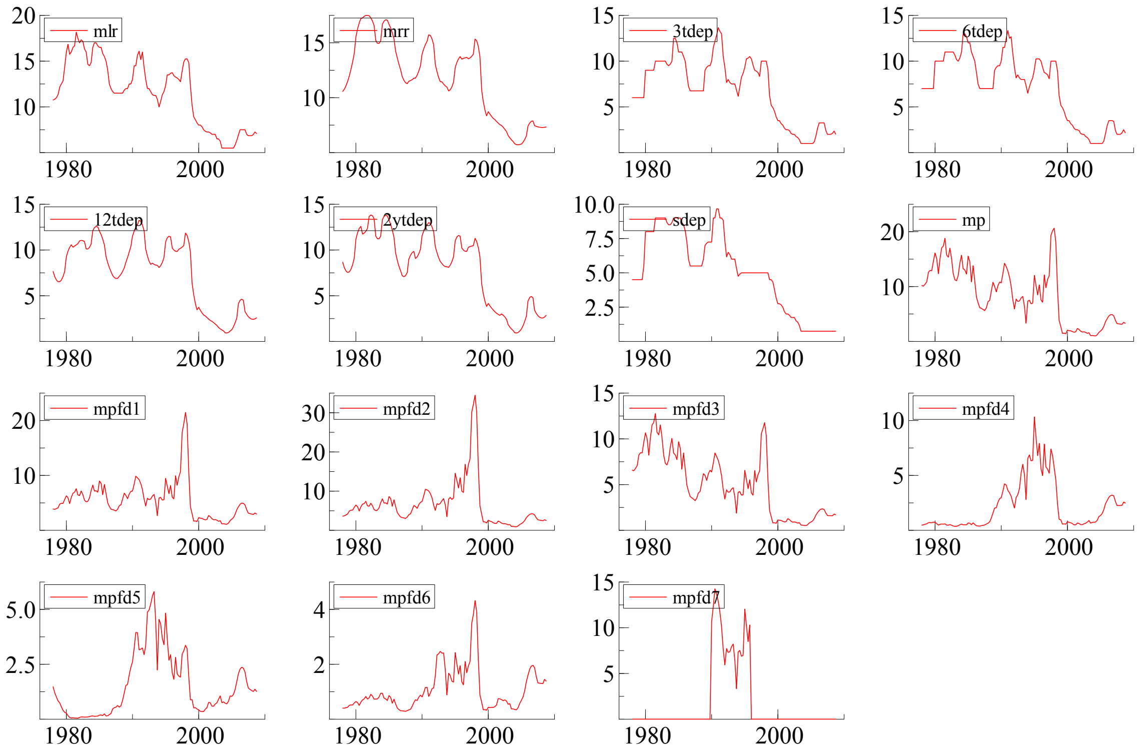
Type of variable	Variable	Symbol	Definition	Source
Monetary policy instrument	policy interest rate	mp_t	14 day repurchase market interest rate	BOT website
Retail interest rates	Minimum lending rate	mlr_t	The interest rate of commercial banks charged on pre-specified repayment schedule's loans	BOT website
	Minimum retail rate	mrr_t	The interest rate of commercial banks charged to overdraft loans	BOT website
	Saving deposit interest rate	sav_t	Saving deposit interest rate of all commercial banks in the market	BOT website
	3 months deposit interest rate	$3tdep_t$	Deposit interest rate of all commercial banks in every 3 months times	BOT website
	6 month deposit interest rate	$6tdep_t$	Deposit interest rate of all commercial banks in every 6 months times	BOT website
	12 months deposit interest rate	$1tdep_t$	Deposit interest rate of all commercial banks in every 12 months times	BOT website
	2 years deposit interest rate	$2ytdep_t$	Deposit interest rate of all commercial banks in every 2 years times	BOT website
Financial development indicators	Banking sector development (size measure)	FD1	Depository bank assets to total financial asset	BOT website
	Banking sector development (activity measure)	FD2	Private credit by deposit money banks to GDP ratio	BOT website
	Banking concentration	FD3	Three largest bank assets to total assets ratio	SET bank balance sheet
	Capital market development (size measure)	FD4	Stock market capitalisation to GDP ratio	SET database
	Capital market development (activity measure)	FD5	Stock market value trade to GDP ratio	SET database
	Bond market development/financial innovation	FD6	The private domestic debt securities issued by financial institutions and corporations to GDP ratio	BOT website
	Financial liberalization	FD7	Liberalisation dummy which equal 1 from 1990Q1 to 2005Q4 and 0 otherwise	Author owned calculation

Table6.4: Summary statistics of all variables used in the model from 1978Q1 to 2008Q4

Variable	Obs	Mean	Std. Dev.	Min	Max
policy interest rate (mp_t)	124	8.3589	5.2035	1.0100	20.640
Minimum lending rate (mlr_t)	124	11.588	3.6844	5.5000	18.167
Minimum retail rate (mrr_t)	124	11.769	3.5782	5.7122	17.496
Saving deposit interest rate (sav_t)	124	5.0410	2.8900	0.7500	9.6667
3 months deposit interest rate ($3tdep_t$)	124	6.8480	3.5429	1.0000	13.667
6 months deposit interest rate ($6tdep_t$)	124	7.0907	3.6285	1.0000	13.333
12 months deposit interest rate ($12tdep_t$)	124	7.4946	3.7219	0.9283	13.250
2 years deposit interest rate ($2ydep_t$)	124	8.0320	3.9213	0.9218	13.829
The interaction term between Depository bank assets to total financial asset and policy interest rate (mpfd1)	124	5.5528	3.5020	21.4836	1.1043
The interaction term between private credit by deposit money bank and policy interest rate (mpfd2)	124	6.4762	5.8509	34.4459	0.9122
The interaction term between three largest bank asset to total financial asset and policy interest rate (mpfd3)	124	5.0199	12.7605	0.5117	3.3982
The interaction term between stock market capitalization to GDP ratio and policy interest rate (mpfd4)	124	2.1985	10.3316	0.3702	2.2421
The interaction term between stock market total value trade to GDP ratio and policy interest rate (mpfd5)	124	1.5022	5.8121	0.0449	1.4476
The interaction term between private domestic debt securities to GDP ratio and policy interest rate (mpfd6)	124	1.0635	4.3221	0.2872	0.7825
The interaction term between Financial liberalization dummy and policy interest rate (mpfd7)	124	1.7526	14.2500	0	3.7814

Figure 6.2 is a graph of all the variables listed in table 6.2. There was a considerable increase in the bank lending interest rates (minimum lending rate and minimum retail rate) and deposit rates (time deposit interest rates and saving interest rate) during the periods from 1983 to 1984 and from 1990 to 1991. This was probably due to the adjustment of the short-term time deposit interest structure. In this case, the 3 and 6 month deposit interest rate ceiling of commercial banks was adjusted upward in order to achieve the comparative interest rate level with the 12 month deposit interest rate (BOT, 1984). This adjustment can lead to an increase in deposit rates, especially time deposit ones. The policy interest rate, as well as the deposit and lending rates, show a downward trend, especially from 1992 to 1995. This is due to the effect of financial liberalization and other deregulation polices, which caused an increase in liquidity in the financial market (details of this are discussed in chapter 3). The financial crisis in Thailand was also an important factor resulting in a significant increase in lending and deposit rates, the repurchase market interest rate, as well as the interaction term between policy interest rate and financial development indicator in Thailand from 1997 to 1998. As a result of the IMF bailout during this period, a tightened monetary policy needed to be issued to stabilise the economic condition. Additionally, the lack of market confidence and the relatively high proportion of non-performing loans and default risk also led to a rise in the bank lending rates to cover the risk cost of banks (BOT, 1997). The deposit interest rates showed a steady increase in this period because banks were trying to attract more funding from investors and depositors in the sluggish financial market conditions during this period. After the crisis period, the policy interest rate and retail interest rates in Thailand showed a downward trend as a result of the Thai economic recovery plans (the IMF and BOT financial recovery measures as already explained in chapter 3) which aim to improve the liquidity condition in the financial market and economy.

Figure6.2: The graphs of variables use in the model estimation (interest rate variables and the interaction term between policy interest rate and financial sector development)



Note: The variable mpfd1, mpfd2, mpfd3, mpfd4, mpfd5, and mpfd6 are the interaction term of the policy interest rate with the financial sector development including the banking sector development, financial competition, capital market development, capital market concentration, financial innovation, and financial liberalization respectively.

6.3.3 Methodology

Several techniques have been applied to examine this issue in the empirical literature on interest rate pass-through. Some studies employ the OLS method to analyse the effect of the policy interest rate or money market interest rate on bank retail interest rates (Kazaziova, 2010; Lapinskas, 2011). However, the financial variables (interest rates) usually have a non-stationary property and the estimation of the non-stationary data by using the general OLS technique can lead to spurious regression (Mousa, 2010; Brooks, 2008; Sørensen and Werner, 2006). This means that the regression of the non-stationary variables will cause a relatively high R^2 even if the variables in the equation are not related to each other (Enders, 2004; Brooks, 2008; Granger and Newbold, 1974). Enders (2004), Granger and Newbold (1974) and Brooks (2008) have proved this issue by constructing the OLS estimation with the non-stationary variables. Their results show a substantially high R^2 as well as a t-ratio and F-statistic which are not in line with the standard distribution.

Due to the problem with the OLS estimation, other papers tend to use other methods to deal with the problem of non-stationary series. The Dynamic OLS technique is used in some papers on interest rate pass-through to solve the non-stationarity problem (Crespo-Cuaresma et al., 2006). Mousa (2010) and Banerjee et al. (1993) state that the non-stationarity property of the data can be solved by first differencing the data and estimating the equation by the dynamic OLS method (DOLS). However, Mousa (2010) argues that the short-run relationship will be only considered when estimating the first differencing equation as in the DOLS method and this ignores the study of the long-run relationship of the variables. Other researchers tend to use the Engle-Granger 2-step method due to various drawbacks of the DOLS method (Singh et al., 2008; Fomum, 2011; Amarasekara, 2005; Chirlesan and Apostoaie, 2012) and the ARDL approach (Aydin, 2010; Hanif and Khan, 2012; Espinosa-Vega and Rebucci, 2004; Samba and Yan, 2010; De Grave et al., 2004; Sander and Kleimeier, 2005) to measure the effect of interest rate pass-through in both the long- and short-run relationship, as well as the cointegrating relationship between variables. Nevertheless, in order to conduct the cointegration test in the Engle-Granger 2-steps method, the unit root test (ADF test) is used to test the stationary property of the residual obtained from the OLS equation (Engle and Granger, 1987; Brooks, 2008). If there is a stationary property in the residual, there is cointegration of the variables (Brooks, 2008). This process will cause an over-rejection of the unit root hypothesis of the residual due to the result of the OLS estimation, which usually has the smallest variance of the residual (Mousa, 2010). Another problem of the ARDL and Engle-Granger 2-step methods is that these techniques only focus on one cointegrating relationship between variables and ignore the fact that there may possibly be more than one cointegration relationship between the series (Brooks, 2008; Mousa, 2010; Harris and Sollis, 2003).

Many studies of interest rate pass-through have employed the VECM method introduced by Johansen (1988) in their models concerning the drawbacks of the other methods (Sørensen and Werner, 2006; Belke et al., 2012; Rehman, 2004; Mojon, 2000; Bredin et al., 2001; Scholnick, 1996; Fomum, 2011). This is because this technique will consider both the long- and short-run relationship in the model (Mousa, 2010; Juselius, 2006). Moreover, the multiple cointegration in the model is focused on this technique and it also has its own test statistic for the cointegration test (this will be discussed in the following section), thus solving the problem of bias in the cointegration test, as in the Engle-Granger 2-step method (Mousa, 2010; Brooks, 2008). Therefore, this chapter will employ the Johansen technique (VECM technique) to study interest rate pass-through in Thailand.

After discussing the technique suitable for the estimation of the interest rate pass-through model, we now explain the detail and process of this technique. This section will be divided into two parts: (1) the unit root test and (2) the cointegration test.

6.3.3.1 The unit root test

Before we construct the model estimation, a unit root test needs to be performed to check for the property of the series (stationary or non-stationary). The unit root test[36] in this chapter comprises: (1) the Augmented Dicky-Fuller test (ADF test) and (2) the Kwiatkowski-Phillips-Schmidt-Shin test (KPSS test).

(1) Augmented Dicky-Fuller test (ADF test)

This test will have the following equation (Brooks, 2008):

$$\Delta y_t = \phi y_{t-1} + \sum_{j=1}^{p} \alpha_j \Delta y_{t-j} + u_t \qquad (6.6)$$

where y_t is the series used to perform the unit root test and

j is the number of lags (j=1,2,3,...,p)

Kirchgässner and Wolters (2008) and Mousa (2010) state that equation 6.6 comes from the autoregressive regression (AR process) as follows:

$$y_t = \beta_1 y_{t-1} + \beta_2 y_{t-2} + ... + \beta_j y_{t-j} + \varepsilon_t \qquad (6.7)$$

where $\varepsilon_t \sim (0, \sigma^2)$. After reparameterising equation 6.7, we obtain

$$y_t = \theta y_{t-1} + \sum_{i=2}^{p} \alpha_i \Delta y_{t-i+1} + \varepsilon_t \qquad (6.8)$$

[36] For the study of the cointegration relationship, there is a problem when using the test for the structural change in different individual variables. This is due to the non-coincidence of the break date in different variables and thus the unit root test with structural breaks is inappropriate for use in this case (Maddala and Kim, 1998).

where $\theta = \sum_{i=1}^{p} \beta_i$, and when equation 6.8 is subtracted from both sides by y_{t-1} , we can write the new equation 6.8 in a similar way to equation 6.6, where ϕ is equal to θ-1 (Mousa, 2010). The null hypothesis of this test is $H_0 : \phi = 0 (\theta = 1)$ and the alternative hypothesis is $H_a : \phi < 0$ (Brooks, 2008). If we cannot reject the null hypothesis, it means that the series have a non-stationary property and a further unit root test needs to be employed in order to obtain the order of integration (Maddala, 2001; Brooks, 2008). Mousa (2010) and Brooks (2008) point out that the k times differentiation of the series that causes the stationary property is called the integration of order k (I(k)). Therefore, if we reject the above hypothesis, it means our series have an I(0) or stationary property. If we cannot reject the null hypothesis, we have to conduct the higher orders of the integration test to examine the number of the unit root by first differencing the series and performing the unit root test again (Kirchgässner and Wolters, 2008). The null hypothesis of this test is $H_0 : y_t$ ~I(2) and the alternative hypothesis is $H_1 : y_t$~ I(1) , and if we reject the null hypothesis of the two unit roots, we can conclude that our series have only one unit root ((I(1) process) and thus the cointegration technique can therefore now be performed (Brooks, 2008).

If we have an intercept in the series, equation 6.6 will take the following form (Mousa , 2010; Kirchgässner and Wolters, 2008),:

$$\Delta y_t = \mu + \phi y_{t-1} + \sum_{j=1}^{p} \alpha_j \Delta y_{t-j} + u_t \qquad (6.9)$$

where μ is the intercept term. If our series have deterministic time trends, equation 6.6 can be rewritten as:

$$\Delta y_t = \mu + \gamma t + \phi y_{t-1} + \sum_{j=1}^{p} \alpha_j \Delta y_{t-j} + u_t \qquad (6.10)$$

where t represents the time trends.

(2) The Kwiatkowski-Phillips-Schmidt-Shin test (KPSS test)

The KPSS test is also employed in this chapter to check for the robustness of the results from the ADF test. This is because the unit root test has difficulty in deciding when the series have a stationary property with the relatively high θ coefficient, causing an over non-rejection of the null hypothesis of the unit root (Brooks, 2008). Kwiatkowski et al. (1991) introduced the KPSS test as a stationary test in order to check for the reverse hypothesis of the ADF test. The model is as follows:

$$y_t = \xi t + r_t + \varepsilon_t \qquad (6.11)$$

where $r_t = r_{t-1} + u_t$, $u_t = iid\left(0, \sigma_u^{\ 2}\right)$, t = 1,2, ...T

r_t is the random walk process, t is the deterministic trends, and ε_t is the stationary error term.

The KPSS test has the null hypothesis that the series have the stationary property ($\sigma_u^{\ 2} = 0$) and the alternative hypothesis is that the series have a unit root ($\sigma_u^{\ 2} \neq 0$) (Kwiatkowski et al., 1991). If we test the level stationary, ξ is assumed to equal zero.

6.3.3.2 The cointegration test

After we ensure that our series have the I(1) property, the cointegration test will be applied. According to Hamilton (1994) and Bredin et al. (2001), when there is a stationary property in the linear combination of the I(1) series, the series will be cointegrated. In other words, if there is a d order of integration in the X_t series in the (n×1) vector and also the (d-b) order of integration in the linear combination of the series in this vector (b>0), there is cointegration in the vector X_t component with the d, b order (X_t~ CI(d,b)) (Enders, 2004; Engle and Granger, 1991; Juselius, 2006; Banerjee et al., 1993).

The model of cointegration is represented by the Vector Error Correction model (VECM) shown below (Johansen and Juselius, 1990; Lütkepohl, 2004):

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \ldots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \varepsilon_t \qquad (6.12)$$

where $\Gamma_i = -(I - A_1 - \ldots - A_i)$

$\Pi = -(I - A_1 - \ldots - A_k)$

i = 1,2,3,...k-1

X_t is the vector of the I(1) series in which $X_t = A_1 X_{t-1} + \ldots + A_k X_{t-k} + u_t$

Π is the vector of the long-run coefficient matrix

Γ is the vector of the short-run coefficient matrix

ε_t is the error term (ε_t~IID($0, \sigma^2$))

If the rank of matrix Π (r) is greater than zero and r < p, we can therefore show that $\Pi = \alpha\beta'$ (Johansen and Juselius, 1990). $\beta' X_t$ has an I(0) process, there is cointegration in the series (X_t) which have β as the vector of cointegration (long-run coefficients matrix), α is the matrix of the adjustment parameter indicating the variable adjustment from the long-run equilibrium, and r is the cointegrating vector number (Mousa, 2010; Johansen, 1988; Johansen and Juselius, 1990; Belke et al., 2012; Harris and Sollis, 2003).

In order to test the cointegration of the series, Johansen introduced two types of tests: (1) the likelihood ratio trace statistic (λ trace) and (2) the maximum eigenvalue statistic (λ max), described below (Johansen, 1988; 1992; Mousa, 2010; Brooks, 2008):

$$\lambda trace = -T\sum_{i=r+1}^{g} \ln(1-\lambda_i)$$

$$\lambda \max = -T\ln(1-\lambda_{r+1})$$

where r is the cointegrating vector number and r = 0,1,2,3,...,n-2,n-1

λ is the eigenvalues of order i and r+1

T is the observation number

Brooks (2008), Lütkepohl (2004) and Enders (2004) state that the null hypothesis of the λ trace statistic is that an r or less than r cointegrating vector and the alternative hypothesis is there is a more than an r cointegrating vector number. On the other hand, there is an r cointegrating vector in the null hypothesis of the λ max statistic and there is an r+1 cointegrating vector in its alternative hypothesis (Brooks, 2008). After using the test statistics above and indicating the number of cointegrating vectors, we can then estimate the long-run relationship of the variables from the β matrix.

Furthermore, a restriction needs to be imposed in the cointegration model in order to test for weak exogeneity. This test is performed in order to ensure that no cointegration relationship is entered into the equation of each of the determinants in the X_t vector, thus confirming that the right hand side of the short-run ECM equation can be modeled with each of the I(1) series in the X_t vector (Harris and Sollis, 2003). Johansen (1992), Enders (2004), Brooks (2008) and Johansen and Juselius (1992) point out that this can be done by applying the restriction that α=0 as is the null hypothesis against the alternative that $\alpha \neq 0$ and employing the likelihood ratio test statistic (LR) as follows:

$$\mathrm{LR} = \mathrm{T}\sum_{i=1}^{r} \ln\left\{\left(1-\hat{\lambda}_i^{*}\right)/\left(1-\hat{\lambda}_i\right)\right\}$$

where $\hat{\lambda}^{*}$ is the unrestricted characteristic root

$\hat{\lambda}$ is the restricted characteristic root

r is the unrestricted characteristic root number

T is the number of observations

If the chi-square statistic of this test indicates non-rejection of the null hypothesis, it means that the long-run coefficient is not affected by other cointegration relations or past disequilibrium feedback (Bredin et al., 2001; Johansen, 1992; Kirchgässner and Wolters, 2008).

After we obtain the long-run relationship by using the VECM model explained previously, the short-run relationship of the model is now estimated by using the Error Correction Model (ECM model). The short-run relationship equation can be shown by the dynamic short-run model as follows (Brooks, 2008; Enders, 2004; Banerjee et al., 1993):

$$\Delta y_t = \beta_0 + \sum_{i=1}^{k} \beta_{1,k} \Delta x_{t-k} + \beta_2 ECM_{t-1} + \varepsilon_t \qquad (6.13)$$

where ECM is the error correction term equal to $y_t - \sum_{i=1}^{k} \gamma_{1,k} x_{t-k}$

γ is the long-run coefficient from the cointegrating vector β

β_1 is the short-run coefficient for this model

β_2 is the error correction term coefficient explaining the speed of equilibrium adjustment.

This short-run dynamic model is estimated by the standard OLS technique in order to obtain the short-run relationship of the model (Rehman, 2004). This dynamic model is employed by many studies of interest rate pass-through to examine the short-run effect of the policy interest rate on retail interest rates (Fomum, 2011; Rehman, 2004; Aziakpono and Wilson, 2010; Mojon, 2000; Kusmiarso et al., 2002). The model estimation in this chapter is performed by Pcgive 13.10.

6.4 Empirical results

This section presents the results obtained from the model estimation and is divided into four sub-sections: (1) unit root test, (2) cointegration test, (3) interest rate pass-through model, and (4) the effect of financial sector development on interest rate pass-through.

6.4.1 Unit root test

The results for the unit root tests of each series as listed in table 6.2 are presented in table 6.5.

Table 6.5 clearly shows that the series used in the model estimation have an I(1) process. The ADF tests show a non-rejection of the null hypothesis of the unit root at the level form, while there is rejection of the null hypothesis at the first different form of the series. The KPSS also confirms the I(1) process of the series. The LM statistic shows rejection of the null hypothesis of the stationary series at the level form, while showing non-rejection of the null hypothesis in the first difference form.

Table6.5: The result of unit root test for the series in the model

Variable	ADF		KPSS	
	level	First difference	level	First difference
mlr	-1.3874	-6.5880***	0.4840**	0.1273
mrr	-1.5705	-3.7191***	0.6851**	0.1324
3tdep	-1.4005	-8.0221***	0.6044**	0.1144
6tdep	-0.9747	-9.4319***	0.5125**	0.1075
12tdep	-2.1776	-5.5214***	0.7078**	0.0889
2ytdep	-1.5407	-6.8954***	0.5330**	0.1120
sav	-0.7361	-7.3962***	0.3704*	0.1686
mp	-2.4983	-9.0832***	0.4423*	0.0355
mpfd1	-2.4741	-9.2035***	0.4273*	0.0367
mpfd2	-1.8125	-9.1660***	0.4355*	0.0358
mpfd3	-2.1121	-10.1313***	0.4224*	0.0386
mpfd4	-2.4301	-9.0477***	0.4264*	0.0938
mpfd5	-1.3453	-10.4383***	0.3650*	0.0363
mpfd6	-2.3201	-10.9860***	0.3485*	0.0538

Note: *, **, *** means the rejection of the null hypothesis of unit root at 10 percent, 5 percent, and 1 percent respectively. This unit root test is performed in the intercept only as the graph presents in figure 6.2 shows that the series have the intercept in their property.

6.4.2 Cointegration test

To ensure that the series used in the model estimation have an I(1) process, the cointegration test can be performed. In this case, the groups of the series in each model have to be tested separately in order to check for the cointegration relationship and the number of cointegrating vectors in each model. Table 6.6 presents the results of this test.

The results from the λ trace statistic show that the series used in each model have a cointegration relationship with one cointegrating vector. This is because there is a rejection of the null hypothesis of no cointegration vector (the number of cointegrating vectors is equal to zero), while there is non-rejection of the null hypothesis of one cointegrating vector. These results thus confirm that the model of interest rate pass-through, as well as the model of the effect of financial development on the pass-through, can be estimated by the VECM model to obtain the long-run relationship of the variables.

Table6.6: The result of the cointegration test for the series in the model

Set of the variables including in the model estimation	rank	Trace statistic	rank	Trace statistic
Interest rate pass-through model				
mlr, mp	0	79.511*** [0.000]	1	2.8793 [0.090]
mrr, mp	0	75.571*** [0.000]	1	1.8488 [0.174]
3tdep, mp	0	29.762*** [0.000]	1	2.0057 [0.157]
6tdep, mp	0	33.403*** [0.000]	1	1.8162 [0.178]8
12tdep, mp	0	37.071*** [0.000]	1	1.7196 [0.190]
2ytdep, mp	0	30.546*** [0.000]	1	1.0584 [0.304]
sav, mp	0	30.035*** [0.000]	1	0.9249 [0.336]

Set of the variables including in the model estimation	rank	Trace statistic	rank	Trace statistic	rank	Trace statistic
The model of the effect of financial sector development on the interest rate pass-through						
mlr, mp, mpfd1	0	99.030*** [0.000]	1	13.937 [0.084]	2	1.8836 [0.170]
mlr, mp, mpfd2	0	82.892*** [0.000]	1	5.4742 [0.757]	2	1.6067 [0.205]
mlr, mp, mpfd3	0	77.611*** [0.000]	1	5.9046 [0.709]	2	2.4642 [0.116]
mlr, mp, mpfd4	0	87.758*** [0.000]	1	8.6204 [0.409]	2	2.4073 [0.121]
mlr, mp, mpfd5	0	93.140*** [0.000]	1	9.9490 [0.290]	2	1.4057 [0.236]
mlr, mp, mpfd6	0	99.028*** [0.000]	1	7.8817 [0.485]	2	2.7477 [0.097]
mlr, mp, mpfd7	0	99.030*** [0.000]	1	13.937 [0.084]	2	1.8836 [0.170]

Note: *, **, *** means the rejection of the null hypothesis of no cointegration among the series at 10 percent, 5 percent, and 1 percent respectively. [-] represents the probability of the rejection of the null hypothesis. Before performing the Johansen cointegration test, the VAR model up to lag 4^{th} is performed and the VAR model with intercept and 2 lag is chosen based on the lowest of the AIC information criteria. This lag length selection in VAR is performed in Eviews 7.0.

Table 6.6 (cont'd):The result of the cointegration test for the series in the model

Set of the variables including in the model estimation	rank	Trace statistic	rank	Trace statistic	rank	Trace statistic
The model of the effect of financial sector development on the interest rate pass-through						
mrr, mp, mpfd1	0	95.248*** [0.000]	1	11.875 [0.165]	2	1.3387 [0.247]
mrr, mp, mpfd2	0	79.298*** [0.000]	1	4.9757 [0.809]	2	1.1274 [0.288]
mrr, mp, mpfd3	0	78.793*** [0.000]	1	4.6641 [0.840]	2	1.8282 [0.176]
mrr, mp, mpfd4	0	82.363*** [0.000]	1	7.9657 [0.476]	2	1.9715 [0.160]
mrr, mp, mpfd5	0	80.598*** [0.000]	1	5.7267 [0.729]	2	2.1465 [0.143]
mrr, mp, mpfd6	0	87.776*** [0.000]	1	6.9700 [0.587]	2	1.7618 [0.184]
3tdep, mp, mpfd1	0	41.092*** [0.001]	1	13.279 [0.105]	2	2.6870 [0.101]
3tdep , mp, mpfd2	0	43.101*** [0.001]	1	4.7495 [0.832]	2	1.4339 [0.231]
3tdep , mp, mpfd3	0	40.916*** [0.001]	1	4.4428 [0.860]	2	2.1176 [0.146]
3tdep , mp, mpfd4	0	39.559*** [0.002]	1	5.9410 [0.705]	2	2.0947 [0.148]
3tdep , mp, mpfd5	0	36.636*** [0.006]	1	8.6013 [0.411]	2	1.9089 [0.167]
3tdep , mp, mpfd6	0	55.842*** [0.000]	1	6.6175 [0.628]	2	2.0195 [0.155]

Note: *, **, *** means the rejection of the null hypothesis of no cointegration among the series at 10 percent, 5 percent, and 1 percent respectively. [-] represents the probability of the rejection of the null hypothesis. Before performing the Johansen cointegration test, the VAR model up to lag 4^{th} is performed and the VAR model with intercept and 2 lag is chosen based on the lowest of the AIC information criteria. This lag length selection in VAR is performed in Eviews 7.0.

Table 6.6 (cont'd):The result of the cointegration test for the series in the model

The model of the effect of financial sector development on the interest rate pass-through	rank	Trace statistic	rank	Trace statistic	rank	Trace statistic
6tdep, mp, mpfd1	0	43.031*** [0.001]	1	11.287 [0.197]	2	1.9938 [0.158]
6tdep , mp, mpfd2	0	52.543*** [0.000]	1	5.3479 [0.771]	2	2.1796 [0.140]
6tdep , mp, mpfd3	0	43.248*** [0.001]	1	4.1800 [0.883]	2	2.0206 [0.155]
6tdep , mp, mpfd4	0	42.168*** [0.001]	1	6.3629 [0.657]	2	1.8736 [0.171]
6tdep , mp, mpfd5	0	40.001*** [0.002]	1	8.1954 .[0.452]	2	1.5832 [0.208]
6tdep , mp, mpfd6	0	58.821*** [0.000]	1	6.4669 [0.645]	2	1.8239 [0.177]

The model of the effect of financial sector development on the interest rate pass-through	rank	Trace statistic	rank	Trace statistic	rank	Trace statistic
12tdep, mp, mpfd1	0	42.535*** [0.001]	1	6.8421 [0.602]	2	2.3619 [0.124]
12tdep, mp, mpfd2	0	57.129*** [0.000]	1	5.0541 [0.801]	2	1.2769 [0.258]
12tdep, mp, mpfd3	0	64.316*** [0.000]	1	4.1523 [0.885]	2	1.6369 .[0.201]
12tdep, mp, mpfd4	0	46.549*** [0.000]	1	5.3209 [0.774]	2	1.9192 [0.166]
12tdep, mp, mpfd5	0	43.298*** [0.001]	1	6.6621 [0.623]	2	1.3111 [0.252]
12tdep, mp, mpfd6	0	65.338*** [0.000]	1	6.6880 [0.620]	2	1.7124 [0.191]

Note: *, **, *** means the rejection of the null hypothesis of no cointegration among the series at 10 percent, 5 percent, and 1 percent respectively. [-] represents the probability of the rejection of the null hypothesis. Before performing the Johansen cointegration test, the VAR model up to lag 4^{th} is performed and the VAR model with intercept and 2 lag is chosen based on the lowest of the AIC information criteria. This lag length selection in VAR is performed in Eviews 7.0.

Table 6.6 (cont'd):The result of the cointegration test for the series in the model

The model of the effect of financial sector development on the interest rate pass-through	rank	Trace statistic	rank	Trace statistic	rank	Trace statistic
2ytdep, mp, mpfd1	0	43.031*** [0.001]	1	11.287 [0.197]	2	1.9938 [0.158]
2ytdep, mp, mpfd2	0	37.482*** [0.005]	1	3.6275 [0.924]	2	0.8629 [0.353]
2ytdep, mp, mpfd3	0	45.635*** [0.000]	1	3.6286 [0.924]	2	1.0847 [0.298]
2ytdep, mp, mpfd4	0	37.086*** [0.005]	1	5.4364 [0.761]	2	1.1609 [0.281]
2ytdep, mp, mpfd5	0	36.000*** [0.008]	1	6.8427 [0.602]	2	1.1962 [0.274]
2ytdep, mp, mpfd6	0	46.771*** [0.000]	1	5.9151 [0.708]	2	1.0290 [0.310]

The model of the effect of financial sector development on the interest rate pass-through	rank	Trace statistic	rank	Trace statistic	rank	Trace statistic
sav, mp, mpfd1	0	37.196*** [0.005]	1	5.5501 [0.749]	2	1.5979 [0.206]
sav , mp, mpfd2	0	45.396*** [0.000]	1	8.1927 [0.452]	2	1.9890 [0.158]
sav , mp, mpfd3	0	36.497*** [0.007]	1	6.4231 [0.650]	2	2.1005 [0.147]
sav , mp, mpfd4	0	36.955*** [0.006]	1	6.7134 [0.617]	2	1.0444 [0.307]
sav , mp, mpfd5	0	45.916*** [0.000]	1	9.9370 [0.291]	2	2.2654 [0.132]
sav, mp, mpfd6	0	39.099*** [0.003]	1	6.9365 [0.591]	2	1.0165 [0.313]

Note: *, **, *** means the rejection of the null hypothesis of no cointegration among the series at 10 percent, 5 percent, and 1 percent respectively. [-] represents the probability of the rejection of the null hypothesis. Before performing the Johansen cointegration test, the VAR model up to lag 4^{th} is performed and the VAR model with intercept and 2 lag is chosen based on the lowest of the AIC information criteria. This lag length selection in VAR is performed in Eviews 7.0.

6.4.3 Interest rate pass-through model

After ensuring that we have a cointegrating relationship in the model, we start by estimating the long-run pass-through model described previously in section 6.3.1 (model 6.2). The seven long-run pass-through models are estimated in terms of the different retail interest rates used in each model.

In order to test for weak exogeneity, each long-run pass-through model is imposed with the restriction that the coefficients of the policy rate variable (mp) in the α matrix are equal to zero to ensure that our models are not affected by other cointegration relations.

The restriction that the coefficient of each of the retail interest rates in the β matrix is equal to one needs to be imposed to ensure that this variable is the dependence variable in the model (normalisation)[37]. The result of the restriction test is shown in table 6.7 and the chi-square statistic of the LR restriction test shows non-rejection of the null hypothesis of the restriction imposed, ensuring that our long-run coefficient is not affected by past disequilibrium feedback, and the short-run pass-through model can be estimated.

[37] The VECM model in this interest rate pass-through model, as shown in section 6.3.1 subsection 1.1, is as follows:

$$\begin{bmatrix} \Delta R_t \\ \Delta mp_t \end{bmatrix} = \Gamma_1 \begin{bmatrix} \Delta R_{t-1} \\ \Delta mp_{t-1} \end{bmatrix} + \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \end{bmatrix} \left[\beta_{11} \beta_{12} \right] \begin{bmatrix} R_{t-1} \\ mp_{t-1} \end{bmatrix} + \varepsilon_t$$

The following restrictions are imposed: α_{21} =0 and β_{11} =1.

Table6.7: The result of the long-run pass-through model

Inependent variable /dependent variable	mlr Coef.	mrr Coef.	3tdep Coef.	6tdep Coef.	12tdep Coef.	2ytdep Coef.	sav
mp	0.7985 (0.0346)	0.7831 (0.0371)	0.7749 (0.0887)	0.7789 (0.0613)	0.8016 (0.0870)	0.8136 (0.0754)	0.7167 (0.0819)
Chi-square statistic (the restriction: α_{21}=0 and β_{11}=1)	0.8121 [0.3675]	2.1841 [0.1394]	2.0750 [0.1497]	2.2719 [0.1521]	1.7086 [0.1912]	2.0595 [0.1513]	2.6907 [0.1009]
Chi-square statistic (the restriction: α_{21}=0 and β_{11}=1, β_{12} = -1)	14.361*** [0.0008]	15.302*** [0.0005]	6.5621** [0.0376]	8.8561** [0.0119]	5.0159** [0.0251]	4.7829* [0.0915]	5.8247* [0.0543]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5%, and 1% respectively.

The results from table 6.7 show an incomplete degree of long-run interest rate pass-through in Thailand, with a considerably high degree of pass-through in the retail interest rates (around 0.71-0.81). This result is in line with the theoretical explanation in section 6.2.2, as interest rate pass-through can be incomplete due to several important factors which cause stickiness in the interest rate (credit rationing and the risk sharing behaviour of banks, the asymmetric information problem and the costs faced by banks and investors, namely switching cost and adjustment cost). The results of an incomplete long-run pass-through with a relatively high degree of pass-through is supported by many empirical papers, both in developed countries (Bredin et al., 2001; Hansen and Welz, 2011; Kwapil and Scharler, 2007; Liu et al., 2005; Egert et al., 2006; De Bondt, 2005; Cottarelli et al., 1995) and in developing countries (Fomum, 2011; Bangura, 2011; Amarasekara, 2005; Bonga-Bonga, 2009; Horváth et al., 2004; Hanif and Khan, 2012; Chirlesan and Aposstoaie, 2012). Furthermore, as our results show a considerably high degree of pass-through, it is possible that the degree of this can be equal to one or a full degree of pass-through. Therefore, another joint restriction is performed to check for the full degree of long-run pass-through. This is done by adding another restriction, that the coefficient of the policy interest rate in the cointegrating vector is equal to one ($\beta_{12} = -1$)[38]. We find from table 6.7 that the null hypothesis of this restriction is rejected, thus confirming that the degree of interest rate pass-through in the long-run is still at the considerably high level described previously.

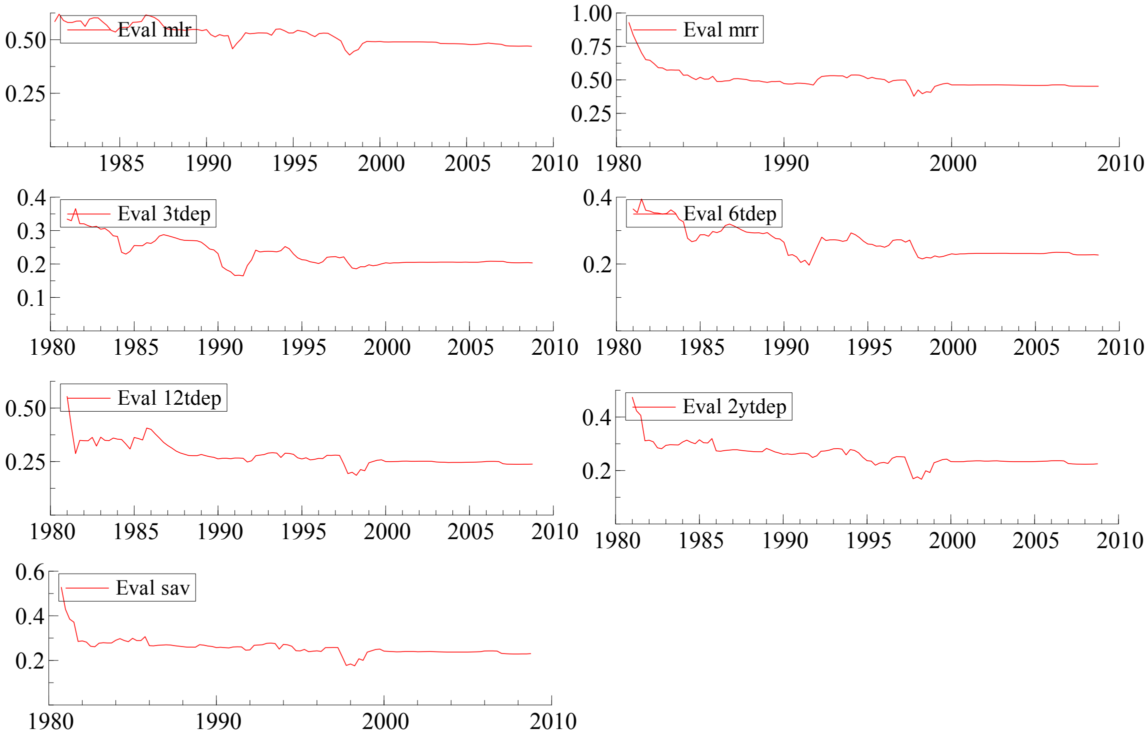
[38] The joint restrictions that we impose are as follows: $\alpha_{21}=0$, $\beta_{11}=1$, and $\beta_{12} = -1$.

Our results show a similar high degree of long-run pass-through in Thailand compared with other studies of the country (Charoenseang and Manakit, 2007; Rehman, 2004). We discussed previously in section 6.2.2 that financial development is also an important factor which causes a higher degree of pass-through. Therefore, the significantly high long-run degree of pass-through in our study was probably caused by the financial sector development which took place in Thailand during our study period (1978-2008), as explained in chapter 3.

Our study of different maturities of deposit interest rates shows that the higher maturities show a higher degree of long-run pass-through. This finding is similar to the studies by Espinosa-Vega and Rebucci (2004). Larrain (2005) and Cokayne (2009) state that when the interest rate series have the mean reversion property (stationary series), the effect of the policy interest rate on the short-term interest rate will be higher than the long-term ones. The interest rate series in the long-run pass-through model are considered to be an I(1) (no mean reversion), thus the effect of the policy interest rate will become higher in the long-run retail interest rate than the short-run.

Furthermore, recursive estimation is also performed to examine for the effect of structural changes on the cointegrating vector. The recursive graph of every model in table 6.7 is shown in figure 6.3.

Figure 6.3: The recursive estimation of the eigenvalue of the cointegrating vector (the baseline interest rate pass-through model)

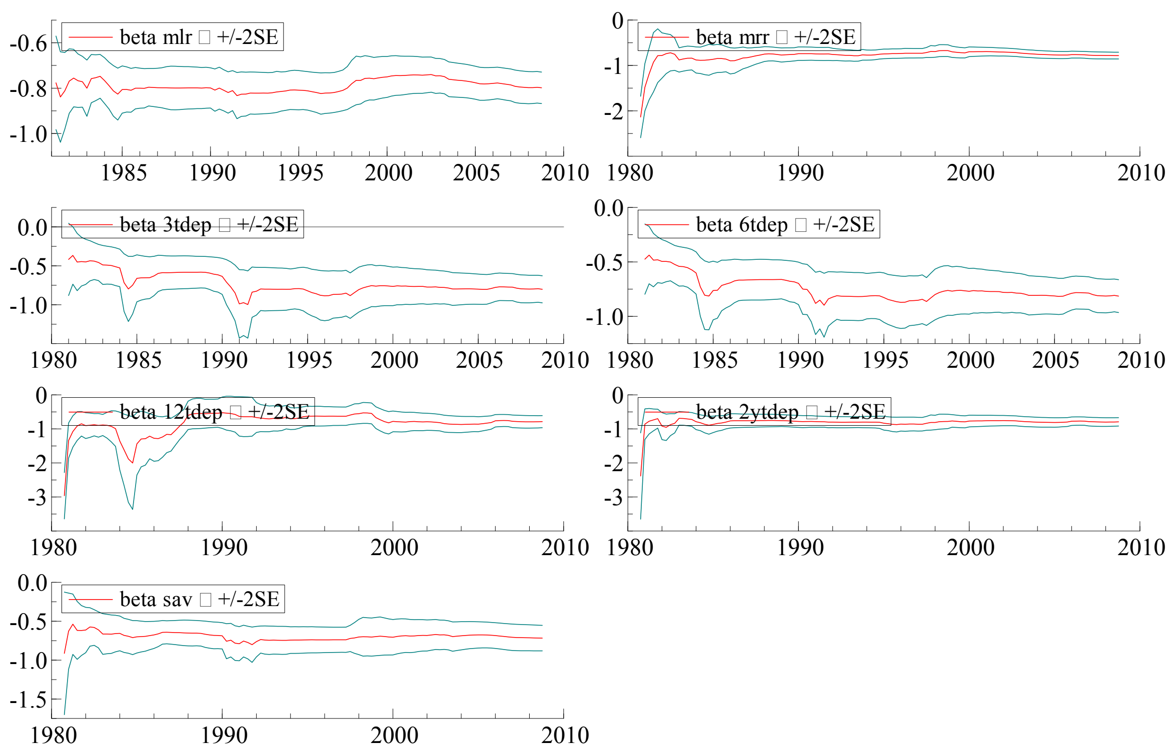


<u>Note:</u> the eigenvalue of each long-run pass-through model is performed in each different retail interest rate equations. Eval mlr, Eval mrr, Eval 3tdep, Eval 6tdep, Eval 12tdep, Eval 2ytdep, and Eval sav represent the eigenvalue of the cointegrating vector of the long-run interest rate pass-through equations of minimum lending rate, minimum retail rate, 3 month deposit interest rate, 6 month deposit interest rate, 12 month deposit interest rate, 2 year deposit interest rate, and saving interest rate respectively.

The results for all the eigenvalues in each equation show their stability throughout the study period, with slight changes taking place, especially during 1997Q4. This was possibly due to the effect of the financial crisis in Thailand in 1997, which had a profound effect on the financial market and institutions. Although there is a change in the eigenvalues during 1997, this change has little effect on the eigenvalues as we do not see the sharp break of the recursive graph of the eigenvalues during this period and the recursive graph still remains stable until 2008.

We also perform recursive estimations of the β coefficient (the coefficient of the degree of pass-through) in order to obtain the result of the change in the degree of pass-through during the study period, as the change in the eigenvalues also resulted from the change in the β coefficient. The recursive graph is shown in figure 6.4.

Figure 6.4: The recursive estimation of the β coefficient (the baseline interest rate pass-through model)



<u>Note:</u> the β coefficient of each long-run pass-through model is performed in each different retail interest rate equations. Beta mlr, beta mrr, beta 3tdep, beta 6tdep, beta 12tdep, beta 2ytdep, and beta sav represent the β coefficient of the cointegrating vector of the long-run interest rate pass-through equations of minimum lending rate, minimum retail rate, 3 month deposit interest rate, 6 month deposit interest rate, 12 month deposit interest rate, 2 year deposit interest rate, and saving interest rate respectively.

The β coefficients in all the lending and deposit interest rate equations show a positive sign and lie within the +/-2standard error band. All the β coefficients also present stability, with some changes occurring in specific periods. The long-run pass-through degree of both lending and deposit interest rates tends to adjust upwards during the periods 1984Q1 and 1991Q1. The increase in pass-through during 1984Q1 was possibly due to the adjustment by commercial banks of the short-term deposit interest structure. In this case, the 3 and 6 month deposit interest rate ceilings were adjusted upwards to achieve an interest rate level comparable to the 12 month-deposit rate (BOT, 1984). This adjustment may have caused the increase in the interest rate pass-through, especially with regard to the 3 and 6 month deposit interest rates. Moreover, transferable deposit certificates were introduced in this period for short-term deposit interest rate mobilization. We discussed in section 6.2.2 that the introduction of a new financial instrument can lead to a higher degree of pass-through as a result of the higher demand elasticity of deposits and loans. Therefore, this can cause an upward adjustment of the β coefficients. The upward movement of the β coefficients also comes from the effect of the financial liberalization which began in 1990. The effect of the relaxation of the retail interest rate ceiling in Thailand, and other deregulation policies, resulted in a higher degree of pass-through, mostly shown in the increase of the β coefficients during 1991Q1. The β coefficients also show negative adjustment during the period 1997Q4, possibly due to the effect of financial crisis. Horváth et al. (2004), Frisancho-Mariscal and Howells (2010) and Karagiannis et al. (2010) state that financial crisis in a country can lead to the problem of financial market volatility and market uncertainty. This leads to a relatively low level of interest rate pass-through, as banks will face higher credit risk, adjustment costs and the asymmetric information problem.

After discussing the results of the long-run pass-through model, it is now important to analyse short-run pass-through. This model is estimated by the error correction model explained previously in section 6.3.1 (model 6.3). The results of this are shown in table 6.8 below.

Table6.8: The result of the short-run pass-through model

Independent variable /dependent variable	mlr Coef.	mrr Coef.	3tdep Coef.	6tdep Coef.	12tdep Coef.	2ytdep Coef.	sav Coef.
Lag of dependent variable(-1)	-0.0136	0.2098**	0.1168	0.0729	0.2196**	0.3212***	0.2699**
	(0.1212)	(0.1056)	(0.0833)	(0.0857)	(0.1048)	(0.0817)	(0.1177)
Lag of dependent variable(-2)	0.1111*	0.1352***	0.0796	0.1078**	0.1248***	0.0591	-0.0477
	(0.0586)	(0.0513)	(0.0602)	(0.0516)	(0.0452)	(0.0386)	(0.1029)
constant	0.4486**	0.2963*	0.0081	-0.0113	0.0472	0.1137	-0.0561*
	(0.2188)	(0.1696)	(0.0559)	(0.0531)	(0.0469)	(0.0901)	(0.0328)
Δ mp (-1)	0.1641***	0.0371*	0.1430***	0.1531***	0.0767***	0.0147	0.0529**
	(0.0475)	(0.0190)	(0.0333)	(0.0350)	(0.0258)	(0.0269)	(0.0224)
Δ mp (-2)	0.0635*	0.0887***	0.0410	0.0333	0.1145***	0.1012***	-0.0008
	(0.0348)	(0.0303)	(0.0254)	(0.0247)	(0.0288)	(0.0240)	(0.0208)
Ecm(-1)	-0.0841**	-0.0605**	-0.0400*	-0.0539*	-0.0371*	-0.0621*	-0.0608*
	(0.0391)	(0.0302)	(0.0240)	(0.0292)	(0.0202)	(0.0324)	(0.0311)
AR 1-5 test	1.5554	1.7374	0.1333	0.4889	0.2733	0.6871	0.3645
	[0.1787]	[0.1806]	[0.9844]	[0.7839]	[0.9268]	[0.5048]	[0.8718]
ARCH 1-4 test	3.1216**	0.2869	0.2015	0.2112	0.1463	1.5670	0.4092
	[0.0178]	[0.7511]	[0.9370]	[0.9317]	[0.9643]	[0.2130]	[0.8016]
Normality test	5.8953	7.9213**	27.7420***	24.9370***	25.510***	18.407***	39.980***
	[0.0525]	[0.0191]	[0.0000]	[0.0000]	[0.0000]	[0.0001]	[0.0000]
Hetero test	1.0943	0.9298	1.7106	1.8142	1.6402	1.2654	1.8481
	[0.3729]	[0.4950]	[0.0742]	[0.0662]	[0.0910]	[0.2687]	[0.0851]
Hetero-X test	1.1071	0.7519	1.2930	1.3096	1.2539	1.7610	1.6302
	[0.3547]	[0.7175]	[0.1832]	[0.1909]	[0.2119]	[0.0543]	[0.1156]
RESET23 test	3.8719**	0.8335	3.1484**	2.6144	2.3362	1.4008	0.1277
	[0.0236]	[0.4372]	[0.0467]	[0.0777]	[0.1013]	[0.2506]	[0.8802]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *,**, *** means the rejection of the null hypothesis of the restriction at 10%, 5%, and 1% respectively.

Table 6.8 shows that there is an incomplete degree of short-run interest rate pass-through in Thailand, with a relatively lower degree of pass-through compared with the long-run (around 0.05 to 0.16 degrees of pass-through compared with 0.71 to 0.82 in the long-run). This result is confirmed by our theoretical explanations. Our result is supported by other studies, which also find incomplete short-run pass-through, with a noticeably lower degree of pass-through compared with the long-run (Samba and Yan, 2010; Bredin et al., 2001; Kwapil and Scharler, 2007; Kazaziová, 2010; Aydin, 2010; Liu et al., 2005; Egert et al., 2006; Singh et al., 2008; Belke et al., 2012; Fomum, 2011; Bangura, 2011; Aziakpono and Wilson, 2010; Marotta,2007). Compared with research on Thailand (Charoenseang and Manakit, 2007; Rehman, 2004; Tai et al., 2012), the results from these studies also confirm that the degree of long-run pass-through is considerably higher than that of the short-run.

The short-run degree of pass-through in lending interest rates is comparably higher than the deposit rates. The outcomes from the different maturity studies also indicate a relatively higher degree of pass-through in lower maturity interest rates (short-term deposit rates) than higher ones. This finding is also supported by Espinosa-Vega and Rebucci (2004) and Kazaziová (2010). The effect of the policy rate on the short-term interest rates will be higher than the long-term ones as the interest rate series in the short-run model have a mean reversion property (all series are in first difference with the I(0) property). For the speed of adjustment of pass-through, every short-run pass-through model in table 6.8 shows a significant negative sign of the coefficient of the ECM term. This finding is also supported by our theoretical expectation.

Moreover, the results from almost all the diagnostic tests in each short-run model show significant non-rejection of the null hypothesis of the following tests: Normality test, AR test, ARCH test, Hetero test and RESET test. This ensures that our results have a normal distribution, no autocorrelation, no heteroscedasticity, and have a linearity of the series respectively. However, the short-run models still show non-normality detection. This is because the outlier resulted from some structural changes which took place in the study period (as explained in the data description in section 6.3.2). Although this occurred during our study period, it has been argued that the inclusion of dummy variables as an exogenous variable or an unrestricted variable in the VECM model to control for these structural changes will have an effect on the underlying distribution of the Johansen cointegration test statistics (Harris and Sollis, 2003; Doornik et al., 1998; Juselius, 2006). In addition, it is difficult to include the same set of dummy variables in different equations as the structural change in different equations will not coincide due to the fact that our study considers pass-through in different types of retail interest rates.

The recursive graph of the β coefficients in each of the short-run pass-through models can be seen in figure 6.5. The β coefficients of the mp variable in each of the short-run pass-through models present a similar pattern to the long-run pass-through model, with the movement of the β coefficient within the +/-2 standard error band. There is also an upward adjustment of the degree of pass-through during the 1984Q1 and 1991Q1 periods due to the effect of the time deposit interest rate structural change and financial liberalization respectively. The negative adjustment of the degree of pass-through can be seen during 1997Q4 due to the effect of the financial crisis in the country. The result from the break point Chow test and forecast Chow test show that the F-statistic is below the critical value of 5 per cent and confirms that our result is stable. However, the 1 step Chow test and the 1 step residual still show a value which lies outside the critical value during 1984Q1, 1991Q1 and 1997Q4, representing the structural changes in the country discussed earlier.

Figure 6.5: The recursive estimation of the short-run interest rate pass-through model

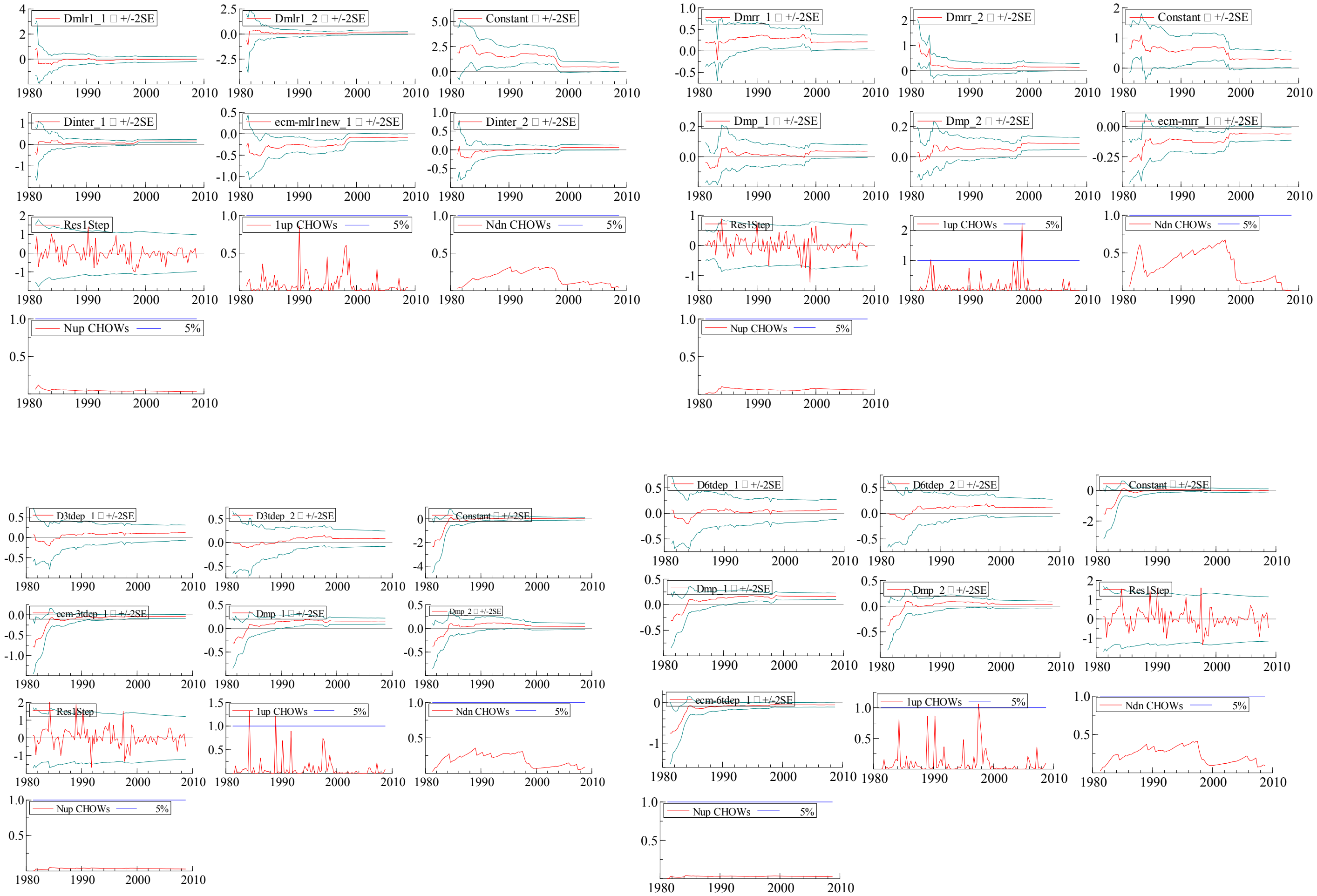
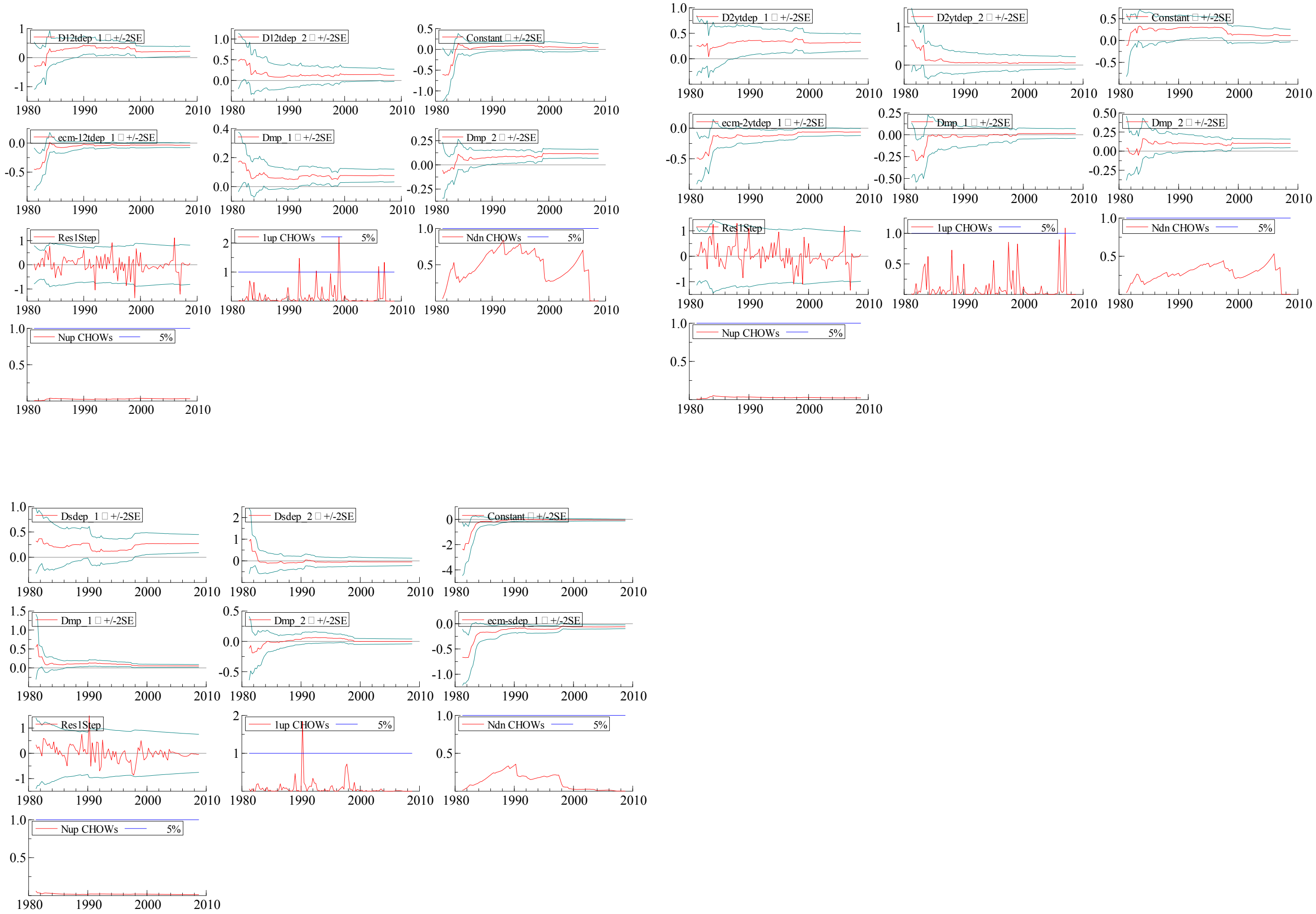


Figure 6.5 (cont'd): The recursive estimation of the short-run interest rate pass-through model



Overall, there is a high degree of interest rate pass-through in Thailand, with a relatively higher degree in the long-run than the short-run. This is due to the financial development in the country which took place during our study period and thus caused a high degree of interest rate pass-through. Our result shows that high maturity interest rates (long-term deposit interest rates) will have a higher degree of pass-through in the long-run, while low maturity interest rates (short-term deposit interest rates) will have a high degree of pass-through in the short-run. This is because the interest rate pass-through in the short-run has a mean reversion property, and thus the effect of the policy interest rate on the short-term interest rate will be higher than the long-term ones.

6.4.4 The effect of financial sector development on interest rate pass-through

We start by estimating the long-run pass-through models described previously in section 6.3.1 (model 6.4). These models are estimated in terms of the different retail interest rates and the financial sector development indicators used in each model. Each model is already imposed with the restriction that the α matrix of the coefficient of policy rate variable (mp) and the interaction term between the policy interest rate and each of the financial sector development indicators (mpfd) are equal to zero[39]. Additionally, there is the restriction that the coefficient of each of the retail interest rates (Rt) in the β matrix is normalised to one. The chi-square statistic of the restriction test in the long-run pass-through model shows non-rejection of the

[39] The VECM model in this interest rate pass-through model, as shown in section 6.3.2, subsection 2.1, is:

$$\begin{bmatrix} \Delta R_t \\ \Delta mp_t \\ \Delta(mpfd)_t \end{bmatrix} = \Gamma_1 \begin{bmatrix} \Delta R_{t-1} \\ \Delta mp_{t-1} \\ \Delta(mpfd)_t \end{bmatrix} + \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \\ \alpha_{31} \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} \end{bmatrix} \begin{bmatrix} R_{t-1} \\ mp_{t-1} \\ (mpfd)_{t-1} \end{bmatrix} + \varepsilon_t$$

The restrictions are imposed as follows: α_{21}=0, $\alpha_{31} = 0$ and β_{11}=1.

null hypothesis, ensuring that our long-run coefficient is not affected by other past disequilibrium feedback and the short-run pass-through model can be estimated. We now explain the results of each of the effects of financial development on the long- and short-run pass-through models below.

Tables 6.9 and 6.10 present the long- and short-run pass-through results of the effect of banking sector development (size measure: fd1) on the pass-through of each retail interest rate. For the pass-through result (coefficient of mp), we find a relatively high degree of pass-through, with the long-run pass-through (0.71-0.86) more than the short-run (0.10-0.25). A higher maturity of the deposit interest rates results in a higher degree of pass-through, especially in the long-run, while lower maturity shows a higher degree of pass-through in the short-run. This result is also in line with the pass-through results explained previously. The ECM term shows a significant negative effect, supporting our theoretical expectation. We reject another joint restriction, that the coefficient of the policy interest rate in the cointegrating vector is equal to one ($\beta_{12} = -1$)[40], thus ensuring that our pass-through result is not equal to one.

The results mainly show a significant negative effect of the interaction term between this indicator and the policy interest rate on the lending rates both in the long-run (-0.18 and -0.25 in mlr and mrr) and short-run (-0.15 and -0.05 in mrr and mlr) models of pass-through. On the other hand, the results show an insignificant effect on all the deposit rates in the long-run and a significant effect in the short-run only in the short-term deposit rates (3 and 6 month deposit

[40] The joint restrictions that we impose are as follows: α_{21}=0 , β_{11} =1, and $\beta_{12} = -1$.

rates) and saving interest rate (around -0.08 to -0.20). Although this indicator has an insignificant effect on all the deposit rates in the long-run, it shows that the inclusion of this interaction term still leads to a lower degree of pass-through of deposit rates, compared with the degree of pass-through before its inclusion (the lower coefficient of mp variable in deposit rates equations shown in table 6.9, compared with the mp coefficient of deposit rates equations shown in table 6.7). Hence, this result confirms that the effect of the size measure of banking sector development still leads to a lower pass-through of lending and deposit rates in Thailand, especially in the lending rates and short-term deposit rate. This is in line with our theoretical expectation, as a greater bank size will show a greater degree of financial intermediation and a greater influence of banks on borrowers and depositors. Hence, this reduces the demand elasticity of loans and deposits and leads to a lower degree of pass-through and the weakening of the interest rate channel.

Table6.9: The result of the effect of financial sector development on the long-run pass-through model (size measure of banking sector development: FD1)

FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD1	mp	0.8483	0.8678	0.7942	0.7801	0.8039	0.8121	0.7189
		(0.0487)	(0.0750)	(0.1279)	(0.2138)	(0.1227)	(0.0879)	(0.1336)
	mpfd1	-0.1801	-0.2515	-0.1194	-0.1143	-0.1958	-0.1124	-0.3985
		(0.0718)	(0.0487)	(0.1905)	(0.1435)	(0.1828)	(0.0783)	(0.2072)
	Chi-square statistic	2.0140	3.2314	2.5137	2.5449	2.4781	2.5082	1.2245
	(the restriction: $\alpha_{21}=0, \alpha_{31}=0, \beta_{11}=1$)	[0.3653]	[0.1987]	[0.2845]	[0.2801]	[0.2897]	[0.2853]	[0.5421]
	Chi-square statistic	8.9438**	16.041***	15.521***	12.886***	11.743***	10.133**	15.158***
	(the restriction: $\alpha_{21}=0, \alpha_{31}=0, \beta_{11}=1, \beta_{12}=-1$)	[0.0300]	[0.0011]	[0.0014]	[0.0049]	[0.0083]	[0.0175]	[0.0017]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *,**, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1% respectively.

Table6.10: The result of the effect of financial sector development on the short-run pass-through (size measure of banking sector development: FD1)

The effect of FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD1	Lag of dependence variable (-1)	0.0935	0.1804**	0.1644**	0.1690**	0.3664***	0.2890***	0.1920**
		(0.0674)	(0.0792)	(0.0759)	(0.0765)	(0.0897)	(0.0853)	(0.0884)
	Lag of dependence variable (-2)	0.1451**	0.1235*	0.0931	0.1039	0.0472	0.0326	-0.0342
		(0.0727)	(0.0721)	(0.0901)	(0.0781)	(0.0855)	(0.0796)	(0.0841)
	constant	0.4707***	0.4954***	0.4796**	0.0385	-0.0064	0.0099	0.0280
		(0.1673)	(0.1675)	(0.2331)	(0.0518)	(0.0368)	(0.0460)	(0.0340)
	Δ mp (-1)	0.1415**	0.1171***	0.1175	0.1844***	0.1012*	0.1339***	0.1445***
		(0.0560)	(0.0399)	(0.1085)	(0.0685)	(0.0413)	(0.0476)	(0.0452)
	Δ mp (-2)	0.1182**	0.1022**	0.2536**	0.1651**	0.1274*	0.0189	0.0755
		(0.0469)	(0.0421)	(0.1057)	(0.0696)	(0.0405)	(0.0479)	(0.0474)
	Δ mpfd1 (-1)	-0.1549***	-0.0123	0.0275	-0.0447	-0.1273	0.0420	-0.0823**
		(0.0384)	(0.0324)	(0.1368)	(0.0557)	(0.0784)	(0.0915)	(0.0371)
	Δ mpfd1 (-2)	0.0131	-0.0587*	-0.2058**	-0.1018*	0.0117	-0.0276	-0.0329
		(0.0400)	(0.0325)	(0.1275)	(0.0536)	(0.0761)	(0.0866)	(0.0382)
	Ecm (-1)	-0.0902***	-0.0843***	-0.0929**	-0.0586**	-0.0706**	-0.0886***	-0.0694***
		(0.0319)	(0.0279)	(0.0443)	(0.0268)	(0.0272)	(0.0255)	(0.0210)
	AR 1-5 test	1.3067	0.9059	0.6029	0.6449	4.8018***	7.3512***	1.7331
		[0.2667]	[0.4072]	[0.6978]	[0.6660]	[0.0005]	[0.0000]	[0.1333]
	ARCH 1-4 test	1.6484	1.9554	0.1229	0.1631	1.1456	3.5982**	0.5389
		[0.1670]	[0.1063]	[0.9740]	[0.9566]	[0.3388]	[0.0085]	[0.7074]
	Normality test	8.3305**	7.9808**	20.177***	19.482***	18.057***	24.152***	35.300***
		[0.0155]	[0.0185]	[0.0000]	[0.0001]	[0.0001]	[0.0000]	[0.0000]
	Hetero test	0.5344	1.3354	1.5198	1.3901	1.0092	1.0634	1.6405
		[0.9352]	[0.2097]	[0.1065]	[0.1526]	[0.4457]	[0.3984]	[0.0914]
	Hetero X test	1.2740	1.2836	1.3885	1.2028	1.2880	1.3390	2.5978***
		[0.1734]	[0.1907]	[0.1123]	[0.2361]	[0.1629]	[0.1549]	[0.0004]
	RESET test	1.1945	1.7168	2.3176	0.2895	2.6521	0.8535	1.2733
		[0.3068]	[0.1845]	[0.1033]	[0.7492]	[0.0749]	[0.4287]	[0.2839]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1% respectively.

For the effect of the activity measure of banking sector development (fd2), tables 6.11 and 6.12 show the long- and short-run pass-through results respectively. The pass-through results (coefficient of mp) still show a relatively high degree of pass-through, with long-run pass-through (0.74-0.81) higher than short-run (0.09-0.17). The higher maturity of deposit interest rates still shows a higher degree of pass-through in the long-run compared with the short-run, in line with our expectation. The ECM term continues to show a significant negative effect. We still reject another joint restriction, that $\beta_{12} = -1$, thus ensuring that our pass-through result is not equal to one.

The results of the coefficient of mpfd2 in the long-run model mainly show a significant negative effect on the lending rates both in the long-run (-0.09 and -0.10 in mlr and mrr) and short-run (-0.14 and -0.06 in mlr and mrr). For the effect on the deposit interest rate, an insignificant effect is shown in the long-run, while this interaction term has an effect only in the short-run on the short-term deposit rates (3 and 6 month rates) and saving interest rate (around -0.01 to -0.09). Despite the insignificant effect on deposit rates in the long-run, the inclusion of this interaction term still leads to a lower degree of pass-through of the deposit rates (the coefficient of mp in table 6.11 is relatively higher than in table 6.7). Hence, this result confirms that the effect of the activity measure of banking sector development still leads to a lower interest rate pass-through of in Thailand, especially in the lending rates and short-term deposit rate. This is in line with our theoretical expectation, as a higher level of banking activities will show a greater degree of financial intermediation. Therefore, this reduces the demand elasticity of loans and deposits and leads to a lower degree of pass-through and the weakening of the interest rate channel.

Table6.11: The result of the effect of financial sector development on the long-run pass-through model (activity measure of banking sector development: FD2)

FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD2	mp	0.8144	0.8185	0.7716	0.7752	0.8051	0.8181	0.7490
		(0.0383)	(0.0439)	(0.1123)	(0.0821)	(0.0901)	(0.0786)	(0.0922)
	mpfd2	-0.0947	-0.1090	-0.0690	-0.0414	-0.1193	-0.1077	-0.2422
		(0.0344)	(0.0391)	(0.1011)	(0.0739)	(0.0820)	(0.0708)	(0.1830)
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1)	0.2077 [0.9013]	1.7435 [0.4182]	1.0586 [0.5890]	2.1815 [0.3360]	0.9824 [0.6119]	2.7269 [0.2558]	0.3887 [0.8234]
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1, β_{12}= -1	6.7036* [0.0820]	9.0265** [0.0289]	7.3958* [0.0603]	10.767*** [0.0046]	24.470*** [0.0000]	8.7975** [0.0321]	8.4128*** [0.0382]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1% respectively.

Table6.12: The result of the effect of financial sector development on the short-run pass-through (activity measure of banking sector development: FD2)

The effect of FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
	Lag of dependent variable	0.1461**	0.1887**	0.1052	0.0723	0.2516***	0.3098***	0.1707*
		(0.0707)	(0.0792)	(0.0896)	(0.0888)	(0.0809)	(0.0844)	(0.0879)
	Lag of dependent variable	0.0800	0.1195**	0.0888	0.1039	0.1165	0.0523	-0.0567
		(0.0689)	(0.0721)	(0.0792)	(0.0778)	(0.0748)	(0.0799)	(0.0838)
	constant	0.4633***	0.4009***	0.0182	0.0556	0.0543	0.1147*	-0.0420
		(0.1539)	(0.1496)	(0.0522)	(0.0543)	(0.0483)	(0.0683)	(0.0339)
FD2	Δ mp (-1)	0.1525***	0.1218***	0.1770**	0.1786**	0.1312**	0.1305**	0.0706
		(0.0573)	(0.0401)	(0.0728)	(0.0688)	(0.0516)	(0.0626)	(0.0468)
	Δ mp (-2)	0.1133**	0.1083**	0.1809**	0.1592**	0.0737	0.0261	0.0937**
		(0.0505)	(0.0421)	(0.0748)	(0.0698)	(0.0521)	(0.0637)	(0.0468)
	Δ mpfd2 (-1)	-0.1422***	-0.0142	-0.0382	-0.0399	-0.0224	-0.0023	-0.0304
		(0.0411)	(0.0326)	(0.0601)	(0.0557)	(0.0426)	(0.0514)	(0.0377)
	Δ mpfd2 (-2)	-0.0193	-0.0609**	-0.0110*	-0.0959*	0.0485	-0.0139	-0.0652*
		(0.0391)	(0.0327)	(0.0578)	(0.0537)	(0.0405)	(0.0487)	(0.0355)
	Ecm (-1)	-0.0880***	-0.0751***	-0.0561**	-0.0632**	-0.0375*	-0.0594**	-0.0722***
		(0.0290)	(0.0273)	(0.0249)	(0.0272)	(0.0209)	(0.0266)	(0.0191)
	AR 1-5 test	1.5763	5.9155***	0.9906	0.0855	5.6525***	9.6993***	0.8792
		[0.1729]	[0.0001]	[0.4271]	[0.5138]	[0.0001]	[0.0000]	[0.4977]
	ARCH 1-4 test	1.8209	1.0537	0.2469	0.1962	0.5101	7.1850***	0.6269
		[0.1297]	[0.3829]	[0.9110]	[0.9399]	[0.7283]	[0.0000]	[0.6442]
	Normality test	4.8834*	16.227***	27.010***	20.498***	24.802***	13.645***	20.742***
		[0.0870]	[0.0003]	[0.0000]	[0.0000]	[0.0000]	[0.0011]	[0.0000]
	Hetero test	1.2730	0.4020	1.6876*	1.9301*	2.3168***	1.0568	1.0698
		[0.2453]	[0.9601]	[0.0535]	[0.0511]	[0.0044]	[0.4061]	[0.3930]
	Hetero X test	1.2679	0.8000	1.3883	1.5231	1.6458**	1.1634	1.8723**
		[0.2021]	[0.7407]	[0.1071]	[0.1517]	[0.0270]	[0.2773]	[0.0077]
	RESET test	2.1628	0.5073	1.7188	0.7423	0.4401	0.0159	2.9672
		[0.1199]	[0.6035]	[0.1841]	[0.4784]	[0.6451]	[0.9841]	[0.1556]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1% respectively.

For the effect of financial concentration (fd3) on interest rate pass-through, the results in tables 6.13 and 6.14 show that this pass-through (coefficient of mp) is still at a relatively high level, with long-run pass-through (0.77-0.83) greater than short-run (0.11-0.19). The higher maturity deposit interest rates still show a higher degree of pass-through in the long-run compared with the short-run. The ECM term still has a significant negative effect. We continue to reject another joint restriction, that $\beta_{12} = -1$. The results of the coefficient of mpfd3 in the long-run model mainly show a significant negative effect on lending rates (-0.15 and -0.13 in the long- and short-run respectively). The impact of this indicator has no effect on the deposit rate in the long-run, while showing a significant negative effect only in the short-run in the short-term deposit rates (3 and 6 month deposit rates) and saving interest rate (around -0.08 to -0.12). Despite the insignificant effect on deposit rates in the long-run, the inclusion of this interaction term still leads to a lower degree of pass-through of the deposit rates (the coefficient of mp in table 6.13 is relatively higher than in table 6.7). This result confirms that the effect of banking concentration will lead to a lower interest rate pass-through, especially in the lending rates and short-term deposit rate. This is in line with our theoretical expectation, as financial concentration will lead to low market power in the banking sector. This decreases financial competition. We previously stated in equation 6.1 (section 6.2) that the weaker the competitive environment, the lower the elasticity of price with respect to marginal cost (γ_1 decrease), thus reducing the demand elasticity of retail interest rates. Also, a weaker competitive environment can lead to an increase in the bank spread. This causes a lower adjustment of retail interest rates when there is a change in policy interest rate. Several empirical studies support our findin (Vel Leuvensteijn et al., 2006; Sander and Kleimeier, 2005, 2006; SØrensen and Werner, 2006; Singh et al., 2008).

Table6.13: The result of the effect of financial sector development on the long-run pass-through model (financial concentration:FD3)

FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD3	mp	0.8278	0.8331	0.7765	0.7790	0.8022	0.8181	0.7812
		(0.0416)	(0.0460)	(0.1212)	(0.0892)	(0.0978)	(0.0786)	(0.1026)
	mpfd3	-0.1287	-0.1447	-0.0820	-0.0479	-0.0253	-0.1077	-0.2473
		(0.0362)	(0.0400)	(0.1022)	(0.0776)	(0.0851)	(0.0708)	(0.1993)
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1)	0.2205 [0.8956]	1.9638 [0.3746]	0.6684 [0.7159]	2.7153 [0.2573]	0.9428 [0.6241]	2.2344 [0.3272]	3.1608 [0.2059]
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1, β_{12}= -1	13.790*** [0.0032]	10.078** [0.0179]	10.322** [0.0159]	13.352*** [0.0039]	9.8529** [0.0199]	8.3634** [0.0391]	8.1472** [0.0431]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1% respectively.

Table6.14: The result of the effect of financial sector development on the short-run pass-through (financial concentration:FD3)

The effect of FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
	Lag of dependent variable (-1)	0.0888	0.1891**	0.1007	0.1480***	0.2476***	0.3228***	0.1827**
		(0.0686)	(0.0813)	(0.0901)	(0.0493)	(0.0818)	(0.0846)	(0.0873)
	Lag of dependent variable (-2)	0.1616**	0.1303*	0.0966**	0.1252	0.1006	0.0561	-0.0510
		(0.0711)	(0.0741)	(0.0459)	(0.0845)	(0.0750)	(0.0807)	(0.0834)
	constant	0.4817***	0.3073**	0.4706**	0.0124	0.0388	0.0848	0.0249
		(0.1693)	(0.1473)	(0.2351)	(0.0546)	(0.0438)	(0.0639)	(0.0330)
	Δ mp (-1)	0.1453**	0.1542***	0.1697**	0.1692**	0.0537	0.0512	0.1603***
		(0.0647)	(0.0435)	(0.0820)	(0.0821)	(0.0386)	(0.0461)	(0.0496)
FD3	Δ mp (-2)	0.1146**	0.0863*	0.1982**	0.1745**	0.1108**	0.1358***	0.0651
		(0.0558)	(0.0444)	(0.0834)	(0.0809)	(0.0369)	(0.0457)	(0.0526)
	Δ mpfd3 (-1)	-0.1351***	-0.0301	-0.0457	-0.0017	-0.0324	-0.0947	-0.0886**
		(0.0438)	(0.0357)	(0.0640)	(0.0613)	(0.0727)	(0.0921)	(0.0386)
	Δ mpfd3 (-2)	-0.0225	0.0213	-0.1251**	-0.1038*	0.0673	-0.0786	-0.0244
		(0.0414)	(0.0342)	(0.0612)	(0.0607)	(0.0698)	(0.0906)	(0.0402)
	Ecm (-1)	-0.0922***	-0.0588**	-0.0916**	-0.0431	-0.0452*	-0.0539**	-0.0851***
		(0.0323)	(0.0274)	(0.0448)	(0.0283)	(0.0242)	(0.0271)	(0.0221)
	AR 1-5 test	1.0274	6.9597***	1.1805	0.7547	2.8878***	9.4684***	0.41661
		[0.4054]	[0.0000]	[0.3237]	[0.5845]	[0.0001]	[0.0000]	[0.8363]
	ARCH 1-4 test	1.5469	1.6945	0.1869	0.1371	0.7614	3.0589*	0.3897
		[0.1935]	[0.1561]	[0.9448]	[0.9683]	[0.5526]	[0.0197]	[0.8156]
	Normality test	10.032***	11.634***	31.663***	27.814***	43.701***	30.512***	43.316***
		[0.0066]	[0.0030]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
	Hetero test	0.4246	0.31021	1.1328	1.0565	1.7146	0.9253	1.1114
		[0.9796]	[0.9863]	[0.3327]	[0.4065]	[0.0732]	[0.5504]	[0.3589]
	Hetero X test	0.6971	0.4886	0.9359	0.9223	1.6825**	0.8681	3.1601***
		[0.9137]	[0.9817]	[0.5967]	[0.6183]	[0.0351]	[0.7028]	[0.0000]
	RESET test	1.8006	0.6088	2.2260	2.1564	1.1036	1.9162	2.5824*
		[0.1701]	[0.5458]	[0.1128]	[0.1207]	[0.3352]	[0.1521]	[0.0803]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1%respectively.

The effect of capital market development (size measure: fd4) on interest rate pass-through is shown in tables 6.15 and 6.1. The results from both the long- and short-run pass-through models (tables 6.15 and 6.16 respectively) indicate a relatively high degree of pass-through (coefficient of mp), with long-run pass-through (0.73-0.83) greater than short-run (0.05-0.11). The short-term deposit rate still shows a lower degree of pass-through than the long-term ones in the long-run pass-through model, while showing a higher degree in the short-run model. This result supports our previous explanation. The ECM term still shows a significant negative effect and we continue to reject another joint restriction, that $\beta_{12} = -1$.

The interaction term between this indicator and the policy interest rate shows an significant positive effect on lending rates only in the short-run (0.06 in mlr and 0.08 in mrr) and showing a significant positive effect on time deposit rates in the long-run (0.46-0.53) and short-run (0.07-0.13). Despite the insignificant result in the long-run pass-through of lending rates, the inclusion of this interaction term still leads to a higher degree of pass-through compared with table 6.8 (the coefficient of mp in table 6.15 is relatively higher than in table 6.7). Thus, our finding still confirms our theoretical expectation, as an increase in this indicator will show a higher degree of financial disintermediation and the development of trading and investment in other financial markets. This causes wider alternative sources of funding and investment for savers and investors, increasing the demand elasticity of loans and deposits and therefore increasing the degree of interest rate pass-through and strengthening the interest rate channel. This result is supported by other empirical papers (Mojon, 2000; Singh et al., 2008; Gropp et al., 2007; Sander and Kleimeier, 2003).

Table 6.15: The result of the effect of financial sector development on the long-run pass-through model (size measure of capital market development: FD4)

FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD4	mp	0.8062 (0.0372)	0.7837 (0.0393)	0.7361 (0.0747)	0.7564 (0.0572)	0.7805 (0.0591)	0.8329 (0.0769)	0.7962 (0.0372)
	mpfd4	0.0613 (0.0866)	0.0921 (0.0915)	0.4606 (0.1761)	0.5437 (0.1397)	0.5308 (0.1374)	0.2922 (0.1789)	0.0613 (0.0866)
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1)	2.1454 [0.3421]	2.4333 [0.3090]	2.3872 [0.2115]	3.4448 [0.2242]	3.7358 [0.2985]	3.6715 [0.2587]	2.1454 [0.3421]
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1, β_{12}= -1)	13.505*** [0.0037]	16.366*** [0.0010]	14.421*** [0.0024]	16.334*** [0.0000]	14.290*** [0.0008]	13.817*** [0.0032]	13.505*** [0.0037]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1% respectively.

Table 6.16: The result of the effect of financial sector development on the short-run pass-through (size measure of capital market development: FD4)

The effect of FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD4	Lag of dependent variable (-1)	0.1526**	0.2160***	0.1942**	0.0813	0.2445***	0.3204***	0.2672***
		(0.0708)	(0.0821)	(0.0783)	(0.0892)	(0.0803)	(0.0850)	(0.0909)
	Lag of dependent variable (-2)	0.0588	0.1268*	0.0515	0.0754	0.1217	0.0430	-0.0575
		(0.0745)	(0.0749)	(0.0770)	(0.0775)	(0.0736)	(0.0805)	(0.0884)
	constant	0.3938***	0.2081	-0.0487	-0.0413	-0.0269	0.0168	-0.0795*
		(0.1403)	(0.1293)	(0.0522)	(0.0493)	(0.0379)	(0.0471)	(0.0404)
	Δ mp (-1)	0.1172***	0.0934***	0.0907*	0.0956*	0.0379	0.0751**	0.0565**
		(0.0348)	(0.0258)	(0.0385)	(0.0422)	(0.0312)	(0.0386)	(0.0285)
	Δ mp (-2)	0.0256	0.0551	0.0698	0.0254	0.0743***	0.0002	-0.0006
		(0.0991)	(0.0663)	(0.0432)	(0.0425)	(0.0315)	(0.0386)	(0.0321)
	Δ mpfd4 (-1)	0.0611*	0.0828**	0.1321*	0.0899	0.0705**	0.0880**	0.0718
		(0.0338)	(0.0305)	(0.0795)	(0.0776)	(0.0281)	(0.0345)	(0.0668)
	Δ mpfd4 (-2)	-0.0651	0.0491	0.0993	0.1292*	0.0396	0.0660	0.0372
		(0.0990)	(0.0302)	(0.0827)	(0.0751)	(0.0566)	(0.0718)	(0.0695)
	Ecm (-1)	-0.0887***	-0.0444*	-0.0974***	-0.0789***	-0.0448*	-0.0567**	-0.0631***
		(0.0301)	(0.0261)	(0.0300)	(0.0301)	(0.0234)	(0.0272)	(0.0193)
	AR 1-5 test	1.2152	4.5346***	0.5302	0.1431	4.2965***	8.3688***	0.7397
		[0.3070]	[0.0009]	[0.7529]	[0.9817]	[0.0013]	[0.0000]	[0.5954]
	ARCH 1-4 test	1.8660	1.7479	0.1771	0.1677	0.7499	6.0513***	0.1727
		[0.1212]	[0.1445]	[0.9498]	[0.9544]	[0.5600]	[0.0002]	[0.9519]
	Normality test	8.5860**	7.1596**	30.167***	28.460***	28.5150***	21.3410***	48.509***
		[0.0137]	[0.0279]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
	Hetero test	1.1671	0.6262	0.8111	0.9989	2.0983	0.7368	0.6688
		[0.3158]	[0.8158]	[0.6834]	[0.4674]	[0.1108]	[0.7659]	[0.8341]
	Hetero X test	1.1124	0.6182	1.0534	1.5128	1.2546	0.8352	2.0386***
		.[0.3432]	[0.9220]	[0.4175]	[0.1545]	[0.1891]	[0.7516]	[0.0030]
	RESET test	2.7180*	1.2027	1.0897	1.9508	0.5390	0.6951	3.5099
		[0.0703]	[0.3043]	[0.3399]	[0.1471]	[0.5849]	[0.5012]	[0.2333]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10 percent, 5 percent , and 1 percent respectively.

For the effect of the activity measure of capital market development (fd5), the results from both the long- and short-run pass-through models (tables 6.17 and 6.18 respectively) still present a relatively high degree of pass-through (coefficient of mp), with the long-run (0.75-0.84) greater than the short-run (0.05-0.15). The short-term deposit rate still shows a lower degree of pass-through than the long-term ones in the long-run pass-through model, while showing a higher degree in the short-run model. This result supports our previous explanation. The ECM term still shows a significant negative effect and we continue to reject another joint restriction, that $\beta_{12} = -1$.

The interaction term between this indicator and the policy interest rate shows a significant positive effect on lending rates only in the short-run (0.06 and 0.10 in mlr and mrr), while showing a significant positive effect on time deposit rates in the long-run (0.40-0.76). Despite the insignificant effect of this interaction term, the mp coefficient of the long-run pass-through of lending rates and short-run pass-through of deposit rates is still relatively high compared with that before inclusion of the interaction term (tables 6.7 and 6.8). Thus, our finding still confirms that the activity measure of capital market development causes a higher degree of pass-through and hence a strengthening of the interest rate channel. This is confirmed by our theoretical aspect, as the development in the activities in the capital market will lead to greater opportunities for banks to obtain other funding sources, increasing the demand elasticity of deposits and loans and therefore increasing the degree of pass-through and strengthening the interest rate channel.

Table 6.17: The result of the effect of financial sector development on the long-run pass-through model (activity measure of capital market development: FD5)

FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD5	mp	0.7992	0.7886	0.7574	0.8196	0.7876	0.8499	0.7992
		(0.0372)	(0.0371)	(0.0760)	(0.1888)	(0.0569)	(0.0771)	(0.0372)
	mpfd5	0.0802	0.2052	0.6241	0.7764	0.7655	0.4010	0.0802
		(0.1355)	(0.1339)	(0.2779)	(0.0525)	(0.1980)	(0.2773)	(0.1355)
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1)	4.5189	2.7939	4.3225	2.9891	3.2482	3.0922	4.5189
		[0.1044]	[0.2474]	[0.1152]	[0.2244]	[0.2267]	[0.2175]	[0.1044]
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1, β_{12}= -1)	9.5984**	10.796**	10.5450**	9.7280***	14.7570***	15.365***	9.5984**
		[0.0223]	[0.0129]	[0.0145]	[0.0077]	[0.0006]	[0.0005]	[0.0223]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1%respectively.

Table 6.18: The result of the effect of financial sector development on the short-run pass-through (activity measure of capital market development: FD5)

The effect of FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD5	Lag of dependent variable (-1)	0.1357*	0.2072**	0.1797**	0.1828**	0.3348***	0.3270***	0.2696***
		(0.0711)	(0.0822)	(0.0778)	(0.0771)	(0.0896)	(0.0851)	(0.0940)
	Lag of dependent variable (-2)	0.1225	0.1043	0.0915	0.0999	0.0633	0.0497	-0.0451
		(0.0843)	(0.0757)	(0.0833)	(0.0904)	(0.0830)	(0.0813)	(0.0911)
	constant	0.3846	0.2652*	-0.0318	-0.0353	-0.0032	0.0625	-0.0311
		(0.2321)	(0.1394)	(0.0578)	(0.0499)	(0.0434)	(0.0584)	(0.0357)
	Δ mp (-1)	0.1437***	0.0527**	0.1553***	0.1556***	0.0667**	0.1363***	0.0765***
		(0.0451)	(0.0263)	(0.0425)	(0.0359)	(0.0334)	(0.0336)	(0.0251)
	Δ mp (-2)	0.0320	0.1068***	0.0762*	0.0831	0.1374***	0.1248***	0.0071
		(0.0412)	(0.0261)	(0.0444)	(0.0415)	(0.0342)	(0.0375)	(0.0282)
	Δ mpfd5 (-1)	0.0647**	-0.0408	0.0903	0.0452	0.0227	0.0874	0.0930
		(0.0326)	(0.0711)	(0.1533)	(0.0415)	(0.1124)	(0.1237)	(0.0968)
	Δ mpfd5 (-2)	-0.0380	-0.0785	-0.0877	0.1908	-0.1136	-0.1147	-0.0200
		(0.0402)	(0.0741)	(0.1534)	(0.1347)	(0.1126)	(0.1252)	(0.0993)
	Ecm (-1)	-0.0759*	-0.0525**	-0.0650**	-0.0634**	-0.0451*	-0.0542*	-0.0509***
		(0.0408)	(0.0265)	(0.0297)	(0.0292)	(0.0254)	(0.0293)	(0.0185)
	AR 1-5 test	1.6353	3.9663***	0.4344	0.2932	1.4331	8.4684***	0.3006
		[0.1569]	[0.0024]	[0.8237]	[0.9157]	[0.2180]	[0.0000]	[0.9114]
	ARCH 1-4 test	1.6951	0.0982	0.1126	0.1618	1.3302	5.1065***	0.7703
		[0.1560]	[0.4204]	[0.9779]	[0.9572]	[0.2630]	[0.0008]	[0.5468]
	Normality test	8.4690**	7.0993**	31.341***	29.545***	40.484***	18.474***	38.631***
		[0.0145]	[0.0287]	[0.0000]	[0.0000]	[0.0000]	[0.0001]	[0.0000]
	Hetero test	0.8807	1.3614	1.4941	1.0563	1.3464	0.9459	1.0015
		[0.5686]	[0.1961]	[0.1373]	[0.4067]	[0.2033]	[0.5268]	[0.4598]
	Hetero X test	1.0429	0.8781	1.1362	1.1797	6.2321***	0.9483	2.6461***
		[0.4240]	[0.6391]	[0.3183]	[0.2598]	[0.0000]	[0.5771]	[0.0001]
	RESET test	1.9202	1.0033	4.9764***	2.8454*	2.2273	1.8824	0.5267
		[0.1515]	[0.3700]	[0.0085]	[0.0624]	[0.1125]	[0.1571]	[0.5919]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1%respectively.

The effect of bond market development (financial innovation) (fd6) on interest rate pass-through is shown in tables 6.19 and 6.20. The results show that there is still a higher degree of pass-through (coefficient of mp) in the long-run (0.79-0.88) than in the short-run (0.06-0.16). The short-term deposit rate still shows a lower degree of pass-through than the long-term rates in the long-run pass-through model, while showing a higher degree in the short-run model. The ECM term still shows a negative coefficient.

The interaction term of this indicator with the policy interest rate shows that there is no effect of this term on either the lending interest rates or deposit interest rates in the long-run, while the effect only appears in the short-run model of lending rates (0.06 and 0.09 in mlr and mrr). Although this interaction term shows an insignificant result, its inclusion also improves the degree of long-run pass-through in both lending and deposit rates as well as short-run pass-through in deposit rates, compared with the level before its addition (tables 6.7 and 6.8). In addition, the result in table 6.19 shows that we not reject the null hypothesis of the joint restriction that $\beta_{12} = -1$. This shows that the inclusion of this interaction term will lead to an increase in the degree of pass-through (in this case, a full degree of pass-through). This therefore shows that the effect of financial innovation still leads to a greater degree of long-run pass-through in deposit interest rates and the strengthening of the interest rate channel. Our finding is confirmed by the theoretical expectation in section 6.2.3, as an increase in financial innovation will show the development of the trading system and payment system technologies, an increase in the sources of finance for investors, and a reduction in bank costs. This therefore increases the demand elasticity of deposits and loans, causing a higher degree of interest rate pass-through. This result is supported by other empirical papers on this issue (Singh et al., 2008; Cottarelli and Kourelis, 1994; Cottarelli et al., 1995).

Table6.19: The result of the effect of financial sector development on the long-run pass-through model (financial innovation:FD6)

FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD6	mp	0.7957	0.7835	0.8242	0.8275	0.8525	0.8809	0.8416
		(0.0527)	(0.0560)	(0.1314)	(0.0785)	(0.0827)	(0.0848)	(0.0730)
	mpfd6	0.1223	0.3340	-0.2671	-0.4369	0.3129	-0.5024	-0.5744
		(0.3404)	(0.3634)	(0.2671)	(0.5227)	(0.5508)	(0.5643)	(0.4863)
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1)	0.5318 [0.7665]	1.9306 [0.3809]	4.0355 [0.1330]	1.6130 [0.4464]	2.8918 [0.2355]	3.1361 [0.2085]	3.6846 [0.1584]
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1, β_{12}= -1)	11.669*** [0.0086]	12.489*** [0.0059]	5.3064[41] [0.1507]	4.0105[42] [0.2603]	4.5348[43] [0.2092]	4.3237[44] [0.2286]	13.992*** [0.0029]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5% , and 1%respectively.

[41] In this case, the coefficient of mp is equal to one and the coefficient and standard error of the mpfd6 will be changed to equal to 0.9336 (0.6286).
[42] In this case, the coefficient of mp is equal to one and the coefficient and standard error of the mpfd6 will be changed to equal to 0.6756 (0.6413).
[43] In this case, the coefficient of mp is equal to one and the coefficient and standard error of the mpfd6 will be changed to equal to 0.1705 (0.6363).
[44] In this case, the coefficient of mp is equal to one and the coefficient and standard error of the mpfd6 will be changed to equal to 0.6833 (0.6300).

Table 6.20: The result of the effect of financial sector development on the short-run pass-through (financial innovation:FD6)

Retail interest rates	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
	Lag of dependent variable (-1)	0.1647**	0.2127***	0.1847**	0.1551**	0.3232***	0.2822***	0.2472**
		(0.0681)	(0.0808)	(0.0766)	(0.0756)	(0.0892)	(0.0867)	(0.0963)
	Lag of dependent variable (-2)	0.1070	0.1122	0.1029	0.1061	0.0685	0.0387	-0.0527
		(0.0835)	(0.0739)	(0.0968)	(0.0850)	(0.0822)	(0.0806)	(0.0915)
	constant	0.2704	0.3221**	0.0069	-0.0262	0.0259	0.0592	-0.0864*
		(0.1823)	(0.1586)	(0.0575)	(0.0559)	(0.0537)	(0.0583)	(0.0490)
	Δ mp (-1)	0.1556***	0.0458	0.1634***	0.1879***	0.0939**	0.0983*	0.0627*
		(0.0333)	(0.1705)	(0.0544)	(0.0510)	(0.0381)	(0.0571)	(0.0326)
FD6	Δ mp (-2)	0.0792**	0.0923***	0.0301	0.0421	0.0941**	0.1216**	0.0392
		(0.0319)	(0.0332)	(0.0558)	(0.0535)	(0.0366)	(0.0540)	(0.0319)
	Δ mpfd6 (-1)	0.0609**	-0.1372	-0.2023	-0.2185	-0.1812	-0.2791	-0.1505
		(0.0298)	(0.1802)	(0.6083)	(0.5782)	(0.2077)	(0.1919)	(0.1854)
	Δ mpfd6 (-2)	-0.0100	0.0979*	0.2068	0.1878	0.1665	0.0341	-0.2073
		(0.0302)	(0.0352)	(0.6210)	(0.5874)	(0.2026)	(0.1813)	(0.1802)
	Ecm (-1)	-0.1029***	-0.0562**	-0.0477*	-0.0403*	-0.0354*	-0.0513*	-0.0305**
		(0.0312)	(0.0272)	(0.0271)	(0.0240)	(0.0199)	(0.0295)	(0.0141)
	AR 1-5 test	1.6353	2.4387**	0.3101	0.6338	8.7682***	8.8961***	0.4931
		[0.1569]	[0.0388]	[0.9059]	[0.6743]	[0.0000]	[0.0000]	[0.7807]
	ARCH 1-4 test	1.6029	2.4043	0.1879	0.1769	1.3796	3.7576**	0.8312
		[0.1655]	[0.0539]	[0.9443]	[0.9499]	[0.2454]	[0.0066]	[0.5081]
	Normality test	2.0132*	7.7987***	38.672***	26.487***	29.365***	14.1480***	45.102***
		[0.0973]	[0.0203]	[0.0000]	[0.0000]	[0.0000]	[0.0008]	[0.0000]
	Hetero test	1.2454	1.3953	0.9911	0.9306	0.9828	1.1804	1.7421
		[0.2544]	[0.1790]	[0.4622]	[0.5290]	[0.4699]	[0.3067]	[0.0681]
	Hetero X test	1.2454	0.9816	1.2002	1.3701	0.7926	1.0894	7.1986***
		[0.2544]	[0.5009]	[0.2563]	[0.1219]	[0.7503]	[0.3698]	[0.0000]
	RESET test	1.9202	0.9539	1.3062	6.8150***	0.0163	0.1959	0.7849
		[0.1515]	[0.3883]	[0.2749]	[0.0016]	[0.9838]	[0.8223]	[0.4587]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10 percent, 5 percent , and 1 percent respectively.

For the effect of financial liberalization (fd7), the results in tables 6.21 and 6.22 still show a higher degree of pass-through (coefficient of mp) in the long-run (0.74-0.79) than in the short-run (0.05-0.12). The short-term deposit rate continues to show a lower degree of pass-through than the long-term rates in the long-run pass-through model, while showing a higher degree in the short-run model. This result supports our previous explanation. The ECM term still shows a significant negative effect. We continue to reject another joint restriction, that $\beta_{12} = -1$.

The results from both the long- and short-run pass-through models indicate a significant positive effect of the interaction term between this indicator and the policy interest rate, in both the long-run (0.15 and 0.12 in mlr and mrr, and around 0.24-0.48 in deposit rates) and short-run (0.05 and 0.04 in mlr and mrr, and around 0.07-0.09 in deposit rates). The finding shows that financial liberalization leads to a greater effect of interest rate pass-through, thus causing a stronger effect of the interest rate channel. This result is confirmed by our expectation, as financial liberalization policies will give banks more possibilities to adjust retail interest rates and also lead to an increase in capital inflows, a higher volume of foreign exchange transactions, and financial openness in the country. This causes an increase in alternative sources of investment for bank customers, leading to a higher demand elasticity of loans and deposits, and thus increasing the extent of interest rate pass-through and strengthening the interest rate channel. Our finding is supported by other empirical papers (Fomum, 2011; Chong, 2009; De Bondt, 2005; De Bondt et al., 2005; Sander and Kleimeier, 2006; Marotta, 2007; Chionis and Leon, 2005; Aziakpono and Wilson, 2010; Brouwer, 1995).

Table 6.21: The result of the effect of financial sector development on the long-run pass-through model (financial liberalization:FD7)

FD	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD7	mp	0.7731	0.7221	0.6499	0.6971	0.6745	0.6999	0.6549
		(0.0469)	(0.0491)	(0.0799)	(0.0776)	(0.0647)	(0.0799)	(0.1031)
	mpfd7	0.1521	0.1238	0.3612	0.3222	0.3409	0.4861	0.2489
		(0.0622)	(0.0588)	(0.1084)	(0.1052)	(0.0864)	(0.1073)	(0.1171)
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1)	4.1119 [0.1280]	2.3873 [0.3031]	1.6383 [0.4408]	3.8858 [0.2431]	4.2220 [0.1211]	3.8115 [0.1487]	4.5595 [0.1023]
	Chi-square statistic (the restriction: α_{21}=0, α_{31}=0, β_{11}=1, β_{12}= -1	13.259*** [0.0041]	19.596*** [0.0002]	9.1730** [0.0102]	9.7677*** [0.0076]	14.211*** [0.0008]	14.978*** [0.0006]	9.8894** [0.0195]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5%, and 1% respectively.

Table 6.22: The result of the effect of financial sector development on the short-run pass-through (financial liberalization: FD7)

Retail interest rates	Independent variable /dependent variable	mlr	mrr	3tdep	6tdep	12tdep	2ytdep	sav
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
FD7	Lag of dependent variable (-1)	0.0259	0.1773**	0.0741	0.1551**	0.2388***	0.3991***	0.2764***
		(0.0834)	(0.0778)	(0.0942)	(0.0756)	(0.0810)	(0.0955)	(0.0931)
	Lag of dependent variable (-2)	0.0492	0.1409*	0.0720	0.0577	0.1165	0.0207	-0.0485
		(0.0705)	(0.0747)	(0.0805)	(0.0885)	(0.0731)	(0.0905)	(0.0848)
	constant	0.5335***	0.3093**	0.0050	0.0463	0.0737	0.0291	-0.0391
		(0.1512)	(0.1422)	(0.0554)	(0.0527)	(0.0495)	(0.0821)	(0.0344)
	Δ mp	0.0932***	0.0513**	0.1283***	0.0944***	0.0493**	0.0489	0.0538***
		(0.0291)	(0.0221)	(0.0344)	(0.0324)	(0.0237)	(0.0308)	(0.0191)
	Δ mp (-1)	0.0615**	0.0887***	0.0577	0.0462	0.1106***	0.1132***	0.0115
		(0.0265)	(0.0213)	(0.0359)	(0.0320)	(0.0235)	(0.0315)	(0.0206)
	Δ mpfd7	0.0525**	0.0467**	0.0845**	0.0728**	0.0903***	-0.0223	0.0853***
		(0.0249)	(0.0205)	(0.0366)	(0.0324)	(0.0235)	(0.0346)	(0.0221)
	Δ mpfd7 (-1)	0.0073	-0.0154	0.0305	0.0190	-0.0228	-0.0259	-0.0101
		(0.0252)	(0.0207)	(0.0364)	(0.0324)	(0.0242)	(0.0338)	(0.0235)
	Ecm (-1)	-0.1172***	-0.0626**	-0.0570**	-0.0926**	-0.0620**	-0.0679**	-0.0480***
		(0.0319)	(0.0277)	(0.0258)	(0.0354)	(0.0284)	(0.0308)	(0.0181)
	AR 1-5 test	0.7847	2.4387**	1.3731	0.6073	8.7682***	6.9077***	0.4931
		[0.5629]	[0.0388]	[0.2400]	[0.6945]	[0.0000]	[0.0000]	[0.7807]
	ARCH 1-4 test	2.0132*	1.3086	0.0591	0.1430	1.3796	3.5652***	0.8312
		[0.0973]	[0.2711]	[0.9934]	[0.9657]	[0.2454]	[0.0089]	[0.5081]
	Normality test	4.4105	7.7987***	16.3080***	30.350***	29.365***	17.992***	45.102***
		[0.1102]	[0.0203]	[0.0003]	[0.0000]	[0.0000]	[0.0001]	[0.0000]
	Hetero test	1.2131	1.3953	0.9911	0.8694	0.9828	0.7632	1.7421
		[0.2707]	[0.1790]	[0.4622]	[0.6155]	[0.4699]	[0.7059]	[0.0681]
	Hetero X test	1.0973	0.9816	1.2002	0.9286	0.7926	0.8066	7.1986***
		[0.3556]	[0.5009]	[0.2563]	[0.6059]	[0.7503]	[0.7586]	[0.0000]
	RESET test	1.8640	0.9539	1.3062	0.7198	0.0163	0.7629	0.7849
		[0.1600]	[0.3883]	[0.2749]	[0.4891]	[0.9838]	[0.4687]	[0.4587]

Note: (-) represents the standard error and [-] represents the probability of rejection of the null hypothesis of restriction where *, **, *** means the rejection of the null hypothesis of the restriction at 10%, 5%, and 1% respectively.

Furthermore, recursive estimation is also performed in order to check for the effect of structural change on the cointegrating vector. The recursive estimation of the eigenvalue of the cointegrating relationship in each equation of the effect of each financial development indicator (fd1-fd7) on the pass-through model is shown in appendix B (figures B6.1.1 to B6.1.7).

Similar to the result in figure A6.1.1, the results for all the eigenvalues in each different equation show their stability throughout the study period, the change occurring during 1998Q1 as a result of the effect of the financial crisis, as previously explained. Although there is a change in the eigenvalues during this period, this change has little effect on them as we do not see the sharp break of the recursive graph of the eigenvalues during this period and the recursive graph continues to be stable until 2008.

We also perform recursive estimations of the β coefficient (the coefficient of the degree of pass-through) to obtain the result of the change in the degree of pass-through during the study period. The results of each of the β coefficients for the effects of different financial development indicators are shown in Appendix B (figures B6.2.1 to A6.2.7).

The β coefficients of the mp and mpfd variables in all the lending interest rate and deposit interest rate equations show positive signs and lie within the standard error band. All the β coefficients are almost stable throughout the period, with some changes occurring in specific periods. The long-run pass-through degree of both lending and deposit interest rates shows an upward trend during the periods 1984Q1 and 1991Q1. This is because of the adjustment of the short-term time deposit interest structure and the introduction of transferable deposit certificates (in 1984Q1) and the effect of financial liberalization (in 1991Q1). The β coefficients of both variables in each of the interest rate pass-through equations also show a decrease in the degree of pass-through during 1997Q4 as a result of the effect of the financial crisis.

The recursive estimation of each of the short-run interest rate pass-through models can be seen in Appendix B (figures B6.3.1 to B6.3.7).

The β coefficients of both the mp and mpfd variables in each of the short-run interest rate pass-through models show a similar pattern to the long-run pass-through model, with the movement of the β coefficient within the +/-2 standard error band. An upward adjustment of the degree of pass-through is seen during the periods 1984Q1 and 1991Q1 due to the effect of the time deposit interest rate structure change and financial liberalization respectively. The degree of pass-through is stable after 1991Q1 and changes negatively again in 1997Q4 due to the effect of the financial crisis in the country. The result from the break point Chow test and forecast Chow test show that the F-statistic is below the critical value of 5 per cent and confirms the stability property of our result. However, the 1 step Chow test and the 1 step residual still show a value which lies outside the critical value during 1984Q1, 1991Q1 and 1997Q4, representing the structural changes in the country discussed earlier. Moreover, the results from almost all the diagnostic tests in each short-run model still show the detection of non-normality. This is due to the outliner problem as a result of structural changes as previously described.

To sum up, the results of the study of interest rate pass-through in Thailand show incomplete interest rate pass-through, with a relatively higher degree of pass-through in the long-run than in the short-run. High interest rate maturity will also show a higher degree of pass-through in the long-run model, while showing a lower degree in the short-run model. The finding is supported by our theoretical explanation and the empirical papers discussed previously. For the effect of financial development on interest rate pass-through, the results show that capital market development (size and activity measure), bond market development (financial innovation), banking competition, and financial liberalization will lead to a greater degree of pass-through, hence also showing the strengthening of the interest rate channel. On the other hand, banking sector development (size and activity measure) will cause a lower degree of pass-through, hence weakening the interest rate channel.

6.5 Conclusion

This chapter examines interest rate pass-through in Thailand and also the effect of financial sector development (financial liberalization, financial competition, financial innovation, capital market development and banking sector development) on this pass-through. We investigate this pass-through effect by obtaining quarterly data on interest rates and also the financial sector development indicators in Thailand from 1978Q1 to 2008Q4 and by using the VECM technique to study long- and short-run interest rate pass-through. The baseline result of the interest rate pass-through in Thailand indicates an incomplete degree of long- and short-run pass-through, with a considerably higher degree in the long-run compared with the short-run. This result is in line with our theoretical expectation, as interest rate pass-through in reality can show an incomplete degree of pass-through due to various important factors which cause stickiness in the interest rate (credit rationing and the risk sharing behaviour of banks, the asymmetric information problem, and the costs faced by banks and investors, namely switching cost and adjustment cost). Our results show a similar high degree of long-run pass-through in Thailand to other studies in Thailand (Charoenseang and Manakit, 2007; Rehman, 2004) and the high degree of pass-through, especially in the long-run, was probably caused by the financial sector development which took place in Thailand during our study period (1978Q1-2008Q4), as explained in chapter 3. The study of different maturities of the time deposit interest rates (3 month, 6 month, 12 month, and 2 year time deposit interest rates) show that the higher the maturity of the time deposit interest rate, the greater the pass-through in the long-run, but the lower in the short-run. This result is supported by our theoretical prediction, as the interest rate pass-through in the short-run has a mean reversion property, and thus the effect of the policy interest rate on the short-term interest rate will be higher than the long-term ones. The speed of adjustment in every short-run pass-through model indicates a significant negative coefficient of the speed of adjustment variable, confirming that the interest rate will have an equilibrium adjustment to the new equilibrium.

For the study of the effect of financial sector development on the long- and short-run models of interest rate pass-through, it can be concluded that banking competition, capital market development, financial innovation, and financial liberalization will cause a greater degree of pass-through, thus resulting in a stronger effect of the interest rate channel of monetary policy transmission. Financial competition (lower concentration) can lead to a reduction in banks' interest rate margins and a higher demand elasticity of retail interest rates, so banks will tend to adjust their retail interest rates in a more competitive way. Also, if we look at the interest rate pass-through model as a marginal cost pricing model (see equation 6.1), the more competitive environment will raise elasticity of price with respect to marginal cost, hence increasing the degree of pass-through. Capital market development (both size and activities measures) causes a higher degree of pass-through as this development leads to a wider range of alternative sources of funding and investment for savers and investors. This increases the demand elasticity of loans and deposits and therefore increasing the degree of interest rate pass-through and strengthening the interest rate channel. Financial innovation also leads to a higher degree of pass-through, as this development involves the development of trading system and payment system technologies. Hence, it can increase the sources of finance for investors and reduce bank costs, raising the demand elasticity of deposits and loans, and causing a higher degree of interest rate pass-through. Moreover, the financial liberalization in Thailand, shown by many deregulation policies (interest rate ceiling abolition, capital control and foreign exchange control relaxation), gives banks more possibilities to adjust retail interest rates. Also, this leads to an increase in capital inflows and a higher volume of foreign exchange transactions in the country, causing an increase in alternative sources of investment for bank customers. This causes a higher demand elasticity of loans and deposits, thus increasing the extent of interest rate pass-through and strengthening the interest rate channel. Banking sector development will cause a lower degree of pass-through, resulting in a weaker effect of the interest rate channel. This is because greater banking sector development (both bank size and activities development) will show a greater degree of financial intermediation and a greater influence of banks on borrowers and depositors. Hence, this reduces the demand elasticity of loans and deposits and leads to a lower degree of pass-through and the weakening of the interest rate channel.

The results for all the recursive graphs of eigenvalues in each equation (both the baseline equation and the equation of the effect of financial development on the pass-through) show their stability throughout the study period, confirming that we do not have the effect of structural changes on the cointegrating vector. When we perform the recursive estimations of the β coefficient (the coefficient of the degree of pass-through) in order to obtain the result of the change in the degree of pass-through during the study period, we found that all of the β coefficients in both the lending and deposit rate equations present stability throughout the period, with some changes occurring in specific periods. The pass-through degree of both lending and deposit interest rates tends to adjust upwards during the periods 1984Q1 and 1991Q1. The increase in pass-through during 1984Q1 was possibly due to the adjustment by commercial banks of the short-term deposit interest structure. In this case, the 3 and 6 month deposit interest rate ceiling was adjusted upwards to achieve an interest rate level comparable to the 12 month-deposit rate (BOT, 1984). This adjustment may have caused the increase in the interest rate pass-through, especially with regard to the 3 and 6 month deposit interest rate. The upward movement of the β coefficients also comes from the effect of the financial liberalization which began in 1990. The effect of the relaxation of the retail interest rate ceiling in Thailand, and other deregulation policies, resulted in a higher degree of pass-through, mostly shown in the increase of the β coefficients during 1991Q1. The β coefficients also show negative adjustment during the period 1997Q4, possibly due to the effects of the financial crisis which may have led to the problem of financial market volatility and market uncertainty. This can lead to a relatively low interest rate pass-through, as banks will face higher credit risk, adjustment costs and the asymmetric information problem.

This study raises some important issues for policy makers in Thailand, since we have obtained the result that an increase in financial development will lead to an increase in the degree of pass-through. Policy makers should therefore consider financial development as one of the factors which can increase the effectiveness of monetary policy through the interest rate channel. However, the effects of financial developments can also pass through to affect the economy via other channels of monetary policy transmission and the effect of these developments on the economy can depend on these other channels. Therefore, an adequate supervisory system and appropriate risk management techniques in the banking and financial sectors are also needed when carrying out financial development in the future in order to control the effect of financial development on the economy. Moreover, policy makers should examine financial and economic conditions before introducing financial development plans. In this case, a reasonably stable macroeconomic condition is required, with stable conditions in the financial market.

There are several issues policy makers should be aware of when conducting financial sector development in the future. We obtained the result that the effect of financial sector development will have a greater effect in the long- run pass-through model than the short-run one. Thus, policy makers should be aware of this long-run effect. This is because their financial sector development policies will take time to affect the economy. Furthermore, financial development, especially capital market development, financial innovation, financial competition, and financial liberalization, can have a greater effect on the degree of pass-through. Therefore, it is important to be aware of the issue of new financial development policies, as this can create an overshooting of the pass-through. Therefore, policy makers and central banks should consider this problem when developing future financial development policies and before implementing monetary policy in the economy.

There is a lack of data on interest rates in the different economic sectors (business loan rate, mortgage interest rate and consumer interest rate) and in different maturities (different maturities of bond interest rates) in our consideration period (1978Q1 to 2008Q4)[45]. Therefore, future studies of interest rate pass-through, as well as the effect of financial development on the pass-through, could be expanded by including examination of these different types of retail interest rates.

[45] We have a lack of data on the interest rates in different economic sector and the data of bond market interest rate available only from 1997 onward.

CHAPTER SEVEN

CONCLUSIONS

7.1 Introduction

Among several channels of monetary policy transmission, the channels of monetary policy transmission relating to the banking sector have been considered to be an important issue in many studies of monetary policy in recent decades. The significance of this study derives from the important role of financial intermediaries (the banking sector and financial institutions) in the financial market in terms of solving the asymmetric information problem by reducing agency, transaction and search costs between lenders (banks) and borrowers (firms and households), diversifying and reducing risks in financial market transactions through the risk diversification approach. Thus, this improves the saving allocation between economic agents, and supporting economic growth.

Moreover, the idea of financial development is another important aspect of the study of monetary policy transmission. Financial development can lead to important effects on the banking sector, affecting the roles which the financial institutions and the banking sector play in the financial market, economic agents and the economy. Therefore, it is also interesting and important to study the effect of financial development on the channels of monetary policy transmission relating to the banking sector. This is due to the importance of financial development on the banking sector and thus this area of study raises the significant issue of the way in which monetary policy passes through to the economy via the banking sector and its impact it has from financial development. In addition, this study can be used as a policy implication for policy makers to control the economy during periods of financial development.

Therefore, this thesis will focuse on the channels of monetary policy transmission which relate to the banking sector, namely the lending, balance sheet and interest rate channels (interest rate pass-through), and also investigates the effect of financial development on the channels of monetary policy transmission relating to the banking sector.

Recent studies of these channels of monetary policy transmission, as well as the effect of financial development on them, broadly focus on developed countries, such as the US and European ones. This leaves a gap for the study of developing countries, and therefore this thesis uses Thailand as a case study of a developing country. It also introduces the micro data based approach to both the bank lending channel and firm balance sheet channel, thus filling the gap in the past empirical studies, which mainly use time series data.

This thesis also shed light on the effect of financial development on the channels of monetary policy transmission relating to the banking sector, which is an aspect which is rarely focused on in past empirical studies, especially of developing countries. It also introduces the effect of financial development on different areas (financial liberalization, financial competition, financial innovation, financial deepening, banking sector and capital market development) and studies the effect of different aspects of financial development on the channels of monetary policy transmission relating to the banking sector. This fills the gap in past empirical papers, which only focus on a few aspects of financial development on monetary policy transmission.

Moreover, this thesis is the first case study of Thailand to examine the effect of financial development on the micro data based aspect of the credit channel and on interest rate pass-through. It is also the first case study of Thailand to introduce different aspects of financial development to examine the effect of financial development on these channels.

The following section will summarise the main empirical findings of the thesis (section 7.2). Section 7.3 will discuss the implications and section 7.4 will state the limitations of the thesis and make suggestions for further research.

7.2 Summary of results

The main aims of this thesis were to examine the channels of monetary policy transmission relating to the banking sector, as well as to investigate the effect of financial development on these channels in Thailand. Therefore, our study was divided into three main empirical chapters investigating the three channels of monetary policy transmission relating to the banking sector as well as the effect of financial development on these channels (the bank lending channel, the bank balance sheet channel and the interest rate channel).

Chapter 4 examined the bank lending channel in Thailand from the micro data based perspective by using bank panel data from 1978 to 2008 and investigated the effect of financial sector development on the bank lending channel. We applied different panel data estimation techniques (fixed effect estimation, 2SLS, first difference GMM and system GMM estimation) and our results confirm the bank lending channel theory in Thailand as we found a significant negative effect of the policy interest rate on bank loans. We also found that the higher the size, capitalization and liquidity of banks, the weaker the effect of the policy interest rate on bank loans and thus the weakening of the bank lending channel. This is due to the relatively high ability to obtain external funding of the large, highly capitalized, and highly liquid banks in Thailand. However, we found that the size characteristic variables show an unexpected negative effect on bank loans due to the balance sheet structure of banks in Thailand, with small banks having higher capital to asset and securities to asset ratios. Also, the capital characteristic variable shows an unexpected negative effect on bank loans, as the poorly capitalized banks have considerably higher average loans than the highly capitalized ones. Despite these unexpected findings, this result will have little impact when the effect of the policy interest rate variable is included. This is because the balance sheet structure of large and high capitalized banks in Thailand which still have the relatively high ability to obtain external funding. In this case, the balance sheet of banks in Thailand shows that large banks still have a relatively high proportion of average bank securities, total equity, total liquid assets, and liquidity to total asset ratio compared with small ones. Better capitalized banks have better access to external funding sources due to the higher proportion of capitalization (capital to asset ratio) and liquidity (liquidity to asset ratio), compared to poorly capitalized banks. Moreover, the highly liquid banks in Thailand have a higher proportion of bank securities, capital and liquid assets compared with those with weak liquidity. Therefore, we conclude that a greater bank size, capital and liquidity will weaken the effect of the policy interest rate on bank loans, and thus weaken the bank lending channel in Thailand.

The results of the effect of financial sector development on the bank lending channel indicate that banking sector development (both in size and activity), banking competition, capital market development (both size and activity), bond market development (financial innovation), and financial liberalization show a similar conclusion, in that these developments will weaken the bank lending channel. Development in the size of the banking sector causes a rise in the degree of financial intermediation, an improvement in financial market liquidity, and an increase in the opportunities for external funding. Also, the development of the activities of the banking sector leads to an increase in banking loans and services provided to customers. Thus, banking sector development can weaken the effect of the policy interest rate on bank loans as banks have greater opportunities to obtain loans, increased external sources of funding and access to banking products and services. Financial competition (a lower concentration ratio) will lead to a more competitive environment in the banking sector and a lower cost for the banks in the market to access other sources of funds. This situation can therefore weaken the effect of the policy interest rate via the bank lending channel due to this greater opportunity to access alternative external funding sources. Furthermore, capital market development, bond market development, and financial innovation will result in a greater opportunity for banks to obtain other funding sources via securities and equity investment, the development of new financial instruments and risk diversification techniques. Thus, this will weaken the effect of the policy interest rate on bank loans and the bank lending channel. In addition, financial liberalization in Thailand can have a weakening effect on the bank lending channel due to the deregulation policies (capital account liberalization, and the relaxation of financial institution and market restrictions). These results in more opportunities to obtain additional sources of funding, thus reducing the effect of the policy interest rate on bank loans.

Chapter 5 examined the firm balance sheet channel and also investigated the effect of different aspects of financial sector development on this channel in Thailand from 1978 to 2008. The study was conducted by investigating the effect of firms' financial condition (their cash flow and leverage) on their investment in order to prove the existence of the firm balance sheet channel. We investigated this by using firm panel data and GMM estimation (first difference-GMM and system-GMM estimation) and the results from the baseline model confirm the firm balance sheet channel theory, as a stronger firm balance sheet condition (higher cash flow and lower firm leverage ratio) has a significant positive effect on firms' investment. These results confirm the theoretical expectation, as higher cash flow leads to an increase in firms' creditworthiness and investment spending. Also, higher firm leverage will raise the risky behaviour of firms (higher agency costs and default risk), raising the external finance premium and lowering investment. Our sub-sample result (small/large firms and high/low dividend payout firms) still shows the positive effect of firms' cash flow on investment, with a relatively higher effect in small and low dividend payout firms than in larger and high dividend ones. This is because small and low dividend firms have more financial constraint (a lower reputation and net worth) than large and high dividend ones, thus lowering their external funding opportunities. Therefore, small and low dividend firms' investment will depend more on their internal finance (cash flow). On the other hand, the leverage ratio shows a significant negative effect on the investment of these firms, while showing a lower insignificant effect on large and high dividend ones. This is in line with the theoretical expectation, since small and low dividend firms have a lower reputation and net worth, and higher external funding costs. Thus, they will have a high possibility of default risk and more agency cost than large and high dividend firms. An insignificant result of the leverage ratio in large and high dividend firms can explain why they tend to face less impact from financial constraint (firm leverage) as not only is there a lower effect of leverage on their investment, but additionally this does not have a significant effect on investment. Our results can have an implication for the firm balance sheet channel, as monetary policy can cause a weaker effect via the firm balance sheet channel, especially in the less financially constrained firms (large and high dividend ones) than the more constrained ones. This is because the less financially constrained firms have a higher reputation and net worth, lower external funding costs, and more dependence on their external finance, so they will reduce the effect of monetary policy via the firm balance sheet channel compared with the more constrained ones.

For the effect of financial sector development, our findings show similar results, in that financial development in Thailand (banking sector development, capital market development, financial competition, financial innovation, and financial liberalization) results in less dependence of firms' investment on their internal finance as they have more opportunity to obtain external funding sources. Banking sector development (both size and activities measure) leads to an increase in bank size, a higher degree of financial intermediation and a rise in the activities of financial intermediation provided to customers. This condition will increase the opportunity for firms to obtain bank loans and lower their external funding costs. This will reduce the dependence of their investment on internal funds (cash flow) and also lower the external funding cost and agency cost, thus raising their debt finance for investment (leverage). We find that financial competition (a lower the concentration ratio) leads to more easier for other banks to access borrowers' information and other sources of funding, thus leading to lower risk, lower external finance premiums faced by firms and less difficulty in accessing external sources of funds. Therefore, the investments of firms will depend less on their internal finance (cash flow) and reduce the effect of firms' leverage on investment. Our results show that capital market development (both size and activities measure) will result in a weaker effect of internal finance (cash flow) on investment and increase debt finance (leverage) for investment. This is because this development can lead to greater possibilities for firms to access external funding sources and thus they will be less dependent on their internal finance (cash flow). Capital market development also leads to lower external funding cost and agency cost for firms, thus increasing the opportunity for them to increase debt for investment. The greater development of the equity and bond markets will result in less dependence of firms' investment on their internal finance. Financial innovation (the development of new financial instruments and techniques) also reduces liquidity and credit risk and the external funding cost of firms, causing a rise in debt finance (leverage) for firms' investment. Financial liberalization in Thailand (domestic interest rate liberalization and relaxation of many financial market controls) also lowers the financial constraint of firms and reduces the dependence of their investment on internal funds. This causes a reduction in the external funding cost of firms and an increase in their dependence on external finance.

We found that the effect of financial development on our sub-sample estimation shows similar results to the total sample case, as banking sector development, capital market development, financial competition, financial innovation, and financial liberalization will result in less dependence of firms' investment on their internal finance and more dependence on external funds. The effects of these aspects of financial development are significant and higher in the small and low dividend firms, while showing a lower effect on the large and high dividend ones. This is because the more financially constrained firms (the small and low dividend payout ones) have a higher dependence on their internal funds, and higher agency and external financial costs. This leads to the greater dependence of investment on the balance sheet condition (cash flow and leverage) of the more constrained firms, and therefore financial development will also affect these firms more. Furthermore, we also found an insignificant effect of financial development on the sensitivity of investment to the balance sheet condition (cash flow and leverage) of firms, especially on the less financially constrained firms. This is because the large and high dividend firms already have greater opportunities to obtain external funding sources and relatively low external funding costs and agency costs than small and low dividend ones, which depend mostly on their internal funds. Therefore, financial development will possibly have no affect on these less constrained firms, which have relatively low agency costs, low external costs of funds and low default risk.

We found that firms will be less dependent on their internal finance and more on their external funds when there is financial development and that this effect is higher in the more constrained firms. Thus, this result also has implications for the theory of the firm balance sheet channel. It shows that monetary policy shock will have a weaker effect through the firm balance sheet channel as firms can obtain external funding sources to offset the effect of monetary policy. Thus, financial development can weaken the firm balance sheet channel and this effect is considerably higher in the more financially constrained firms.

Chapter 6 examined interest rate pass-through in Thailand and also the effect of different aspects of financial sector development on this pass-through from 1978Q1 to 2008Q4. We apply the quarterly time series data of interest rates in Thailand and the VECM technique and found an incomplete degree of long- and short-run interest rate pass-through, with a considerably higher degree of pass-through in the long-run compared with the short-run. This result is in line with our theoretical expectation, as an incomplete degree of pass-through is caused by various important factors which cause stickiness in the interest rate (credit rationing and the risk sharing behaviour of banks, the asymmetric information problem, and the costs faced by banks and investors, namely switching cost and adjustment cost). Also, the high degree of pass-through is probably caused by the financial sector development in the country during our study period. The study of different maturities of the time deposit interest rates (3 month, 6 month, 12 month, and 2 year time deposit interest rate) show that the higher the maturity of the time deposit interest rate, the greater the pass-through in the long-run, but the lower in the short-run. This result is supported by our theoretical prediction, as the interest rate pass-through in the short-run has a mean reversion property, and thus the effect of the policy interest rate on the short-term interest rate will be higher than the long-term ones. The speed of adjustment in every short-run pass-through model indicates a significant negative coefficient, thus confirming that we have disequilibrium adjustment in the short-run model.

For the effect of financial sector development, we found that capital market development, financial liberalization, banking competition and financial innovation will cause a greater degree of pass-through, thus leading to a stronger effect of the interest rate channel of monetary policy transmission. The explanation is that financial competition (lower concentration) can lead to a reduction in the banks' interest rate margins, as they do not want to pass on bank costs to customers, hence banks will tend to adjust their retail interest rates in a more competitive way. Also, when the interest rate pass-through model is considered as a marginal cost pricing model, the more competitive environment will cause a higher elasticity of price with respect to marginal cost, hence increasing the degree of pass-through. Capital market development (both size and activities measure) and financial innovation result in a higher degree of pass-through as this development creates wider alternative sources of funding and investment for savers and investors. This increases the demand elasticity of loans and deposits and therefore increasing the degree of interest rate pass-through and strengthening the interest rate channel. Moreover, the financial liberalization in Thailand, shown by many deregulation policies, such as interest rate ceiling abolition, capital control and foreign exchange control relaxation, gives banks additional opportunities to adjust retail interest rates and also leads to an increase in capital inflows, a higher volume of foreign exchange transactions, and financial openness. This results in an increase in alternative sources of investment for bank customers, leading to a higher demand elasticity of loans and deposits, thus increasing the extent of interest rate pass-through as well as strengthening of the interest rate channel. However, banking sector development will cause a lower degree of pass-through, resulting in a weaker effect of the interest rate channel. This is because greater banking sector development (both bank size and activities development) will show a greater degree of financial intermediation and a greater influence of banks among borrowers and depositors. This reduces the demand elasticity of loans and deposits and therefore leads to a lower degree of pass-through and the weakening of the interest rate channel.

When we performed the recursive estimations of the coefficient of the degree of pass-through (β coefficient), we found that all the β coefficients in both the lending and deposit rate equations present stability throughout the period, with some changes occurring in specific periods. The pass-through degree of both lending and deposit interest rates tends to adjust upwards during the periods 1984Q1 and 1991Q1 due to the adjustment by commercial banks of the short-term deposit interest structure (the 3 and 6 month deposit interest rate ceiling was adjusted upwards to achieve an interest rate level comparable to the 12 month deposit rate). The effect of the relaxation of the retail interest rate ceiling in Thailand, and other deregulation policies, resulted in a higher degree of pass-through, mostly shown in the increase of the β coefficients during 1991Q1. Moreover, the β coefficients also show negative adjustment during the period 1997Q4. This is due to the effect of financial crisis, which can lead to the problem of financial market volatility and market uncertainty, causing higher credit risk, adjustment costs and the asymmetric information problem and thus resulting in a lower degree of pass-through in this period.

7.3 Policy implications

Our empirical studies of the channels of monetary policy transmission related to the banking sector and the effect of financial development on these channels raises some important implications for policy in Thailand. The results in chapter 4 and 5 show that financial development can lead to an increase in the bank loan supply and the opportunity for firms to obtain bank loans and external financial sources of funds, thus lowering their external funding costs. The results in chapter 6 also show that financial development will lead to an increase in the degree of pass-through and thus will cause strengthen of the interest rate channel. Therefore, we found from our study that financial development can be used in order to stimulate economic growth in the country as it leads to an increase in loan supply and a rise in the opportunity for banks and firms to obtain external funding sources, thus increasing investment and economic growth. Policy makers could also possibly consider financial development as one of the factors that can lead to the effectiveness of monetary policy through the interest rate channel, as we found that financial development in Thailand can result in a higher degree of interest rate pass-through, thus strengthen the interest rate channel.

However, although we found that financial development can be used to stimulate the economy, our results also raise some important points for policy makers to consider before issuing new financial development plans in the future. In this case, we found in chapters 4 and 5 that financial development can lead to a rise in bank loan supply, thus policy makers should be aware that if they do not carefully control financial development in the country at a suitable level of development, this will probably result in a rise in the default risk of banks and firms and weaken the balance sheet condition. This possibly will increase the non-performing loan problem in the future and possibly lead to financial fragility. Moreover, we found that financial sector development can cause a weaker effect via the bank lending and firm balance sheet channels, as banks and firms can outweigh the effect of policy shock by obtaining alternative external sources of funds. Thus, policy makers should consider the effect of financial development when controlling and regulating monetary policy and before issuing new financial development policy, as these policies can cause a weaken effect via these channels and raise difficulties for them to control the economy through these channels. In addition, our results from chapter 6 show that financial development, especially capital market development, financial innovation, financial competition, and financial liberalization, can have a greater effect on the degree of pass-through. Therefore, it is important to be aware of the introduction of new financial development policies, as this can create an overshooting of the pass-through.

In addition, the effects of financial development can also pass through to the economy via other channels of monetary policy transmission apart from those in our study related to the banking sector. Hence, the effect of financial development on the economy also depend on other channels of monetary policy transmission and our discussion of the policy implication presented previously also depends on the other channels of monetary policy transmission, such as the asset price and exchange rate channels, as described in chapter 1. Therefore, an adequate supervisory system, appropriate risk management techniques in the banking and financial sectors, and stable conditions in the financial market and banking sector, are also needed when carrying out future financial development. In this case, it is important for policy makers to use macro-prudential policies as well as an appropriate supervisory system in order to control and regulate the economy when issuing financial development plan in the future as well as to reduce the risk of financial fragility possibly caused by the financial development. Some important policy implications including the macro-prudential policies and other supervisory measures are presented below.

Risk management should be considered in order to achieve financial stability and reduce the risk of external shocks. Loan loss reserves should be built up by banks during good economic conditions to reduce the liquidity risk which may occur in economic downturns and prevent the over issuing of debt of banks (Dickinson and Mullineux, 2001; Siregar, 2011). Sufficient capital to cover the risk should be put in place and controlled in line with the minimum capital requirement following the Basel II Accord (Siregar, 2011). Policy makers should also consider the introduction of the capital requirement based on the new Basel III Accord in order to prevent the possibility of systematic risk in the future, largely caused by international financial risk (BOT, 2011a). In Basel III, there is stricter requirement of capital in terms of an increase in the minimum capital requirement, a stricter definiton of risk-weighted assets, and an increase in other measures to improve risk management supervision and prevent financial risk in the future[46]. Therefore, policy makers in Thailand should consider the possibility of introducing the capital requirement based on the new Basel III standards in the future.

The loan-to-value ratio (LTV), debt-to-income ratio (DTI) and the credit ceilings should be used as macro-prudential policy tools to help prevent systematic risk, excessive expansion of credit and the liquidity problem of banks and firms, especially investment in the non-productive sector (real estate and short-term securities investment) as well as credit cards loans and personal loans (Watanagase, 2012; Oh, 2013; Nijathaworn, 2010). Other liquidity management instruments, such as the liquid asset minimum holding, maximum cash outflow, maximum leverage ratio, and maximum reserve holding, should also be controlled and regulated to prevent the maturity mismatch problem and improve the balance sheet strength of banks and firms (Siregar, 2011). Furthermore, both financial and non financial institutions should be aware of offshore over-borrowing, as a relatively large foreign currency denominated debt in their portfolio leads to a high degree of currency and liquidity risk

[46] The important changes in the Basel III capital requirement are an increase in the Tier 1 capital requirement (from 4% in Basel II to 6% of risk-weighted assets in Basel III), a rise in the common equity Tier 1 (from 2% to 4.5% of risk-weighted assets), an increase in the capital defined as Tier 1 (additional Tier 1), and the inclusion of additional measures to control the risk of financial institutions (leverage ratio and capital buffer requirement) (BIS, 2010; BOT, 2011a; Siregar, 1999). The details of the Basel II approach can be seen in BIS(2010) and BOT(2011a). The BOT is in the process of gathering information and studying the effect of Basel III on financial institutions and the economic sector in order to prepare to apply this approach in the future (from 2013 onwards) (BOT, 2011a).

(Jacque, 1999). In this case, the hedging instruments in Thailand (future and forward contract, options and debt-equity swap) should be further developed and introduced by the institutions in order to prevent these risks in the financial market.

Further supervisory measures should be introduced to prevent the possibility of financial market risk occurring in the market. Stress testing should be used by policy makers as policy tools for the investigation of financial institution risk profiles and financial stability and for improvement in the standard quantitative techniques for risk management (Siregar, 1999). Policy makers should improve the supervision of both financial and non-financial institutions as well as the credit rating agencies in terms of information disclosure and transparency (Dickinson and Mullineux, 2001). The strict control of the disclosure rules and the auditing process of banks and firms, particularly concerning bad and doubtful debts, are important for regulators in order to prevent the debt concealment (Dickinson and Mullineux, 2001). The liquidity disclosure of banks should be regularly controlled by policy makers to prevent the possibility of liquidity risk and the maturity mismatch problem (Siregar, 1999). Also, disclosure of banks' and firms' foreign borrowing and lending as well as a regularly provided corrected report are needed for the central banks to control the capital accounts and balance sheet status of banks and firms (Jacque, 1999). This can prevent the indebted problem and improve the accuracy of the information of central banks (Jacque, 1999).

Not only are appropriate risk management techniques and adequate supervision in the banking and financial sectors needed when carrying out financial development in the future, but also a reasonably stable macroeconomic condition is required. Therefore, it is also important for policy makers to enact suitable monetary policy to control the economy and maintain financial and economic stability in the country. In this case, the important macroeconomic vulnerabilities, including capital market conditions, financial and non-financial institution balance sheet strength, household and public debts, conditions in the real estate sector and risks of external shock (foreign exchange market conditions, trade partners and international economy), should be considered and controlled by the monetary policy committee in order to achieve economic and financial stability (Nakornthab, 2009). Policy makers should introduce an early warning system by using these vulnerability conditions or the economic indicators[47] as a way of detecting the risk of economic instability at an early stage and to introduce suitable policy to mitigate this risk (Nakornthab, 2009; Kochhar et al., 1998). Tightened monetary policy should be used when there is the possible signal of excessive macroeconomic growth and high inflation pressure, and the reduction of contractionary pressure should be made when there are signs of a return to stability in the markets (Kochhar et al., 1998; Watanagase, 2012). Furthermore, the accountability and transparency of monetary policy should be controlled and achieved by the central bank when devising monetary policy. In this case, the announcement of the monetary policy implementation to the public (via its website and the central bank annual or quarterly report), the clear policy objectives and targets issued by the central banks, the coordination of the central banks and the external committee members when there is monetary policy decision making, and regular meetings of the monetary policy committees, should be achieved when implementing the monetary policy (Nakornthab, 2009). Moreover, an adequate economic and financial infrastructure, such as suitable accounting, legal and supervisory systems, an improvement in regulatory coordination, the provision of adequate information to institutions and economic agents, and the support of the mechanisms of

[47] Short term debt to total debt, the broad money to reserves ratio, equity price volatility, the real effective exchange rate, foreign direct investment as a proportion of capital inflow, and terms of trade are considered as examples of useful economic indicators used for signalling economic vulnerabilities (Kochhar et al., 1998).

consumer protection should be developed before implementing monetary policy and the new financial development plans in the future (Trairatvorakul, 2012; Lee, 2003; BOT, 2006b).

In addition, policy makers should encourage international cooperation in the financial market and institutional sectors. In this case, they should support the improvement of adequate cross-border financial institution supervisory cooperation and cross-country supervisory coordination in order to support the effectiveness of macro-prudential policy and to reduce a regulatory arbitrage, and the spillover of the financial market and institutional risks (BOT, 2011b; Siregar, 2011).

Therefore, the policy implications and suggestions discussed previously can be used as the policy implications for further development of the Thai financial sector (financial master plan phase II). Moreover, we described in chapter 3 that this master plan aims to support financial competition, financial access and financial infrastructure, as well as to improve the financial risk management system and reduce operating costs in the banking system. Thus, the main aims of improving the risk management system and supporting the financial infrastructure should be achieved in line with other developments in this plan in order to reduce the possible risk of financial fragility in the future. Policy makers should also use the monetary policy in order to maintain stable economic and financial conditions in the country. As a result, this can prevent systematic risk, financial market risk, and the risk from external shocks that can possibly affect the economy during the implementation of the financial development plan in the future.

7.4 Limitations and suggestions for further research

There are some limitations in this thesis in relation to the three main empirical chapters, which raise suggestions for further study:

(1) For the study of the bank lending channel in Thailand, the bank balance sheet data for bank lending to specific sectors, such as bank loans to the business sector or to households, are not available. As a result, we only use the data of total loans in different banks to represent bank loans. Accordingly, it would be interesting for further studies to investigate the effect of monetary policy and financial development on the bank lending channel in terms of the effect on bank loans in specific sectors, such as the corporate and household ones.

(2) The study of the firm balance sheet channel in Thailand mainly focuses on the firm balance sheet and the effect of financial development on it in both the total sample cases and the sub-sample cases (firm size and firm dividend payout ratio). There remains the possibility of study by dividing the firms according to their industrial sectors, and thus further research could also extend investigations in this area by focusing on the firm balance sheet channel in different sectors of firms, as well as the effect of financial development on this channel.

(3) There is a data limitation in the study of interest rate pass-through in Thailand in terms of the interest rates in different economic sectors (business loan rate, mortgage interest rate and consumer interest rate) as well as the loan interest rate in different maturities (short-term and long-term loan rates, and different maturities of bond interest rates); therefore, we cannot examine the pass-through on different types of retail interest rates. This leave a gap for further

studies of this issue to include analysis of interest rate pass-through for different types of retail interest rates as well as the effect of financial development on this pass-through.

(4) Data is unavailable in our consideration period for the investigation of other channels of monetary policy transmission (asset price and exchange rate channels). Therefore, this thesis has mainly focused on the channels of monetary policy transmission relating to the banking sector, namely the interest rate channel, bank lending channel and firm balance sheet channel. Further study could be extended by examining the other channels of monetary policy transmission as well as the effect of financial development on them.

REFERENCES

Acheampong, K. (2005) bank interest rate channel of monetary policy transmission in Ghana. *Bank of Ghana Working Paper* [online],8. Available from: http://www.bog.gov.gh/privatecontent/ Publications/Staff_Working_Papers/2005/wp-10.pdf [Accessed 10th October 2012].

Adams, R.M. and Amel, D.F. (2005) The effects of local banking market structure on the bank-lending channel of monetary policy. *Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series Working paper* [online], 16. Available from: http://www.federalreserve.gov/pubs/feds/2005/200516/200516pap.pdf [Accessed 7th July 2011].

Afandi, A. (2005) *Monetary policy transmission mechanism and structural breaks in Indonesia.* PhD. thesis, University of Wollongong

Agca, S. and Mozumdar, A. (2008) The impact of capital market imperfections on investment-cash flow sensitivity. *Journal of Banking and Finance,* 32 (3): 207-216

Agung, J. (1998) financial deregulation and the bank lending channel in developing countries: the case of Indonesia. *Asian Economic Journal,* 12 (3): 273-294

Agung, J. (1999) *Financial deregulation and monetary policy: The case of Indonesia*. PhD. thesis, University of Birmingham.

Agung, J., Morena, R., Pramono, B., and Prastowo, N.J. (2002a). "Bank Lending Channel of Monetary Transmission in Indonesia" In Warjiyo, P. and Agung, J. (Eds.) *Transmission Mechanisms of Monetary Policy in Indonesia*, Indonesia: Financial Market Structure and Studies Division, pp. 103-136

Agung, J., Morena, R., Pramono, B., and Prastowo, N.J. (2002b). "Monetary Policy and Firm Investment: Evidence for Balance Sheet Channel in Indonesia" In Warjiyo, P. and Agung, J. (Eds.) *Transmission Mechanisms of Monetary Policy in Indonesia*, Indonesia: Financial Market Structure and Studies Division, pp. 137-158

Aktaş, C. and Onur-Taş, B.K. (2007) The bank lending channel in Turkey: Effect of capital adequacy ratio. *Journal of Banking and Financial Markets*, 1(1):61-76.

Alam, T. And Waheed, M. (2006) The monetary transmission mechanism in Pakistan: a sectoral analysis. *Munich Personal RePEc Archive Paper* [online], 2719. Available from: http://mpra.ub.uni-muenchen.de/2719 /1/MPRA_paper_2719.pdf [Accessed 7th January 2013]

Alba, P., Hernandez, L., and Klingebiel, D. (1999) *Financial Liberalization and the capital account: Thailand 1988-1997*. The World Bank Book [online]. Available from: [http://elibrary.worldbank.org/docserver/download/2188.pdf?expires=1377548449&id=id&accname=guest&checksum=C5BE5F110E2E1B0DA1E7CC10D5D9544E [Accessed 16th May 2013]

Aleem, A. (2009) Transmission mechanism of monetary policy in India. *Journal of Asian Economics*, 21(2):186-197

Alfaro, R., Franken, H., Garcia, C., and Jara, A. (2003) Bank lending channel and the monetary transmission mechanism: the case of Chile. *Central Bank of Chile Working Papers* [online],223. Available from: http://www.bcentral.cl/estudios/ documentos-trabajo/pdf/dtbc223.pdf [Accessed 6th March 2010].

Allen, F. And Santomero, A.M. (2001) What do financial intermediaries do? *Journal of Banking & Finance,* 25:271-294

Alonso-Borrego, C. and Arellano, M. (1999) Symmetrically normalized instrumental-variable estimation using panel data. *Journal of Business &Economic statistics*, 17(1):36-49

Altunbaş, Y., Fazylov, O. and Molyneux, P. (2002) Evidence on the bank lending channel in Europe. *Journal of Banking and Finance,* 26 (11): 2093-2110

Altunbas, Y., Gambacorta, L. and Marques-Ibanez, D. (2009a) Financial innovation, bank capital and the bank lending channel: A European empiricist's perspective. *Conference Paper on monetary policy transmission mechanism in the euro area in its first 10 years, European Central Bank, Frankfurt* [online], 28th September 2009. Available from: http://www.ecb.int/events/pdf/conferences/moneymechanism/session3_item5_paper.pdf ?ad97766ef9c8932cbf094422cee9001e [Accessed 5th August 2012]

Altunbas, Y., Gambacorta, L. and Marques-Ibanez, D. (2009b) Securitisation and the bank lending channel. *European Economic Review,* 53 (8): 996-1009

Amarasekara, C. (2005) Interest rate pass-through in Sri Lanka. *Central Bank of Sri Lanka Staff Studies*, 35(1):1-32.

Anderson, T.W. and Hsiao, C. (1982) Formulation and estimation of dynamic models using panel data. *Journal of Econometrics*, 18: 47-82

Andriesz, E., Asteriou, D. and Pilbeam, K. (2005) The Lilnkage between financial liberalization and economic development: empirical evidence from Poland. *Journal of Economic Integration,* 20: 383-399

Angelini, I. and Cetorelli., N. (2000) *Bank Competition and Regulatory Reform: The Case of the Italian Banking Industry* [online]. Available from: http://www.bancaditalia.it/pubblicazioni/econo/temidi/td00/td380_00/td380/tema_380_00.pdf [Accessed 20th April 2011].

Angeloni, I. and Ehrmann, M. (2003) Monetary Transmission in the Euro Area: Early Evidence. *Economics Policy*, 37:469-500

Angeloni, I., Kashyap, A., Mojon, B., and Terlizzese, D. (2002) Monetary transmission in the Euro area: where do we stand?. *European Central Bank Working Paper Series,* 114: 1-72

Angelopoulou, E. and Gibson, H.D. (2007) The balance sheet channel of monetary policy transmission: evidence from the UK. *Bank of Greece Working Paper Series* [online], 53. Available from: http://www.bankofgreece.gr/BogEkdoseis/Paper200753.pdf [Accessed 18th July 2012]

Arbeláez, M.A. and Echavarria, J.J. (2002) *Credit, financial liberalisation and manufacturing investment in Colombia* [online]. Available from: http://www.iadb.org/res/publications/pubfiles/pubR-450.pdf [Accessed 10th June 2011].

Arellano, C., Bai, Y. and Zhang, J. (2009) *Firm dynamics and financial development.* [online]. Available from: http://www.nber.org/papers/w15193.pdf [Accessed 19th October 2011]

Arellano, M. and Bond, S. (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies,* 58:277-297

Arestis, P. and Demetriades, P.O. (1997) Financial development and economic growth: assessing the evidence. *Economic Journal*, 107:783-799.

Arestis, P. and Caner, A. (2004) Financial liberalization and Poverty: Channel of Influence. *The Levy Economics Institute of Bard College*, 411:1-29

Arestis, P. and Sawyer, M. (2004) Can Monetary Policy affect the Real Economy?. *Levy Economics Institute Working Paper* [online], 335. Available from: http://www.levyinstitute.org/pubs/wp355.pdf [Accessed 31th November 2013].

Ashcraft, A.B. (2001) New evidence on the lending channel. *Federal Reserve Bank of New York Staff Reports* [online], 136. Available from: http://www.newyorkfed.org/research/economists/ashcraft/jmcb_11202003.pdf [Accessed 10th August 2011]

Aslanidi, O. (2007) *The optimal monetary policy and the channels of monetary transmission mechanism in CIS-7 countries: The case of Georgia* [online]. Available from: http://www.cerge.cuni.cz/pdf/wbrf_papers/O_Aslanidi_WBRF_Paper.pdf [Accessed 10th August 2011]

Atchariyachanvanich, W. (2004) VAR Analysis of monetary policy transmission mechanisms: empirical study on five Asian countries after the Asian crisis. *Forum of International Development Studies, 25*:39-59

Aydin, H. I. (2010) Interest rate pass-through in Turkey. *International Research Journal of Financial and Economics*,57:1-21.

Aysun, U. and Hepp, R. (2011) Securitisation and the balance sheet channel of monetary transmission. *Journal of Banking and Finance,* 35 (8): 2111-2122

Aziakpono, M. J. and Wilson, M. K. (2010) *Interest rate pass-through and monetary policy regimes in South Africa* [online]. Available from: http://www.csae.ox.ac.uk/conferences/2010-EDiA/papers/487-Aziakpono.pdf [Accessed 10th August 2012].

Aziakpono, M.J., Kleimeier, S., and Sander, H. (2010) Banking Market Integration in the SADC countries: evidence from interest rate analyses. *Applied Economics*, 44(29):1-34

Bacchetta, P. and Ballabriga, F. (2000) The impact of monetary policy and banks' balance sheets: some international evidence. *Applied Financial Economics,* 10: 15-26

Baltagi, B.H. (1994) Econometric Analysis of Panel Data. 4th ed. UK: John Wiley & Sons Ltd.

Banerjee, A. (1999) Panel data unit roots and cointegration: an overview. *Oxford Bulletin of Economics and Statistic*, 61(S1):607-629

Banerjee, A., Dolado, J., Galbraith, J.W., Hendry, D.F. (1993) *Co-integration, Error-Correction, and the Econometric Analysis of Non-Stationary Data.* UK: Oxford University Press.

Bangura, L. (2011) *Adjustment of commercial banks interest rates and the effectiveness of monetary policy: evidence from Anglophone West Africa*. Master thesis of commerce (financial markets). Department of Economics and Economic History, Rhodes University, Grahamstown.

Bank of England (1999) The transmission mechanism of monetary policy. The Monetary Policy Committee, Bank of England Report [online]. Available from: http://www.bankofengland.co.uk/publications/Documents/other/monetary/montrans.pdf [Accessed 2nd December 2013].

Bank of Korea (1998) Korea's experience of the monetary transmission mechanism. *Bank of International Settlement Policy Papers* [online],3. Available from: http://www.bis.org/publ/plcy03f.pdf [Accessed 30th April 2010].

Bank of Thailand (1979) *Annual Economic Report 1980.* Bangkok: Bank of Thailand.

Bank of Thailand (1980) *Annual Economic Report 1981.* Bangkok: Bank of Thailand.

Bank of Thailand (1982) *Annual Economic Report 1982.* Bangkok: Bank of Thailand.

Bank of Thailand (1983) *Annual Economic Report 1983.* Bangkok: Bank of Thailand.

Bank of Thailand (1984) *Annual Economic Report 1984.* Bangkok: Bank of Thailand.

Bank of Thailand (1985) *Annual Economic Report 1985.* Bangkok: Bank of Thailand.

Bank of Thailand (1986) *Annual Economic Report 1986.* Bangkok: Bank of Thailand

Bank of Thailand (1987) *Annual Economic Report 1987.* Bangkok: Bank of Thailand.

Bank of Thailand (1987) *Financial Institutions in Thailand*. Bangkok: Bank of Thailand.

Bank of Thailand (1988) *Annual Economic Report 1988.* Bangkok: Bank of Thailand.

Bank of Thailand (1989) *Annual Economic Report 1989.* Bangkok: Bank of Thailand.

Bank of Thailand (1990) *Annual Economic Report 1990.* Bangkok: Bank of Thailand.

Bank of Thailand (1991) *Annual Economic Report 1991.* Bangkok: Bank of Thailand.

Bank of Thailand (1992a) *Annual Economic Report 1992.* Bangkok: Bank of Thailand.

Bank of Thailand (1992b) *50 years Bank of Thailand (1942-1992)* (Thai Version). Bangkok. Bank of Thailand.

Bank of Thailand (1993) *Annual Economic Report 1993.* Bangkok: Bank of Thailand.

Bank of Thailand (1994a) *Annual Economic Report 1994.* Bangkok: Bank of Thailand.

Bank of Thailand (1994b) *Financial system and monetary policy procedure in Thailand.* Bangkok. Bank of Thailand.

Bank of Thailand (1995) *Financial Institutions, Supervision, and Development in Thailand.* Bangkok. Bank of Thailand.

Bank of Thailand (1996) *Annual Economic Report 1996.* Bangkok: Bank of Thailand.

Bank of Thailand (1997) *Annual Economic Report 1997.* Bangkok: Bank of Thailand.

Bank of Thailand (1998a) *Annual Economic Report 1998* [online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-98.pdf [Accessed 23th September 2010].

Bank of Thailand (1998b) *Financial system in Thailand.* Bangkok: Bank of Thailand.

Bank of Thailand (1999) *Annual Economic Report 1999* [online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-99.pdf [Accessed 23th September 2010].

Bank of Thailand (2000) *Annual Economic Report 2000*[online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-00.pdf [Accessed 23th September 2010].

Bank of Thailand (2001) *Annual Economic Report 2001* [online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-01.pdf [Accessed 23th September 2010].

Bank of Thailand (2002a) *Annual Economic Report 2002* [online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-02.pdf [Accessed 23th September 2010].

Bank of Thailand (2002b) *60 year Bank of Thailand (1942-2002).* Bangkok: Bank of Thailand.

Bank of Thailand (2004) *Annual Economic Report 2004* [online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-04.pdf [Accessed 23th September 2010].

Bank of Thailand (2006a) *Annual Economic Report 2006* [online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-06.pdf [Accessed 23th September 2010].

Bank of Thailand (2006b) *Thailand's Financial Sector Master Plan Handbook* [online]. Available from: http://www.bot.or.th/Thai/FinancialInstitutions/Highlights/MasterPlan/Documents/FSMP.pdf [Accessed 23th September 2010].

Bank of Thailand (2007) *Annual Economic Report 2007* [online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-07.pdf [Accessed 23th September 2010].

Bank of Thailand (2008a) *Annual Economic Report 2008* [online]. Available from: http://www.bot.or.th/English/ResearchAndPublications/Report/DocLib_AnnualEconReport/Annual-08.pdf [Accessed 23th September 2010].

Bank of Thailand (2008b) *All Statistic*cs *Report and Contact Persons* [online]. Available from: http://www.bot.or.th/English/Statistics/ContactPerson/Pages/Contact.aspx [Accessed 28th September 2010].

Bank of Thailand (2008c) *Specific Financial Institutions Supervision* (Thai version) [online]. Available from: http://www.bot.or.th/Thai/FinancialInstitutions/BOTRole/Scope/Pages/Scope21.aspx [Accessed 28th September 2010].

Bank of Thailand (2009) *The financial master plan phase II* [online]. Available from: http://www.bot.or.th/English/FinancialInstitutions/Highlights/FSMP2/Documents/FSMPII_EexecutiveSummaryE.pdf [Accessed 3th September 2010].

Bank of Thailand (2010a) *Financial Market Development* [online]. Available from: http://www.bot.or.th/English/FinancialMarkets/Fin_Mkt_Development/Pages/FinancialMarketDevelopment.aspx [Accessed 25th October 2010].

Bank of Thailand (2010b) *Debt Securities Trading* [online]. Available from: http://www.bot.or.th/English/FinancialMarkets/IntroductionToGovernmentDebtSecurities/InterestingContent/Pages/Trading.aspx [Accessed 3th November 2010].

Bank of Thailand (2010c) *Development of the Monetary Policy Framework in Thailand* [online]. Available from: http://www.bot.or.th/English/MonetaryPolicy/Target/Framework/Pages/index.aspx [Accessed 10th November 2010].

Bank of Thailand (2010d) *Thailand's financial system (Thai version)* [online]. Available from: http://www.bot.or.th/Thai/FinancialInstitutions/FIStructure/FI_System/THFISYS/Documents/Thai_FISystem.pdf [Accessed 28th September 2010].

Bank of Thailand (2011a) *Capital and liquidity requirement measures and supervison based on the Basel III approach (Thai version)* [online]. Available from: http://www.bot.or.th/Thai/FinancialInstitutions/Highlights/BaselIII/Documents/Basel_III_Paper_15_Jun_2011.pdf [Accessed 10th December 2013].

Bank of Thailand (2011b) *Monetary policy in the post-crisis world: the perspective from Thailand* [online]. Available from: http://www.bis.org/publ/bppdf/bispap57x.pdf [Accessed 10th December 2013].

Bank for International Settlements (BIS) (2010) *Basel III: A global regulatory framework for more resilient banks and banking systems* [online].Available from: http://www.bis.org/publ/bcbs189.pdf [Accessed 10th December 2013].

Barran, F., Coudert, V., Mojon, B. (1996) The transmission of monetary policy in the European Countries. *CEPII Research Center Working Papers* [online], 3. Available from: http://www.cepii.fr/anglaisgraph/workpap/pdf/1996/wp96-03.pdf [Accessed 10th August 2011]

Baswir, R. (2013) *The dangers of financial liberalization for the developing countries* [online]. Available from: http://www.evb.ch/cm_data/Revrisond.pdf [Accessed 22th January 2013].

Bates, S. and Vaugirard, V. (2009) *Monetary transmission channels around the subprime crisis: The US experience* [online]. Available from: http://basepub.dauphine.fr/xmlui/bitstream/handle/123456789/1483/7.Bates-.pdf;jsessionid=DA40A32733B178821F330DBCBA5137F4?sequence=2 [Accessed 1st August 2011]

Baum, C.F. (2009) *Instrumental variables and panel data methods in economics and finance* [online]. Available from: http://www.youtube.com/watch?v=MPP7Co_dJ4E [Accessed 10th October 2011]

Baugnet, V., Collin, M., and Dhyne, E. (2007) *Monetary policy and the adjustment of Belgian private bank interest rates- An econometric analysis*. Research Department, National Bank of Belgium [online]. Available from: http://www.ecb.europa.eu/events/pdf/conferences/mir/BaugnetCollinDhyne.pdf [Accessed 10th June 2012].

Baum, C.F., Caglayan, M., and Talavera, O. (2006) Firm Investment and Financial. *German Institute for Economic Research Discussion Papers* [online], 634. Available from: http://www.diw.de/documents/publikationen/73/diw_01.c.44845.de/dp634.pdf [Accessed 30th October 2012].

Beck, T. and Demirgüç-Kunt, A. (2009) Financial institutions and markets across countries and over time – data and analysis. *The World Bank Policy Research Working Paper* [online], 4943. Available from: http://siteresources.worldbank.org/INTRES/Resources/469232-1107449512766/Financial_Institutions_and_Markets_across_Countries.pdf [Accessed 11th February 2010].

Beck, T., Demirgüç-Kunt, A. and Levine, R. (1999) A new database on financial development and structure. *The World Bank Financial Sector Discussion Paper* [online], 2. Available from: http://www1.worldbank.org/finance/assets/images/fs02_web.pdf [Accessed 11th February 2010]

Beck, T., Feyen, E., Ize, A. and Moizeszowicz, F. (2008) Benchmarking financial development. *The World Bank Policy Research Working Paper* [online], 4638. Available from: http://elibrary.worldbank.org/content/workingpaper/10.1596/1813-9450-4638 [Accessed11th February 2010]

Beck, T. and Levine, R. (2003) Legal Institutions and Financial Development. *World Bank Policy Research Working Paper* [online], 3136. Available from: http://elibrary.worldbank.org/content/workingpaper/10.1596/1813-9450-3136 [Accessed11th February 2010]

Beck, T. and Rahman, M.H. (2006) Creating a more efficient financial system: challenges for Bangladesh. *The World Bank Policy Research Working Paper* [online], 3938. Available from: http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2006/06/ 07/000016406_20060607101704/Rendered/PDF/wps3938.pdf [Accessed11th February 2010]

Becker, R., Osborn, D. R., and Yildirim, D. (2010) *A threshold cointegration analysis of interest rate pass-through to UK mortgage rates* [online]. Available from: http://www.socialsciences.manchester.ac.uk/cgbcr/discussionpapers/index.html [Accessed 12th October 2012].

Belke, A., Beckmann, J., Verheyen, F. (2012) Interest Rate Pass-Through in the EMU. New Evidence from Nonlinear Cointegration Techniques for Fully Harmonized Data. *Ruhr Economic Papers* [online], 350. Available from: http://en.rwi-essen.de/media/content/pages/publikationen/ruhr-economic-papers/REP_12_350.pdf [Accessed 12th October 2012].

Benkovskis, K. (2008) *Is there a bank lending channel of monetary policy in Latvvia? Evidence from bank level data* [online]. Available from: http://www.bank.lv/public_files/images/img_lb/izdevumi/english/citas/wp_2008-1_benkovsky.pdf [Accessed 17th October 2011]

Ber, H., Blass, A. and Yosha, O. (2002) Monetary policy in an open economy: the differential impact on exporting and non-exporting firms. *Centre for Economic Policy Research Discussion Paper* [online], 3191. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=301871 [Accessed 11th February 2010]

Berg, J., Rixtel, A. V., Ferrando, A., de Bondt, G., and Scopel, S. (2005) The Bank Lending Survey for the Euro Area. *European Central Bank, Occasional Paper Series* [online], 23. Available from: http://www.ecb.europa.eu/pub/pdf/scpops/ecbocp23.pdf [Accessed 11th February 2010]

Bernanke, B.S. (2007) The financial accelerator and the credit channel. *The Speech at The Credit Channel of Monetary Policy in the Twenty-First Century Conference* [online]. Available from: http://www.federalreserve.gov/newsevents/speech/bernanke20070615a.htm [Accessed 30th October 2011]

Bernanke, B.S. and Blinder, A.S. (1992) The federal funds rate and the channels of monetary transmission. *American Economic Review,* 82 (4): 901-921

Bernanke, B.S. and Gertler, M. (1995) Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives*, 9(4):27-48.

Bernanke, B., Gertler, M. and Gilchrist, S. (1996) The financial accelerator and the flight to quality. *The Review of Economics and Statistics,* 78 (1): 1-15

Betancourt, R., Vargas, H., Rodriguez, N. (2008) Interest Rate Pass-Through in Colombia: A Micro-Banking Perspective. *Latin American Journal of Economics-formerly Cuadernos de Economia*, 45(131):29-58.

Bhaduri, S.N. (2005) Investment, financial constraints and financial liberalization: some stylised facts from a developing economy, India. *Journal of Asian Economics,* 16 (4): 704-718

Bhattacharyya, I. and Sensarma, R. (2008) How effective are monetary policy signals in India: evidence from a SVAR model. *Journal of Policy Modelling,* 30(1): 169-183

Bikker, J.A. and Haaf, K. (2000) Competition, concentration and their relationship: an empirical analysis of the banking industry. *Journal of Banking and Finance,* 26 (11): 2191-2214

Bikker, J.A., Spierdijk, L., and Finnie, P. (2007) Misspecification of the Panzar-Rosse Model: Assessing Competition in the Banking Industry. *Netherlands Central Bank, Research Department Working Papers* [online], 114 Available from: http://www.researchgate.net/publication/4809967_Misspecifiation_of_the_Panzar-Rosse_Model_Assessing_Competition_in_the_Banking_Industry [Accessed 8th June 2010].

Black, L.K. and Rosen, R.J. (2007) How the credit channel works: differentiating the bank lending channel and the balance sheet channel. *Federal Reserve Bank of Chicago Working Paper Series* [online],13. Available from: http://www.chicagofed.org/digital_assets/publications/working_papers/2007/wp2007_13.pdf [Accessed 8th June 2010].

Blot, C. and Labondance, F. (2011) *Bank interest rate pass-through in the eurozone: monetary policy transmission during the boom and since the financial crash* [online]. Available from: http://economics.soc.uoc.gr/macro/docs/Year/2011/papers/paper_4_126.pdf [Accessed 11th October 2012].

Blundell, R. and Bond, S. (1998) Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87:115-143

Blundell, R., Bond, S., Devereux, M. and Schiantarelli, F. (1992) Investment and Tobin's Q: Evidence from company panel data. *Journal of Econometrics,* 51 (1-2): 233-257

Bogoev, J. and Petrevski, G. (2012) Interest rate pass-through in South East Europe: An empirical analysis. *Economic Systems*, 36(4):571-593.

Bond, S. (2002) Dynamic panel data models: a guide to micro data methods and practice. *Portuguese Economic Journal*, 1(2):141-162

Bond, S. and Meghir, C. (1994a) Dynamic investment models and the firm's financial policy. *The Review of Economic Studies,* 61 (2): 197-222

Bond, S. and Meghir, C. (1994b) Financial constraints and company investment. *Fiscal Studies,* 15 (2): 1-18

Bond, S., Elston, J., Mairesse, J. and Mulkay, B. (1997) Financial factors and investment in Belgium, France, Germany and The UK: a comparison using company panel data. *The Review of Economics and Statistics,* 85(1)*:* 153-165

Bonga-Bonga, L. (2009) Monetary policy and long-term interest rates in Africa South *Economic Research Southern Africa Working Papers* [online],125. Available from: http://www.econrsa.org/node/149 [Accessed 20th October 2012].

Borio, C. E.V. and Fritz, W. (1995) The response of short-term bank lending rates to policy rates: A cross-country perspective. *Bank for International Settlement Working Paper* [online], 27. Available from: http://papers.ssrn.com/sol3/papers.cfm? abstract_id =863385[Accessed 10th November 2010].

Borys, M.M., Horváth, R. and Franta, M. (2009) The effects of monetary policy in the Czech Republic: an empirical study. *The Center for Economic Research and Graduate Education Working Papers* [online], 4. Available from: http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/en/research/research_publications/cnb_wp/download/cnbwp_2008_04.pdf [Accessed 10th November 2010].

Bougheas, S., Mizen, P. and Yalcin, C. (2006) Access to external finance: Theory and evidence on the impact of monetary policy and firm-specific characteristics. *Journal of Banking and Finance,* 30 (1): 199-227

Bourghrara, A. (2009) Monetary transmission mechanisms in Morocco and Tunisia. *Economic Research Forum Working Paper* [online], 460. Available from: http://www.erf.org.eg/CMS/uploads/pdf /1232888973 _460.pdf [Accessed 8th June 2010].

Bourghrara, A. And Ghazouani, S. (2010) Is there a bank lending channel of monetary policy in selected MENA countries? A comparative analysis. *Middle East Development Journal*, 2(2):251-282

Bredin, D., Fitzpatrick, T., and Reilly, G.O. (2001) Retail interest rate pass-through: the Irish Experience. *Central Bank of Ireland Research Technical Papers* [online], 6/RT/01. Available from: http://www.centralbank.ie/publications/documents/6rt01.pdf [Accessed 20th October 2012].

Brissimis, S.N. and Delis, M.D. (2009) *Bank heterogeneity and monetary policy transmission* [online]. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1233.pdf [Accessed 16th July 2012].

Brouwer, G. D. (1995) The liberalisation and integration of domestic financial markets in Western Pacific Economics. *Reserve Bank of Australia Research Discussion Paper* [online], 9506. Available from: http://www.rba.gov.au/publications/rdp/1995/pdf/rdp9506.pdf[Accessed 20th October 2012].

Brooks, C. (2008) *Introductory Econometrics for Finance*. 2nd Ed. Cambridge. Cambridge University Press.

Brooks, P.K. (2007) Does the bank lending channel of monetary transmission work in Turkey? *International Monetary Fund Working Paper* [online], 272. Available from: http://www.imf.org/external/pubs/ft/wp/2007/wp07272.pdf [Accessed 20th October 2012].

Bryson, T. (2009) *Firm investment and monetary transmission in Jamaica: an investigation of the balance sheet channel with micro-level firm data* [online]. Available from: http://www.boj.org.jm/uploads/pdf/papers_pamphlets/papers_pamphlets_Firm_investment_and_Monetary_Transmission_in_Jamaica__An_Investigation_of_the_Balance_Sheet_Channel_with_Micro-level_Firm_Data.pdf [Accessed 17th July 2012]

Butkiewicz, J.L. and Ozdogan, Z. (2009) Financial crisis, monetary policy reform and the monetary transmission mechanism in Turkey. *University of Delaware, Department of Economics Working Papers Series* [online],4. Available from: http://www.lerner.udel.edu/sites/default/files/imce/economics/WorkingPapers/2009/UDWP2009-04.pdf [Accessed 17th July 2012]

Butzen, P., Fuss, C. and Vermeulen, P. (2001) The interest rate and credit channels in Belgium: an investigation with micro-level firm data. *European Central Bank Working Paper Series* [online], 107. Available from: http://econpapers.repec.org/cpd/2002/7_Fuss.pdf [Accessed 17th July 2012]

Caprio, Jr. (1996) "Banking on financial reform? A case of sensitive dependence on initial conditions". In Caprio, Jr., G., Atiyas, I., and Hanson, J.A. (Ed.) *Financial Reform Theory and Experience,* Cambridge: Cambridge University Press. pp. 49-63

Caprio, G., Atiyas, I. and Hanson, J.A. (1993) "Financial reform: Lessons and strategies". In Faruqi, S. (Ed.) *Financial sector reforms in Asian and Latin American countries: Lessons of comparative experience*, Washington D.C., The International Bank for Reconstruction and Development, The World Bank

Carpenter, S. and Demiralp, S. (2009) *Money and the transmission of monetary policy* [online]. Available from: http://eaf.ku.edu.tr/sites/eaf.ku.edu.tr/ files/erf_ wp_0906.pdf [Accessed 17th August 2012]

Carrasquilla, A. (1998) Monetary policy transmission: the Colombian case. *BIS Working Paper Series* [online], 431. Available from: http://www.bis.org/publ/plcy 03d.pdf [Accessed 19th July 2012]

Çavuşoğlu, A.T. (2002) Credit transmission mechanism in Turkey: an empirical investigation . Economic Research Center Working Papers [online],3. Available from: http://www.erc.metu.edu.tr/ menu/series02/0203.pdf [Accessed 20th August 2011]

Cecchetti, S.G. (1995) *Distinguishing theories of the monetary transmission mechanism* [online]. Available from: http://research.stlouisfed.org/publications/ review/95/05/Distiguishing_May_June1995.pdf [Accessed 19th August 2010]

Cecchetti, S.G. (1999) *Legal structure, financial structure and the monetary policy transmission mechanis* [online]. Available from: http://www.nber.org /papers/w7151 [Accessed 19th July 2012]

Cetorelli, N. (1999) *Competitive analysis in banking: appraisal of the methodologies* [online]. Available from: http://www.chicagofed.org/digital_assets/ publications/economic_perspectives/1999/ep1Q99_1.pdf [Accessed 29th July 2011]

Chakravarty, S. L. (1971) *The credit channel of monetary transmission mechanism* [online]. Available from: http://www.igidr.ac.in/money/mfc_08/The%20Credit %20Channel%20of%20Monetary%20Transmission...Suvojit%20L.%20Chakravarty.pdf [Accessed 30th November 2010]

Charoenseang, J. and Manakit, P. (2002) Financial crisis and restructuring in Thailand. *Journal of Asian Economics,* 13(5):597-613

Charoenseang, J. And Manakit, P. (2007) Thai monetary policy transmission in an inflation targeting era. *Journal of Asian Economics*, 18:144-157

Chavan, A. and Vaidya, R.R. (2003) Financial liberalization in India and the bank lending channel of monetary transmission. *South Asia Economic Journal,* 4 (2): 221-243--103

Chatelain, J.B., Ehrmann, M, Generale, A., Martinez-Pagés, J., Vermeulen, P. and Worms, A. (2003a) Monetary policy transmission in the Euro area: new evidence from micro data on firms and banks. *Journal of the European Economic Association*, 1 (2-3): 731-742

Chatelain, J.B., Generale, A., Hernando, I., Von Kalckreuth, U. and Vermeulen, P. (2002) Firm investment and monetary policy transmission in the Euro area. Conference paper on 10th International Conference on Panel data, Berlin [online], 5-6 July 2002. Available from: http://econpapers.repec.org/cpd/2002/14_Vermeulen .pdf [Accessed 17th July 2012]

Chatelain, J.B., Generale, A., Hernando, I., Von Kalckreuth, U. and Vermeulen, P. (2003b) New findings on firm investment and monetary policy transmission in the Euro area. *Oxford Review of Economic Policy,* 19 (1): 1-11

Chatelain, J.B. and Tiomo, A. (2001) Investment, the cost of capital and monetary policy in the nineties in France: a panel data investigation. *European Central Bank Working Paper* [online], 106. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=356701 [Accessed 10th November 2011]

Chionis, D.P. and Leon, C.A. (2005) *Modeling interest rate transmission dynamics in Greece. Is there any structural break after EMU?* [online]. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=815584 [Accessed 20th June 2012].

Chirinko, R.S. (1997) Finance constraints, liquidity, and investment spending: theoretical restrictions and international evidence. *Journal of the Japanese and International Economies,* 11 (2): 185-207

Chirinko, R.S. and Schaller, H. (1995) why does liquidity matter in investment equations? *Journal of Money, Credit and Banking,* 27 (2): 527-548

Chirlesan, D. and Apostoaie, M.C. (2012) *The interest rate pass-through from policy rates to iinterbank interest rates in the Romanian financial system* [online]. Available from: http://www.freit.org/WorkingPapers/Papers/Other/FREIT411.pdf
[Accessed 20th November 2012].

Choi, I. (2001) Unit root tests for panel data. *Journal of International Money and Finance*, 20:249-272

Chong, B. S. (2010) Interest rate deregulation: monetary policy efficacy and rate rigidity. *Journal of Banking & Finance*, 34:1299-1307.

Chotigeat, T. and Lin, J.B. (2001) Coping with the 1997 financial crisis: policy issues in Southeast-Asia. *Multinational Business Review:* 52-56

Ciccarelli, M., Maddaloni, A., and Peydro, J.L. (2009) *Trusting the Bankers: A New Look at the Credit Channel of Monetary Policy*[online]. Available from: http://www.greta.it/credit/credit2009/Friday/11_Ciccarelli_Maddaloni_Peidro.pdf [Accessed 2nd February 2010].

Claessens, S. (2009) Competition in the financial sector: overview of competition policies. *International Monetary Fund Working Paper,* 45: 1-35

Claessens, S. and Laeven, L. (2005) Financial dependence, banking sector competition and economic growth. *Journal of the European Economic Association*, 3 (1): 179-207

Claessens, S. and Laeven, L. (2003) *What drives bank competition? Some international evidence* [online]. Available from: http://www.luclaeven.com/papers_files/2004%20CL%20Bank%20Competition%20JMCB.pdf [Accessed 15th July 2011].

Cokayne, G. (2009) The expectations hypothesis of the term structure of interest rates with mean-reverting expectation [online]. Available from: http://www.nek.lu.se/NEKfng/GCokayne.pdf [Accessed 23th July 2013].

Cooley, T.F. and Quadrini, V. (2006) Monetary policy and the financial decisions of firms. *Economic Theory,* 27 (1): 243-270.

Cottarelli, C. and Kourelis, A. (1994) Financial structure, bank lending rates, and the transmission mechanism of monetary policy. *International Monetary Fund Staff Papers*, 41(4): 587-623

Cottarelli, C., Ferri, F. and Generale, A. (1995) Bank lending rates and financial structure in Italy: a case study. *IMF Staff Paper*, 42(3):670-700.

Crespo-Cuaresma, J., Egert, B., and Reininger, T. (2006) Interest Rate Pass-Through in Central and Eastern Europe: Reborn from Ashes Merely to Pass Away?.*William Davidson Institute Working Papers Series* [online], wp851. Available from: http://wdi.umich.edu/files/publications/workingpapers/wp851.pdf [Accessed 15th August 2012].

Cull, R. and Effron L. (2005) World Bank lending and financial sector development. *The World Bank Policy Research Working Paper* [online], 3656. Available from: http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2005/06/27/000016406_20050627095937/Rendered/PDF/wps3656.pdf[Accessed 11th December 2010].

Dale, S. and Haldane, A.G. (1995) Interest rates and the channel of monetary transmission: some sectoral estimates. *European Economic Review,* 39: 1611-1626

Dasree, T. (1985) *financial system and banking in Thailand* (Thai version). Thailand: Bank of Thailand.

Da Silva, G.F. (2002) The impact of financial system development on business cycles volatility: cross-country evidence. *Journal of Macroeconomics,* 24 (2): 233-253,

De Bondt, G. (2002) Retail bank interest rate pass-through: new evidence at the Euro area level. *European Central Bank Working Paper Series*, 136:1-43

De Bondt, G. J. (2005) Interest rate pass-through: empirical results for the Euro Area. *German Economic Review*, 6(1):37-78

De Bondt, G., Mojon, B., and Valla, N. (2005) Term structure and sluggishness of retail bank interest rates in Euro area countries. *European Central Bank Working Paper Series*, [online], 518. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp518.pdf [Accessed 10th December 2012]

De Graeve,F., De Jonghe, O., and Vennet, R. V. (2007) Competition, transmission and bank pricing policies: evidence from Belgian loan and deposit markets. *Journal of Banking & Finance*, 31:259-278.

De Haan, L. (2001) The credit channel in the Netherlands: evidence from bank balance sheet. *European Central Bank Working Paper Series* [online], 98. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp098.pdf [Accessed 10th July 2010]

De la Torre, A., Gozzi, J.C. and Schmukler, S.L. (2006) Financial development in Latin America: big emerging issues, limited policy answers. *The World Bank Policy Research Working Paper* [online], 3963. Available from: http://elibrary.worldbank.org/docserver/download/3963.pdf?expires=1377603934&id=id&accname=guest&checksum=E83C9D1934E06DF3F5C9C905951F0B6E [Accessed 10th July 2010]

De Oliveira, F.N. (2006) *Effects of monetary policy on corporations in Brazil: an empirical analysis of the balance sheet channel* [online]. Available from: http://www.cemla.org/old/pdf/redxi/red-xi-012.pdf [Accessed 18th July 2012]

De Oliverira, F.N. and Ramos, M. I. (2008) *Bank lending channel in Brazil: evidence form the supply of bank loans and from the composition of external finance of corporations* [online]. Avalable from: http://virtualbib.fgv.br/ocs/index.php/sbe/EBE08/paper/download/484/45[Accessed 11th April 2010].

Demirguc-Kunt, A. and Detragiache, E. (1998) Financial Liberalization and Financial Fragility. *World Bank Policy Research Working Paper* [online], 1917. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=604928 [Accessed 11th May 2010].

Demirguc-Kunt, A. and Levine, R. (2008) Finance, Financial Sector Policies, and Long-Run Growth. The *World Bank Policy Research Working Paper Series* [online], 4469. Available from: http://www- wds.worldbank.org/ servlet /WDSC /WDSContentServer/WDSP/IB/2008/01/07 /000158349_20080107115116/Rendered/PDF/wps4469.pdf [Accessed 10th October 2010]

Demirgüç-Kunt, Al. and Maksimovic, V. (2000) Funding growth in bank-based and market-based financial systems. *The World Bank Policy Research Working Paper* [online], 2432. Available from: http://elibrary.worldbank.org/docserver/download/2432.pdf?expires=1377605294&id=id&accname=guest&checksum=D7C132936C391ED181E4117050571408 [Accessed 10th October 2010]

Den Haan, W.J., Summer, S.W. and Yamashiro, G.M. (2007) Bank loan portfolios and the monetary transmission mechanism. *Journal of Monetary Economics,* 54 (3): 904-924

Devereux, M. and Schiantarelli, F. (1989) Investment, financial factors and cash flow: Evidence from UK panel data. *The National Bureau of Economic Research Working Paper* [online], 3116. Available from: http://www.nber.org/papers/w3116.pdf?new_window=1 [Accessed 10th June 2010]

Dickinson, D. G. and Liu, J. (2007) The real effects of monetary policy in China: An empirical analysis. *China Economic Review*, 18:87-111

Dickinson, D. G. and Mullineux, A.W. (2001) Lessons from the East Asian financial crisis: A financial sector perspective. Geoforum, 32:133-142

Disyatat, P. and Vongsinsirikul, P. (2003) Monetary policy and the transmission mechanism in Thailand. *Journal of Asian Economics,* 14 (3): 389-418

Donnay, M. and Degryse, H. (2001) *Bank lending rate pass-through and differences in the transmission of a single EMU monetary policy* [online]. Available from: http://www.econ.kuleuven.be/eng/ew/discussionpapers/Dps01/Dps0117.pdf [Accessed 20 th October 2012].

Doornik, J.A., Hendry, D.F., and Nielsen, B. (1998) Inference in Cointegrating Models: UK M1 Revisited. *Journal of Economic Surveys*, 12(5):533-572

Edirisuriya, P. (2007) Effects on financial sector reforms in Sri Lanka: Evidence from the banking sector. *Journal of Finance and Banking Research,* 1 (1): 45-64

Ees, H.V. and Garretsen, H. (1994) Liquidity and business investment: Evidence from Dutch panel data. *Journal of Macroeconomics*, 16(4): 613-627

Egert, B. and Macdonald, R. (2006) Monetary Transmission Mechanism in Transition Economies: Surveying the Surveyable. *CESifo Working Paper Series* [online], 1739. Available from: http://papers.ssrn.com/sol3/papers.cfm? abstract_ id=914472 [Accessed 11th March 2010].

Egert, B., Crespo-Cuaresma, J., and Reininger, T. (2006) Interest rate pass-through in Central and Eastern Europe: Reborn from Ashes Merely to Pass Away?. *William Davidson Institute Working Papers Series* [online], wp851. Available from: http://wdi.umich.edu/files/publications/workingpapers/ wp851.pdf [Accessed 10th November 2012].

Ehrmann, M. and Worms, A. (2004) Bank networks and monetary policy transmission. *Journal of the European Economic Association,* 2 (6): 1148-1171

Ehrmann, M., Gambacorta, L., Martinez-Pagés, J., Sevestre, P. and Worms, A. (2001) Financial systems and the role of banks in monetary policy transmission in the Euro area. *European Central Bank Working Paper Series* [online], 105. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp105.pdf [Accessed 10th November 2012].

Enders, W. (2004) *Applied Econometric Time Series.* 2nd Ed. US. John Wiley & Sons, Inc.

Engle, R.F. and Granger, C.W.J. (1987) Co-integration and error correction: representation, estimation, and testing. *Econometrica*, 55(2):251-276.

Espinosa-Vega, M.A. and Rebucci, A. (2004) Retail bank interest rate pass-through: is Chile Atypical? *IMF Working Paper* [online], 112. Available from: http://www.imf.org/external/pubs/ft/wp/2003/wp03112.pdf [Accessed 10th November 2012].

Farinha, L. and Marques, C.R. (2001) The bank lending channel of monetary policy: identification and estimation using Portuguese micro bank data. *European Central Bank Working Paper Series* [online], 102. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp102.pdf [Accessed 10th October 2010].

Favero, C. A., Giavazzi, F. and Flabbi, L. (1999) The transmission mechanism of monetary policy in Europe: Evidence from banks' balance sheets. *National Bureau of Economic Research Working Paper* [online], 7231. Available from: http://homepages.nyu.edu/~lf367/transmission.pdf [Accessed 3rd January 2010].

Fazzari, S., Hubbard, R.G. and Petersen, B.C. (1988) Financing constraints and corporate investment. *Brooking Papers on Economic Activity*, 1: 141-206.

Federation of Thai Capital Market Organisation (2009a) *The Master Plan of Developing Thai Capital Market* (Thai version) [online]. Available from: http://www.fetco.or.th/th/files/MasterPlan_2.pdf [Accessed 13th November 2010].

Federation of Thai Capital Market Organisation (2009b) *Thai capital market master plan phase II* (Thai version) [online]. Available from: http://www.set.or.th/setresearch/files/1_feb_06_%20master_%20plan-edit.pdf [Accessed 13th November 2010].

Fernandez, V. (2004) *The credit channel in an emerging economy* [online]. Available from:http://www.dii.uchile.cl/~ceges/publicaciones/ceges55.pdf [Accessed 10th June 2011]

Ferri, G. And Kang, T.S. (1999) *The credit channel at work: lessons from the Republic of Koreas Financial crisis* [online]. Available from: http://elibrary.worldbank.org/docserver/download/2190.pdf?expires=1357631990&id=id&accname=guest&checksum=BD2BC09524A2D1EDC43D8A35D078D009 [Accessed 20th July 2011]

Ferreira, C. (2010) *The credit channel transmission of monetary policy in the European Union* [online]. Available from: http://aquila2.iseg.utl.pt/aquila/getFile.do?method=getFile&fileId=94463 [Accessed 13th November 2010].

Frisancho-Mariscal, I. B. and Howells, P. (2010) Interest rate pass-through and risk. *University of the West of England, Department of Economics Discussion Papers* [online], 1016. Available from: http://carecon.org.uk/DPs/1016.pdf [Accessed 20th October 2012].

Fritz, R.G. (2013) *Economic development and financial deepening: a study of causation and dynamics* [online]. Available from: http://www.systemdynamics.org/conferences/1985/proceed/fritz259.pdf [Accessed 25th January 2013].

Fomum, T. A. (2011) *Interest rate pass-through in Cameroon and Nigeria: a comparative analysis*. Master of Commerce in Financial Markets thesis. Rhodes University, Grahamstown.

Fried, J. and Howitt, P. (1980) Credit Rationing and Implicit Contract Theory. *Journal of Money, Credit and Banking*, 12(3):471-487.

Fung, B.S.C. (2002) A VAR analysis of the effects of monetary policy in East Asia. *BIS Working Paper* [online], 119. Available from: http://www.bis.org/publ/work119.pdf [Accessed10th October 2010]

Gaiotti, E. and Generale, A. (2001) Does monetary policy have asymmetric effects? A look at the investment decisions of Italian firms. *Giornale degli Economisti e Annali di Economia,* 61(1):29-59

Galindo, A., Schiantarelli, F. and Weiss, A. (2007) Does financial liberalization improve the allocation of investment? Micro-evidence from developing countries. *Journal of Development Economics,* 83 (2): 562-587

Gallego, F. and Loayza, N. (2000) Financial structure in Chile: macroeconomic developments and microeconomic effects. *Central Bank of Chile Working Paper* [online], 75. Available from: http://www.bcentral.cl/estudios/documentos-trabajo/pdf/dtbc75.pdf [Accessed 14 th May 2010].

Gambacorta, L. (2001) Bank-specific characteristics and monetary policy transmission: the case of Italy. *European Central Bank Working Paper Series* [online], 103. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp103.pdf [Accessed 14th May 2010].

Gambacorta, L. and Mistrulli, P.E. (2004) Doe bank capital affect lending behaviour? *Journal of Financial Intermediation,* 13 (4): 436-457

Garretsen, H. and Swank, J. (2003) The bank lending channel in the Netherlands: the impact of monetary policy on households and firms. *De Economist,* 151: 35-51

Gelos, R.G. and Werner, A.M. (2002) Financial liberalization, credit constraints and collateral: investment in the Mexican manufacturing sector. *Journal of Development Economics,* 67 (1): 1-27

Georgopoulos, G. and Hejazi, W. (2009) Financial structure and the heterogeneous impact of monetary policy across industries. *Journal of Economics and Business,* 64(1):1-33

Gertler, M. and Gilchrist, S. (1993) The role of credit market imperfections in the monetary transmission mechanism: arguments and evidence. *Scandinavian Journal of Economics,* 95 (1): 43-64

Gertler, M. and Gilchrist, S. (1994) Monetary policy, business cycles and the behaviour of small manufacturing firms. *The Quarterly Journal of Economics,* 91 (2): 309-340

Gertler, M. And Rose, A. (1996) Finance, Public policy, and growth. In Caprio, Jr., G., Atiyas, I., and Hanson, J. *Financial reform theory and experience,* Cambridge: Cambridge University Press. pp. 36-40

Ghazali, N.A. and Rahman, A.A. (2001) Monetary policy, development of financial market and banking lending: an analysis of the bank-lending channel in Malaysia. *Malaysian Management Journal,* 5 (1&2): 119-137

Ghosh, S. (2006) Monetary policy and bank behaviour: Empirical evidence from India. *Political Weekly*, 41(10):853-856

Ghosh, S. and Sensarma, R. (2004) Does monetary policy matter for corporate governance? Firm-level evidence for India. *Advances in Financial Economics*, 9:327-353.

Giannone, D., Lenza, M. and Reichlin, L. (2009) *Money, credit, monetary policy and the business cycle in the Euro area* [online]. Available from: http://research.stlouisfed.org/conferences/appliedeconometrics/2009/Giannone.pdf [Accessed 4 th August 2012]

Gilchrist, S.G. and Zakrajsek, E. (1995) "The importance of credit for macroeconomic activity: identification through heterogeneity." In Peek, J. and Rosengren, E.S. (eds.) *Is bank lending important for the transmission of monetary policy?,*39. Boston: Federal Reserve Bank of Boston. pp.130-157

Gilchrist, S. and Himmelberg, C.P. (1995) Evidence on the role of cash flow for investment. *Journal of Monetary Economics,* 36 (3): 541-572

Golodniuk, I. (2006) Evidence on the bank-lending channel in Ukraine. *Research in International Business and Finance,* 20 (2): 180-199

Gomez-Gonzalez, J. and Grosz, F. (2007) Evidence of a bank lending channel for Argentina and Colombia. *Cuadernos de Economía-Latin American Journal of Economics,* 44 (129): 109-126

Goyal, R., Marsh, C., Raman, N., Wang, S. and Ahmed, S. (2011) financial deepening and international monetary stability. *IMF Staff Discussion Note* [online], 16. Available from: http://www.imf.org/external/pubs/ft/sdn/2011/sdn1116.pdf [Accessed 10th October 2010]

Granger, C.W.J. and Newbold, P. (1974) Spurious regressions in econometrics. *Journal of Econometrics*, 2:111-120

Greenwood, J. and Smith, B. (1997) Financial markets in development and the development of financial markets. *Journal of Economic Dynamics and Control*, 21:145-182.

Gropp, R., Serensen, C. K., and Lichtenberger, J. (2007) The dynamics of bank spreads and financial structure. *European Central Bank Working Paper Series* [online], 714. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp714.pdf [Accessed 5th April 2010].

Guariglia, A. (1999) The effects of financial constraints on inventory investment: Evidence from a panel of UK firms. *Economica,* 66 (261): 43-62

Gudmundsson, M. (2008) Financial globalisation: key trends and implications for the transmission mechanism of monetary policy. *BIS Working Paper* [online], 39. Available from: http://www.bis.org/publ/bppdf/bispap39c.pdf [Accessed 5th April 2010].

Guncavdi, O., Bleaney, M. and McKay, A. (1998) Financial liberalization and private investment: evidence from Turkey. *Journal of Development Economics,* 57 (2): 443-455

Guninigundo, D.C. (2008) Transmission mechanism of monetary policy in the Philippines *BIS Working Paper* [online], 35. Available from: http://www.bis.org/publ/ bppdf/ bispap35s.pdf [Accessed 26th October 2009]

Gunji, H. And Yuan, Y. (2010) Bank profitability and the bank lending channel: evidence from China. *Journal of Asian Economics,* 21:129-141

Gunji, H., Miura, K. and Yuan, Y. (2009) Bank competition and monetary policy. *Japan and the World Economy,* 21 (1): 105-115

Gupta, K.L. (1987) Aggregate savings, financial intermediation, and interest rate. *Review of Economics and Statistics*, 69(2):303-311.

Gupta, A. (2004) *Comparing bank lending channel in India and Pakistan* [online]. Available from: http://mpra.ub.uni-muenchen.de/9281/1/MPRA_paper_9281.pdf [Accessed 4th August 2012]

Gupta, P. (2003) Determinants of bank lending and the effects of monetary policy on bank lending in developing countries. *Master Dissertation, London School of Economics and Political Science*.

Hall, S. (2001) Credit channel effects in the monetary transmission mechanism. *Bank of England Quarterly Bulletin, winter* [online]. Available from: http://www.bankof england.co.uk/ publications/ Documents/ quarterlybulletin/qb010404.pdf [Accessed 19th July 2012].

Haan, L. D. (2001) The credit channel in the Netherlands: Evidence from bank balance sheets. *European Central Bank Working Paper Series*[online], 98. Available from: http://www.ecb.int/pub/pdf/scpwps/ecbwp098.pdf [Accessed 28th March 2010].

Hanif, M.N. and Khan, M.H. (2012) Pass-through of SBP policy rate to market interest rates: an empirical investigation. *Munich Personal RePEc Archive Working Paper* [online], 39587. Available from: http://mpra.ub.uni-muenchen.de/39587/ [Accessed 20th October 2012].

Hanson, J.A. (1996) "An open capital account: A brief survey of the issues and the results." In Caprio, Jr., G., Atiyas, I., and Hanson, J. A. (eds.) *Financial Reform: Theory and Experience*. Cambridge: Cambridge University Press. pp.323-356

Hansen, N. H. And Welz, P. (2011) Interest rate pass-through during the global financial crisis: the case of Sweden. *OECD Economics Department Working Papers,* [online], 855. Available from: http://www.oecd- ilibrary.org/docserver/download/5kgdx1j025ln.pdf?expires=1377615269&id=id&accname=guest&checksum=80FD5428F4576D86D7E1F59025DE36A6 [Accessed 8th January 2012].

Hamilton, J.D. (1994) *Time Series Analysis.*UK: Princeton University Press.

Harris, R. and Sollis, R. (2003) *Applied Time Series Modelling and Forecasting*. England: John Wiley & Sons Ltd.

Harris, J.R., Schiantarelli, F. and Siregar, M.G. (1994) The effect of financial liberalization on the capital structure and investment decisions of Indonesian manufacturing establishments. *The World Bank Economic Review,* 8 (1): 17-47

Harrison, A.E., Love, I. and McMillan, M.S. (2002) Global Capital Flows and Financing Constraints. *Journal of Development Economics*, 75(1): 269-301.

Hataiseree, R. (1995) Fianncial Liberalization and Its Effect on Monetary Policy: Thailand's Recent Evidences. *Chulalongkorn Review,* 7(27):102-119

Hayashi, F. (1982) Tobin's marginal q and average q: a neoclassical interpretation. *Econometrica,* 50 (1): 213-224

Heffernan, S. (1996) *Modern Banking: Theory and Practices.* Chichester: John Wiley & Sons Ltd.

Heffernan, S. (2005) *Modern Banking.* Chichester: John Wiley & Sons Ltd.

Hericourt, J. (2006) Monetary Policy Transmission in the CEECs: A Comprehensive analysis. *Economic and Business Review*, 8(1): 37-81

Héricourt, J. and Poncet, S. (2007) *FDI and credit constraints: firm level evidence in China.* [online]. Available from: ftp://mse.univ-paris1.fr/pub/mse/ CES2007 /Bla07009.pdf [Accessed 27th July 2011]

Hermes, N. and Lensink, R. (1996) Financial reform and information problems in capital markets: an empirical analysis of the Chilean experience, 1983-1992. *Systems, Organisations and Management Research Report* [online], 96C37. Available from: http://som.eldoc.ub.rug.nl/FILES/reports/1995-1999/themeC/1996/96C37/96c37.pdf [Accessed 27th July 2012]

Hernando, I. and Martinez-Pagés (2001) Is there a bank lending channel of monetary policy in Spain? *European Central Bank Working Paper Series,* [online], 99. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp099.pdf [Accessed 27th July 2012]

Himmelberg, C.P. and Morgan, D.P. (1995) "Is bank lending special?." In Peek, J. and Rosengren, E.S. (eds.) *Is bank lending important for the transmission of monetary policy?,*39. Boston: Federal Reserve Bank of Boston. pp.15-36

Holtemoller, O. (2002) *Identifying a credit channel of monetary policy transmission and empirical evidence for Germany* [online]. Available from: http://www.eea-esem.com/papers/eea-esem/esem2002/669/Crch-ger.pdf [Accessed 30th June 2012]

Horváth, C., Krekó, J. and Naszódi, A. (2006) Is there a bank lending channel in Hungary? Magyar Nemzeti Bank Working Paper [online], 7. Available from: http://english.mnb.hu/Root/ Dokumentumtar /ENMNB/Kiadvanyok/mnben_mnbfuzetek/mnben_wp2006_7/wp2006_7.pdf [Accessed 9th June 2011].

Hoshi, T., Kahyap, A. and Scharfstein, D. (1991) Corporate structure, liquidity and investment: evidence from Japanese industrial groups. *The Quarterly Journal of Economics,* 106 (1): 33-60

Hosono, K. (2006) The transmission mechanism of monetary policy in Japan: Evidence from banks' balance sheets. *Journal of the Japanese International Economies,* 20 (3): 380-405

Hsiao, C. (2003) *Analysis of Panel Data*. 2nd Ed. London: Cambridge University Press.

Hsiao, C. and Tahmiscioglu, A.K. (1997) A panel analysis of liquidity constraints and firm investment. *Journal of the American Statistical Association,* 92 (438): 455-465

Hubbard, R.G. (1995) Is there a credit channel for monetary policy? *Federal Reserve Bank of St. Louis Working Paper* [online],5. Available from: http://research.stlouisfed.org/publications/review/95/05/Credit_May_June1995.pdf [Accessed 27th July 2012]

Hubbard, R.G. (1998) Capital-market imperfections and investment. *Journal of Economic Literature,* 36 (1): 193-225

Huelsewig, O., Mayer, E. and Wollmershaeuser, T. (2005) Bank loan supply and monetary policy transmission in Germany: an assessment based on matching impulse responses. *Journal of Banking & Finance*, 30: 2893-2910

Hulsewig, O., Mayer, E., and Wollmershauser, T. (2009) Bank behaviour, incomplete interest rate pass-through, and the cost channel of monetary policy transmission. *Economic Modelling*, 26:1310-1327

Hung, L.V. and Pfau, W.D. (2008) VAR analysis of the monetary transmission mechanism in Vietnam. *Applied Econometrics and International Development*, 9(1): 165-179

Iacoviello, M. and Minetti, R. (2008) The credit channel of monetary policy: Evidence from the housing market. *Journal of Macroeconomics,* 30 (1): 69-96

Im, K.S., Pesaran, M.H., Shin, Y. (2003) Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1):53-74

International Monetary Fund (1999) *IMF's World Economic Outlook Database October 1999* [online]. Available from: http://www.imf.org/external/ns/cs.aspx?id=28 [Accessed 20th July 2010].

International Monetary Fund (2005) Indicators of financial structure, development and soundness in *Financial Sector Assessment A Handbook*, *chapter2* [online]. Available from: http://www.imf.org/external/pubs/ft/fsa/eng/pdf/ch02.pdf [Accessed 29th July 2012].

International Monetary Fund (2009) *IMF's World Economic Outlook Database October 2009* [online]. Available from: http://www.imf.org/external/ns/cs.aspx?id=28 [Accessed 20th July 2010].

Ireland, P.N. (2006) The monetary transmission mechanism. *Federal Reserve Bank of Boston Working Paper* [online], 6(1). Available from : http://www.bos.frb.org/economic/wp/wp2006/wp0601.pdf [Accessed 5th August 2010]

Isakova, A. (2008) Monetary policy efficiency in the economies of Central Asia. *Journal of Economics and Finance*, 58(11-12):525-553

Islam, S.S. and Mozumdar, A. (2007) Financial market development and the importance of internal cash: Evidence from international data. *Journal of Banking and Finance,* 31 (3): 641-658

Islam, M. S. and Rajan, R. S. (2009) The bank lending channel of monetary policy transmission: India and the global financial crisis. *International Journal of Economics and Business Research,* 3(5): 557-575

Jacque, L.L. (1999) The Asian Financial Crisis: Lessons from Thailand. *The FLETCHER FORUM of World Affairs*, 23(1):87-108

Jaramillo, F, Schiantarelli, F. and Weiss, A. (1993) The effect of financial liberalization on the allocation of credit: panel data evidence for Ecuador. *World Bank Policy Research Working Paper Series* [online], WPS1092. Available from: http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/1993/02/01/000009265_3961004060019/Rendered/PDF/multi_page.pdf [Accessed 20th March 2010].

Jayaraman, T.K. and Choong, C.K. (2008) Monetary policy Transmission Mechanism in Fiji: An Empirical Analysis of The Quarterly Model. *International Journal of Business and Management*, 3(11): 1-26

Jbili, A., Enders, K. and Treichel, V. (1997) Financial sector reforms in Algeria, Morocco and Tunisia: A preliminary assessment. *IMF Working Paper* [online], 81. Available from: http://www.imf.org/external/pubs/ft/wp/wp9781.pdf [Accessed 29th July 2012]

Jimborean, R. (2009) The role of banks in the monetary policy transmission in the new EU new member states. *Economic Systems,* 33: 360-375

Jiménez, G., Ongena, S., Peydró, J.L. and Saurina, J. (2009) *The impact of economic and monetary conditions on loan supply: identifying firm and bank balance-sheet channels* [online]. Available from: http://www.bm.ust.hk/gmifc/Prof.%20OngenaThe%20Impact%20of%20Economic%20and%20Monetary%20Conditions.pdf [Accessed 19th July 2012]

Jobst, C. and Kwpil, C. (2008) The interest rate pass-through in Austria effects of the financial crisis. *Oesterreichische Nationalbank's Monetary Policy and the Economy*, 4:54-67.

Johansen, S. (1988) Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, 12:231-254.

Johansen, S. (1992) Testing Weak Exogeneity and the Order of Cointegration in UK Money Demand Data. *Journal of Policy Modeling.* 14(3):313-344

Johansen, S. and Juselius, K. (1990) Maximum Likelihood Estimation and Inference on Cointegration-with Application to the Demand for Money. *Oxford Bulletin of Economics and Statistic*, 52(2):169-210

Johansen, S. and Juselius, K. (1992) Testing structural hypotheses in a multivariate cointegration analysis of the PP and the UIP for UK. *Journal of Econometrics*, 53:211-244.

Johnston, R.B. (1998) Sequencing capital account liberalizations and financial sector reform. *IMF Working Paper* [online], 35(4). Available from: http://www.imf.org/external/pubs/ft/wp/wp97157.pdf [Accessed 22th February 2010]

Johnston, R. B. And Pazarbasioglu, C. (1995) Linkages between financial variables, financial sector reform and economic growth and efficiency. *IMF Working Paper* [online], 95. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=883250 [Accessed 22th February 2010]

Judson, R.A. and Owen, A.L. (1999) Estimating dynamic panel data models: a guide for macroeconomists. *Economics Letters*, 65:9-15

Juselius, K. (2006) *The Cointegrated VAR Model: Methodology and Application.* UK: Oxford University Press.

Kadapakkam, P.R., Kumar, P.C. and Riddick, L.A. (1998) The impact of cash flows and firm size on investment: The international evidence. *Journal of Banking and Finance,* 22 (3): 293-320

Kahn, A. (2001) Financial development and economic growth. *Macroeconomic Dynamics*, 5:413-433.

Kakes, J. (1998) Monetary transmission and bank lending in the Netherlands. *Systems, Organisations, and Management Research Report* [online], 98C30. Available from: http://som.eldoc.ub.rug.nl/FILES/reports/1995-1999/themeC /1998/98C30/98c30.pdf [Accessed 19th July 2012]

Kaminsky, G. L. And Schmukler, S. L. (2003) Short-Run Pain, Long-Run Gain: The Effects of Financial liberalization. *IMF Working Paper* [online], 34. Available from: http://www.imf.org/external/pubs/ft/wp/2003/wp0334.pdf [Accessed 19th July 2012]

Kaplan, S. and Zingales, L. (1995) Do financing constraints explain why investment is correlated with cash flow? *The National Bureau of Economic Research* [online], 5267. Available from: http://www.nber.org/papers/ w5267.pdf [Accessed 27th July 2012]

Kaplan, S. and Zingales, L. (1997) Do investment-cash flow sensitivities provide useful measures of financing constraints? *The Quarterly Journal of Economics,* 112 (1): 169-215

Karagiannis, S., Panagopoulos, Y., Vlamis, P. (2011) *Interest rate pass-through in the Eurozone and the USA: implications for monetary policy in the context of the recent financial crisis* [online]. Available from: http://www.eefs.eu/conf/Athens/ Papers/587.pdf [Accessed 11th July 2011].

Karim, Z.A., Ngah, W.A.S.W., and Karim, B.A. (2010) Bank lending channel of monetary policy: dynamic panel data evidence from Malaysia. *Munich Personal RePEc Archive Working Paper* [online], 26157. Available from: http://mpra.ub.uni-muenchen.de/26157/1/MPRA_paper_26157.pdf [Accessed 10th July 2010].

Kashyap, A.K., Lamont, O.A. and Stein, J.C. (1994) Credit conditions and the cyclical behaviour of inventories. *Quarterly Journal of Economics,* 109 (3): 565-592

Kashyap, A.K. and Stein, J.C. (1993) Monetary policy and bank lending. *NBER Working Paper Series* [online], 4317. Available from: http://www.nber.org/papers/w4317.pdf [Accessed 10th April 2010].

Kashyap, A.K. and Stein, J.C. (1994) The impact of monetary policy on bank balance sheets *The National Bureau of Economic Research* [online], 4821. Available from: http://faculty.chicagobooth.edu/ anil.kashyap/ research/Impact.pdf [Accessed 15th March 2010].

Kashyap, A.K. and Stein, J.C. (2000) What do a million observations on banks say about the transmission of monetary policy? *The American Economic Review,* 90 (3): 407-428

Kashyap, A.K., Stein, J.C. and Wilcox, D.W. (1992) Monetary policy and credit conditions: evidence from the composition of external finance. *American Economic Review,* 83 (1): 78-98

Kassim, S.H. and Abdul Manap, T.A. (2008) Consumer credit and monetary policy in Malaysia. *International Journal of Consumer Studies,* 32: 188-193

Kazaziová, G. (2010) *Interest rate pass-through:does it change with financial distress? The Czech Experience*. Master Thesis. Faculty of Social Sciences, Charles University in Prague.

Khawaja, M. I. and Khan, S. (2008) Pass-through of change in Policy interest rate to market rates. *The Pakistan Development Review*, 47(4):661-674.

Kim, H.E. (1999) Was the credit channel a key monetary transmission mechanism following the recent financial crisis in the Republic of Korea?. *The World Bank Policy Research Working Paper Series* [online], 2103. Available from: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1999/09/14/000094946_99051205342778/additional/128528322_20041117181110.pdf [Accessed 19th July 2012]

King, R.G. and Levine, R. (1993a) Finance, entrepreneurship, and growth. Thoery and evidence. *Journal of Monetary Economics*,32(3):513-542

Kirchgässner, G. and Wolters, J. (2008) *Introduction to modern time series analysis*. Germany: Springer.

Kishan, R.P. and Opiela, T.P. (2000) Bank size, bank capital and the bank lending channel. *Journal Money, Credit and Banking,* 32 (1): 122-140

Klinhowhan, U. (1999) *Monetary Transmission Mechanism in Thailand*. Master of Economics Thesis, Thammasat University.

Kochhar, K., Loungani, P. and Stone, M.R. (1998) The East Asian Crisis: Macroeconomic Developments and Policy Lessons. IMF Working Paper [online], 128. Available from: http://www.imf.org/external/pubs/ft/wp/wp98128.pdf [Accessed 10th December 2013].

Kohsaka, A. and Enya, M. (2007) The balance sheet effects and macroeconomic development in the Pacific region. *Asian Economic Papers,* 6 (1): 101-129

Kogar, C. I. (1995) Financial innovations and monetary control. *The Central Bank of The Republic of Turkey*, 9515: 1-32

Koo, J. and Shin, S. (2004) Financial liberalization and corporate investments: evidence from Korean firm data. *Asian Economic Journal,* 18 (3): 277-292

Krause, S. and Rioja, F. (2006) *Financial development and monetary policy efficiency* [online]. Available from: http://ideas.repec.org/p/emo/wp2003/0613.html [Accessed 20th October2012].

Krstevska, A. (2008) The effectiveness of the transmission channels of the monetary policy in the Republic of Macedonia. *International Journal Economic Policy in Emerging Economies*, 1(4):376-387 –5c

Kubo, A. (2008) Macroeconomic impact of monetary policy shocks: Evidence from recent experience in Thailand. *Journal of Asian Economics,* 19 (1): 83-91

Kwapil, C. and Scharler, J. (2007) Interest rate pass-through, monetary policy rules and macroeconomic stability. *Journal of International Money and Finance*, 29(2):236-251.

Kuijs, L. (2002) Monetary policy transmission mechanisms and inflation in the Slovak Republic. *IMF Working Paper* [online], 80. Available from: http://www.imf.org/external/pubs/ft/wp/2002/wp0280.pdf [Accessed 10th August 2010].

Küppers, M. (2001) Curtailing the black box: German baking groups in the transmission of monetary policy. *European Economic Review,* 45 (10): 1907-1930

Kusmiarso, B., Sukawati, E., Pambudi, S., Angkoro, D., Prasmuko, A., Hafidz, I.S. (2002) "Interest Rate Channel of Monetary Transmission in Indonesia" In Warjiyo, F. and Agung, J. (Eds.) *Transmission Mechanisms of Monetary Policy in Indonesia*. Indonesia: Financial Market Structure and Studies Division, pp. 27-50

Kuwayama, P.H. (1997) Credit channels and the small firm sector in Japan. *Columbia University Academic Commons* [online], 132. Available from: http://academiccommons.columbia.edu/item/ac:98559 [Accessed 20th October 2011]

Kwiatkowski, D., Phillips, P.C.B., Schmidt, P., and Shin, Y. (1991) Testing the null hypothesis of stationarity against the alternative of a unit root. How sure are we that economic time series have a unit root?. *Journal of Econometrics*, 54:159-178

Laeven, L. (2000) *Financial liberalization and financing constraints: evidence from panel data on emerging economies* [online]. Available from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.17.9512&rep=rep1&type=pdf [Accessed 10th October 2012].

Laeven, L. (2003) Does financial liberalization reduce financing constraints? *Financial Management,* 32 (1): 1-69

Lang, M. And Krznar, I (2004) Transmission mechanism of monetary policy in Croatia. *The Tenth Dubrovnik Economic Conference* [online], 23-26 June. Available from: http://hnb.hr/dub-konf/10-konferencija-radovi/lang-krznar.pdf [Accessed 1st August 2010]

Lapinskas, V. (2011) Interest rate pass-through in Lithuania. *Ekonomika,* 90(2):1-19

Larraín, M. (2005) Monetary policy and long-term interest rates in Chilies. *Central Bank of Chile Workings Papers* [online], 335. Available from: http://www.bcentral.cl/eng/studies/working-papers/pdf/dtbc335.pdf [Accessed 12th July 2013]

Lee, C.H. (2003) *Financial Liberalization and the Economic Crisis in Asia* [online]. Available from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.196.5730&rep=rep1&type=pdf [Accessed 10th December 2013]

Lee, S.Y. and Jao, Y.C. (1982) *Financial Structures and Monetary policy in Southeast Asia.* London and Basingstoke: The Macmillan Press Ltd. pp. 148-171

Levin, A., Lin, C.F., and Chu, C.S.J. (2002) Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1):1-24

Levine, R. (1997) Financial development and economic growth: views and agenda. *Journal of Economic Literature,* 35(2):688-726

Levine, R., Loayza, N. and Beck, T. (2000) Financial intermediation and growth: causality and causes. *Journal of Monetary Economics,* 46 (1): 31-77

Levine, R., and Zervos, S. (1998) Stock markets, banks, and economic growth. *American Economic Review*, 88:537-558.

Li, Y. (2009) *Market structure in banking and the bank lending channel: evidence from the bank-level data in Asian and Latin American countries*. PhD thesis, Drezel University [online]. Available from: http://idea.library.drexel.edu/ bitstream/1860/3137/1/Li_Yuan.pdf [Accessed 9th June 2011].

Liu, M., Margaritis, D., and Tourani-Rad, A. (2005) Monetary policy transparency and pass-through of retail interest rates. *Journal of Banking & Finance*, 32(4):501-511

Llewellyn, D. (1992) Financial innovation: a basic analysis. In Cavanna, H. (ed.) *Financial innovation*. London: Routledge. pp. 1-51

Loayza, N. and Schmidt-Hebbel, K. (2002) Monetary policy functions and transmission mechanisms: an overview. In Loayza, N. and Schmidt-Hebbel, K. (ed.), *Monetary Policy: Rules and Transmission Mechanisms,* 1: 1-20

Loungpitak, C. (2005) *Money and Banking, Chapter 9-12* (Thai version). Bangkok: Faculty of Economics, Kasetsart University.

Loupias, C., Savignac, F. and Sevestre, P. (2002) Is there a bank lending channel in France? Evidence from bank panel data. *Banque de France Working Paper* [online], *92.* Available from: http://www.banque-france.fr/uploads/tx_bdfdocumentstravail/ner92.pdf [Accessed 10th April 2011].

Love, I. (2003) Financial development and financing constraints: international evidence from the structural investment model. *The Review of Financial Studies,* 16 (3): 765-791

Lowe, P. and Rohling, T. (1992) Loan rate stickiness: theory and evidence. *Reserve Bank of Australia Discussion Paper* [online], 9206. Available from: http://www.rba.gov.au/publications/rdp/1992/pdf/rdp9206.pdf [Accessed 20th April 2013].

Lütkepohl, H. (2004) Vector Autoregressive and Vector Error Correction Models. In Lütkepohl, H. And Kratzig, M. (Eds.) *Applied Time Series Econometrics.* Cambridge: Cambridge University Press.

Lünnemann, P. and Mathä, T. (2001) Monetary transmission: empirical evidence from Luxembourg firm level data. *European Central Bank Working Paper Series* [online], 111. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp111.pdf [Accessed 4th January 2011].

Lyziak, T., Przystupa, J. And Wrobel, E. (2008) *Monetary policy transmission in Poland: a study of the importance of interest rate and credit channels* [online]. Available from: http://www.suerf.org/download/studies/study20081.pdf [Accessed 5th August 2012].

Maddala, G.S. (2001) Introduction to Econometrics. 3rd Ed. England. John Wiley & Sons, Inc.

Maddala, G.S. and Kim, I. (1998) *Unit Roots, Cointegration, and Structural Change*. UK: Cambridge University Press.

Maddala, G.S. and Wu, S. (1999) A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, 61(S1): 631-652

Markovic, B. (2005) *Essays on the credit channel of the monetary transmission mechanism*. PhD. Thesis, University of Birmingham.

Marotta, G. (2007) Structural breaks in the interest rate pass-through and the euro. A cross-country study in the Euro area and the UK. *Department of Economics, University of Modena and Reggio E.* [online], 0549. Available from: http://www.dep.unimore.it/materiali_discussione/0549.pdf [Accessed 20th October 2012].

Maskay, N. M. and Pandit, R. (2010) Interest rate pass-through in Nepal. *Economic Review*, 22(4):1-18.

Matousek, R. and Sarantis, N. (2009) The bank lending channel and monetary transmission in Central and Eastern European countries. *Journal of Comparative Economics,* 37 (2): 321-334

Meltzer, A.H. (1995) Monetary, credit and (other) transmission processes: A monetarist perspective. *Journal of Economic Perspectives,* 9 (4): 49-72

Menkhoff, L. and Suwanaporn, C. (2007) 10 Years after the crisis: Thailand's financial system reform. *Journal of Asian Economics,* 18(1):4-20

Mies, V. and Tapia, M. (2003) *Monetary policy and transmission mechanisms in Chile: Has the effect of monetary policy changed in time? Why?* [online]. Available from: http://www.cemla.org/old/pdf/redviii/chile_mies_tapia.pdf [Accessed 5th August 2010]

Mileva, E. (2007) Using Areelano-Bond Dynamic Panel GMM estimators in Stata. Tutorial with Examples using Stata 9.0 (xtabond and xtabond2) [online]. Available from: http://www.fordham.edu/economics/mcleod/Elitz-UsingArellano%E2%80%93BondGMMEstimators.pdf [Accessed 5th August 2010]

Mishkin, F.S. (1996) *The channels of monetary transmission: Lessons for monetary policy*. [online]. Available from: http://www.nber.org/papers /w5464.pdf? new_window=1 [Accessed 5th August 2010]

Mishkin, F. S. (2007) *Monetary policy strategy*. 1st ed. London. The MIT Press.

Mishkin, F. S. (2013) *The economics of money, banking, and financial markets*. 10th ed. USA.: Pearson Education Limited.

Mishra, P.K. and Pradhan, B.B. (2008) *Financial innovation and effectiveness of monetary policy* [online]. Available from: http://papers.ssrn.com /sol3/papers.cfm?abstract_id=1262657 [Accessed 5th August 2010]

Mohanty, D. (2012) *Evidence on interest rate channel of monetary policy transmission in India* [online]. Available from: http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/WPS6180512FL.pdf [Accessed 20th October 2012].

Mojon, B. (2000) Financial structure and the interest rate channel of ECB monetary policy. *European Central Bank Working Paper Series,* 40: 1-45

Mousa, N.Y.A. (2010) *Monetary policy and the role of exchange rate: the case of Jordan*. PhD. thesis. Department of Economics, University of Birmingham.

Myers, S.C. and Majluf, N.S. (1984) Corportate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2):187-221

Nakornthab, D. (2009) Thailand's monetary policy since the 1997 crisis. *Kobe University Economic Review*, 55:75-88

Nidhiprabha, B. (1999) Economic Crises and the Debt-Deflation Episode in Thailand. In Arndt, H.W. and Hill, H. (eds.) *Southeast Asias economic crisis: origins, lessons and the way forward*. Singapore: Institute of Southeast Asian Studies. pp. 67-79.

Nijathaworn, B. (2010) *Macroprudential policies and capital flows-managing under the new globalization* [online]. Available from: http://www.bis.org/review/r101029e.pdf [Accessed 10th December 2013].

Northcott, C. A. (2004) Competition in banking: A review of the literature. *Bank of Canada Working Paper* [online], 24. Available from: http://www.publications.gc.ca/collections/Collection/FB3-2-104-24E.pdf [Accessed 30th April 2012].

Nourzad, F. (2002) Financial development and productive efficiency: a panel study of developed and developing countries. *Journal of Economics and Finance,* 26 (2): 138-148

Office of the National Economic and Social Development Board (2009a) *National Income* [online]. Available from: http://www.nesdb.go.th/Default.aspx? tabid=94[Accessed 26th September 2010].

Office of the National Economic and Social Development Board (2009b) *National Income of Thailand Statistical Framework* [online]. Available from: http://www.nesdb.go.th/Portals/0/eco_datas/account/ni/ni_1997-2004/NI%20Framework.pdf [Accessed 26th September 2010].

Ogawa, K. (2000) Monetary policy, credit and real activity: evidence from the balance sheet of Japanese firms. *Journal of the Japanese and International Economies,* 14: 385-407

Oh, H.S. (2013) Loan-to-Value as Macro-Prudential Policy Tool: Experiences and Lessons of Asian Emerging Countries. *Duisenberg School of finance Policy Paper Series* [online], 33.Available from: http://www.dsf.nl/assets/cms/File/Research/DSF%20Policy%20No%2033%20Loan-to-Value%20as%20Macro-Prudential%20Policy%20Tool.pdf [Accessed 10th December 2013].

Oliner, S. and Rudebusch, G.D. (1992) Sources of the financing hierarchy for business investment. *The Review of Economics and Statistics,* 74 (4): 643-654

Oliner, S. and Rudebusch, G.D. (1996a) Is there a broad credit channel for monetary policy? *Economic Review,* 1: 3-13

Oliner, S.D. and Rudebusch, G.D. (1996b) Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance: Comment. *The American Economic Review,* 86(1) :300-309

Oliner, S.D., Rudebusch, G.D., and Sichel, D. (1995) New & Old model of business investment: a comparison of forecasting performance. Journal of Money Credit and Banking, 27(8): 806-826

Peek, J. And Rosengren, E. S. (1995) *Is bank lending important for the transmission of monetary policy? An overview* Boston: Federal Reserve Bank of Boston. pp. 1-11

Peek, J. and Rosengren, E.S. (1995) *Bank lending and the transmission of monetary policy.* Boston: Federal Reserve Bank of Boston. pp. 47-68

Petersen, M. A. And Rajan, R. G. (1995) The effect of credit market competition on lending relationship. *The Quarterly Journal of Economics*, 110(2): 407-443

Piyavongpinyo, P. (2002) *Credit channel and monetary policy transmission in Thailand.* Master of Economics thesis. Thammasat University

Pobré, M.L. (2003) An analysis of the monetary transmission mechanism in East Asia. *Philippines Journal of Development,* 2: 229-254

Pruteanu-Podpiera, A. M. (2007) The role of banks in the Czech monetary policy transmission mechanism. *Economics of Transition*, 15(2):393-428.

Prasad, A. and Ghosh, S. (2005) Monetary policy and corporate behaviour in India. *IMF Working Paper,* 25:

Rajan, R. and Zingales, L. (1998) Financial dependence and growth. *The American Economic Review,* 88 (3): 559-586

Raghavan, M. And Silvapulle, P. (2012) *Structural VAR approach to Malaysian monetary policy framework: evidence from the pre-and post-Asian crisis periods* [online]. Available from: http://nzae.org.nz/wp-content/uploads/2011/08/ nr1215397050.pdf [Accessed 10th February 2010].

Ranciere, R. (2013) *Financial liberalization* [online]. Available from: http://www.romainranciere.com/research/palgrave.pdf [Accessed22th January 2013].

Rehman, H. U. (2004) *Interest rate pass-through and banking market integration in ASEAN: A cross country comparison*. M.B.A Dissertation, Faculty of Business and Accountancy, University of Malaya.

Robinson, W. and Robinson, J.W. (1997) *The transmission mechanism of monetary policy in the Jamaican economy* [online]. Available from: http://www.boj.org.jm/uploads/pdf/papers_pamphlets/papers_pamphlets_the_transmission_mechanism_of_monetary_policy_in_jamaica.pdf [Accessed 10th February 2010].

Romer, C.D., Romer, D. H., Goldfeld, S. M., and Friedman, B.M. (1990) New evidence on the monetary transmission mechanism. *Brookings Papers on Economic Activity,* 1: 149-213

Roodman, D. (2006) How to Do xtabond2: An introduction to "Difference" and "System" GMM in Stata. *Center for Global Development Working Paper* [online], 103. Available from: http://www.cgdev.org/files/11619_file_HowtoDoxtabond8_with_foreword.pdf [Accessed 10th October 2010]

Rungsomboon, S. (2005) Deterioration of firm balance sheet and investment behaviour: evidence from panel data on Thai firms. *Asian Economic Journal,* 19 (3): 335-354

Samba, M.C. and Yan, Y. (2010) Interest rate pass-through in the Central African Economic and Monetary Community (CAEMC) Area: Evidence from an ADRL Analysis. *International Journal of Business and Management*, 5(1):31-41

Samkharadze, B. (2008) *Monetary transmission mechanism in Georgia: Analyzing pass-through of different channels* [online]. Available from: http://www.nbg.gov.ge/uploads/workingpaper/nbgwp02.08.pdf [Accessed 20th October 2012].

Sander, H. And Kleimeier, S. (2005) *Interest rate pass-through in an enlarged Europe: The role of banking market structure for monetary policy transmission in transition countries* [online]. Available from: http://edocs.ub.unimaas.nl/ loader/file.asp?id=953 [Accessed 20th October 2012].

Sander, H. And Kleimeier, S. (2006) Convergence of interest rate pass-through in a wider euro zone? *Economic System*, 30:405-423.

Santiprabhob, V. (2003) *Lessons learned from Thailand's experience with financial-sector restructuring* [online].Available from: http://tdri.or.th/wp- content/ uploads/2013/03/BM5.pdf [Accessed 17th July 2012]

Schiantarelli, F. (1996) Financial constraints and investment: methodological issues and international evidence. *Oxford Review of Economic Policy,* 12 (2): 70-89

Schiantarelli, F., Weiss, A. and Jaramillo, F. (1992) Capital market imperfections before and after financial liberisation: an euler equation approach to panel data for Ecuadorian firms. *The World Bank Research Working Paper Series* [online], 1091. Available from: http://fmwww.bc.edu/ec-p/WP221.pdf [Accessed 28th July 2012]

Schmitz, B. (2004) *What role do banks play in monetary policy transmission in EU new member countries?* [online]. Available from: http://www.eea- esem.com/papers/ eea-esem/2004/831/The%20Role%20of%20Banks%20in%20Accession%20 Countries%20ESEM%20.pdf [Accessed 16th July 2012].

Sen, K. (2010) Towards inclusive financial development for achieving the MDGs in Asia and Pacific, *MPDD Working Papers* [online], 7. Available from: http://www.unescap.org/pdd/publications/workingpaper/wp_10_07.pdf [Accessed 20th April 2010].

Sellon, G.H. Jr. (2002) The changing U.S. financial system: some implications for the monetary transmission mechanism. *Economic Review*, 1:5-35

Settrade dot com (2010) Basic stock analysis by SETSMART (Thai version). Bangkok. Seven Printing Ltd.

Shaffer, S. (1983) Non-structural measure of competition toward a synthesis of alternatives. *Economics Letters*, 12:3349-353

Sheng, S. and Wu, P. (2009) The binary transmission mechanism of Chinas monetary policy- A research on the "two intermediaries, two targets' model. *Front Econ. China*, 4(3): 335-360

Shin, H.H. and Park, Y.S. (1999) Financing constraints and internal capital markets: Evidence from Korean 'chaebols'. *Journal of Corporate Finance,* 5 (2): 169-191

Sichei, M.M. (2005) Bank-lending channel in South Africa: Bank-lending dynamic panel data analysis. *Department of Economic Working Paper Series, University of Pretoria* [online], 10. Available from: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.113.5290 [Accessed 17th July 2012]

Simatele, M. (2004) Financial sector reforms and monetary policy in Zambia. *PhD Thesis. Department of Economics and Law, School of Business, Göteborg University* [online]. Available from: https://gupea.ub.gu.se/bitstream/2077/2930/1/Simatele_avhandl.pdf [Accessed 10th Auguest 2010].

.

Singh, S., Razi, A., Endut, N., and Ramlee, H. (2008) Financial market developments and their implications for monetary policy. *Bank for International Settlement Working Paper Series* [online],39. Available from: http://www.bis.org/publ/bppdf/bispap39e.pdf [Accessed 7th January 2009].

Siregar, R. (2011) Macro-Prudential Approaches to Banking Regulation: Perspectives of Selected Asian Central Banks. *Asian Development Bank Institute* [online], 325. Available from: http://www.eaber.org/sites/default/files/documents/2011.11.25.wp325.macro_.prudential.approaches.banking.regulation.pdf [Accessed 10th December 2013].

Sirivedhin, T. (1997) *Financial reform and the monetary transmission mechanism: the case of Thailand* [online]. Available from: http://www.bis.org/publ/plcy03i.pdf [Accessed 15th July 2009].

Skully, M.T. (1984) *Financial Institutions and Markets in Southeast Asia: A study of Brunei, Indonesia, Malaysia, Philippines, Singapore and Thailand*. London and Basingstoke: The Macmillan Press Ltd. pp. 296-375

Smant, D. (2002) Bank credit in the transmission of monetary policy: a critical review of the issues and evidence. *Munich Personal RePEc Archive* [online], 19816. Available from: http://mpra.ub.uni-muenchen.de/19816/ [Accessed 19th July 2012].

Sodsrichai, P. (1993) *An economic impact of financial liberalization in Thailand*. Master of Economics Thesis, Thammasat University.

Son Y. S. (2009) *The analysis of channels of the monetary transmission mechanism in Korea before and after the financial crisis in 1997* [online]. Available from: http://warrington.ufl.edu/graduate/academics/pdb/docs/proposals/2009_YoungSon.pdf [Accessed 10th December 2010].

Sorensen, C.K. and Werner, T. (2006) Bank interest rate pass-through in the Euro area. A cross country comparison. *European Central Bank*, 580:1-65.

Sousa, R.M. (2009) *What are the wealth effects of monetary policy?* [online], 26. Available via: http://www.nipe.eeg.uminho.pt/Uploads/WP_2009 /NIPE% 20WP_ 26_2009.pdf [Accessed 29th July 2012].

Sriphayakand, A. and Vongsinsirikul, S. (2007) Asset prices and monetary policy transmission in Thailand. *Bank of Thailand Discussion Paper* [online], DP01. Available from: http://www.bot.or.th/Thai/EconomicConditions/Publication/DiscusPaper/doclip_discussion/dp012007amara_thai.pdf [Accessed 8th March 2010].

Stata Corporation LP (2011) *Panel-data unit-root tests* [online]. Available from: http://www.stata.com/stata11/xtur.html [Accessed 10th October 2011]

Stiglitz, J.E. and Weiss (1981) Credit rationing in markets with imperfect information. The *American Economic Review*, 71(3):393-410

Stock Exchange of Thailand (SET) (2010a) *Products/Services* [online]. Available from: http://www.set.or.th/en/products/index/setindex_p1.html [Accessed 10th November 2010].

Stock Exchange of Thailand (SET) (2010b) *History & Roles* [online]. Available from: http://www.set.or.th/en/about/overview /history_p1.html [Accessed 25th October 2010].

Stock Exchange of Thailand (SET) (2010c) *List of SET listed company& contact information* [online]. Available from: http://www.set.or.th/en/company/companylist.html [Accessed 26th October 2010].

Stock Exchange of Thailand (SET) (2010d) *Set Groups*, [online]. Available from: http://www.set.or.th/en/about/overview/setgroup_p1.html [Accessed 3th November 2010].

Stock Exchange of Thailand (SET) (2010e) *30 years Stock Exchange of Thailand* (Thai version) [online]. Available from: http://www.set.or.th/th/about/overview/book30years_p1.html [Accessed 10th November 2010].

Subhanij, T. (2000) Financial *Liberalization Policy and Its Economic Consequences: Thailand's Experience*. PhD. Thesis, University of Cambridge.

Supachet, C. (2005) The efficiency in Thai financial sector after the financial crisis. *Munich Personal RePEc Archive Paper* [online], 1776 Available from: http://mpra.ub.uni-muenchen.de/ 1776/1/MPRA_paper_1776.pdf [Accessed 20th September 2010].

Sussangkarn, C. and Vichyanond, P. (2007) Ten Years After the Financial Crisis in Thailand: What Has Been Learned or Not Learned?. *Asian Economic Policy Review*, 2(1): 100-118

SWIFT (Society for Worldwide International Funds Transfers) (2013) *Company Information* [online]. Available from: http://www.swift.com/about_swift/ company_information/company_information [Accessed 15th May 2013].

Tan, A.C.K. and Goh, K-L. (2007) Financial disintermediation in the 1990s: Implications on monetary policy in Malaysia. *Hitotsubashi Journal of Economics,* 50 (1): 1-27 –98

Thailand Future Exchange market (2010) *Product* [online]. Available from: http://www.tfex.co.th/en/products/products.html [Accessed 3th November 2010].

The World Bank (1990) Financial Systems and Development. Policy and Research Series, 15. Washington, DC. The World bank.

The World Bank (2010) *Financial sector development indicators: Comprehensive assessment through enhanced information capacity* [online]. Available from: http://siteresources.worldbank.org/INTTOPACCFINSER/Resources/Webintro .pdf [Accessed 29th July 2010]

The World Bank (2013) *Thailand Data* [online]. Available from: http://data.worldbank.org/country/thailand [Accessed 14th March 2013].

Thornton, D.L. (1994) *Financial innovation, deregulation and the "credit view" of monetary policy* [online]. Available from: http://research.stlouisfed.org/publications /review/94/01/Innovation_Jan_Feb1994.pdf [Accessed 19th July 2012]

Tieman, A. F. (2004) Interest rate pass-through in Romania and other Central European Economies. *IMF Working Paper* [online], 211. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=879036 [Accessed 10th June 2012].

Topi, J. and Vilmunen, J. (2001) Transmission of monetary policy shocks in Finland: evidence from bank level data on loans. *European Central Bank Working Paper Series,* [online], 100. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=356621 [Accessed 10th June 2012].

Toolsema, L.A., Sturm, J.E., Haan, J. De.(2002) Convergence of pass-through from money market to lending rates in EMU countries: new evidence. CCSO Centre for Economic Research Working Papers [online], 200206. Available from: http://ccso.eldoc.ub.rug.nl/FILES/root/2002/200206/200206.pdf [Accessed 20th October 2012].

Trairatvorakul, P. (2012) Financial crises and the future of global and Asian banking [online].Available from: http://www.bis.org/review/r120719a.pdf?frames=0 [Accessed 22th January 2013].

Uanguta, E. and Ikhide, S. (2002) Monetary policy transmission mechanism in Namibia. Bank of Namibia, 2[online]. Available from: http://www.bon.com.na/docs/pub/Monetary%20Policy%20Transmission%20Mechanism%20in%20Namibia.pdf [Accessed 14th March 2010].

Ucer, E.M. (1997) *Note on financial liberalization* [online]. Available from: http://www.econ.chula.ac.th/public/members/sothitorn/liberalization_1.pdf [Accessed 22th January 2013].

Valderrama, M. (2001) Credit channel and investment behaviour in Austria: a micro-econometric approach. *European Central Bank Working Paper Series* [online], 108. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp108.pdf [Accessed11th January 2010].

Valverde, S.C. and Del Paso, R.L. (2009) Bank-lending channel and non-financial firms: evidence for Spain. *Spanish Economic Review,* 11 (2): 125-140

Van den Heuvel, S.J. (2002) Does bank capital matter for monetary transmission?. *FRBNY Economic Policy Review*, 5: 259-265

Van Ees, H. and Garretsen, H. (1994) Liquidity and business investment: Evidence from Dutch panel data. *Journal of Macroeconomics,* 16 (4): 613-627

Van Leuvensteijn, M., Kok-Sorensen, C. Bikker, J.A., and Van Rixtel, A.A.R.J.M. (2006) *Impact of bank competition on the interest rate pass-through in the euro area* [online]. Available from: http://www.ecb.int/events/pdf/conferences/mir/VanLeuvensteijnEtAl.pdf [Accessed 20th October 2012].

Vichyanond, P. (1994) *Thailand's Financial System: Structure and Liberalization.* Bangkok: The Thailand Development Research Institute.

Walsh, C.E. and Wilcox, J.A. (1995) "Bank Credit and Economic Activity." In Peek, J. and Rosengren, E.S. (eds.) *Is bank lending important for the transmission of monetary policy?,*39. Boston: Federal Reserve Bank of Boston. pp.85-112

Warr, P.G. (1999) What happened to Thailand?. *The World Economy*, 22(5):631-650.

Watanagase, T. (2012) *Monetary policy workshop on strengthening macroprudential frameworks* [online[, Available from: http://www.imf.org/external/oap/np/seminars/2012/macroprudential/pdf/watanagase.pdf [Accessed 10th December 2013].

Weber, A.A., Gerke, R., and Worms, A. (2009) Has the monetary transmission process in the euro area changed? Evidence based on VAR estimates. *BIS Working Paper,* [online], 276. Available from: http://www.bis.org/publ/work276.pdf [Accessed 30th October 2011].

Wesche, K. (2000) Is there a credit channel in Austria? The impact of monetary policy on firms' investment decisions. *Oesterreichische Nationalbank Working Paper* [online],41. Available from: http://www.oenb.at/en/img/wp41_tcm16-6119.pdf [Accessed 17th July 2012].

Westerlund, J. (2003) A panel data test of the bank lending channel in Sweden. *Lund University, Department of Economics Working Papers* [online], 16. Available from: http://www.nek.lu.se/publications/workpap/Papers/WP03_16.pdf [Accessed 16th July 2012]

Weth, M. A. (2002) The pass-through from market interest rates to bank lending rates in Germany. *Economic Research Centre of the Deutsche Bundesbank* [online], 2. Available from: http://www.bundesbank.de/Redaktion/EN/Downloads/Publications/Discussion_Paper_1/2002/2002_05_12_dkp_11.pdf?__blob=publicationFile [Accessed 20th October 2012].

Wibowo, P.P. (2005) *Monetary policy transmission mechanism and bank portfolio behaviour: the case of Indonesia*. PhD. thesis. University of Birmingham.

Windmeijer, F. (2005) A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, 126:25-51

Worms, A. (2001) The reaction of bank lending to monetary policy measures in Germany. *European Central Bank Working Paper Series,* [online], 96. Available from: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp096.pdf [Accessed 10th December 2010].

Wu, J., Luca, A.C. and Jeon, B.N. (2007) Transmission of monetary policy via domestic and foreign banks in emerging economics: evidence from bank-level data. *Journal of International Money and Finance*, 30(6):1128-1156

Yalcin, C., Bougheas, S. and Mizen, P. (2004) The impact of firm-specific characteristics on the response to monetary policy actions. Republic of Turkey Working Papers [online], 0407. Available from: http://www.tcmb.gov.tr/research/discus/WP0407ENG.pdf [Accessed 19th July 2012]

Yamashiro, G. and Uesugi, I. (2006) Economic conditions and Japanese firm financing. *Economics Bulletin,* 5 (11): 1-17

Yananda, K.R., Odle, M., and De Vera, J. (1992) *Modern Management and Supervision of Financial Institutions*. USA: United Nations Centre on Transnational Corporation.

Younus, S. (2005) *Monetary transmission through bank portfolio in Bangladesh.* [online]. Available from: http://siteresources.worldbank.org/PSGLP/Resources/monetarytransmission.pdf [Accessed 3 rd August 2012]

Zulverdi, D., Gunadi, I. and Pramono, B. (2006) Bank portfolio model and monetary policy in Indonesia. *Journal of Asian Economics,* 18 (1): 158-174

Appendix A

TableA5.1: The result of panel unit root test for the series in the model (total sample)

Variable/test	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
	W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
I/K	-19.8598***	1702.3469***	-5.4873***	-16.0338***	27.1583***	2692.6967***	-25.1621***	-35.1210***	53.7791***
$\Delta S/K$	-39.0542***	1202.7368***	-4.2282***	-9.0734***	13.7287***	1675.1794***	-47.0795***	-67.7109***	107.0685***
C/K	-23.1338***	2397.1404***	-14.9886***	-29.8918***	45.8345***	1912.7858***	-29.3303***	-38.6787***	59.6951***
B/K	-23.4618***	1224.9718***	-3.9791***	-8.9233***	14.3264***	1433.1653***	-11.5937***	-14.3876***	19.9226***
(C/K)*FD1	-23.3763***	1010.1669***	-4.6946***	-4.7194***	8.5524***	1903.1767***	-29.1497***	-38.4638***	59.4368***
(D/K)*FD1	-28.8513***	1210.5702***	-3.7081***	-8.6098***	13.9393***	1418.9319***	-11.7895***	-14.2839***	19.5401***
(C/K)*FD2	-31.7234***	1192.5025***	-2.6844***	-7.7151***	13.4536***	1144.5280***	-31.4302***	-42.7235***	65.9244***
(D/K)*FD2	-46.2688***	1066.2296***	-4.1281***	-7.6566***	10.0594***	1110.6548***	-8.0253***	-9.3799***	11.2535***
(C/K)*FD3	-10.2161***	1098.2526***	-1.3085*	-6.1759***	10.9201***	2032.5623***	-30.7823***	-40.9572***	62.9147***
(D/K)*FD3	-6.9023***	1270.9130***	-5.4389***	-10.3680***	15.5613***	1483.6086***	-12.2559***	-15.6283***	21.2786***
(C/K)*FD4	-4.2327***	2229.5834***	-12.4715***	-26.5360***	41.3305***	1896.2142***	-18.0311***	-22.2726***	32.3695***
(D/K)*FD4	-1.9238**	2250.3875***	-12.5878***	-29.3213***	49.9538***	1096.7508***	-6.2568***	-7.7801***	10.8798***
(C/K)*FD5	-11.6482***	1084.3513***	-3.5316***	-6.9562***	10.5465***	3227.9234***	-32.9619***	-45.3033***	68.1660***
(D/K)*FD5	-17.7391***	3207.7746***	-24.4058***	-44.1885***	67.6244***	2973.0824***	-28.2990***	-40.9074***	61.3159***
(C/K)*FD6	-1.4487*	2275.7617***	-13.1499***	-27.1895***	42.5718***	2292.9912***	-22.5246***	-28.4325***	43.0349***
(D/K)*FD6	-20.2887***	2725.4121***	-15.0496***	-32.8436***	54.6585***	2820.5934***	-19.1448***	-34.8753***	57.2169***
(C/K)*FD7	-[48]	854.0109***	-12.7292***	-18.1634***	4.3549***	3554.4710***	-31.0537***	-55.0586***	76.9437***
(D/K)*FD7	-	1410.1080***	-18.6378***	-31.6920***	149.3029***	3271.6495***	-27.9234***	-50.2322***	69.3141***

Note: *,**,*** indicates the significant level at the 10%, 5%, and 1% respectively.

[48] This series is the interaction term between cash flow to capital ratio and the financial liberalization dummy. Due to W-t-bar test can be calculated when there is no more than 10 samples, thus we cannot obtain the W-t-bar in this case. We already obtained the result that CK series do not have unit root and also there is no unit root test require for the dummy variable. Thus, it is generally assumed that CKFD6 series should not have unit root. The AIC information criteria is used to select the lag length of ADF test.

TableA5.1 (cont'd): The result of panel unit root test for the series in the model (total sample) (when controlling for cross sectional dependence of the series)

Variable	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
	W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
I/K	-38.0188***	856.5592***	-3.5268***	-4.7208***	4.4234***	2225.3092***	51.7339***	-76.2118***	121.8561***
$\Delta S/K$	-31.3039***	1072.4373***	-4.4656***	-8.0040***	10.2262***	2063.3897***	-49.5341***	-73.6667***	117.5037***
C/K	-28.6423***	1039.3958***	-4.0500***	-6.8832***	9.3381***	2221.0842***	-23.4448***	-28.7466***	41.1020***
B/K	-8.2803***	1439.1081***	-16.8702***	-18.5771***	20.0824***	891.4385***	-6.6009***	-7.1670***	5.3609***
(C/K)*FD1	-27.4734***	1037.1367***	-4.0633***	-6.8554***	9.2773****	2198.9173***	-23.1575***	-28.3596***	40.5062***
(D/K)*FD1	-8.2093***	1430.1795***	-16.6752***	-18.4241***	19.8424***	885.2391***	-6.4716***	-7.0186***	5.1943***
(C/K)*FD2	-27.3250***	982.6622***	-4.0188***	-6.1699***	7.8130***	1358.5007***	-25.7796***	-31.5919***	44.7958***
(D/K)*FD2	-8.7350***	802.9754***	-3.8989****	-5.4671***	2.9830***	921.9909***	-5.9387***	-6.8770***	6.1822***
(C/K)*FD3	-64.3366***	1127.0173***	-4.6832***	-8.2019***	11.6933***	1310.7522***	-24.5784***	-30.3557***	43.5123***
(D/K)*FD3	-4.6434***	1350.6042***	-15.6478***	-16.9895***	17.7034***	929.0218***	-7.2100***	-7.9342***	6.3712***
(C/K)*FD4	-6.9653***	1328.3701***	-6.5090***	-11.0889***	17.1057***	1696.6644***	-15.9599***	-19.2206***	27.0055***
(D/K)*FD4	-12.8571***	1019.1300***	-9.1577***	-10.1437***	8.7933***	1019.1300***	-9.1577***	-10.1437***	8.7933***
(C/K)*FD5	-13.2853***	979.2650***	-4.2598***	-6.7004***	7.7217***	2731.9814***	-28.3668***	-37.2296***	54.8350***
(D/K)*FD5	-22.3203***	849.5597***	-9.7396***	-8.9726***	4.2352***	1239.5284***	-10.9864***	-12.8736***	14.7177***
(C/K)*FD6	-6.0275***	807.8376***	-1.9673**	-3.0360***	3.1137***	1813.7819***	-18.0418***	-21.6097***	30.1537***
(D/K)*FD6	-13.2955***	1670.2773***	-21.1152***	-22.5421***	26.2963***	1643.4039***	-18.8575***	-21.2717***	25.5739***
(C/K)*FD7	-	1997.2898***	-23.7947***	-46.1503***	35.0864***	3591.3776***	-33.0256***	-56.2974***	77.9358***
(D/K)*FD7	-	1400.2545***	-16.1655***	-30.3528***	19.0380***	1118.0058***	-40.3411***	-65.8403***	92.0916***

TableA5.2: The result of panel unit root test for the series in the model (sub-sample)

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
I/K	Large firms	-11.7110***	250.3694***	-4.7488***	-6.3297***	7.8345***	605.0837***	-10.9189***	-17.9176***	29.8177***
	Small firms	-20.2196***	1391.0761***	-5.5590***	-14.8711***	24.1152***	2131.2070***	-22.6573***	-30.5492***	45.8207***
	High dividend firms	-9.1349***	689.0215***	-5.5491***	-12.8755***	20.8520***	764.0188***	-13.4330***	-16.7749***	24.3040***
	Low dividend firms	-34.1591***	1012.6342***	-2.6145***	-10.2930***	18.1145***	1959.1028***	-21.4268***	-31.4283***	49.2511***
$\Delta S/K$	Large firms	-14.5113***	277.8746***	-2.6443***	-5.8161***	9.5672***	798.1620***	-19.5304***	-26.7774***	41.8851***
	Small firms	-42.1382***	925.8588***	-3.4469***	-7.3230***	10.3848***	1866.3340***	-42.1560***	-61.0915***	96.9424***
	High dividend firms	-30.4445***	417.5320***	-3.0198***	-5.4202***	8.3557***	1622.2883***	-28.5179***	-40.2276***	63.8091***
	Low dividend firms	-27.3365***	783.3958***	-3.1296***	-7.4050***	10.5731***	3065.6795***	-37.2591***	-54.1332***	85.6548***
C/K	Large firms	-12.5977***	223.3341***	-2.0072**	-3.9016***	6.1315***	632.0709***	-15.8258***	-20.5710***	31.5044***
	Small firms	-26.6872***	1834.4851***	-12.5186***	-24.8340***	37.2020***	2376.4835***	-25.5613***	-34.1989***	53.0473***
	High dividend firms	-15.8071***	897.2639***	-9.6058***	-18.6171***	30.4371***	978.5472***	-17.5700***	-23.2313***	34.1785***
	Low dividend firms	-25.0767***	1499.3107***	-11.5049***	-23.3877***	34.1250***	1999.9562***	-23.8948***	-31.8953***	50.5950***
D/K	Large firms	-4.1624***	286.9395***	-3.3374***	-7.1828***	10.1382***	239.6336***	-4.4240***	-5.1765***	6.9771***
	Small firms	-17.1182***	1022.5474***	-3.7519***	-8.4333***	13.2385***	1247.2985***	-11.0526***	-14.0552***	19.7783***
	High dividend firms	-16.1904***	379.2951***	-2.3681***	-3.9565***	6.5957***	562.3813***	-8.4312***	-10.9548***	15.0229***
	Low dividend firms	-3.0491***	844.7737***	-3.0888***	-8.1039***	12.5923***	919.8260***	-8.6027***	-10.5445***	15.0614***

TableA5.2 (cont'd): the result of panel unit root test for the series in the model (sub-sample)

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
(C/K)*FD1	Large firms	-12.5850***	221.2854***	-2.0115**	-3.8309***	6.0024***	629.3102***	-15.7464***	-20.4780***	31.3319***
	Small firms	-26.1198***	785.8175***	-2.4099**	-3.1825***	6.2516***	2370.5703***	-25.3941***	-34.0199***	52.8730***
	High dividend firms	-22.3827***	343.0518***	-2.2871**	-2.4232***	4.9275***	974.0295***	-17.4494***	-23.1023***	33.906***
	Low dividend firms	-19.8250***	667.6729***	-4.7206***	-4.1597***	6.7661***	1996.2172***	-23.7577***	-31.7474***	50.4720***
(D/K)*FD1	Large firms	-4.1621***	189.0113***	-2.5830**	-2.2099**	3.9693***	250.2165***	-4.8184***	-5.6460***	7.6385***
	Small firms	-4.2377***	1017.4322***	-3.6908***	-8.3591***	13.0875***	1222.0173***	-11.1388***	-13.7310***	19.0335***
	High dividend firms	-8.9414***	372.0113***	-2.2770**	-3.8075***	6.2604***	540.4952***	-8.4116***	-10.4879***	14.0155***
	Low dividend firms	-7.2582***	837.6519***	-2.8195***	-7.8261***	12.3580***	923.6387***	-8.8691***	-10.7046***	15.1868***
(C/K)*FD2	Large firms	-15.1265***	311.8389***	-3.7558***	-7.3811***	11.7067***	768.8564***	-18.1908***	-25.6623***	40.0535***
	Small firms	-24.4639***	1883.6869***	-12.7028***	-25.6513***	38.6542***	2436.4521***	-26.4919***	-35.5278***	54.8141***
	High dividend firms	-21.4922***	452.2973***	-4.7582***	-7.2332***	9.9559***	917.9806***	-16.8911***	-21.3993***	31.3907***
	Low dividend firms	-22.0971***	647.4207***	-2.5854***	-4.1802***	6.0999***	2253.6021***	-26.5544***	-37.3005***	58.9394***
(D/K)*FD2	Large firms	-1.5029*	724.5203***	-11.4904***	-23.8219***	37.7032***	181.4172***	-2.5056***	-2.8157***	3.3386***
	Small firms	-29.4993***	2058.5302***	-13.0400***	-28.4281***	43.8145***	1015.8233***	-8.3934***	-10.3132***	12.9584***
	High dividend firms	-5.7317***	355.6520***	-3.3943***	-4.5154***	5.5074***	412.1909***	-7.3355***	-7.7767***	8.1098***
	Low dividend firms	-3.3561***	706.0844***	-4.1589***	-6.4893***	8.0298***	731.8908***	-4.9736***	-6.4861***	8.8788***

TableA5.2 (cont'd): the result of panel unit root test for the series in the model (sub-sample).

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
(C/K)*FD3	Large firms	-13.7654***	585.9232***	-8.9916***	-18.4459***	28.9724***	695.7320***	-16.9556***	-22.9408***	35.4833***
	Small firms	-10.5592***	1881.4118***	-12.9322***	-25.6499***	38.5870***	2436.3651***	-26.7179***	-35.6610***	54.8115***
	High dividend firms	-19.8210***	422.9994***	-3.8667***	-6.1184***	8.6073***	1020.4969***	-18.4936***	-24.5121***	36.1232***
	Low dividend firms	-21.0728***	1554.4991***	-12.1427***	-24.5505***	35.9406***	2072.8609***	-25.0258***	-33.6951***	52.9934***
(D/K)*FD3	Large firms	-3.6110***	681.0758***	-11.2038***	-22.1758***	34.9665***	336.2043***	-6.5922***	-9.0418***	13.0128***
	Small firms	-3.6483***	2078.4101***	-13.4443***	-28.6661***	44.4013***	814.33179***	-7.0050***	-7.9733***	7.0219***
	High dividend firms	-3.8630***	881.3716***	-6.6292***	-15.8773***	29.7056***	777.1735***	-15.4736***	-18.0365***	24.9095***
	Low dividend firms	-6.8618***	1785.2341***	-13.7282***	-28.6215***	43.5312***	584.3222***	-3.9930***	-4.3556***	4.0241***
(C/K)*FD4	Large firms	-8.4944***	450.5801***	-6.5266***	-13.6677***	20.4466***	364.3028***	-8.7418***	-10.4776***	14.7689***
	Small firms	-14.2088***	1775.3872***	-10.4999***	-22.6835***	35.4578***	1617.4471***	-16.0970***	-20.6410***	30.6839***
	High dividend firms	-15.0840***	388.0743***	-3.8465***	-5.0329***	6.9998***	602.5020***	8.9825***	-11.7800***	16.8696***
	Low dividend firms	-14.2938***	1367.4384***	-9.6863***	-20.4772***	29.7867***	1347.4027***	-15.9367***	-19.7579***	29.1276***
(D/K)*FD4	Large firms	-3.2119***	646.9943***	-10.5374***	-20.6017***	32.8196***	190.1486***	-9.9447***	-13.0163***	19.7686***
	Small firms	-2.1811**	1890.9639***	-8.6708***	-22.4902***	38.8690***	1643.0839***	-23.0214***	-24.7423***	31.4393***
	High dividend firms	-2.0834**	396.5080***	-2.3682***	-4.0699***	7.3880999	429.2257***	-3.7401***	-5.5323***	8.8939***
	Low dividend firms	-1.6654**	1743.8752***	-12.0149***	-26.3324***	42.1706***	2266.1256***	-17.8061***	-35.1046***	59.3514***

TableA5.2 (cont'd): The result of panel unit root test for the series in the model (sub-sample).

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
(C/K)*FD5	Large firms	-15.0444***	526.4014***	-9.6250***	-16.8650***	25.2229***	364.3028***	-8.7418***	-10.4776***	14.7689***
	Small firms	-14.2088***	870.1423***	-4.3778***	-6.8409***	8.7404***	1617.4471***	-16.0970***	-20.6410***	30.6839***
	High dividend firms	-10.0699***	464.4787***	-6.3666***	-8.1492***	10.5166***	1251.5921***	-20.8926***	-30.5773***	46.7464***
	Low dividend firms	-23.3829***	1470.4214***	-10.1692***	-21.8462***	33.1746***	1921.2891***	-25.0737***	-32.5124***	48.0071***
(D/K)*FD5	Large firms	-18.1052***	637.9577***	-11.4154***	-21.1662***	32.2503***	1127.3706***	-18.6131***	-37.3944***	62.4607***
	Small firms	26.8564***	2554.3341***	-21.2599***	-38.5885***	58.4477***	2120.4856***	-15.0885***	-27.6863***	45.5048***
	High dividend firms	-3.0597***	328.3695***	-1.7463**	-2.7690***	4.2516***	1054.0431***	-17.9616***	-25.2693***	37.6535***
	Low dividend firms	-20.4544***	2081.0379***	-18.8148***	-35.8922***	53.2624***	2956.1821***	-27.1869***	-50.1653***	82.0526***
(C/K)*FD6	Large firms	-9.6269***	471.1801***	-7.5658***	-14.4806***	21.7443***	499.4031***	-12.1588***	-15.6144***	23.2127***
	Small firms	-15.2446***	1800.7005***	-10.8518***	-23.1414***	36.2049***	2193.0033***	-16.1217***	-29.0519***	47.6414***
	High dividend firms	-2.5359***	358.8455***	-1.7151**	-2.6068***	5.6544***	771.4205***	-12.1331***	-15.9471***	24.6447***
	Low dividend firms	-14.6134***	723.6644***	-3.8159***	-6.7431***	8.6081***	1115.3859***	-13.4533***	-15.3302***	21.4948***
(D/K)*FD6	Large firms	-1.3997*	725.0636***	-10.3845***	-22.6537***	37.7375***	1266.9487***	-20.3369***	-42.0059	71.1843***
	Small firms	-15.0208***	1990.7909***	-11.3600***	-25.2848***	41.8153***	1868.5294***	-19.5152***	-24.8427***	38.0815***
	High dividend firms	-3.8441***	881.3716***	-6.6292***	-15.8773***	29.7056***	661.7207***	-7.5885***	-12.4948***	19.5954***
	Low dividend firms	-22.1851***	2081.0379***	-18.8148***	-35.8922***	53.2624***	2255.8190***	-18.6897***	-35.4295***	59.0123***

TableA5.2 (cont'd): The result of panel unit root test for the series in the model (sub-sample).

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
(C/K)*FD7	Large firms	-	175.2035***	-6.1508***	-12.6972***	3.0995***	797.8423***	-16.2061***	-29.4715***	41.8651***
	Small firms	-	756.4103***	-12.2493***	-16.8896***	5.3837***	2762.1188***	-26.5731***	-46.7817***	64.4091***
	High dividend firms	-	356.9561***	-8.1236***	-10.4838***	5.5675***	1207.0174***	-17.0534***	-30.5465***	44.6947***
	Low dividend firms	-	569.1784***	-10.8386***	-17.6494***	3.5259***	2332.2504***	-25.8320***	-45.3375***	61.5267***
(D/K)*FD7	Large firms	-	230.4083***	-9.1173***	-17.3450	6.5771***	857.9267***	-16.9937***	-31.6309***	45.6204***
	Small firms	-	1111.7863***	-16.0748***	-26.0947***	15.8722***	2448.8607***	-23.3711***	-41.2204***	55.1797***
	High dividend firms	-	311.9803***	-6.6661***	-8.7566***	3.4973***	1483.3751***	-20.7991***	-38.3504***	57.4151***
	Low dividend firms	-	657.7510***	-12.1733***	-20.6162***	6.4397***	1790.4546***	-19.2041***	-33.7171***	43.7029***

TableA5.2 (cont'd): the result of panel unit root test for the series in the model (sub-sample) (when controlling for the cross sectional dependence in the panel).

Variable	Sub-sample	Im-Pesaran-Shin W-t-bar	ADF Inverse chi-square	ADF Inverse normal	ADF Inverse logit	ADF Modified inv. Chi-squared	PP Inverse chi-square	PP Inverse normal	PP Inverse logit	PP Modified inv. Chi-squared
I/K	Large firms	-25.3429***	250.3694***	-4.7488***	-6.3297***	7.8345***	1509.5085***	-30.0088***	-51.7275***	86.3443***
	Small firms	-32.9915***	827.8427***	-4.9049***	-6.7450***	7.41919***	1167.2137***	-45.7297***	-66.4437***	105.8071***
	High dividend firms	-24.8159***	380.8698***	-5.3808***	-5.9151***	6.6682***	1949.8837***	-32.7234***	-49.1263***	78.8879***
	Low dividend firms	-21.7337***	529.2373**	-2.1915**	-3.0984***	2.2119**	1372.4551***	-41.1443***	-59.9714***	95.7469***
$\Delta S/K$	Large firms	-15.6864***	277.8746***	-2.6443***	-5.8161***	9.5672***	809.4524***	-19.0517***	-26.9952***	42.5908***
	Small firms	-42.2855***	850.7209***	-3.9699***	-6.9762***	8.1672***	2411.0808***	-46.2677***	-70.1828***	112.9922***
	High dividend firms	-28.0545***	304.1747***	-1.4830*	-2.0022**	3.1380***	2219.7820***	-35.1782***	-55.8201***	91.3110***
	Low dividend firms	-31.4251***	627.2395***	-1.8636**	-4.5088***	5.4360***	1550.5403***	-32.7613***	-44.6554***	68.7079***
C/K	Large firms	-13.8276***	382.2853***	-7.0163***	-11.4567***	16.1445***	527.2293***	-14.6184***	-17.2633***	24.9518***
	Small firms	-17.9284***	842.9353***	-3.9006***	-6.0840***	7.9374***	1821.4058***	-20.2527***	-25.1364***	36.6931***
	High dividend firms	-16.3227***	603.4288***	-8.6559***	-11.8207***	16.9123***	1098.3808***	-19.1684***	-26.2763***	39.6943***
	Low dividend firms	-19.2597***	642.1971***	-2.4614***	-4.9811***	5.9281***	1250.8929***	-15.5673***	-18.4535***	25.9527***
D/K	Large firms	-6.0358***	773.2033***	-14.1200***	-26.4374***	40.7700***	328.9465***	-6.4269***	-8.7061***	12.5592***
	Small firms	-5.7887***	1212.3687***	-16.8683***	-17.5366***	18.8409***	791.3054***	-6.4863***	-7.4099***	6.3435***
	High dividend firms	-12.4742***	534.4927***	-5.8903***	-8.6658***	13.7392***	714.2536***	-14.2341***	-16.2661***	22.0134***
	Low dividend firms	-7.7781***	1057.8653***	-16.9053***	-18.4723***	19.6025***	571.8673***	-3.5001***	-3.8598***	3.6144***

TableA5.2 (cont'd): the result of panel unit root test for the series in the model (sub-sample) (when controlling for the cross sectional dependence in the panel).

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
(C/K)*FD1	Large firms	-13.8337***	386.3776***	-7.1676***	-11.6284***	16.4022***	525.6158***	-14.5970***	-17.2096***	24.8510***
	Small firms	-17.3740***	826.7272***	-3.8259***	-5.8317***	-5.8317***	1794.0154***	-19.8834***	-24.6213***	35.8861***
	High dividend firms	-15.6868***	602.0595***	-8.6675***	-11.8041***	16.8493***	1077.9513***	-18.9213***	-25.7563***	38.7539***
	Low dividend firms	-16.2096***	645.2927***	-2.5265***	-5.0577***	6.0299***	1248.8523***	-15.5088***	-18.3834***	25.8855***
(D/K)*FD1	Large firms	-5.9839***	254.5863***	-3.0361***	-5.9645***	8.1002***	328.8225***	-6.4465***	-8.7287***	12.5514***
	Small firms	-5.8544***	1720.5073***	-24.1927***	-26.3846***	33.7204***	788.8628***	-6.3738***	-7.3198***	6.2715***
	High dividend firms	-12.0662***	510.2001***	-5.6161***	-8.0710****	12.6211***	710.3907***	-14.2267***	-16.1971***	21.8356***
	Low dividend firms	-3.1613***	1049.8691***	-16.8287***	-18.3272***	19.3395***	571.4795***	-3.3790***	-3.7702***	3.6016***
(C/K)*FD2	Large firms	-13.6554***	510.6549***	-10.8550***	-17.3508***	24.2310***	1110.7144***	-24.6273***	-37.7507***	61.4196***
	Small firms	-18.9762***	1061.8667***	-5.1296***	-9.6158***	14.3989***	1916.6068***	-22.0399***	-27.5084***	39.4980***
	High dividend firms	-16.3499***	328.2314***	-3.0227***	-3.8114***	4.2453***	920.5197***	-17.5188***	-22.0259***	31.5076***
	Low dividend firms	-16.4941***	569.1686***	-4.1735***	-4.5165***	3.5256***	1398.3343***	-18.1998***	-21.9704***	30.8031***
(D/K)*FD2	Large firms	-5.0914***	778.8708***	-14.2045***	-26.5833***	41.1270***	1065.6661***	-18.6152***	-35.3263***	58.6041***
	Small firms	-8.3844***	1088.5880***	-14.1855***	-14.8209***	15.1876***	841.5564***	-5.6554***	-7.1790***	7.8240***
	High dividend firms	-5.6532***	584.3759***	-7.4344***	-10.9611***	16.0353***	616.6655***	-12.4413***	-13.7501***	17.5215***
	Low dividend firms	-4.0190***	706.0844***	-4.1589***	-6.4893***	8.0298***	607.8329***	-3.6649***	-4.7062***	4.7976***

TableA5.2 (cont'd): the result of panel unit root test for the series in the model (sub-sample) (when controlling for the cross sectional dependence in the panel).

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
(C/K)*FD3	Large firms	-13.8782***	419.2016***	-7.1085***	-12.3452***	18.4700***	398.6476***	-3.4776***	-5.1045***	7.4865***
	Small firms	-18.1557***	881.4172***	-4.2754***	-6.8890***	9.0731***	1924.8140***	-21.6584***	-27.2363***	39.7398***
	High dividend firms	-17.0904***	398.6476***	-3.4776***	-5.1045***	7.4865***	1127.4351***	-19.7563***	-27.1439***	41.0316***
	Low dividend firms	-13.0212***	537.5731***	-3.4363***	-3.9224***	2.4862***	1288.6756***	-16.2263***	-19.3678***	27.1956***
(D/K)*FD3	Large firms	-6.1014***	800.9445***	-14.5935***	-27.4321***	42.5175***	336.2043***	-6.5922***	-9.0418***	13.0128***
	Small firms	-8.8404***	1156.5086***	-16.2957***	-16.5548***	17.1922***	814.3317***	-7.0050***	-7.9733***	7.0219***
	High dividend firms	-4.5608***	673.7728***	-8.0509***	-12.8406***	20.1501***	673.7728***	-8.0509***	-12.8406***	20.1501***
	Low dividend firms	-5.0867***	1014.4767***	-16.1719***	-17.5308***	18.1751***	584.3222***	-3.9930***	-4.3556***	4.0241***
(C/K)*FD4	Large firms	-13.5575***	476.4023***	-7.7069***	-13.7426***	22.0733***	471.3408***	-12.5461***	-15.2026***	21.4588***
	Small firms	-13.7495***	1026.1932***	-4.7433***	-8.4751***	13.3461***	1310.2141***	-13.0242***	-15.4437***	21.6320***
	High dividend firms	-8.4809***	467.5627***	-5.4621***	-7.5861***	10.6585***	726.6971***	-11.2747***	-15.0508***	22.5862***
	Low dividend firms	-13.2385***	949.2073***	-5.3261***	-10.3343***	16.0279***	1008.6011***	-11.2515***	-13.1797***	17.9819***
(D/K)*FD4	Large firms	-5.1721***	965.9149***	-17.0559***	-34.2486***	52.9097***	304.1228***	-4.8842***	-7.0639***	11.0077***
	Small firms	-3.0981***	1323.4608***	-18.9096***	-19.8399***	22.1196***	1643.0839***	-23.0214***	-24.7423***	31.4393***
	High dividend firms	-3.0597***	344.4489***	-1.4962*	-3.3631***	4.9918***	815.8952***	-14.6673***	-18.2480***	26.6918***
	Low dividend firms	-7.1825***	574.1583***	-1.3918*	-2.7916***	3.6897***	1642.8194***	-23.4558***	-28.1821***	38.8461***

TableA5.2 (cont'd): the result of panel unit root test for the series in the model (sub-sample) (when controlling for the cross sectional dependence in the panel).

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
(C/K)*FD5	Large firms	-15.2170***	249.1106***	-1.6187*	-5.0819***	7.7552***	684.6629***	-17.1623***	-23.0339***	34.7914***
	Small firms	-27.4181***	870.1423***	-4.3778***	-6.8409***	8.7404***	2270.3446***	-25.5411***	-33.8006***	49.9201***
	High dividend firms	-10.2340***	1049.9436***	-15.3545***	-24.2436***	37.4648***	1486.3453***	-24.0437***	-36.3808***	57.5518***
	Low dividend firms	-19.3429***	643.1889***	-4.0198***	-6.1153***	5.9607***	1491.6034***	-18.6010***	-23.7806***	33.8715***
(D/K)*FD5	Large firms	-13.8340***	555.6334***	-7.6348***	-16.9460***	27.01644***	556.6627***	-12.8085***	-18.1222***	26.7914***
	Small firms	-9.7829***	781.3469***	-9.6020***	-9.2591***	6.1197***	2698.8309***	-36.1532***	-43.2849***	62.5445***
	High dividend firms	-16.3185***	562.6230***	-6.7882***	-10.1567***	15.0340***	2066.9206***	-32.0478***	-51.8372***	84.2749***
	Low dividend firms	-5.4698***	539.1561***	-2.1751**	-3.7533***	2.5382***	2004.8169***	-27.3965***	-35.2282***	50.7549***
(C/K)*FD6	Large firms	-13.4476***	203.0110***	-2.3151**	-3.7569***	4.8512***	533.7700***	-15.1835***	-17.7654***	25.3606***
	Small firms	-12.2681***	832.9939***	-4.5469*	-4.5692***	7.6440***	1399.8203***	-13.9016***	-16.8691***	24.2720***
	High dividend firms	-10.2340***	500.4782***	-6.2451***	-8.3653***	12.1736***	938.3997***	-18.9032***	-22.4555***	32.3306***
	Low dividend firms	-20.4210***	707.2136***	-4.5871***	-5.5082***	8.0669***	1491.6034***	-18.6010***	-23.7806***	333.8715***
(D/K)*FD6	Large firms	-5.4440***	332.4972***	-6.1978***	-8.5940***	12.7811***	332.4972***	-6.1978***	-8.5940***	12.7811***
	Small firms	-9.7829***	1143.5217***	-15.4322***	-15.7574***	16.8089***	1370.6549***	-18.9597***	-19.8229***	23.4127***
	High dividend firms	-10.0699***	402.6638***	-4.2269***	-6.3084***	7.6713***	938.3997***	-18.9032***	-22.4555***	32.3306***
	Low dividend firms	-4.3328***	933.6008***	-14.3148***	-15.2934***	15.5145***	1544.9293***	-22.4727***	-26.3950***	35.6258***

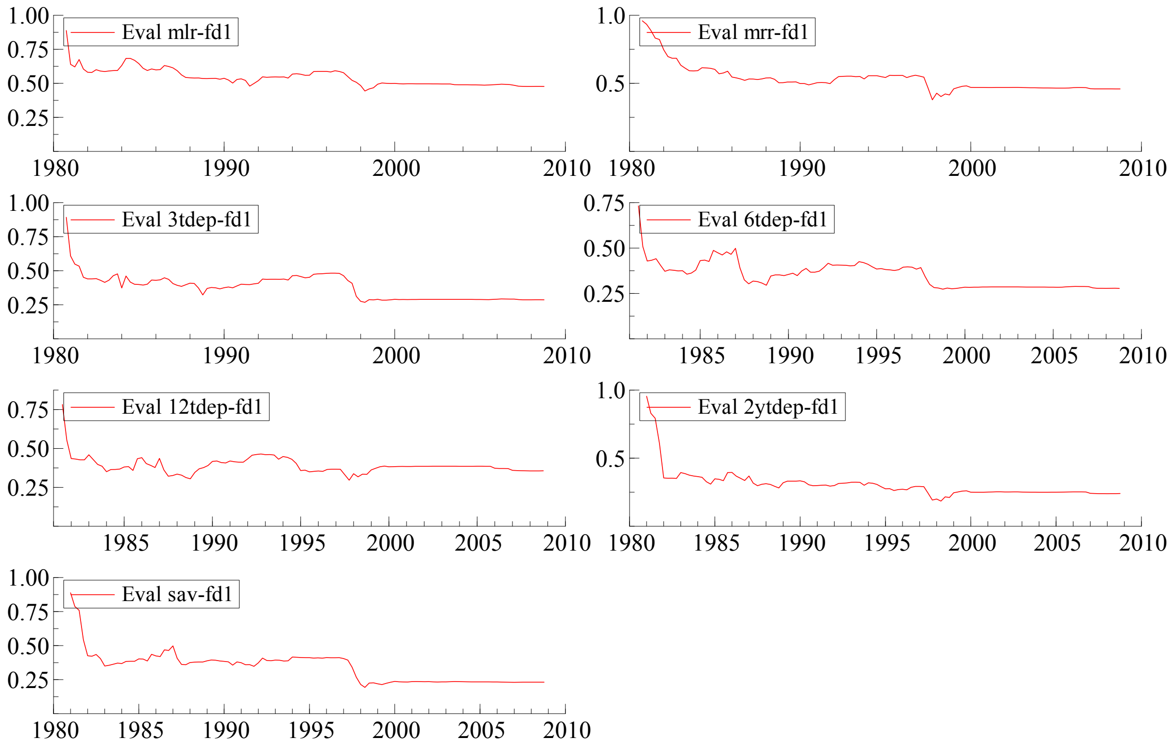
TableA5.2 (cont'd): the result of panel unit root test for the series in the model (sub-sample) (when controlling for the cross sectional dependence in the panel).

Variable	Sub-sample	Im-Pesaran-Shin	Fisher ADF				Fisher PP			
		W-t-bar	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared	Inverse chi-square	Inverse normal	Inverse logit	Modified inv. Chi-squared
(C/K)*FD7	Large firms	-	358.4429***	-12.6009***	-27.1781***	14.6425***	1242.7253***	-24.6561***	-47.0099***	69.6703***
	Small firms	-	1551.0715***	-20.0896***	-37.2121***	28.8374***	2627.0010***	-26.8136***	-44.8463***	60.4282***
	High dividend firms	-	710.8976***	-12.4659***	-22.3049***	21.8589***	1418.1736***	-21.0658***	-36.8214***	54.4140***
	Low dividend firms	-	1176.8116***	-19.1571***	-38.8478***	23.5156***	2389.9801***	-27.7730***	-47.1081***	63.4259***
(D/K)*FD7	Large firms	-	313.14181***	-10.0757***	-23.3529***	11.7873***	1215.4054***	-23.5365***	-45.9556***	67.9628***
	Small firms	-	1316.8605***	-15.1383***	-29.9698***	21.9248***	3008.5498***	-34.5091***	-52.8683***	71.6697***
	High dividend firms	-	1512.6989***	-23.7565***	-20.3678***	58.7648***	2488.0106***	-39.1739***	-66.7578***	103.6572***
	Low dividend firms	-	842.7921***	-12.9118***	-26.2859***	12.5271***	1987.0697***	-24.1349	-38.7027***	50.1711***

APPENDIX B

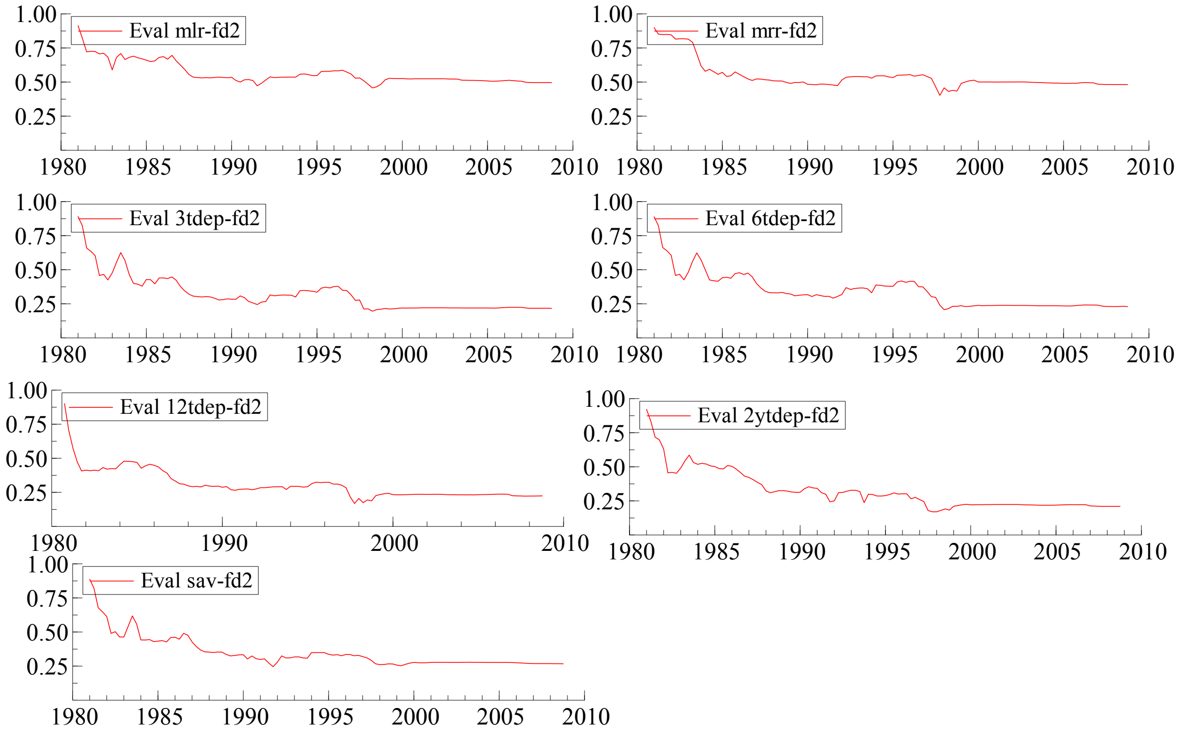
Figure B6.1: The recursive estimation of the eigenvalue of the cointegrating vector

Figure B6.1.1 The effect of banking sector development (size measure) on the Interest rate pass-through model (fd1)



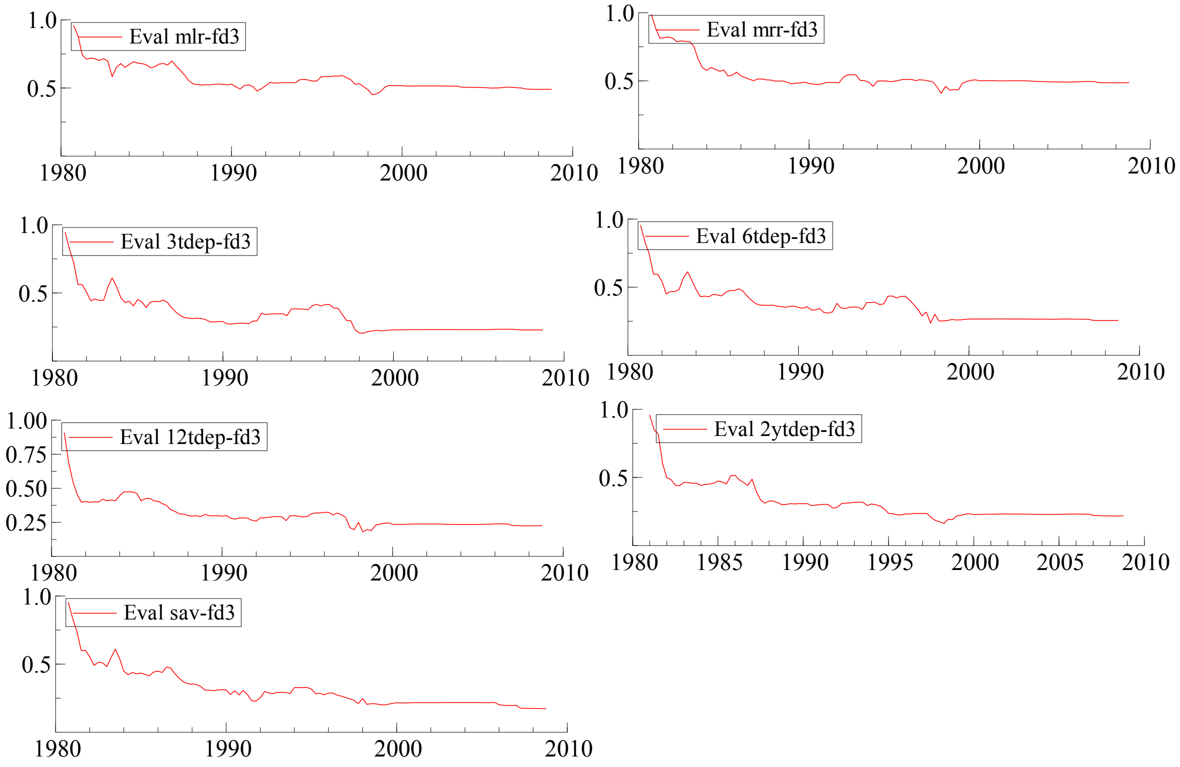
Note: Eval mlr-fd1, Eval mrr-fd1, Eval 3tdep-fd1, Eval 6tdep-fd1, Eval 12tdep-fd1, Eval 2ytdep-fd1, and Eval sav-fd1 represent the eigenvalue of the cointegrating vector for the model of the effect of banking sector development (size measure:fd1) on minimum lending rate (mlr), minimum retail rate (mrr), 3 month deposit interest rate (3tdep), 6 month deposit interest rate (6tdep), 12 month deposit interest rate (12tdep), 2 year deposit interest rate (2ytdep), and saving interest rate (sav) respectively.

Figure B6.1.2 The effect of banking sector development (activity measure) on the Interest rate pass-through model (fd2)



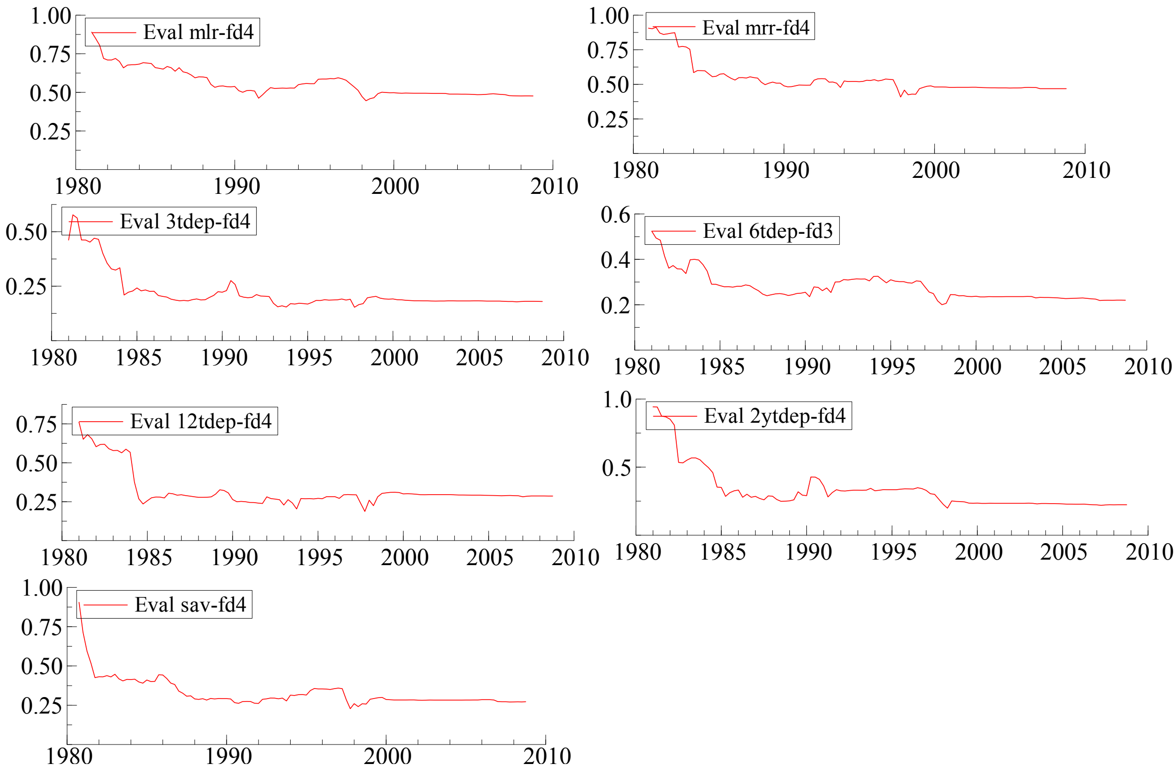
Note: Eval mlr-fd2, Eval mrr-fd2, Eval 3tdep-fd2, Eval 6tdep-fd2, Eval 12tdep-fd2, Eval 2ytdep-fd2, and Eval sav-fd2 represent the eigenvalue of the cointegrating vector for the model of the effect of banking sector development (size measure:fd1) on minimum lending rate (mlr), minimum retail rate (mrr), 3 month deposit interest rate (3tdep), 6 month deposit interest rate (6tdep), 12 month deposit interest rate (12tdep), 2 year deposit interest rate (2ytdep), and saving interest rate (sav) respectively.

Figure B6.1.3 The effect of banking competition on the Interest rate pass-through model (fd3)



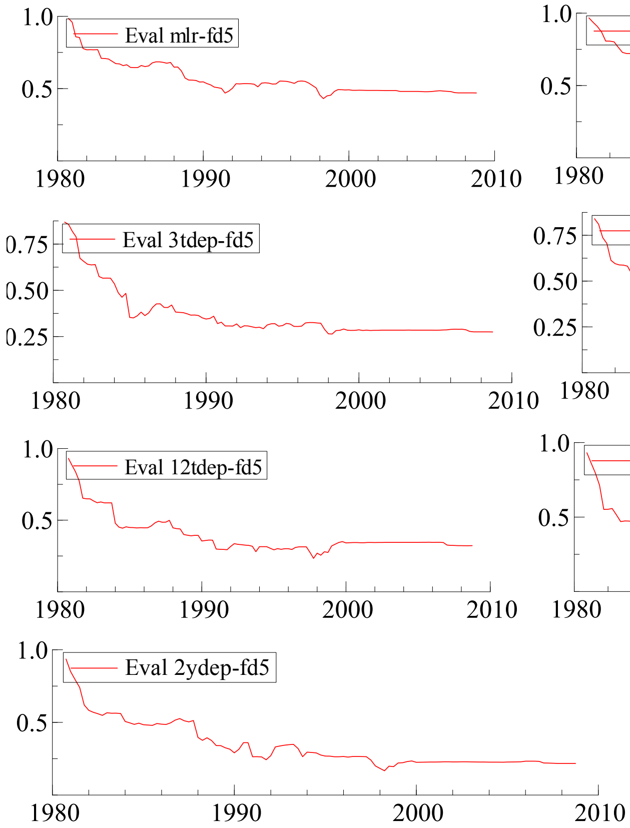
<u>Note:</u> Eval mlr-fd3, Eval mrr-fd3, Eval 3tdep-fd3, Eval 6tdep-fd3, Eval 12tdep-fd3, Eval 2ytdep-fd3, and Eval sav-fd3 represent the eigenvalue of the cointegrating vector for the model of the effect of banking sector development (size measure:fd1) on minimum lending rate (mlr), minimum retail rate (mrr), 3 month deposit interest rate (3tdep), 6 month deposit interest rate (6tdep), 12 month deposit interest rate (12tdep), 2 year deposit interest rate (2ytdep), and saving interest rate (sav) respectively.

Figure B6.1.4 The effect of capital market development (size measure) on the Interest rate pass-through model (fd4)



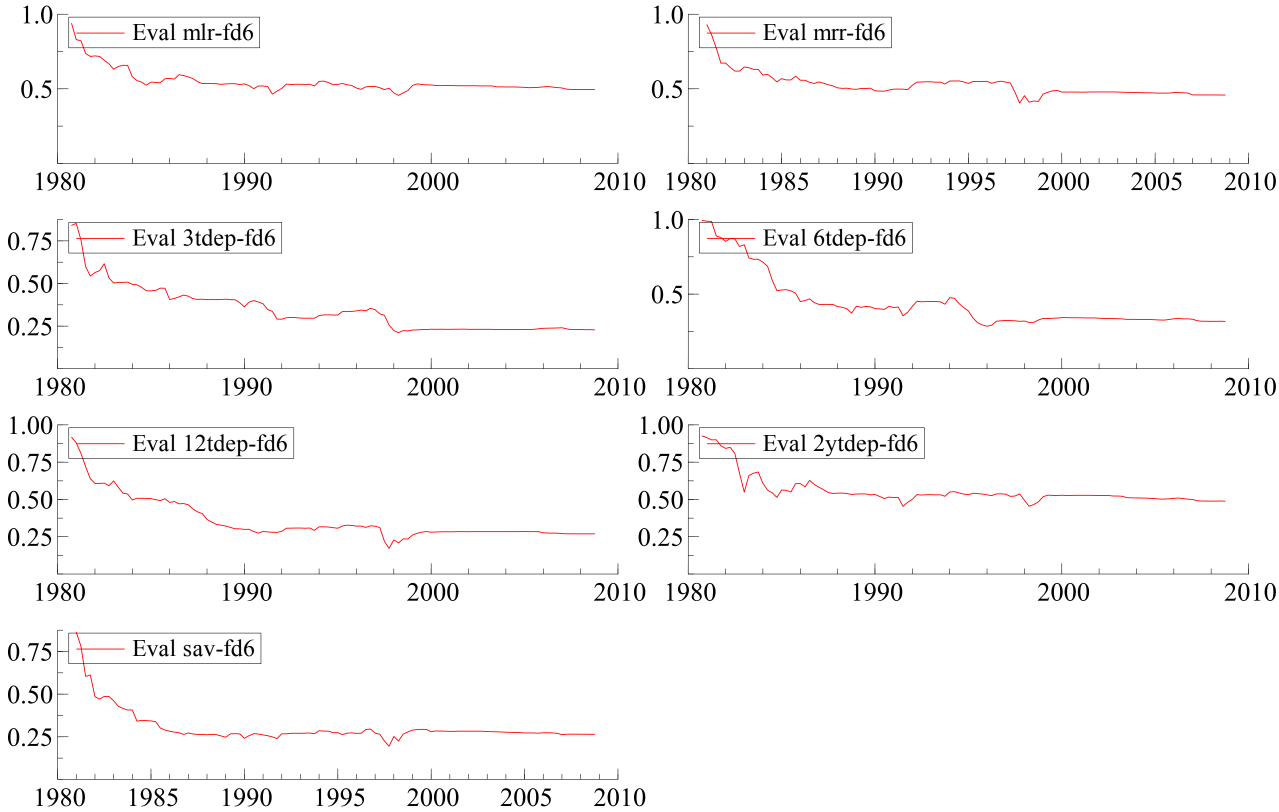
<u>Note:</u> Eval mlr-fd4, Eval mrr-fd4, Eval 3tdep-fd4, Eval 6tdep-fd4, Eval 12tdep-fd4, Eval 2ytdep-fd4, and Eval sav-fd4 represent the eigenvalue of the cointegrating vector for the model of the effect of banking sector development (size measure:fd1) on minimum lending rate (mlr), minimum retail rate (mrr), 3 month deposit interest rate (3tdep), 6 month deposit interest rate (6tdep), 12 month deposit interest rate (12tdep), 2 year deposit interest rate (2ytdep), and saving interest rate (sav) respectively.

Figure B6.1.5 The effect of capital market development (activity measure) on the Interest rate pass-through model (fd5)



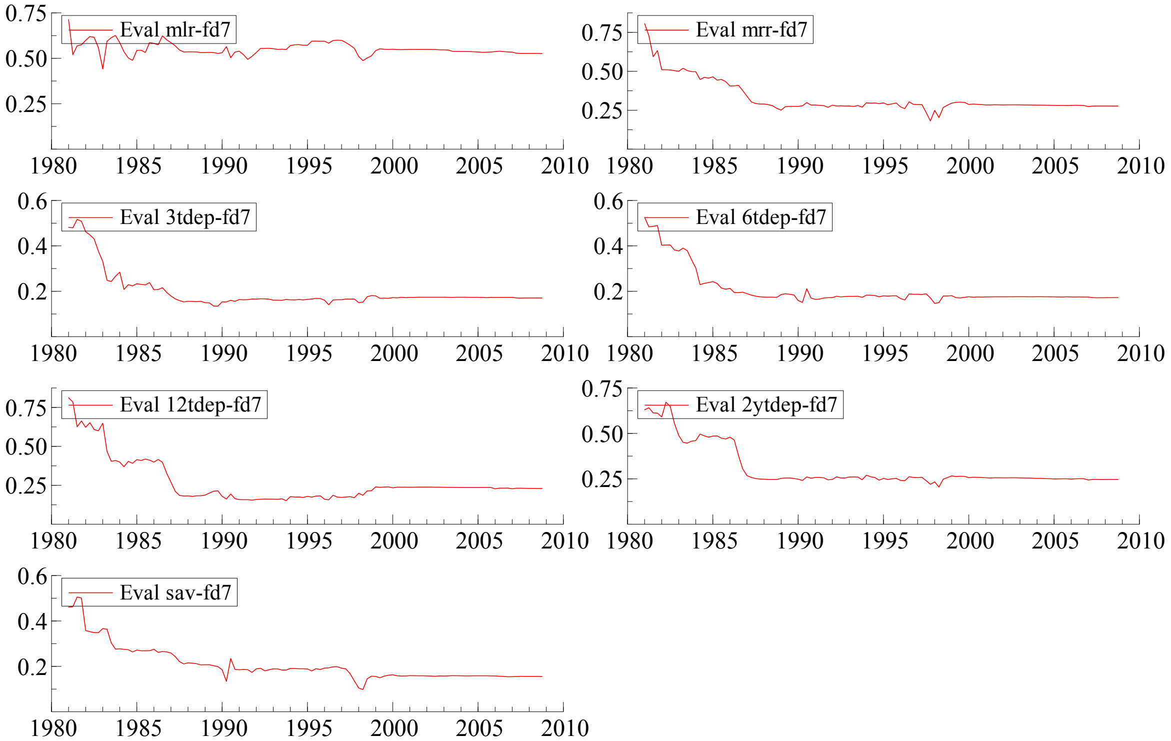
Note: Eval mlr-fd5, Eval mrr-fd5, Eval 3tdep-fd5, Eval 6tdep-fd5, Eval 12tdep-fd5, Eval 2ytdep-fd5, and Eval sav-fd5 represent the eigenvalue of the cointegrating vector for the model of the effect of banking sector development (size measure:fd1) on minimum lending rate (mlr), minimum retail rate (mrr), 3 month deposit interest rate (3tdep), 6 month deposit interest rate (6tdep), 12 month deposit interest rate (12tdep), 2 year deposit interest rate (2ytdep), and saving interest rate (sav) respectively.

Figure B6.1.6 The effect of bond market development (financial innovation) on the Interest rate pass-through model (fd6)



Note: Eval mlr-fd6, Eval mrr-fd6, Eval 3tdep-fd6, Eval 6tdep-fd6, Eval 12tdep-fd6, Eval 2ytdep-fd6, and Eval sav-fd6 represent the eigenvalue of the cointegrating vector for the model of the effect of banking sector development (size measure:fd1) on minimum lending rate (mlr), minimum retail rate (mrr), 3 month deposit interest rate (3tdep), 6 month deposit interest rate (6tdep), 12 month deposit interest rate (12tdep), 2 year deposit interest rate (2ytdep), and saving interest rate (sav) respectively.

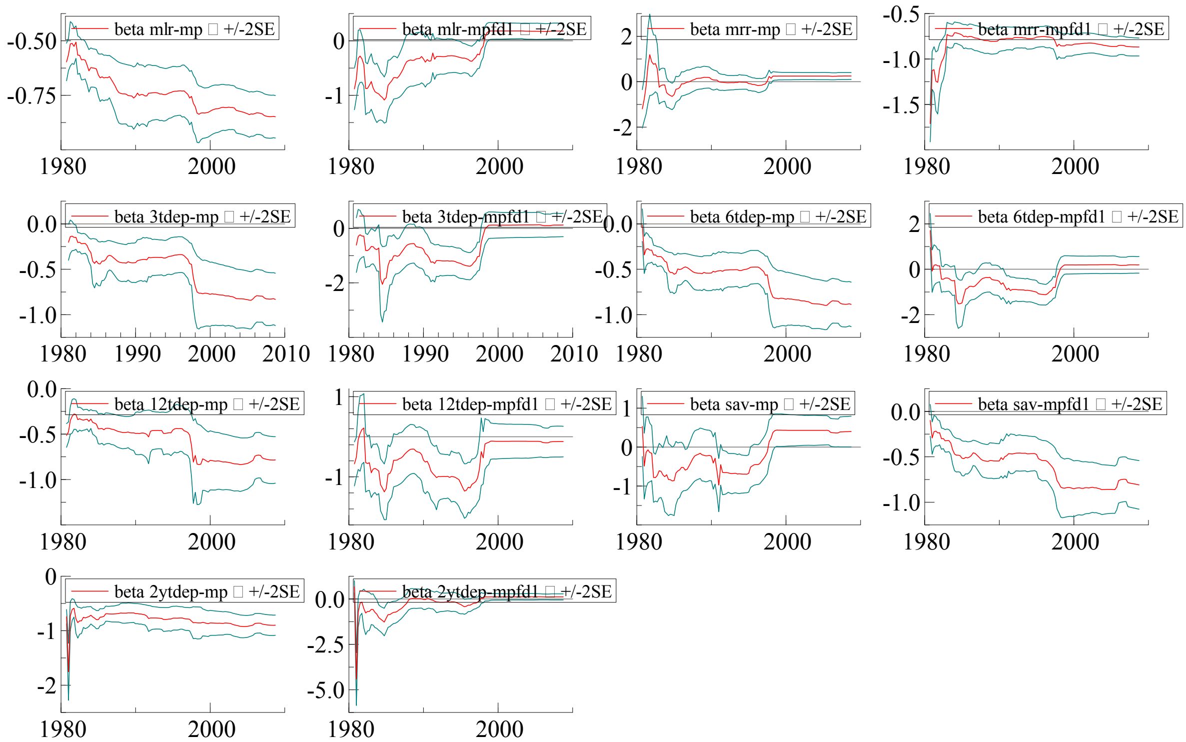
Figure B6.1.7 The effect of financial liberalization on the Interest rate pass-through model (fd7)



Note: Eval mlr-fd7, Eval mrr-fd7, Eval 3tdep-fd7, Eval 6tdep-fd7, Eval 12tdep-fd7, Eval 2ytdep-fd7, and Eval sav-fd7 represent the eigenvalue of the cointegrating vector for the model of the effect of banking sector development (size measure:fd1) on minimum lending rate (mlr), minimum retail rate (mrr), 3 month deposit interest rate (3tdep), 6 month deposit interest rate (6tdep), 12 month deposit interest rate (12tdep), 2 year deposit interest rate (2ytdep), and saving interest rate (sav) respectively.

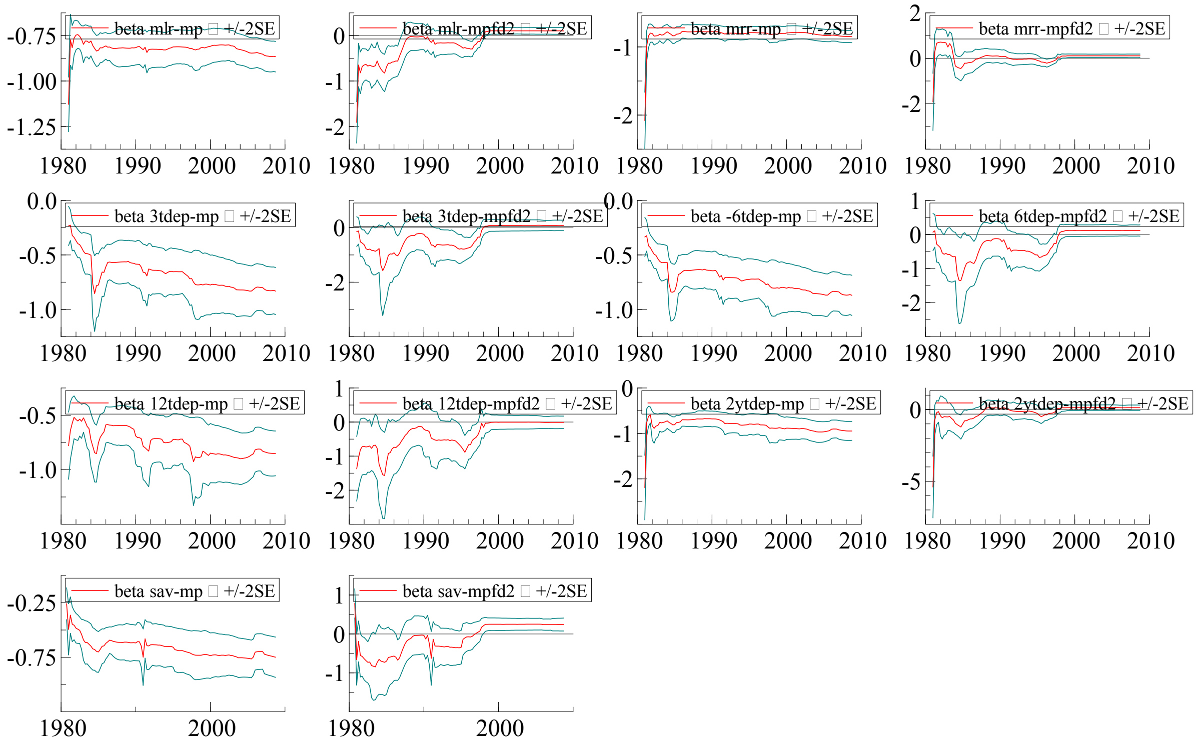
Figure B6.2: The recursive estimation of β coefficient

Figure B6.2.1 The effect of banking sector development (size measure) on the Interest rate pass-through model (fd1)



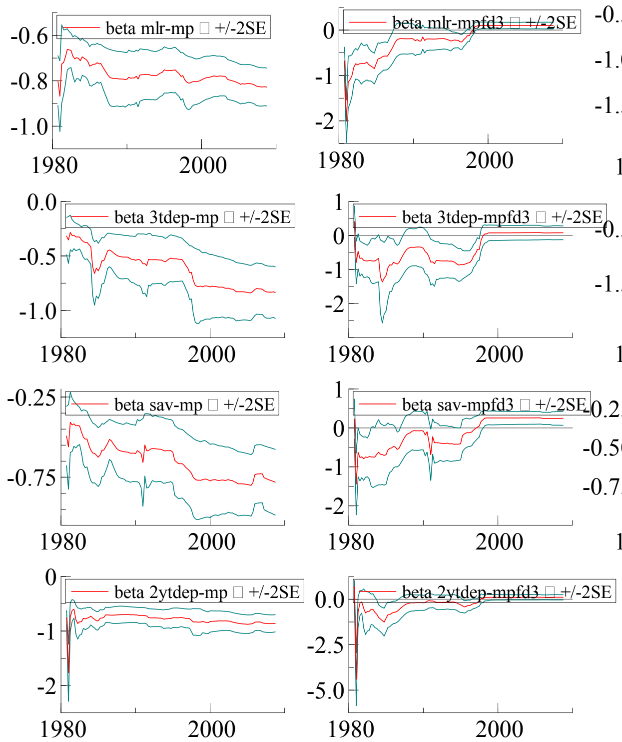
Note: beta mlr-mp, beta mrr-mp, beta 3tdep-mp, beta 6tdep-mp, beta 12tdep-mp, beta 2ytdep-mp, and beta sav-mp represent the beta coefficient of policy interest rate variable in the cointegrating vector. beta mlr-mpfd1, beta mrr-mpfd1, beta 3tdep-mpfd1, beta 6tdep-mpfd1, beta 12tdep-mpfd1, beta 2ytdep-mpfd1, and beta sav-mpfd1 represent the beta coefficient of the cointegrating vector of the interaction term variable (policy interest rate and the banking sector development (size measure:fd1). Each beta coefficient if estimated based on different retail interest rates equations (minimum lending rate, mlr, minimum retail rate, mrr, 3 month deposit interest rate, 3tdep, 6 month deposit interest rate, 6tdep, 12 month deposit interest rate, 12tdep, 2 year deposit interest rate, 2ytdep, and saving interest rate, sav respectively).

Figure B6.2.2 The effect of banking sector development (activity measure) on the Interest rate pass-through model (fd2)



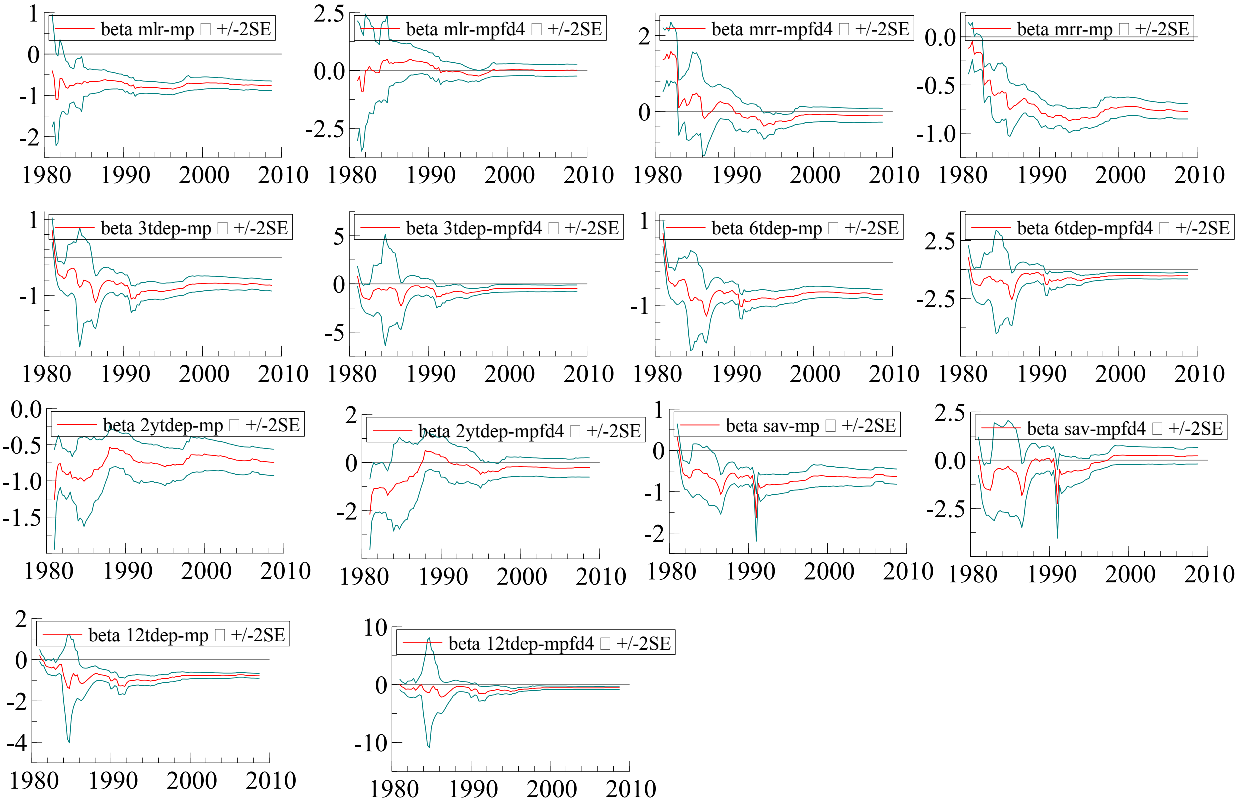
<u>Note:</u> beta mlr-mp, beta mrr-mp, beta 3tdep-mp, beta 6tdep-mp, beta 12tdep-mp, beta 2ytdep-mp, and beta sav-mp represent the beta coefficient of policy interest rate variable in the cointegrating vector. beta mlr-mpfd2, beta mrr-mpfd2, beta 3tdep-mpfd2, beta 6tdep-mpfd2, beta 12tdep-mpfd2, beta 2ytdep-mpfd2, and beta sav-mpfd2 represent the beta coefficient of the cointegrating vector of the interaction term variable (policy interest rate and the banking sector development (activity measure:fd2). Each beta coefficient if estimated based on different retail interest rates equations (minimum lending rate, mlr, minimum retail rate, mrr, 3 month deposit interest rate, 3tdep, 6 month deposit interest rate, 6tdep, 12 month deposit interest rate, 12tdep, 2 year deposit interest rate, 2ytdep, and saving interest rate, sav respectively).

Figure B6.2.3 The effect of banking competition on the Interest rate pass-through model (fd3)



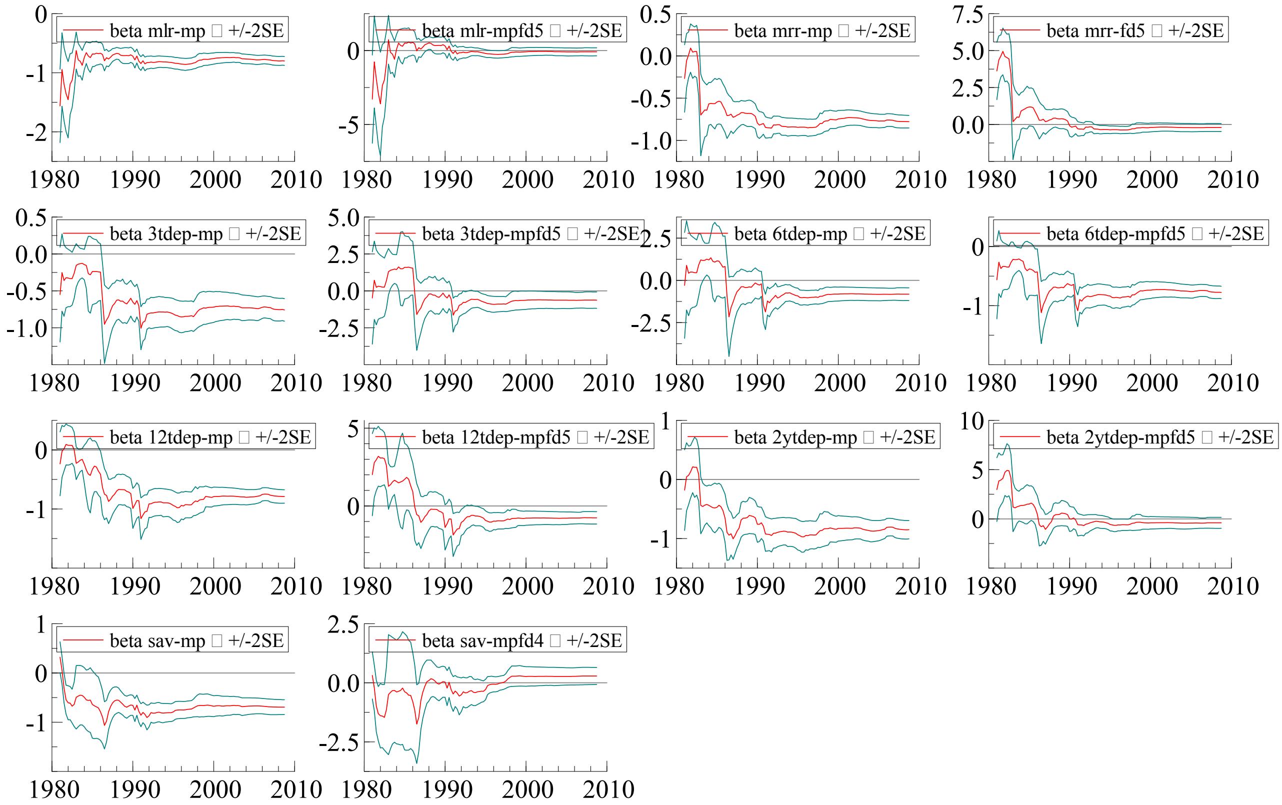
Note: beta mlr-mp, beta mrr-mp, beta 3tdep-mp, beta 6tdep-mp, beta 12tdep-mp, beta 2ytdep-mp, and beta sav-mp represent the beta coefficient of policy interest rate variable in the cointegrating vector. beta mlr-mpfd3, beta mrr-mpfd3, beta 3tdep-mpfd3, beta 6tdep-mpfd3, beta 12tdep-mpfd3, beta 2ytdep-mpfd3, and beta sav-mpfd3 represent the beta coefficient of the cointegrating vector of the interaction term variable (policy interest rate and the banking competition. Each beta coefficient if estimated based on different retail interest rates equations (minimum lending rate, mlr, minimum retail rate, mrr, 3 month deposit interest rate, 3tdep, 6 month deposit interest rate, 6tdep, 12 month deposit interest rate, 12tdep, 2 year deposit interest rate, 2ytdep, and saving interest rate, sav respectively).

Figure B6.2.4 The effect of capital market development (size measure) on the Interest rate pass-through model (fd4)



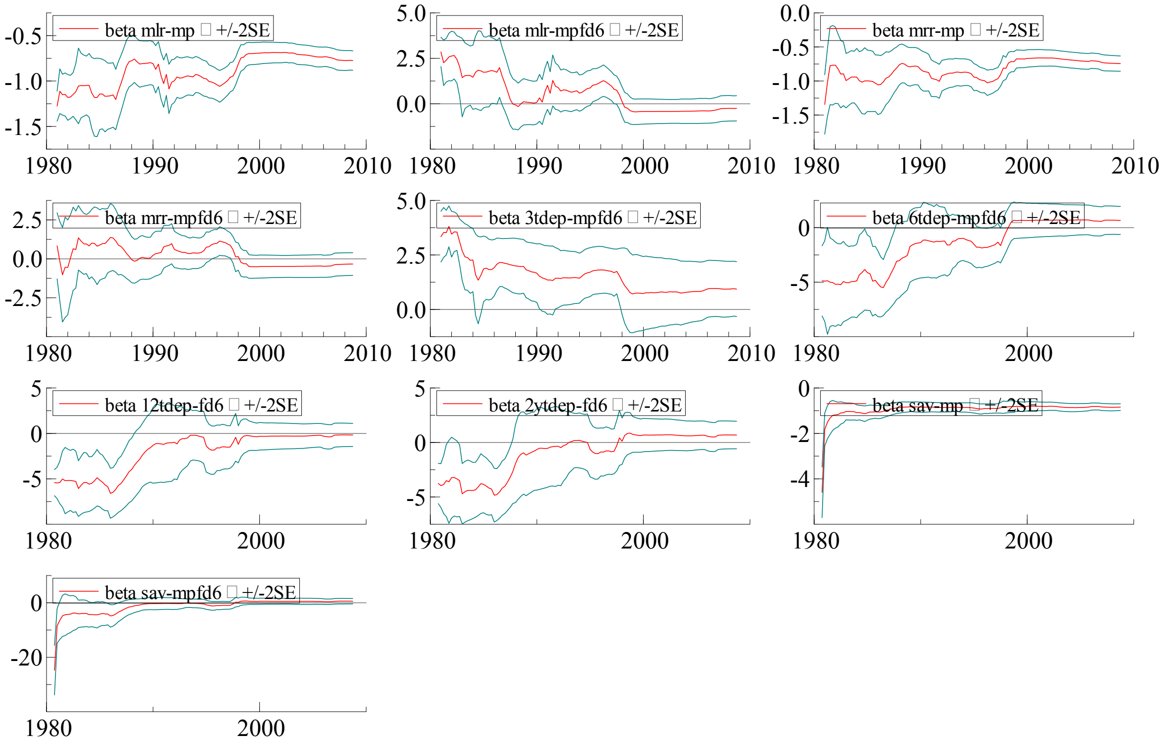
<u>Note:</u> beta mlr-mp, beta mrr-mp, beta 3tdep-mp, beta 6tdep-mp, beta 12tdep-mp, beta 2ytdep-mp, and beta sav-mp represent the beta coefficient of policy interest rate variable in the cointegrating vector. beta mlr-mpfd4, beta mrr-mpfd4, beta 3tdep-mpfd4, beta 6tdep-mpfd4, beta 12tdep-mpfd4, beta 2ytdep-mpfd4, and beta sav-mpfd4 represent the beta coefficient of the cointegrating vector of the interaction term variable (policy interest rate and the banking competition. Each beta coefficient if estimated based on different retail interest rates equations (minimum lending rate, mlr, minimum retail rate, mrr, 3 month deposit interest rate, 3tdep, 6 month deposit interest rate, 6tdep, 12 month deposit interest rate, 12tdep, 2 year deposit interest rate, 2ytdep, and saving interest rate, sav respectively).

Figure B6.2.5 The effect of capital market development (activity measure) on the Interest rate pass-through model (fd5)



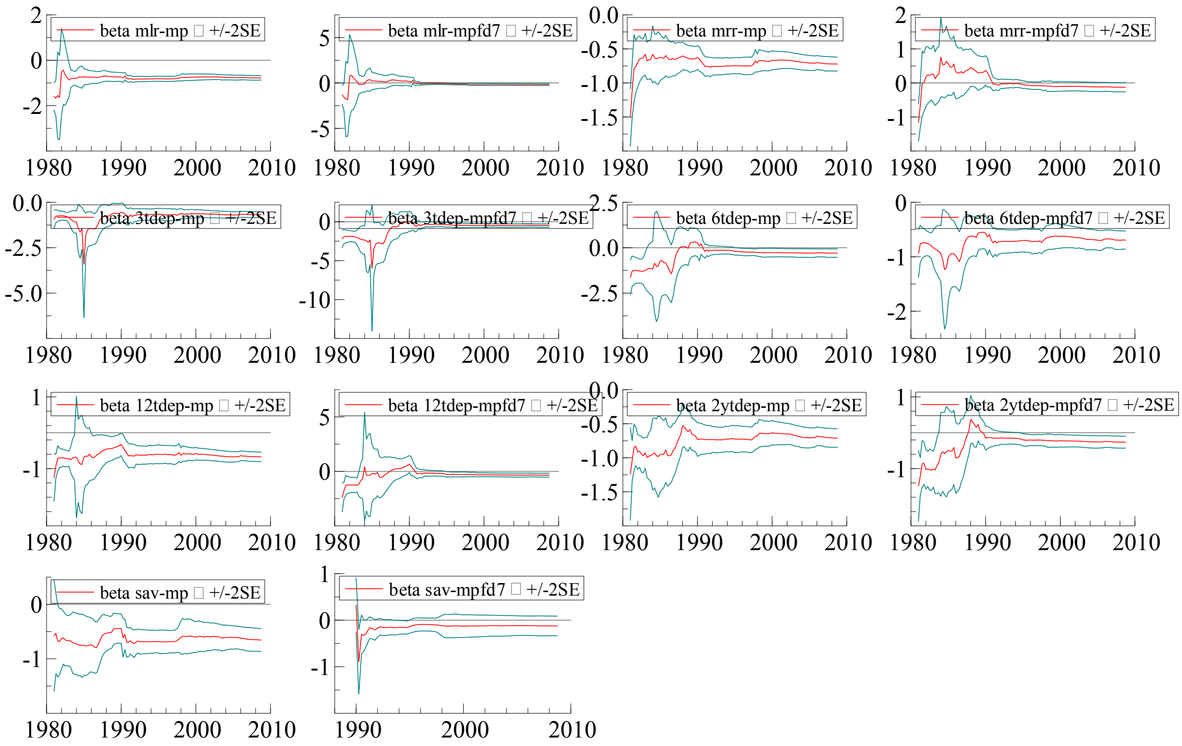
<u>Note:</u> beta mlr-mp, beta mrr-mp, beta 3tdep-mp, beta 6tdep-mp, beta 12tdep-mp, beta 2ytdep-mp, and beta sav-mp represent the beta coefficient of policy interest rate variable in the cointegrating vector. beta mlr-mpfd5, beta mrr-mpfd5, beta 3tdep-mpfd5, beta 6tdep-mpfd5, beta 12tdep-mpfd5, beta 2ytdep-mpfd5, and beta sav-mpfd5 represent the beta coefficient of the cointegrating vector of the interaction term variable (policy interest rate and the banking competition. Each beta coefficient if estimated based on different retail interest rates equations (minimum lending rate, mlr, minimum retail rate, mrr, 3 month deposit interest rate, 3tdep, 6 month deposit interest rate, 6tdep, 12 month deposit interest rate, 12tdep, 2 year deposit interest rate, 2ytdep, and saving interest rate, sav respectively).

Figure B6.2.6 The effect of bond market development (financial innovation) on the Interest rate pass-through model (fd6)



__Note:__ beta mlr-mp, beta mrr-mp, beta 3tdep-mp, beta 6tdep-mp, beta 12tdep-mp, beta 2ytdep-mp, and beta sav-mp represent the beta coefficient of policy interest rate variable in the cointegrating vector. beta mlr-mpfd6, beta mrr-mpfd6, beta 3tdep-mpfd6, beta 6tdep-mpfd6, beta 12tdep-mpfd6, beta 2ytdep-mpfd6, and beta sav-mpfd6 represent the beta coefficient of the cointegrating vector of the interaction term variable (policy interest rate and the banking competition. Each beta coefficient if estimated based on different retail interest rates equations (minimum lending rate, mlr, minimum retail rate, mrr, 3 month deposit interest rate, 3tdep, 6 month deposit interest rate, 6tdep, 12 month deposit interest rate, 12tdep, 2 year deposit interest rate, 2ytdep, and saving interest rate, sav respectively).

Figure B6.2.7 The effect of financial liberalization on the Interest rate pass-through model (fd7)



<u>Note:</u> beta mlr-mp, beta mrr-mp, beta 3tdep-mp, beta 6tdep-mp, beta 12tdep-mp, beta 2ytdep-mp, and beta sav-mp represent the beta coefficient of policy interest rate variable in the cointegrating vector. beta mlr-mpfd7, beta mrr-mpfd7, beta 3tdep-mpfd7, beta 6tdep-mpfd7, beta 12tdep-mpfd7, beta 2ytdep-mpfd7, and beta sav-mpfd7 represent the beta coefficient of the cointegrating vector of the interaction term variable (policy interest rate and the banking competition. Each beta coefficient if estimated based on different retail interest rates equations (minimum lending rate, mlr, minimum retail rate, mrr, 3 month deposit interest rate, 3tdep, 6 month deposit interest rate, 6tdep, 12 month deposit interest rate, 12tdep, 2 year deposit interest rate, 2ytdep, and saving interest rate, sav respectively).

Figure B6.3: the recursive estimation of the short-run pass-through model

Figure B6.3.1: the effect of banking sector development (size measure) on the Interest rate pass-through model (fd1)

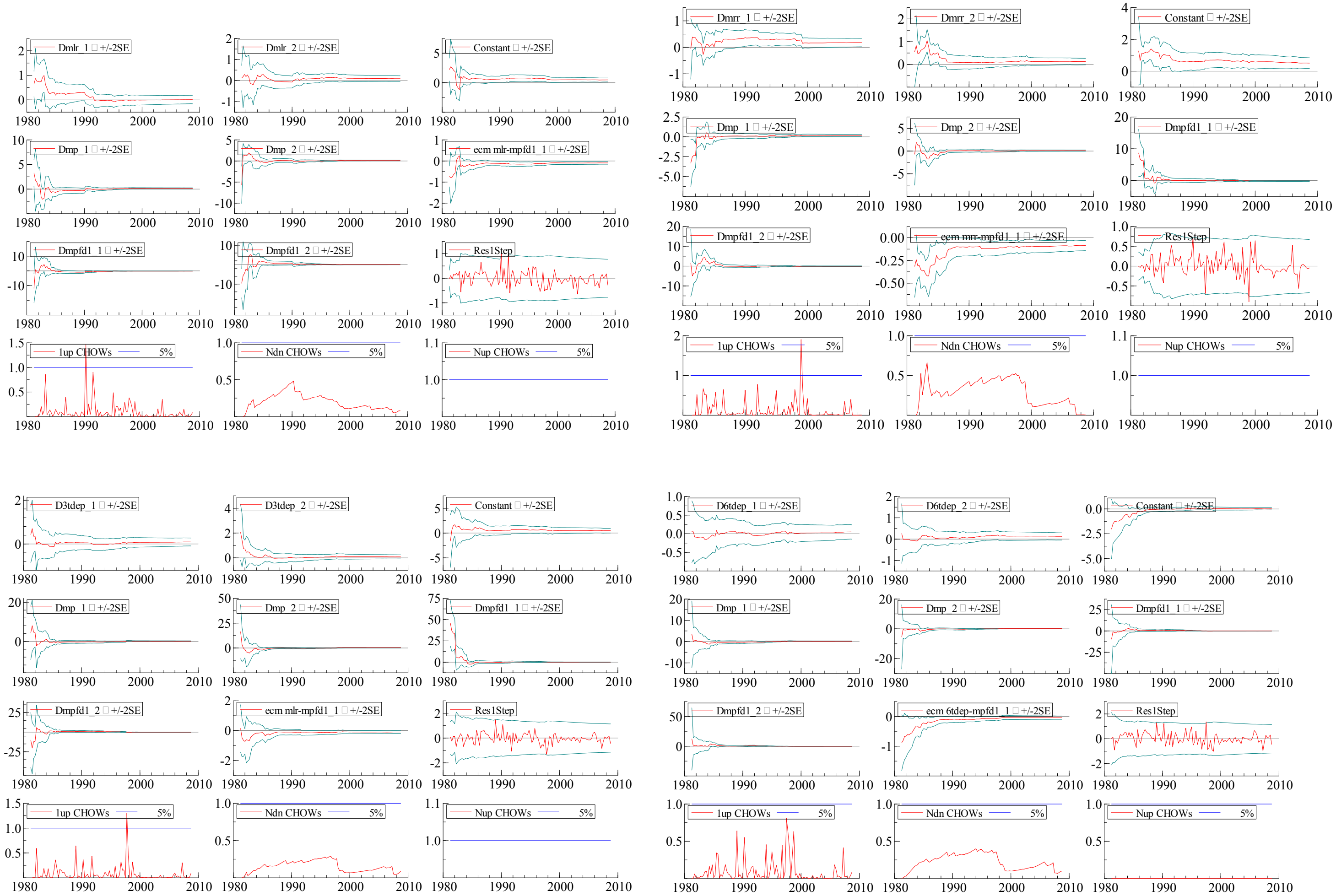
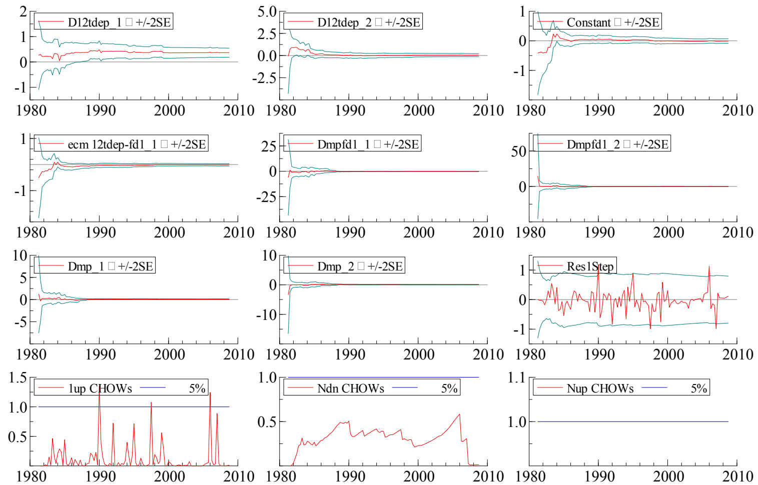
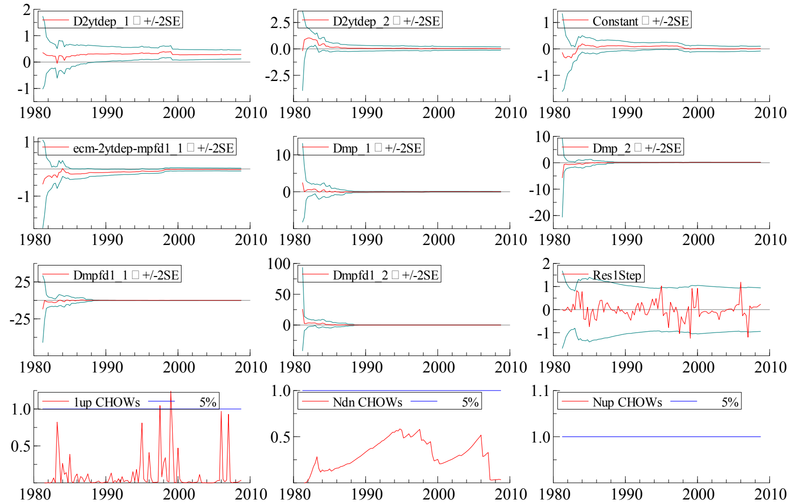


Figure B6.3.1 (cont'd): the effect of banking sector development (size measure) on the Interest rate pass-through model (fd1)





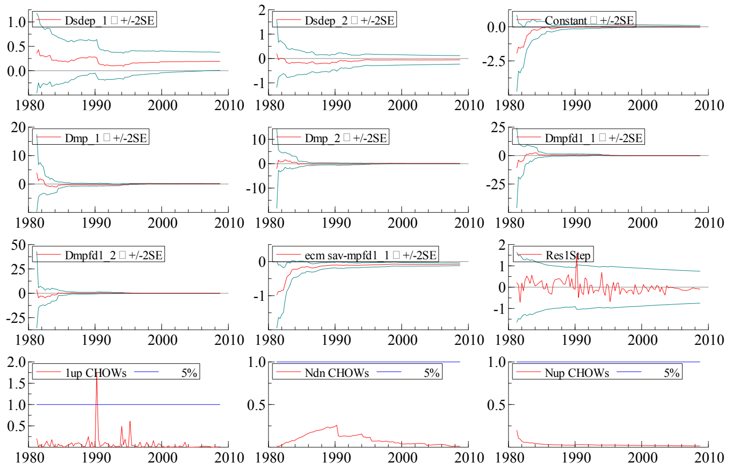


Figure B6.3.2: the effect of banking sector development (activity measure) on the Interest rate pass-through model (fd2)

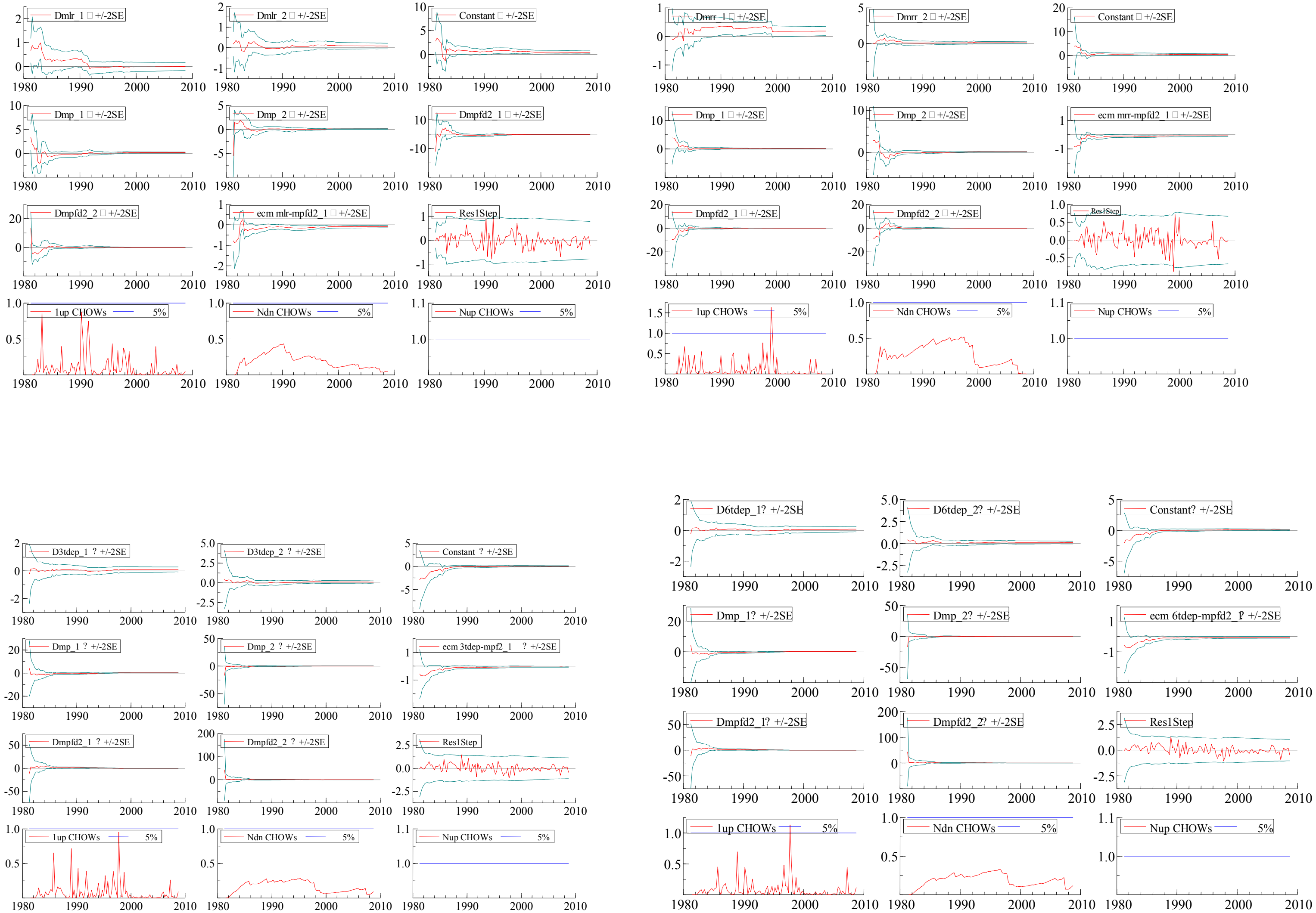
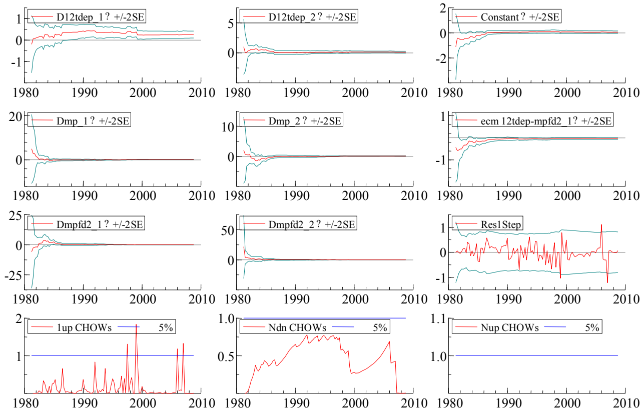
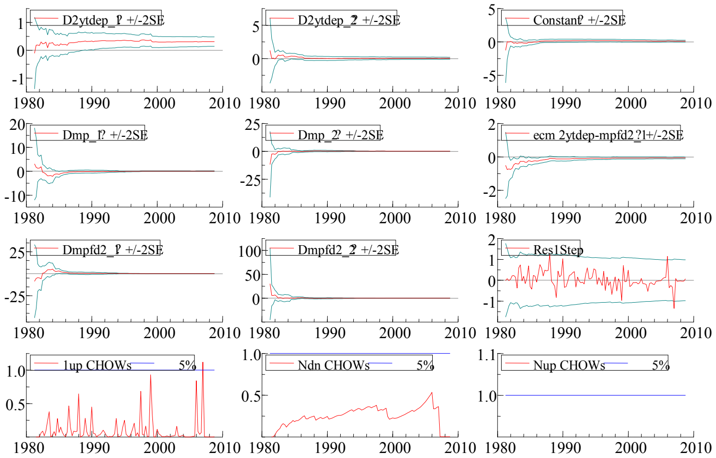


Figure B6.3.2 (cont'd): the effect of banking sector development (activity measure) on the Interest rate pass-through model (fd2)





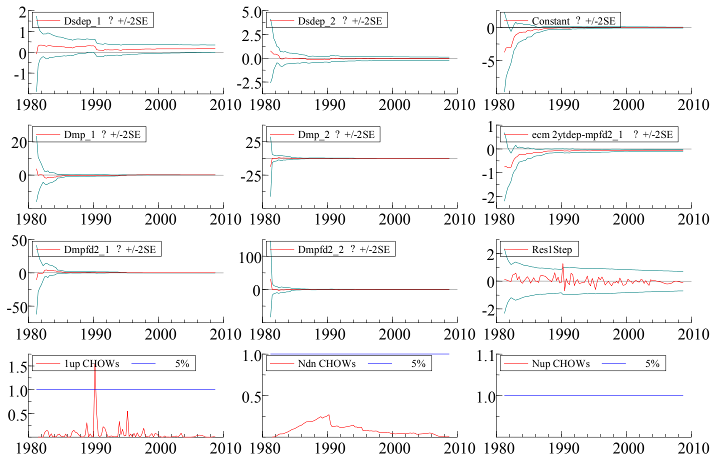


Figure B6.3.3: the effect of banking competition on the Interest rate pass-through model (fd3)

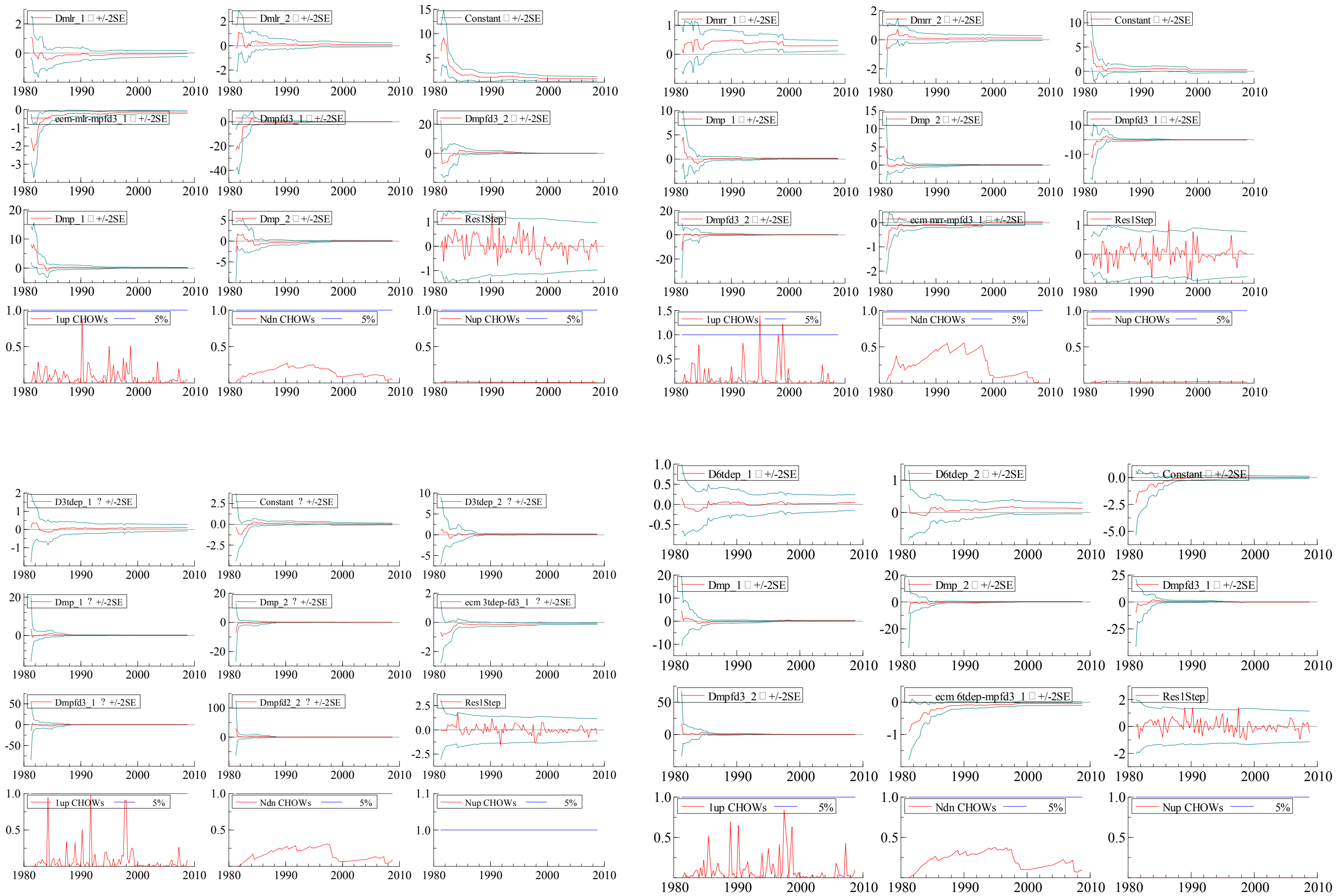
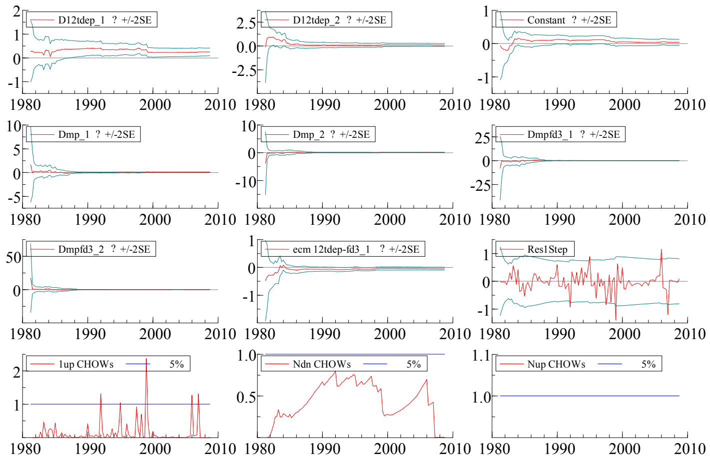
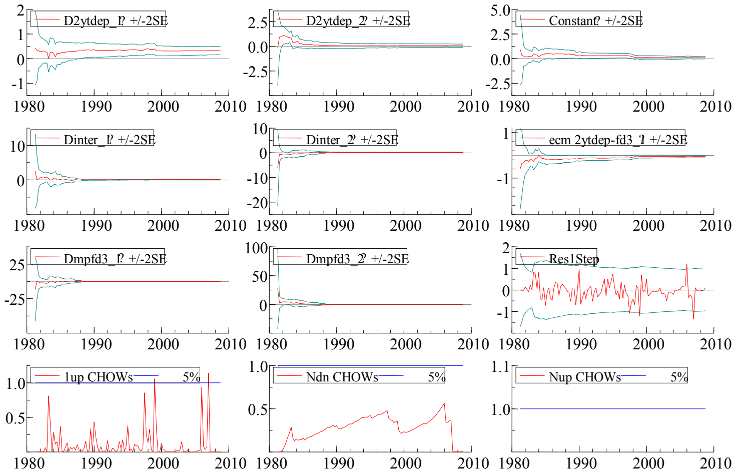


Figure B6.3.3(cont'd): the effect of banking competition on the Interest rate pass-through model (fd3)





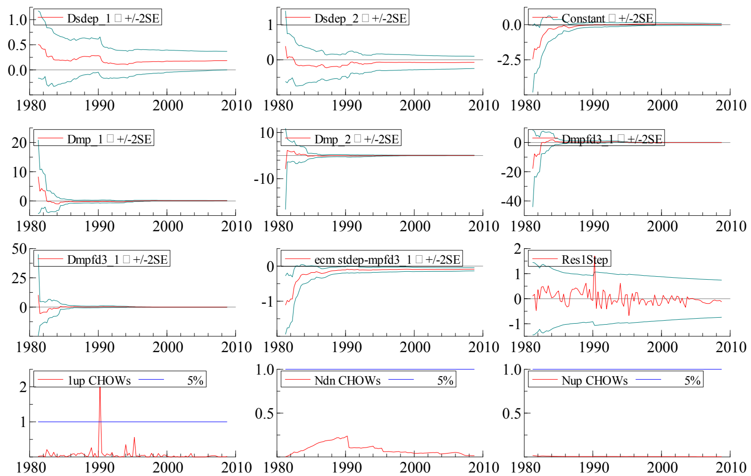


Figure B6.3.4: the effect of capital market development (size measure) on the Interest rate pass-through model (fd4)

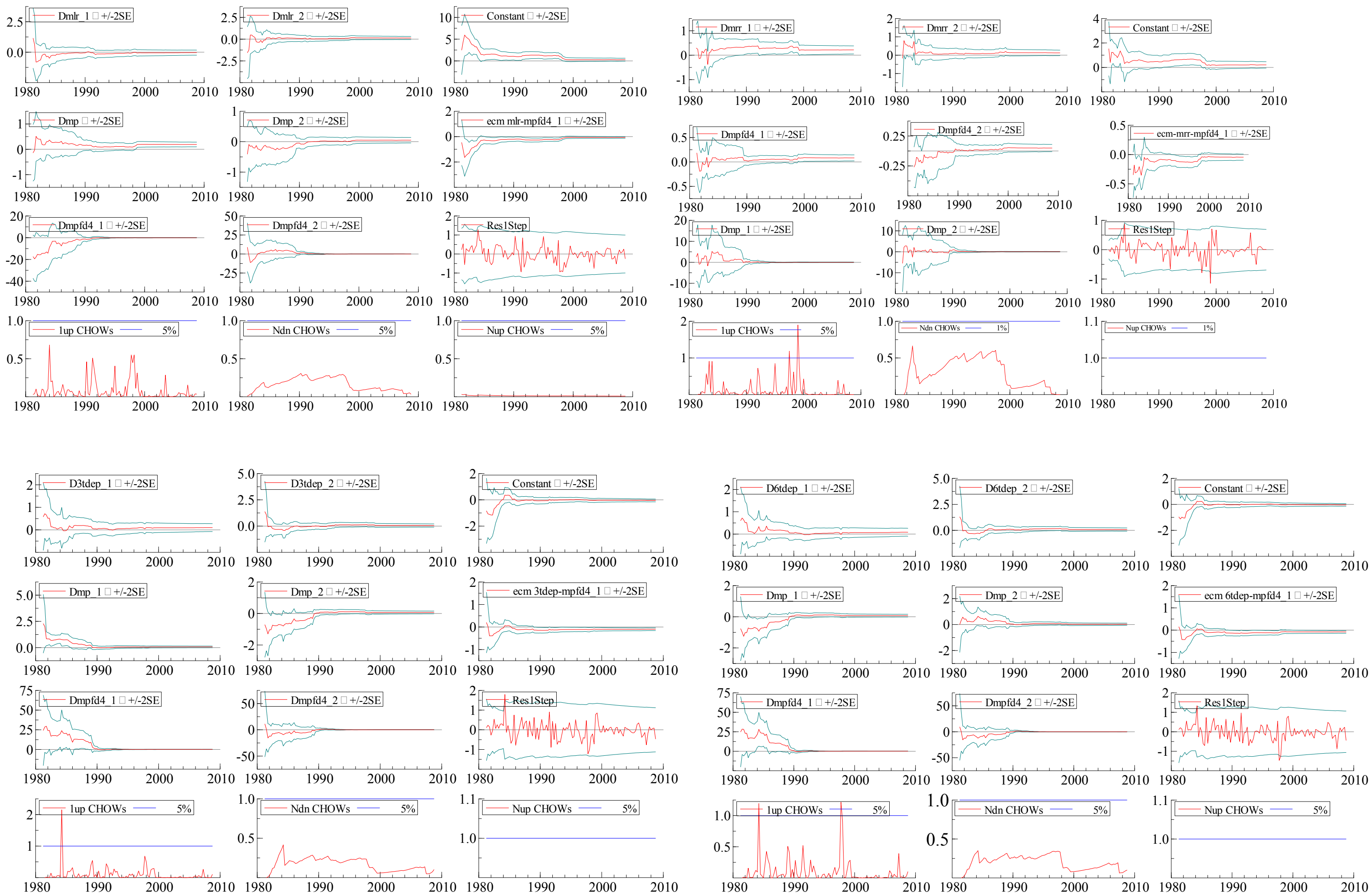


Figure B6.3.4 (cont'd): the effect of capital market development (size measure) on the Interest rate pass-through model (fd4)

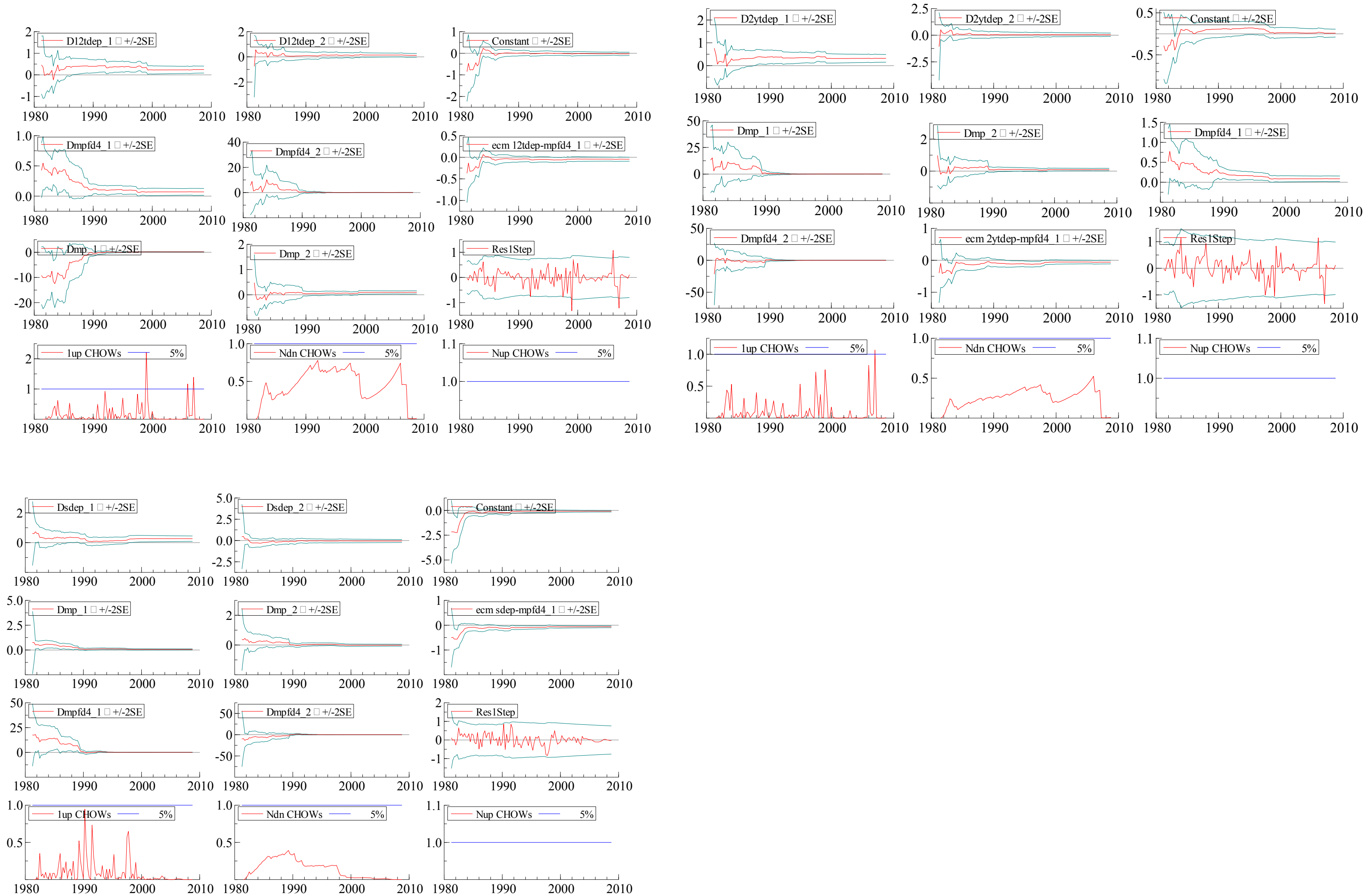


Figure B6.3.5: the effect of capital market development (activity measure) on the Interest rate pass-through model (fd5)

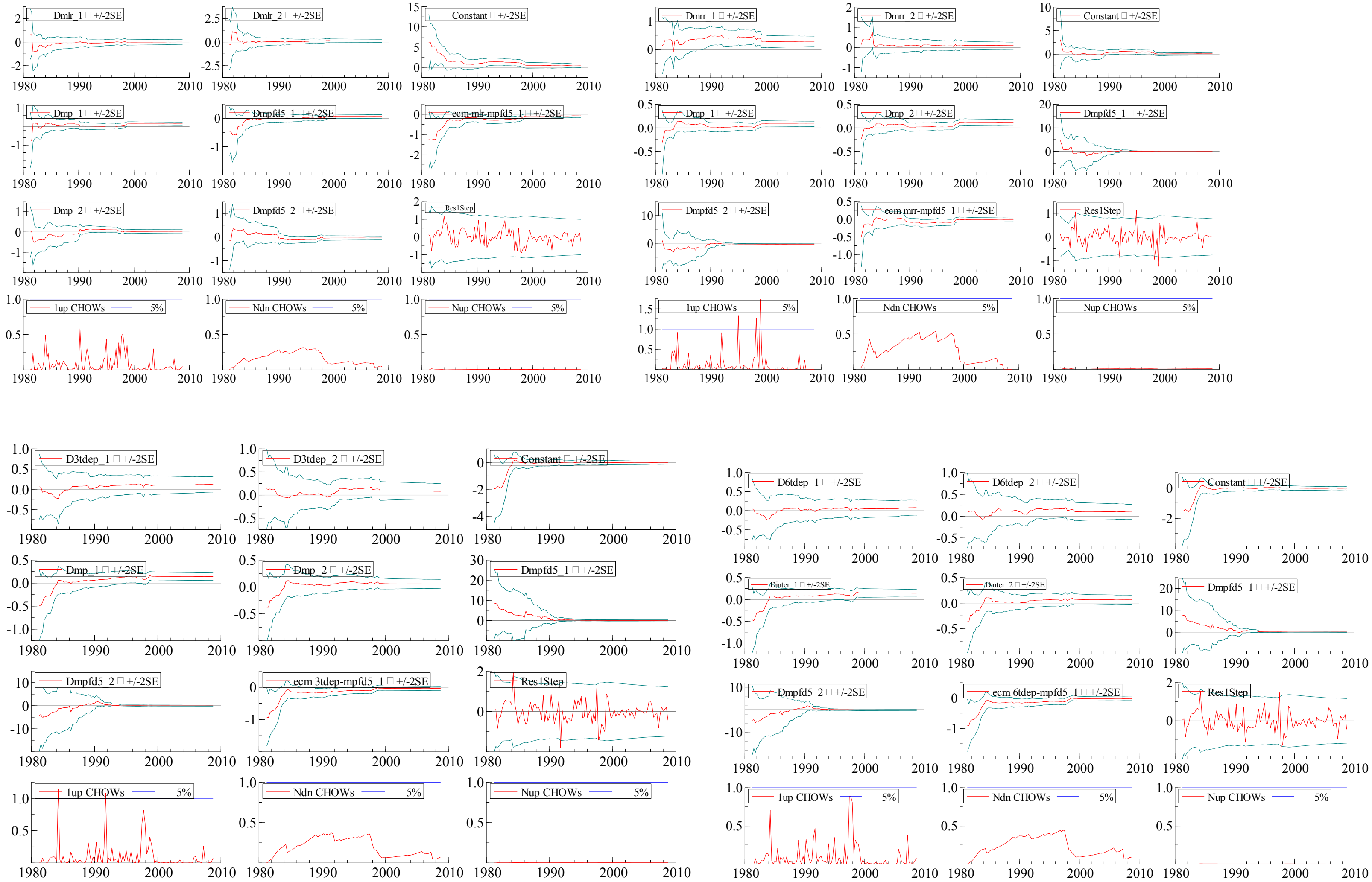
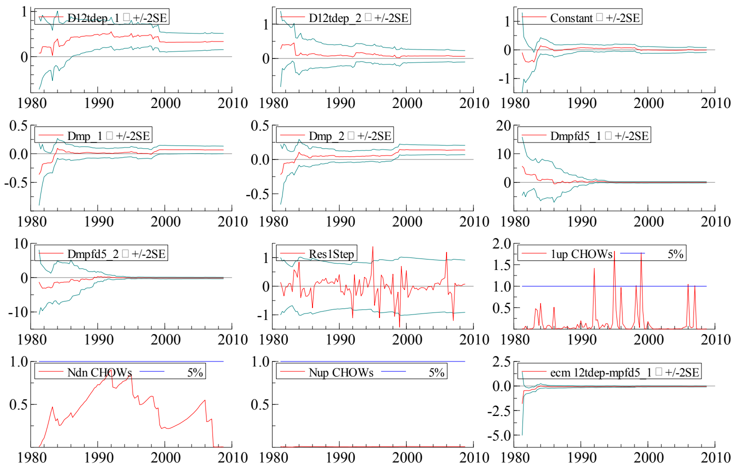
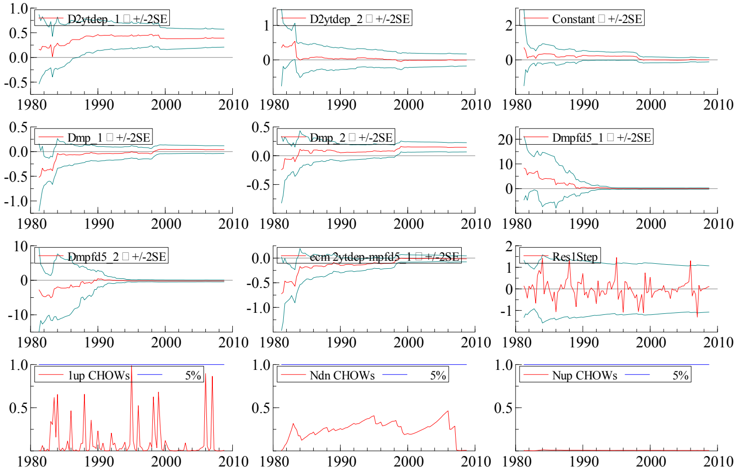


Figure B6.3.5 (cont'd): the effect of capital market development (activity measure) on the Interest rate pass-through model (fd5)





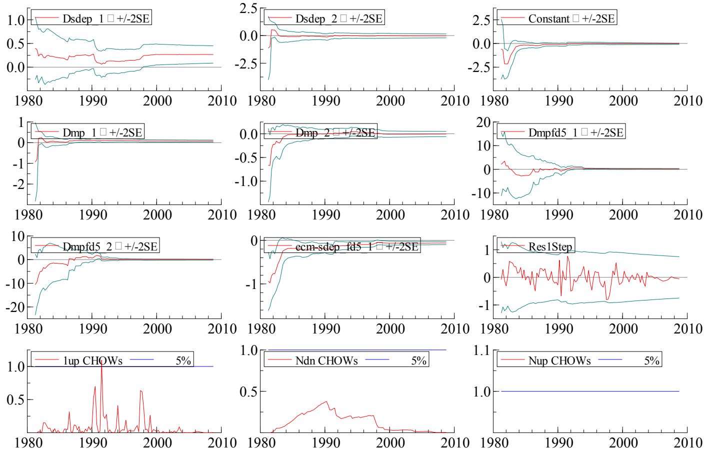


Figure B6.3.6: the effect of bond market development on the Interest rate pass-through model (fd6)

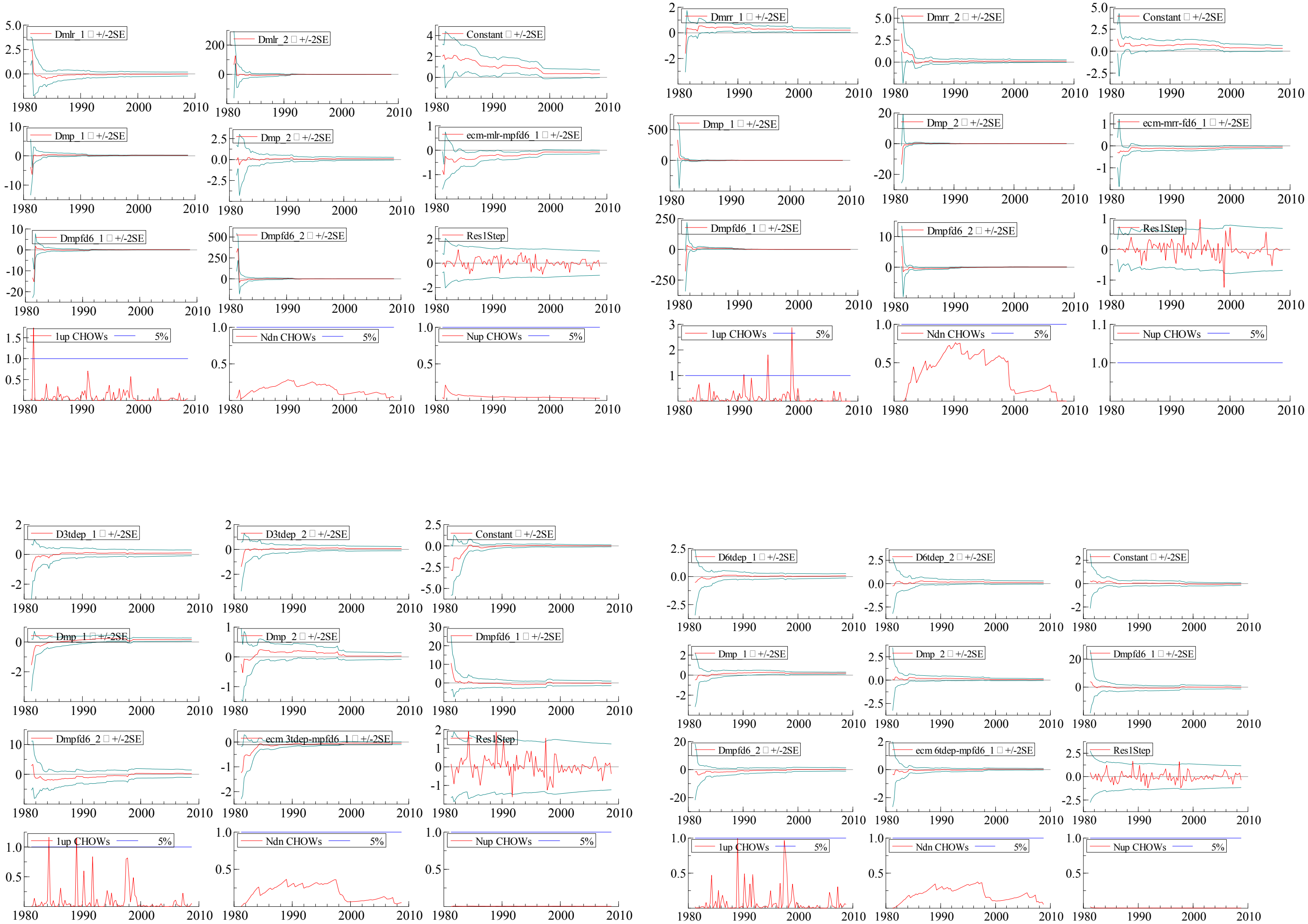


Figure B6.3.6 (cont'd): the effect of bond market development on the Interest rate pass-through model (fd6)

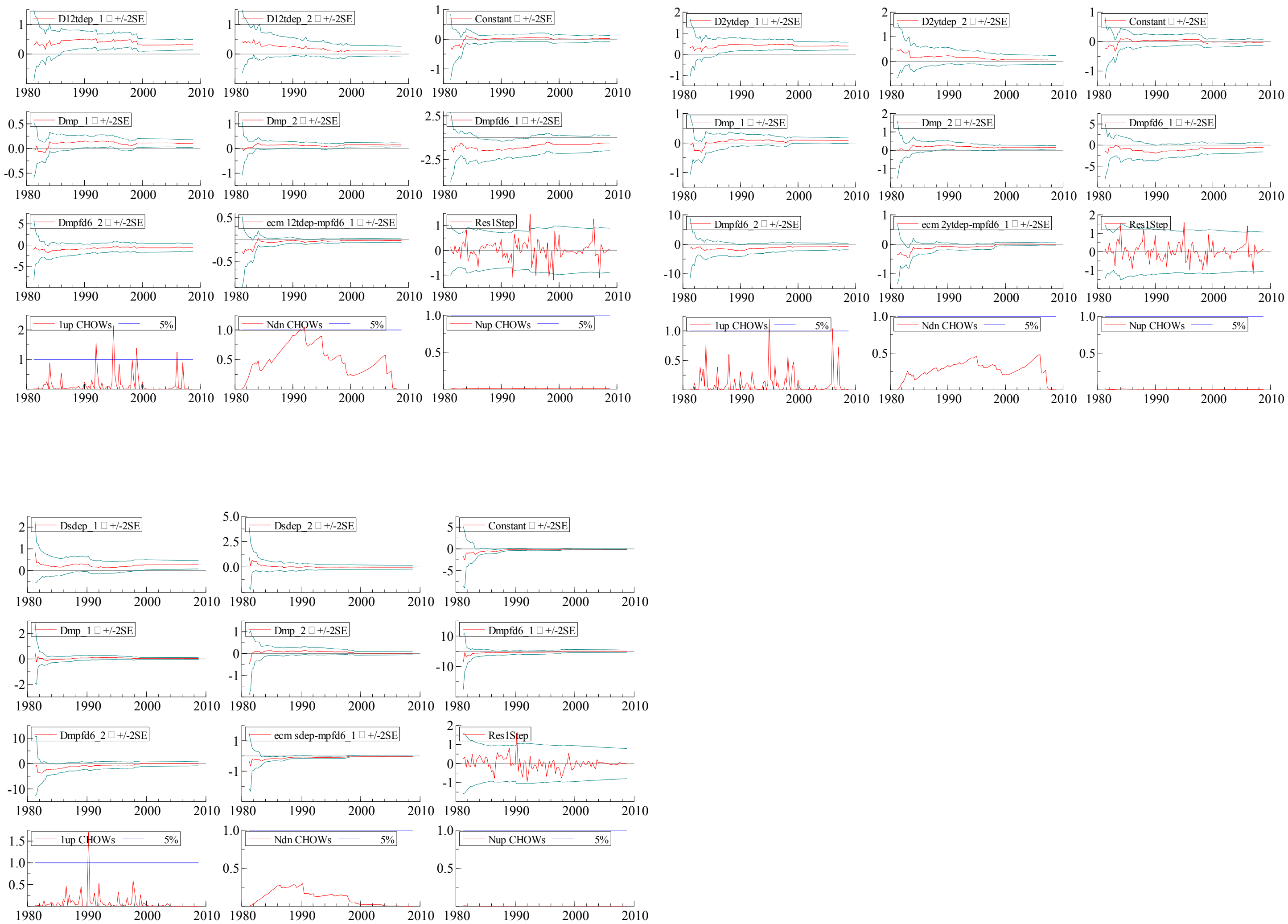


Figure B6.3.7: the effect of financial liberalization on the Interest rate pass-through model (fd7)

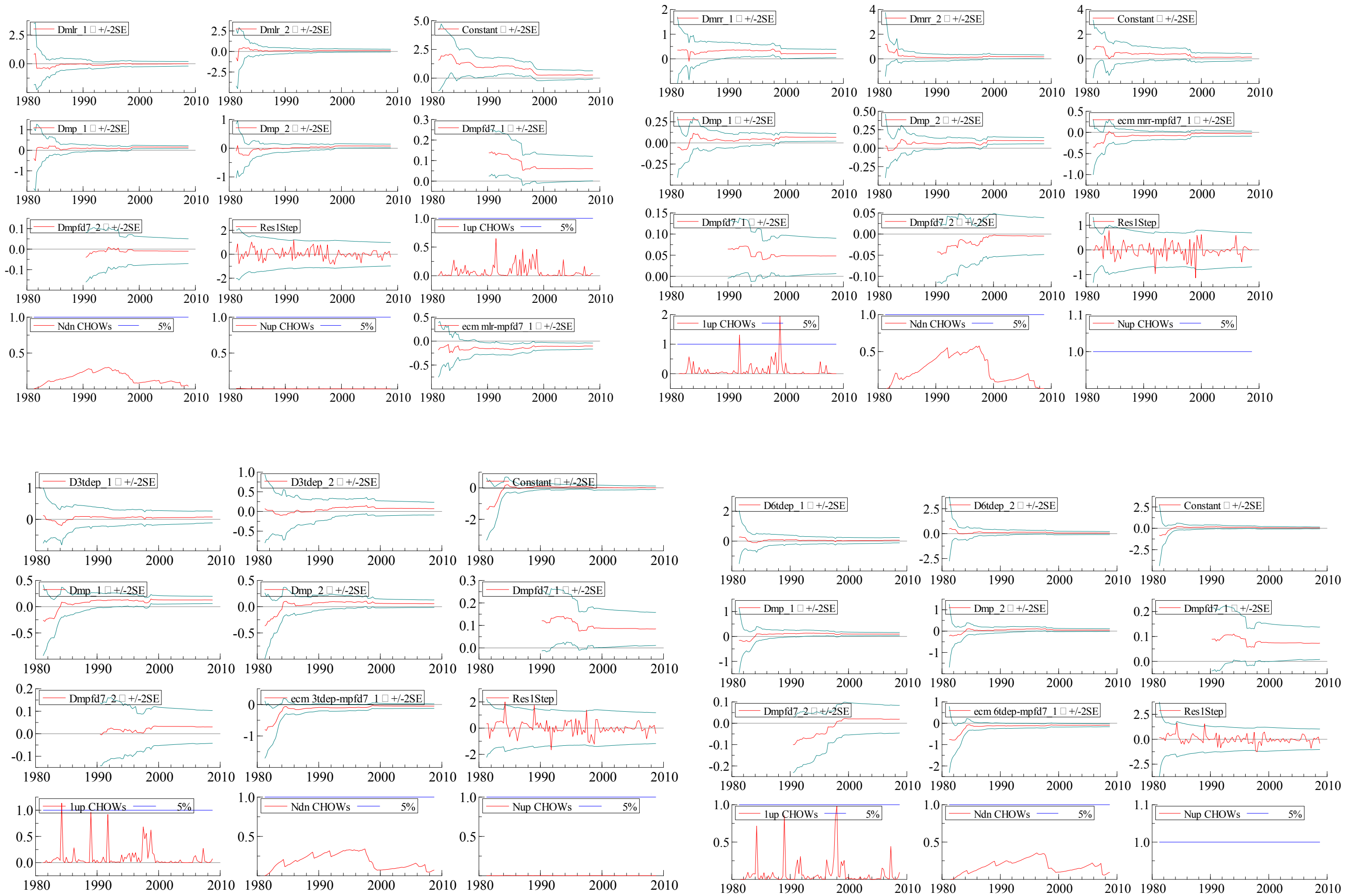


Figure B6.3.7 (cont'd): the effect of financial liberalization on the Interest rate pass-through model (fd7)