INTEREST RATE AND CREDIT CHANNELS OF

MONETARY TRANSMISSION MECHANISM:

A STUDY

OF THE MALAYSIAN EXPERIENCE

(JANUARY 1996 – JUNE 2012)

By

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ABSTRAK

Mekanisme transmisi monetari didefinasikan oleh Taylor (1995) sebagai satu proses di mana polisi di transmisikan kepada perubahan dalam pendapatan dan inflasi. Mekanisme transmisi monetari berfungsi melalui pelbagai saluran iaitu saluran kadar faedah, saluran kredit, saluran kadar pertukaran, saluran harga asset dan saluran jangkaan. Kajian lepas menyokong bahawa saluran kredit menjadi saluran transmisi monetari yang lebih penting daripada saluran kadar faedah di negara-negara seperti China, Korea dan Amerika Syarikat.

Kertas projek ini mengkaji saluran kadar faedah dan kredit sebagai mekanisme transmisi monetari di Malaysia sepanjang tempoh Januari 1996 hingga Jun 2012 dengan menggunakan kaedah Vector autoregrasi (VAR). Kajian ini di bentuk untuk memenuhi dua objektif utama. Pertama, mengkaji kepentingan kadar faedah dan jumlah pinjaman bank perdagangan sebagai saluran mekanisme transmisi monetari di Malaysia. Kedua, mengenal pasti arah kausalitas diantara pembolehubah dalam kajian ini iaitu kadar faedah, jumlah pinjaman bank perdagangan, kadar pinjaman dan indeks harga pengguna.

Keputusan menunjukkan bahawa kadar faedah, kadar pinjaman, jumlah pinjaman bank perdagangan dan indeks harga pengguna adalah berkointegrasi. Kajian ini mendapati bahawa kedua-dua saluran adalah penting dalam mekanisme transmisi monetari di Malaysia.

Kata Kunci: mekanisme transmisi monetari, saluran kadar faedah, saluran kredit dan kaedahVektorAutoregresi (VAR).

ABSTRACT

Monetary transmission mechanism as define by Taylor (1995) as a process through which monetary policy decisions are transmitted into changes in income and inflation. Monetary transmission mechanism works through various channels namely interest rate channel, credit channel, exchange rate channel, asset price channel and expectation channel. A review of the related literature supported that the credit channel to be a more significant monetary transmission channel than the interest rate channel in foreign countries like China, Korea and United States.

This project paper investigates the interest rate and credit channels in the monetary transmission mechanism in Malaysia over the period of January 1996 to June 2012 by employing a Vector autoregressive (VAR) approach. It planned to meet two major objectives. Firstly, is to examine the significance influence of overnight policy rate (OPR) and total loans by commercial banks (TL) as channels of monetary transmission mechanism in Malaysia. Secondly, to identify the direction of causality between the variables used in this study which are overnight policy rate, total loans by commercial banks, lending rate and consumer price index.

The results show that, overnight policy rate, lending rate, total loans by commercial banks and consumer price index are cointegrated. This study finds conclusive evidence that both channels are important in the monetary transmission mechanism in Malaysia.

Keywords: Monetary transmission mechanism, Interest rate channel, Credit channel and Vector Autoregressive (VAR) approach.

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Organization of the Petroleum Exporting Countries	OPEC
Bank Negara Malaysia	BNM
Development of Financial Institutions	DFI
Narrow Money	M1
Broad Money	M2 & M3
Base Lending Rate	BLR
Monetary Policy	MP
Overnight Policy Rate	OPR
Total Loans by Commercial Banks	TL
Lending Rate	LR
Consumer Price Index	CPI
Vector Autoregressive	VAR
Probability Value	P-VALUE
Observation	OBS

CHAPTER 1

INTRODUCTION

1.0 Background of the Study

The impacts of monetary policy on the economy and the channels through which they pass constitute a long standing discussion in which no clear consensus has been reached. Various explanations from specific to general, complementary and contradictory, have been given to explain the way monetary policy decisions are transmitted to prices.

Monetary policy consists of rules and regulations implemented by the central bank to achieve its objectives. In fact, price stability has been viewed as one of the major monetary policy goals in most countries like United States, Japan, Germany and including Malaysia. Apart from price stability, central bank implements monetary policy in order to achieve full employment, economic growth, stability in financial markets and stability in foreign exchange market. Stability in prices is important as it will increase the confidence in the value of money and leads to a healthy economy. In ensuring the price stability; central bank needs to have effective monetary policy. Central bank uses various channels like monetary aggregate, interest rates, credit aggregate or exchange rate in formulating its policy or as policy tools. These channels will work as transmission mechanisms in achieving the policy goals.

The purpose of this paper is to provide useful insight on the channels of monetary transmission mechanism in Malaysia. Two channels that will be studied are interest rate

channels and bank lending channels. Therefore, understanding the transmission mechanism of these channels is crucial in determining the effective channel for monetary policy in Malaysia. This is to ensure that an effective and efficient monetary policy formulation will result in a positive impact on the real sector.

The use of indirect monetary instrument like interest rate in transmitting the monetary policy into the economy is dependent on the effectiveness of the channel in achieving its monetary policy target. Meanwhile, the financial sector also plays an important role in ensuring the economic growth because it serves to provide sources of fund to businesses and individuals. That makes the bank lending channel an important monetary transmission mechanism.

Figure 1 presents the monetary policy framework of transmission mechanism. Changes in monetary policy (expansionary or contractionary) can be transmitted through various channels: interest rate channel, bank lending channel, asset price channel and exchange rate channel will subsequently affect the aggregate demand in the economy. Changes in this market will directly affect the price and output. Lastly, the changes in price and output will reflect the policy objective of the central bank.
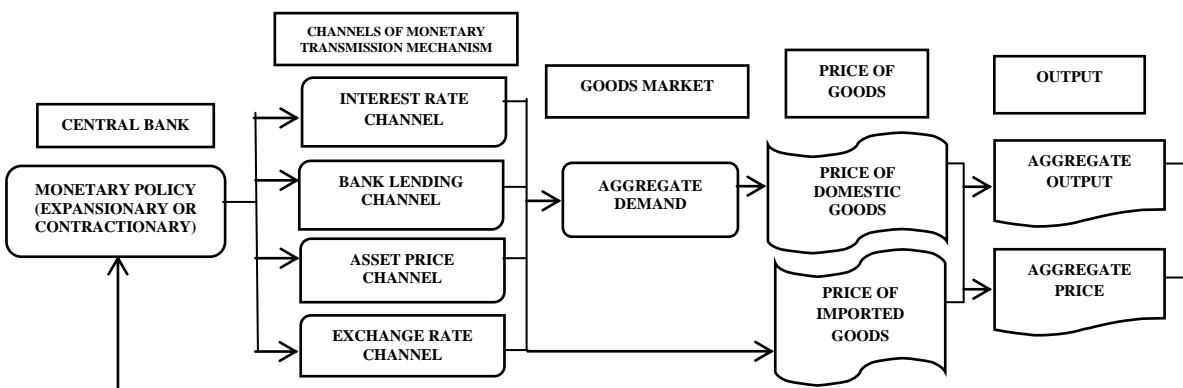
Figure 1.0
Transmission of monetary policy through various channels into the economy

The development of the financial system in Malaysia can be traced back as far as 1960. Since then the financial system in Malaysia has undergone a process of deepening in parallel with its economic growth. This section describes the financial system in Malaysia and the evolution of monetary policy in Malaysia.

1.0.1   Financial System in Malaysia

Financial system in Malaysia is divided into three major divisions: banking system, non-banking system and financial markets.

a) Banking System

According to Bank Negara Malaysia annual report (2011), Malaysian banking system comprises of monetary institutions and non-monetary institutions. Monetary institutions are those institutions whose principal liabilities are generally accepted as money and the only institutions that were allowed to operate the current account. It includes Central bank of Malaysia, commercial banks, foreign banks and offshore banks in the Labuan International Offshore Financial Centre. Non-monetary institutions constitute the institutions with main activities are near money or fee based. It includes development of financial institutions[1], insurance companies and takaful operators or Islamic issuers.

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[1]The Development Financial Institutions (DFIs) in Malaysia are specialized financial institutions set up by the government with a specific role in developing and promoting key sectors that are considered of strategic importance to the overall socio-economic development objectives of the country. These strategic sectors comprise of the agricultural, SMEs, infrastructure, maritime and export-oriented sectors, as well as capital-intensive and high-technology industries.

b) **Non-financial intermediaries**

These institutions are set up to provide financing for development in key sectors namely the agricultural, industrial and international trade and; export sectors. It can be categorized into four categories, namely (1) development of finance institutions, (2) savings institutions, (3) insurance companies and provident and pension fund and (4) other non-financial intermediaries (for instance National mortgage corporation, housing credit institutions, unit trust and special investment institutions).

c) **Financial markets**

Malaysian financial markets consist of money and foreign exchange markets, capital market (Bursa Malaysia), commodity futures market (Kuala Lumpur Commodity Exchange), financial futures and options markets. Money market in Malaysia consists of interbank market and short term funds market. Transactions of foreign exchange can be done through spot and forward market. Capital market deals with securities with maturity period more than one year which constitute public and private debt instruments.

1.0.2   Money

According to Bank Negara Malaysia, there are three definitions of money which are M1 (narrow money), M2 and M3 (broad money). M1 refers to the notes and coins and current account of commercial and Islamic banks.

M2 which is often used in policymaking is defined as M1 plus the following narrow quasi money:

a) Savings deposit of the other financial institutions and public agencies with the commercial banks and Islamic banks,

b) Fixed deposit of the other financial institutions and public agencies with the commercial banks and Islamic banks,

c) Negotiable certificate of deposit, and

d) Foreign currency deposit held by resident and non-resident in commercial and Islamic banks.

Broad money, M3 refers to the M2 plus deposits in other banking institutions for example development of financial institutions, provident and pension fund, insurance companies, takaful operators, saving institutions and unit and property trusts.

The three main factors that influence the level of money supply in Malaysia are the lending activities of financial institutions to other non-financial private sector, the position of the country's balance of payment and the government's financial operations.

i. Lending activities of financial institutions to other non-financial private sector:

Financial institutions are important institutions that help to supply funds from surplus unit to the deficit unit. Surplus units shall save the extra money that they have with the financial institutions such as banks. Banks will then transfer the money from the surplus units to the deficit units who needed the money for consumption, for financing of their working capital, and for investment and expansion purposes. Deficit units have to pay back the money that they borrowed from the banks and failing to do so will affect the

operations of financial institutions in that the financial institutions will not able to supply enough money in return to those who needed the funds.

ii.   Country's balance of payment

One of the ways to increase the money supply in the country is through balance of payment. When the foreign exchange receipt of export goods are more than payment for imported goods, then the country is said to have excess supply of money. When there are extra inflows of money into the country, this will increase the amount of deposit receive by the banking system, as a result it will increase the money supply in the economy.

iii.   Government's financial operation

Budget deficit faced by the government will affect the money supply in the country. During budget deficit period, Government will borrow from private sector to finance their operations. Increasing amount of government's borrowing from the private sector will lead to the increase in interest rates due to the crowding out effect. As a result a reduction in the lending activities in the financial institutions may make businesses and individuals face difficult time on getting loans during this period.The government in an attempt to increase its revenue collection needs to increase the tax rate on individuals and businesses directly or indirectly. This will have an impact of reducing the purchasing power individuals and businesses.

Understanding the factors affecting the money supply and its effect to the economy are crucial to the economic development. Researchers, study the macroeconomic model that represents the relationship between the money supply and other macroeconomic variables. Studying relationship between money supply and other

macroeconomic variables will provide useful insights to the policy makers in formulating effective and efficient monetary policy.

1.0.3 PERIOD OF ECONOMIC CRISIS

Cheng and Sayed (2001) stated that, Malaysia had experienced 4 types of crises since its independence in the year 1957. The crises are shown in the table 1.1 below:

Table 1.1
Type of crises in Malaysia

YEAR	TYPE OF CRISES
1973 – 1974	FIRST OIL CRISIS
1980 – 1981	SECOND COMMODITY / OIL CRISIS
1985 – 1986	ELECTRONIC / THIRD COMMODITY CRISIS
1997 – 1998	ASIAN FINANCIAL AND CURRENCY CRISIS

In brief, Malaysia experienced an economic downturn when the world was affected with first oil crisis in October 1973. At that time, the oil price increased due to high price stated by the organization of petroleum exporting countries (OPEC). High oil prices caused economic slowdown and recession in the industrialized countries that in turn had led to a reduction in Malaysian's export and economic sluggish.

Second oil crisis in 1980 also affected Malaysian economy severely. The Iran revolution also pushed the price of oil to new record high. Furthermore, increased in budget deficit of the government and domestic and external debt as well as the sudden decreased in commodity prices hence caused the difficulties in carrying out the fiscal and monetary policies and short run financial imbalances in the country. As a result this had dampened the Malaysian economy.

Prior to the year 1985, Malaysian's growth rate was negative 1.1 percent. The main reason that lead to negative economic growth was the declining prices of electronic goods and commodities like petroleum, palm oil and tin. Reduction in demand for these products had led to the decline in their prices. At the same time the government had aggresively encouraged Malaysian manufacturers to produce electronics and commoditites products. Thus, this gave the bad effect to the growth of the country's economy.

Financial crisis in the year 1997 was the worst crisis that ever faced by Malaysia since it's independence. This crisis began when there was a sudden withdrawals of short term capital from the country in accordance with the floating of Thai's Bhat in July 1997. This withdrawal had caused the uncertainty in the equity and foreign exchange market. Investors started to take out short term capital in large amount which resulted in currency depreciation and increase in interest rates. Asian economic crisis had caused decreased in the share prices and the other asset prices significantly, especially the prices of properties since there was high speculative demand for the property sector before the period of crisis.

Recently, in the year 2007, Malaysia faced another crisis which is 'Global Economic and Financial Crisis' due to increase in bank lending and corporate borrowings.

1.1   MONETARY POLICY IN MALAYSIA–THE EVOLUTION

Financial liberalization and deregulation in Malaysia have brought the development of the financial system in Malaysia to new height and created new

opportunities in the financial market. A well functional financial system requires effective policy however the efficiency of monetary policy direction is still a debatable issue. Thus, this section will discuss an evolution of monetary policy in Malaysia.

Malaysian monetary policy has undergone few changes in its operations over the last decade. These changes were due to the global developments. The evolution of monetary policy in Malaysia is broadly categorized into the following stages: monetary targeting, interest rate targeting, interest rate targeting with fixed exchange rate and interest rate targeting with floating exchange rate. Figure 1.1 below show the stages of how monetary policy in Malaysia operates in the economy.

MONETARY TARGETING (1973 – 1996)	INTEREST RATE TARGETING (1996 – 1998)	INTEREST RATE TARGETING WITH FIXED EXCHANGE RATE (1998 – 2005)	INTEREST RATE WITH FLOATING EXCHANGE RATE (2005 –PRESENT)
• M1 up to 1970's • M2 up to early 1980's • M3 up to early 1990's • Managed float from 1975 to 1998	• Mid 1990s to Sept 1998 • Base lending rate (BLR) framework	• Exchange rate pegged to the US$ at RM 3.80/US$ • BLR framework (BLR linked to Intervention Rate) • Capital controls	• New interest rate framework with the OPR to signal MP stance • Managed float regime • Gradual liberalization of capital controls

Figure 1.1
The evolution of monetary policy transmission mechanism of monetary policy in Malaysia

i. **Monetary Targeting (1973 – 1996)**

During the pre-liberalization period, monetary targeting was used as transmission mechanism in Malaysia. Pre-liberalization period started from the year Malaysia gained

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its independence in 1957 until the end of 1978 when domestic interest rates were regulated. In the year 1970s, M1 has been used as monetary policy targeting in Malaysia. Financial liberalization and innovation had made M1 became weak and it had been replaced by M2 in the early 1980s and subsequently to M3 in the early 1990s. High capital inflows during the mid-1990s due to the increase in foreign private investment and import had weakened the monetary targeting. As a result, Bank Negara Malaysia had shifted from monetary targeting to interest rate targeting. Period of large capital inflows can be seen from the figure 1.2 below.
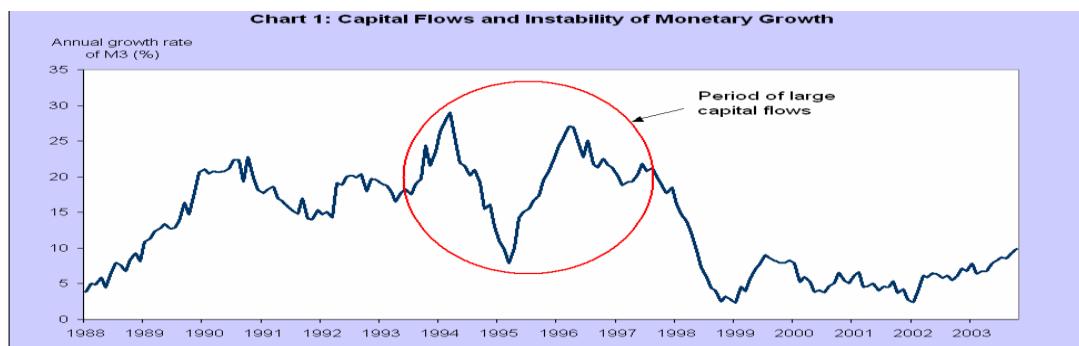
Source: Quarterly Economic Bulletin, Bank Negara Malaysia, various issues

Figure 1.2
Capital flows and instability of monetary growth

ii.   Interest Rate Targeting (1996 – 1998)

In the mid-1990's, the monetary authority decided to change the monetary policy tool from money supply to interest rates. The changes were due to four reasons. First, interest rates liberalization in the year 1978 which had led to more market oriented toward interest rates determination. Second, financial liberalization and deregulation of lending and deposit rate in the year 1978 had improved the role of the interest rate in the monetary transmission mechanism. Third, there was a notable shift in the financing

pattern of the economy since the mid-1980s following the structural changes in the economy from an interest-inelastic market (government securities market) to a more interest sensitive market (bank credit and capital market). Fourth, as a matter of policy, BNM has maintained positive real rates of return on deposits. In the year 1983, the monetary authority had introduced the base lending rate (BLR) which all banks needed to follow for lending activities. On February 1991, banking institutions were able to decide its own lending rate due to the deregulation of BLR. Objective of the present monetary policy (2012) is to maintain the economic growth in an environment of price stability. Based on Bank Negara Malaysia announcement (2004), new interest rate framework which was the overnight policy rate, lending and deposit rate had been introduced to influence effective pricing by banking institutions and as a tool for monetary policy. New interest rate framework is important in ensuring the effectiveness of monetary policy and provides an environment with fair and just pricing in order to achieve macroeconomic objectives. Overnight policy rate is use by the central bank as a new monetary policy stance and as a target for day to day liquidity operations. Figure 1.3 below shows how overnight policy rate affects the economy.
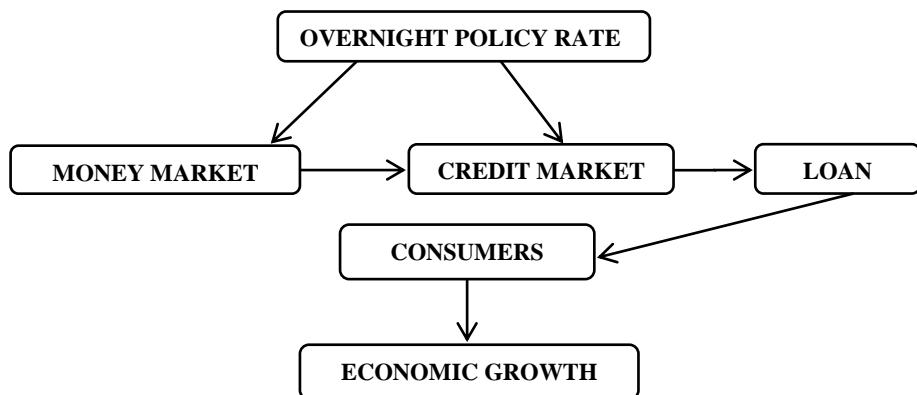
Figure 1.3
Effect of the overnight policy rate on the economy

iii.   Interest Rate Targeting With Fixed Exchange Rate (1998 – 2005)

Asian financial crisis in 1997 had reduced the ability of central bank of Malaysia to influence the domestic interest rates due to excessive volatility of short term capital flows and value of ringgit. In 1998, in order to attract ringgit funds for speculation on the ringgit thus Bank Negara Malaysia had to let interest rates run high and they cannot use interest rates as the instrument to control the money supply on the economy. In September 1998, the introduction of selective exchange control in which the ringgit exchange rate was fixed at the prevailing market rate had contributed to monetary autonomy to Bank Negara Malaysia in effecting the domestic rate in assisting the country's economic recovery.

iv.   Interest Rate Targeting With Floating Exchange Rate (2005 – present)

Bank Negara Malaysia introduced the floating exchange rate in July 2005. As a result of managed floating system, ringgit was pegged at RM 3.80 to 1 US Dollar. Although Central Bank of Malaysia allowed ringgit exchange rate operates in a managed float but they will observe the exchange rate to ensure that the rate will remain close to its fair value. Figure 1.4 below presents the movement of exchange rates against the Ringgit.
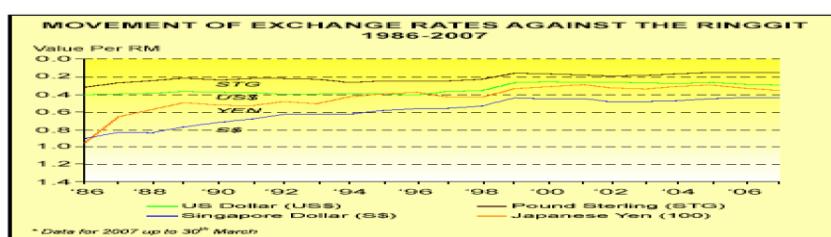
Source: Department of Statistic of Malaysia

Figure 1.4
Movement of exchange rates against Ringgit

1.1.1 Monetary Policy and Monetary Transmission Mechanism: overview

Tucker (2005) defines monetary policy as an action taken by the government to change the money supply. It will affect the availability of money, and cost of money or rate of interest to attain a set of objectives oriented towards the growth and stability of the economy. Tobin (2008) however has the view that monetary policies are demand-side macroeconomic policies. According to the author, monetary policies work by stimulating or discouraging spending on goods and services. Economy-wide recessions and booms reflect fluctuations in aggregate demand rather than in the economy's productive capacity.

Taylor (1995) stated that monetary transmission mechanism is the process through which monetary policy are transmit to changes in real gross domestic product and inflation. On the other hand, monetary transmission mechanism according to Ireland (2006), explain how changes in government policy on the short term nominal interest rate and nominal money stock affect the output and employment.

1.1.2 Importance of Monetary Policy and Monetary Transmission Mechanism

Monetary policy consists of actions, rules and guidelines used by the central bank in accomplishing its objectives. The main objective of monetary policy for most of the countries is price stability. Besides that, full employment, domestic financial stability and balance of payment are also the objectives of most central bank. Price stability is important for most countries because it will ensure the price level for all consumer goods will remain unchanged over time. Increasing in general price of goods and services will lead to inflation. Inflation will make household spend less for goods and services and

business will get less income thus this will affect the economic growth of a country. Implementation of policy changes by central bank are done by using various channels like money, interest rate, credit or bank lending, exchange rate, balance sheet, asset price and expectation (Mishkin, 2007). These channels will work through various transmission mechanisms in achieving monetary policy objectives. According to Bernanke and Gertler (1995), monetary policy works through several channels in which changes in money supply affects output. Furthermore, monetary transmission mechanism has become as a 'blackbox' because there are not only one, but many channels through which monetary policy operates. However, there are few important channels which are the interest rate channel, credit channel, exchange rate channel, asset price channel and expectation channel. Thus, it is crucial to understand how the monetary policy is transmitting into the economy through those channels.

As suggested by Mishkin (2007), transmission mechanism of monetary policy through interest rate channel can be explained by basic Keynesian ISLM model. The model can be explained by using the following schematic diagrams: (See figure 1.5, 1.6 and 1.7)

$$M\!\uparrow \Longrightarrow r\!\downarrow \Longrightarrow I\!\uparrow \Longrightarrow Y\!\uparrow$$
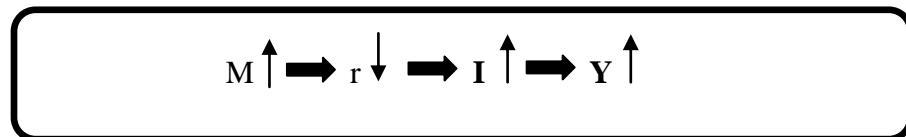
Figure 1.5
Interest Rate Channel of Monetary Transmission Mechanism

The diagram states that during expansionary monetary policy (M), real interest rate will fall (r) which will lower the cost of borrowing, thereby leading to an increase in

investment (I). Further this lead to an increase in aggregate demand and hence, an increase in output (Y).

The second linkage is the bank lending channel which focuses on the possible effect of monetary policy actions on the supply of loans by the banking system. The monetary policy effects can be summarized as follows:
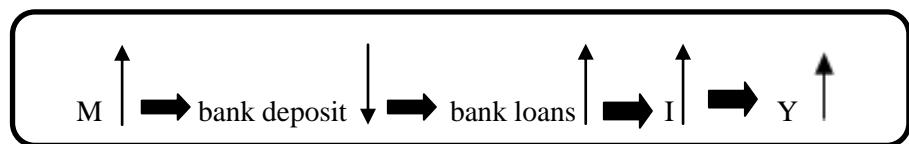
Figure 1.6
Bank Lending Channel of Monetary Transmission Mechanism

Expansionary monetary policy (M) will lead to an increase in bank reserve and reduction in bank deposit, total bank loans will raise due to cheaper cost of borrowing. This in turn will increase the investment spending (I) and rise in output.

Activities of import and export have becoming one of the important economic sources for the country. Thus more attention has been paid to monetary policy transmission operate through exchange rate. This channel also involve interest rate (r) effects because when domestic interest rate fall, domestic exchange rate (E) will fall thus this will make domestic currency become less attractive compare to foreign currency. As a result price of domestic goods and services will become cheaper and this will attract foreign country to buy more of the domestic goods, thus domestic net export (NX) and aggregate output (Y) will increase.

$$M \uparrow \Longrightarrow r \downarrow \Longrightarrow E \downarrow \Longrightarrow NX \uparrow \Longrightarrow Y \uparrow$$
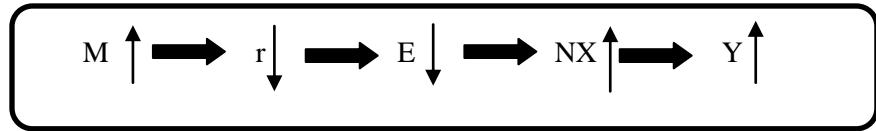
Figure 1.7
Exchange Rate Channel of Monetary Transmission Mechanism

Credit channel has found to be an important channel compared to interest rate channel for many development countries like China, United State, Turkey and Korea due to important role of bank in influencing the economy through the supply of loan (Azlan and Aisyah, 2005; Salina and Shabri, 2009; Gambacorta and Ibanez, 2011; Liu and Minford, 2012). Several studies based on the Malaysian data have found credit to be an important channel of monetary transmission mechanism. However, a study by Tai et. al (2012) has detected that interest rate is an influential channel of monetary transmission mechanism in Malaysia. The interest of the present study is on two channels of monetary transmission mechanism: interest rate channel as well as credit channel. According to Mishkin (2007), interest rates are important due to several reasons. For personal level, high interest rate could deter consumer from buying house or car but higher interest rate would encourage people to save. Furthermore interest rate does not only affect the household but it also give impact to the corporation. When interest rate is high, corporation might postpone their business expansion which would reduce their productions. In addition, the author also focuses on the important of the credit channel. Credit channel is very important because first credit channels do affect firms' employment and spending decisions. Second, there is evidence that small firms (which are more likely to be credit-constrained) are hurt more by tight monetary policy than large firms, which are unlikely to be credit-constrained.

1.2   Problem Statement

Our review of the related literature as can be found in chapter two suggest the following interesting findings:

a) Interest rate is not an important channel of monetary transmission mechanism in developing countries like Turkey, Korea, China and Ukraine due to important role of bank in influencing the economy through the supply of loan.

b) However, a study by Tai et. al (2012) has detected that interest rate is an influential channel of monetary transmission mechanism in Malaysia.

c) In Malaysia, however, in recent years interest rate appears to be an important tool used by the central bank - Bank Negara Malaysia in managing money supply in the country. Several studies based on the Malaysian data have found credit to be an important channel of monetary transmission mechanism.

Given aforementioned scenario of findings in the previous studies, during the decades of 1996 and first decade of the new millennium have the interest rate and credit channel become two influential channels of the monetary transmission mechanism?

1.3   Research Question

The study aims to provide answers to the research questions below:

i.   Do interest rate and credit channels are influential channels in Malaysia?

ii.   What are the direction of causality between overnight policy rate, total loans by commercial banks, lending rate and consumer price index?

iii.   What are the direction of causality between total loans by commercial banks, overnight policy rate, lending rate and consumer price index?

1.4   Objectives of the study

Given the problem statement, the objectives of the study are follows:

a) To investigate the significant influence of the overnight policy rate (OPR) and total loans by commercial banks (TL) as channels of monetary transmission mechanism in Malaysia.

b) To identify the directions of causality between:

i.   Overnight Policy Rate (OPR), total loans by commercial banks, lending rate (LR) and consumer price index (CPI).

ii.   Total loans by commercial banks (TL), overnight policy rate (OPR), Lending rate (LR) and consumer price index (IPI).

1.5   Significance of the Study

The importance of monetary policy in steering economic performance stems from the fact that there is a positive relationship between money and output. A good monetary policy contributes toward maintaining price stability in order to promote sustainable economic growth. Through economic growth, employment can be generated and higher standards of living can be attained.

Monetary policy provides leverage for monetary authorities to attain certain macroeconomic objectives. It is important to note that a good monetary policy yields

good macroeconomic performance such as sustainable growth and low inflation, a bad monetary policy yields bad macroeconomic performance such as low growth and high inflation.

Monetary policy works through various channels. Some of the important monetary policy channels are credit channel, interest rate channel, exchange rate channel, asset price channel and expectation channel. The effectiveness of these channels differs across economies, depending on the efficiency of their financial systems and the degree of monetization.

The study will examine two channel of monetary transmission mechanism: interest rate and credit channel.

Findings of the study might be useful for policy makers in understanding the direction and importance of these two channels of monetary transmission mechanism. Such an understanding might provide some useful insights for policy makers into formulating more effective and efficient monetary policy in the future.

1.6   Scope of the Study

This study will be based on four variables. They are overnight policy rate (OPR), total loans by commercial banks (TL), lending rate (LR), and consumer price index (CPI). The sample period for the study is only sixteen years and six month, ranging from January 1996 to June 2012.

1.7   Limitations of the study

In the process to complete this study there are some limitations that need to be highlighted. This study will be based on four variables. They are overnight policy rate (OPR), total loans by commercial banks (TL), lending rate (LR) and consumer price index (CPI). The sample period is only sixteen years and six months, ranging from January 1996 to June 2012. They will be analyzed by using vector autoregression (VAR) methodology. Significant to any econometric procedure, VAR model has its own weaknesses. Besides, with the time constraint given in completing this project paper in depth study about the topic are not able to be conducted.

1.8   Organization of the Thesis

The present project paper is made up of five sections. Firstly, we begin in chapter 2 by reviewing the literature related to monetary transmission mechanism. Chapter 3 describes the data and empirical method used in the study and chapter 4 presents the empirical findings. Lastly, chapter 5 concludes the conducted study.

CHAPTER 2

LITERATURE REVIEW

2.0   Introduction

Chapter two describes the past studies on monetary transmission mechanism. Followed by section 2.1 which elaborated on the different channels of monetary transmission mechanism globally and section 2.2 summarizes the chapter.

2.1   Different Channels of Monetary Transmission Mechanism across Countries

According to Taylor (1995), there were four strands to the monetary transmission channels, namely, interest rate, the exchange rate, the asset price, and the credit or bank lending channel. There were differences in term of channels through which the monetary policy was transmitted into the economy. Therefore, this section emphasizes on the importance of credit and interest rate channels of monetary transmission mechanism made by the previous studies.

Importance of credit channel in different countries had been proved by the following previous studies for example; Kim (1999) conducted a study on importance of credit channel for monetary transmission mechanism in Korea. The result from the study showed that bank lending channel was an influential channel for monetary transmission mechanism in Korea.

According to Zhenshan and Zhiqiang (2000) credit channel was the main channel in which the monetary policy is transmitted in China. Accordingly the total volume of

credit reported by financial institutions could explain China's real GDP while money supply did not have any apparent impact on real GDP.

Krylova (2002) studied on the importance of the credit channels in the transmission mechanism of monetary policy in Austria. He founded and reported that the credit variables played a significant role in transmitting the impact of monetary policy shocks on output.

In addition, Robert and Kalckreuth (2003) studied on importance of the interest rates and credit channels on businesses by looking at the fixed investment in Germany. In their study they used financial statement and costs of capital data to measure the credit worthiness of the company. The study revealed a statistically significant interest rate channel with direct measure of creditworthiness and they discovered that the credit channel was important for a subset of firms.

Serju (2003) analyzed the response of the real sector in Jamaica on its monetary policy shocks. The results from a structural VAR model indicated that monetary policy innovations trigger a cumulative decline in the value added of the economy. With the exception of mining, all the goods producing sectors are affected negatively by monetary tightening. The manufacturing sector experienced the largest and quickest decline in response to an interest rate shock, while financial sector appeared vulnerable to such increases in the short term. There was little evidence that the credit channel played any significant role in the transmission of monetary policy to the real sector in Jamaica.

A study by Agosto (2003) on Chile from year 1990 to 2002 showed the importance of credit channel within the Chile economy. He employed Vector autoregression approach in the study.

Morita and Miyagawa (2004) used Japanese data to examine the monetary transmission mechanism in two different periods (1981-1990) and (1992-1999). These periods were associated with the burst of the bubble economy in 1990. They discovered that the money channel has a stronger influence to GDP in [1981-1990] compared with the credit channel. Their studies indicated that during the period from [1992-1999] which included the period "after the bubble economy", the importance of credit channel dramatically increased.

Ramlogan (2004) in his study of the monetary policy transmission mechanism in four Caribbean countries; Jamaica, Trinidad and Tobago, Barbados and Guyana, reported that the credit and exchange rate channels were more important than the money channel in transmitting impulses from the financial sector to the real sector.

In addition, Asif et.al (2005) stated that monetary tightening led first to a fall in domestic demand, primarily investment demand financed by bank lending, which translated into a gradual reduction in price pressures that eventually reduced the overall price level with a significant lag. In addition to the traditional interest rate channel, the results of the study pointed to a transmission mechanism in which banks play an important role. They had also found that an active asset price channel has been more significant compared to the exchange rate channel.

The monetary transmission mechanism in Jordan was studied by Tushar et. al (2006). Their study did not reveal any evidence of monetary policy affecting output. Output responded very little to changes in bank lending rates. Furthermore, equity prices and the exchange rate were not significant channels for transmitting monetary policy to economic activity.

Additionally, Viet (2008) used vector autoregression approach in analyzing the monetary policy transmission mechanism in Vietnam. His work proved that the credit and exchange rate channels were the influential channels in Vietnam.

Ahmad (2008) studied the Fiji and Papua New Guinea (PNG) on the strengths of different channels in transmitting the monetary pulses. Using the VAR model, results of the study showed that monetary channel was more important than credit channel in Fiji. While in Papua New Guinea the credit channel was more important according to the study.

Mello and Pisu (2009) study on the presence of bank lending channel in the monetary transmission mechanism of Brazil. Vector error correction model was used to test the relationship among the variables. The result showed that loan supply was negatively related to interbank deposit rate which supported the existence of bank lending channel in Brazil.

Hussain (2009) used vector autoregression approach showed the importance of exchange rate as an instrument for monetary policy and it can be used to influence the economy of Pakistan.

Hosein (2010) analyzed the monetary transmission mechanism in Iran by using two approaches; vector autoregression (VAR) and structural vector autoregression (SVAR). The study showed that credit channel was the best channel in transmitting the monetary policy to the economy.

The monetary policy transmission mechanism in Turkey and Argentina were studied by Cambazoglu and Gunes (2011). Economic variables such as overnight rate, bank deposit, bank loan, consumer price index and industrial production index from year

2003 to 2008 were used in the study. According to their findings, money channel was important in Turkey when overnight interest rate and unexpected credit shock affected the output and price level. In contrast, the bank credit channel was important channel for monetary policy transmission mechanism in Argentina.

Shabbir (2012) investigated the existence of balance sheet channel in Pakistan. He used firm level micro data of 160 non-financial companies listed at Karachi stock exchange from year 1999 to 2010. Evidence proved the effectiveness of balance sheet channel in Pakistan.

A number of studies conducted to examine the importance of monetary transmission mechanism channels in Malaysia for example; Noor and Aisyah (2005) investigated the link between banking activities and macroeconomic performance in Malaysia with respect to the money and credit channel. They studied on the causal influence of banks' assets and liabilities. Their study showed that the Granger causality analysis supported the importance of the credit channel within the Malaysian economy. Significant causations were traced running from changes in loans issued by banks to economic variables. Limited evidence was found for the deposits. Parallel to the working of the credit channel, a one-way causation pattern from deposits to loans was identified. Thus, the Central Bank's policies with respect to the availability of reserve deposits which were transmitted to the economy via bank lending activities was supported by the credit channel explanations.

Additionally, the results from the study by Fathin and Ghafar (2008) on the existence of bank lending channel as a monetary transmission mechanism in Malaysia proved the presence of bank lending channel.

Meanwhile, to determine the effectiveness of bank loans and deposits in the monetary transmission mechanism in Malaysia, Salina et.al (2009) conducted a study on two different periods, pre-crisis period (1989-1996) and post crisis period (1999-2006). The evidence from the study showed that both bank deposits and loans played an important role in monetary transmission mechanism which supported the money endogeneity theory of post Keynesian economist.

According to Zulkefly et. al (2010) that monetary policy shock was significantly and negatively influenced by the bank loan supply and the arguments supported the importance of the credit channel in Malaysia.

Previous studies revealed and proved the importance of interest rate channel in different countries. Many monetary economists, for example, Meltzer (1995) critiqued on the different views of monetary policy transmission mechanism between monetarists and standard models. Monetarists viewed that market interest rate were the only one of the relative prices affected by monetary impulses. Monetary impulses that alter the nominal and real stocks of money did not only change the short term interest rate and cost of borrowing but also altered the actual and anticipated prices on different types of domestic and foreign assets. Later this would affect investment and consumer spending through Tobin's q theory of investment and the wealth effect on consumption.

Igor (2003) investigated the monetary transmission mechanism in Lithuania. He found that investment demand in Lithuania was more sensitive than private consumption to the interest rate shock. In addition, the main burden of the economy's adjustment to the shock was placed on the real variables as opposed to the nominal ones and that the GDP

response was greater and the CPI response was smaller under the interest rate shock scenario as compared to the exchange rate shock case.

Moses (2005) studied on the bank-lending channel (BLC) of monetary policy in South Africa using quarterly bank-level data for the period 2000Q1-2004Q4. Utilizing dynamic panel estimation methods the study reported that bank lending channel prevailed in South Africa. The findings of the study indicated that first; there was a need to coordinate monetary policy with financial innovations and prudential banking regulations. Second, the overall effects of monetary policy pursued by the South African Reserve Bank cannot be completely characterized by interest rates only.

According to Vonnak (2006), the study on monetary transmission mechanism in Hungary during the past ten years, the monetary policy did exert measurable influence on real activity and prices. The dominance of the exchange rate channel explained why price respond faster and output responds milder than in closed developed economies like the US or the Eurozone. He expected that after adopting the euro, the absence of exchange rate will be compensated by the fact that the interest rate channel will work through foreign demand as well; therefore no significant asymmetries can be expected inside the eurozone in terms of monetary transmission.

Erdem et.al (2007) studied the monetary policy transmission mechanism in Turkey. They asserted that the interest rate and the credit channel had an increasingly visible effect on the economic activity, while prominence of the exchange rate channel tends to attenuate in the post-crisis period due to prudent fiscal policies and the start of the inflation-targeting regime under floating exchange rates.

Yiding and Shuanghong (2007) conducted Granger causality test to examine the transmission mechanism in China was represented by the conventional interest rate. The result showed that there were no causality either between investment expenditure and the market interest rates or between household consumption and the market interest rates, which suggested that the transmission of monetary policy in China was impeded.

Jose and Manuel (2008) studied on the monetary transmission mechanism in Mexico. They found two additional channels of monetary transmission in Mexico, credit and expectations channels. Firms' financing through securities has recently become more responsive to interest rate fluctuations. Nevertheless, statistical exercises suggested that the interest rate did not seem to have an expected effect on bank credit to households. Possible explanations for this result concerned both the demand for and the supply of credit.

Vizek (2008) suggested that the monetary policy in Croatia has a significant influenced on the real activity through the direct monetary transmission and exchange rate channel. The results from the statistical tests suggested that the interest rate channel was not active.

Bilan and Kryshko (2008) examined the relative importance of interest rates channel in Ukraine by using five-variable VAR model. The study found some weak traces of interest rates channel; yet had not detected persuasive evidence that the interest rates channel dominated other channels of monetary transmission.

Additionally, Daryl and Earl (2008) studied the degree of effectiveness of interest rate channel as a monetary policy transmission mechanism in Trinidad and Tobago. They

pointed out that interest rate channel was not an effective channel for monetary transmission mechanism in Trinidad and Tobago.

Yiping et.al (2009) studied on the transmission mechanism amongst 17 interest rates in the inter-banks and bourse markets in China. They argued that in the current situation, it was very difficult for the People's Bank of China to affect market interest rates through open market operations.

By employing two stage least squares method Roseline et.al (2010) revealed the ineffectiveness of interest rates channel for monetary transmission mechanism in Kenya.

The channels for monetary policy in Nigeria were studied by Saibu (2012) by using quarterly data for the period from 1986 to 2009. The findings of the study showed that interest rates channel was the most efficient channel for monetary policy transmission for the agricultural sector and the manufacturing sectors whereas exchange rate channel was an efficient channel for building, construction, mining, service, and wholesale or retail sectors.

The importance of interest rate channel in Malaysia had been studied by Hsiao (2006) and Tai et. al (2012). Hsiao (2006) investigated the relative strength of four monetary policy transmission channels (exchange rate, asset price, interest rate and credit) in Malaysia by using 12-variables of VAR model. The result showed the interest rate channel was found to be more important in influencing output and inflation but during inflation, the exchange rate channel was more relevant than the asset price channel.

Tai et.al (2012) studied the effectiveness of interest rates channel for monetary transmission from money market rate into retail banking in several Asian countries: Hong

Kong, Indonesia, Malaysia, Philippines, Singapore and Thailand. The authors asserted that the interest rate passes through into lending and deposit rate were different across the Asian economies. Interest rates transmission mechanism in lending and deposit rates was slow except for Malaysia, Hong Kong and Singapore. Interest rate pass through into lending and deposit rate were fast in Malaysia, meanwhile Hong Kong experienced high interest rate pass through into lending rate only during post-crisis period. Thus, this showed that interest rate was an effective and influential tool that can be used by government in transmitting the monetary policy into these economies.

2.2   Summary of the chapter

Table 2.1 below summarizes the empirical findings from the previous studies on the channels for monetary transmission mechanism.

Table 2.1
Summary of empirical findings from the previous studies

Author (Year)	Country/Frequency Data	Model/ Method of Estimation	Variables Used	Findings
Kim (1999)	Korea data (1987-1998)	Narrative approach and Definitive Test	M1,MCT, Industrial Production Index, Base money and Total amount of bank loans for 16 nations wide banks and 10 regional banks	The result from the study showed that bank lending channel was an influential channel for monetary transmission mechanism in Korea
Zhenshan and Zhiqiang (2000)	China data (1996-2005)	Unit root test and Granger Causality test	7 day interbank interest rates, consumer price index, real market interest rate (difference between interbank interest rate and consumer price index)	The total volume of credit reported by financial institutions could explain China's real GDP while money supply did not have any apparent impact on real GDP.

Krylova (2002)	Austria data (1983-2000)	Unit root test, Granger Causality test and Cointegration analysis	Industrial production index, consumer price index, M1, M2, Austrian National Bank interest rate and 3 month interest rate of German National Bank	The results showed that the credit variables played a significant role in transmitting the impact of monetary policy shocks on output.
Robert and Kalckreuth (2003)	Germany data (1988-1997)	Autoregressive Distributed Lag (ADL) model	Creditworthiness ratio, User cost of capital, real sales in million and cash flow/capital ratio.	The study has uncovered a statistically significant interest rate channel with direct measure of creditworthiness; they found that credit channels were important for a subset of firms.
Agosto (2003)	Chile data (1990-2002)	Vector Autoregression (VAR) Model	Total loans, consumer loans and commercial loans.	A study by Agosto on Chile from year 1990 to 2002 showed the importance of credit channel within the Chile economy
Morita and Miyagawa (2004)	Japan data (1981-1990) and (1992-1999)	Vector error correction (VEC) model	Gross domestic product, bank loans, money supply and price.	They showed that the money channel has a stronger influence to GDP in [1981-1990] compared with credit one, while in [1992-1999] which includes the period "after the bubble" the importance of credit channel dramatically increases.
Ramlogan (2004)	Trinidad and Tobago data (1970-2000), Jamaica and Barbados (1970-1999), Guyana (1972-1998)	Vector autoregression (VAR) analysis	Reserves, deposits, loans, exchange rate, prices, and annual gross domestic product.	He showed that the credit and exchange rate channels were more important than the money channel in transmitting impulses from the financial sector to the real sector.
Asif et. al (2005)	Pakistan data (1996-2004)	Vector autoregression (VAR) model	Industrial production index, consumer price index, private sector credit, 6 months treasury bill rates, Karachi stock	Monetary tightening led first to a fall in domestic demand, primarily investment demand financed by bank lending, which translated into a

			exchange index and real effective exchange rate.	gradual reduction in price pressures that eventually reduced the overall price level with a significant lag. In addition to the traditional interest rate channel, the results pointed to a transmission mechanism in which banks played an important role. They had also found an active asset price channel, while the exchange rate channel has been less significant by comparison.
Tushar et. al (2006)	Jordan data (1995-2005)	Vector autoregression (VAR) model	3 month certificate of deposit rate on real bank deposit and lending rates, output, broad money, spread between 3 month certificate of deposit in Jordan and United States, real credit, stock index, real effective exchange rate and foreign reserves.	They did not find evidence of monetary policy affecting output. Output responded very little to changes in bank lending rates. Furthermore, equity prices and the exchange rate were not significant channels for transmitting monetary policy to economic activity.
Viet (2008)	Vietnam data (1996-2005)	Vector autoregression (VAR) model	Real industrial output, consumer price index, broad money, real lending rate, domestic credit, index of REER, world oil price, rice price and federal fund rate.	Results showed that credit and exchange rate channels were the influential channels in Vietnam.
Mello and Pisu (2009)	Brazil data (1995-2008)	Vector error correction model (VECM)	Borrowing rate, lending rate, consumer price index, industrial production index, bank capital and stock of bank loans.	The result showed that loan supply was negatively related to interbank deposit rate which supported the existence of bank lending channel in Brazil.
Hussain (2009)	Pakistan data (1964-2007)	Vector autoregression (VAR) model.	M1, M2, real gross domestic product, exchange rate in US dollar, money	Vector autoregression approach showed the importance of exchange rate as an instrument for

			market interest rate, consumer price index and government expenditure.	monetary policy and it can be used to influence the economy in Pakistan.
Hosein (2010)	Iran data (1989-2009)	Vector autoregression (VAR) model and Structural autoregression (SVAR) model	Gross domestic product, industrial production index, M1, required reserve or the borrowed reserve, unofficial exchange rate, nominal credit and house price index	The study showed that credit channel is the best channel in transmitting the monetary policy to the economy
Shabbir (2012)	Pakistan data (1999-2010)	Hausman test	Shareholder's equity, surplus on revaluation of assets, bank and non-bank borrowing, short term and long term borrowing, fixed assets, inventories, cash and bank balance, net sales, cost of sales, operating profit, financial, admin and selling expenses, profit after tax, real gross domestic product, nominal gross domestic product, inflation, overnight interest rate, M2, SLR, and CRR.	Evidence proved the effectiveness of balance sheet channel in Pakistan.
Noor and Aisyah (2005)	Malaysian data (1982-1999)	Granger Causality test	Short term, long term loans and total deposit of commercial banks, demand deposit, saving deposit, fixed deposit, industrial production index, consumer price index, 3 month Kuala Lumpur interbank offer rate and Kuala Lumpur stock exchange rate	The result of the Granger causality analysis supported the importance of the credit channel within the Malaysian economy. Significant causations were traced running from changes in loans issued by banks to economic variables. Limited evidence was found for the deposits. Parallel to the working of the credit channel, a one-

			composite index.	way causation pattern from deposits to loans was identified. Thus, the Central Bank's policies with respect to the availability of reserve deposits are transmitted to the economy via bank lending activities supported the credit channel explanations.
Fathin and Ghafar (2008)	Malaysian data (1997-2004)	Unit root test, mean, median, maximum, minimum, standard deviation, skewness, Kurtosis, Jarque-Bera and probability.	Loan ratio, non-deposit ratio, Islamic banking fund ratio, profit, 3 month Islamic interbank rate, gross domestic product deflator, unemployment rate and monetary growth M3.	The study proved the presence of bank lending channel.
Salina et.al (2009)	Malaysian data (1989-2006)	Auto-regressive distributed lag (ARDL)	Overnight rate, bank loans, bank deposits, consumer price index and industrial production index.	The evidence from the study showed that both bank deposit and loans played an important role in monetary transmission mechanism which supported the money endogeneity theory of post Keynesian economist.
Zulkefly et. al (2010)	Malaysian data (1990-2008)	Dynamic panel GMM estimation	Current period of investment spending, net firm fixed assets, cash flow, sales and user cost of capital.	Monetary policy shock was significantly and negatively influenced the bank loan supply and the arguments supported the importance of credit channel in Malaysia.
Serju (2003)	Jamaica data (1990-2002)	Vector autoregression model (VAR)	Gross domestic product	With the exception of mining, all the goods producing sectors were affected negatively by monetary tightening. The manufacturing sector experienced the largest and quickest decline in response to an interest rate shock, while financial sector appears

				vulnerable to such increases in the short term. There was little evidence that the credit channel plays any significant role in the transmission of monetary policy to the real sector in Jamaica.
Igor (2003)	Lithuania data (1995-2001)	Equilibrium correction (EC) approach	Money market rate, bank loan rate, bank deposit rate, aggregate supply, capital stock, potential output and the output gap, aggregate demand, private consumption, gross fixed capital formation, exports, imports, foreign direct investment, money demand (M2), bank lending, real effective exchange rate, nominal effective exchange rate, prices, consumer price index, producer price index, import price index, private consumption deflator, public consumption deflator, investment deflator, export deflator, import deflator, wages and labor demand	He found that investment demand in Lithuania was more sensitive than private consumption to the interest rate shock. In addition, the main burden of the economy's adjustment to the shock was placed on the real variables as opposed to the nominal ones also the GDP response is greater and the CPI response was smaller under the interest rate shock scenario as compared to the exchange rate shock case.
Moses (2005)	South Africa data (2000-2004)	Dynamic panel GMM estimation	Bank loans, bank deposits, repo rate, real gross domestic product, real capital, real capital * repo rate, bank size and bank size*repo rate.	The findings of the study showed that first; there was a need to coordinate monetary policy with financial innovations and prudential banking regulations. Second, the overall effects of monetary policy pursued

				by the South African Reserve Bank cannot be completely characterized by interest rates only.
Vonnak (2006)	Hungarian data (1995-2004)	Vector autoregression model (VAR)	Industrial production index, 3 month treasury bill rate and exchange rate	The study on monetary transmission mechanism in Hungary during the past ten years, the monetary policy did exert measurable influence on real activity and prices. The dominance of the exchange rate channel explains why price responded faster and output responded milder than in closed developed economies like the US or the eurozone. He expected that after adopting the euro the absence of exchange rate will be compensated by the fact that the interest rate channel would work through foreign demand as well; therefore no significant asymmetries can be expected inside the eurozone in terms of monetary transmission.
Jose and Manuel (2008)	Mexico data (1990-2006)	Vector autoregression model (VAR)	Output gap, consumer price inflation, short term nominal interest rate, M1 and depreciation of nominal exchange rate,	They found two additional channels of monetary transmission in Mexico, credit and expectations channels. Firms' financing through securities has recently become more responsive to interest rate fluctuations. Nevertheless, statistical exercises suggested that the interest rate did not seem to have the expected effect on bank credit to households. Possible explanations for this result concerned both the demand for and the supply of credit.

Yiding and Shuanghong (2007)	Chinese data (1996-2005)	Unit root test, Granger causality test and correlative analysis	7 day Interbank interest rate, consumer price index and difference between real interest rate and market interest rate.	The result showed that there were no causality either between investment expenditure and the market interest rates or between household consumption and the market interest rates, which suggested that the transmission of monetary policy in China was impeded.
Vizek (2008)	Croatian data (1995-2006)	Unit root test, VAR Johansen cointegration test, and Granger Causality test and error correction model.	Volume of aggregate industrial production, M1, interest rate on money market and overnight credit and average HRK/EUR exchange rate at the end of the period.	The results from the statistical tests suggest that the interest rate channel was not active.
Ahmad (2008)	Fiji data (1974-2003) and Papua New Guinea data (1971-2003)	Vector autoregression model (VAR)	Reserves, bank deposit, bank loan, effective exchange rate, consumer price index, and gross domestic product.	Using the VAR model, results of the study showed that in Fiji monetary channel was more important than credit channel while in PNG credit channel was more important.
Bilan and Kryshko (2008)	Ukraine data (1997-2006)	Vector autoregression model (VAR)	Total reserves, nominal interest rate, consumer price index, real output and real investment	The study found some weak traces of interest rates channel; yet have not detected persuasive evidence that the interest rates channel dominated the other channels of monetary transmission.
Daryl and Earl (2008)	Trinidad and Tobago data (2002-2008)	Vector autoregression (VAR) model	Repo rate, 91 day treasury bill rate, interbank rate, log liquidity, prime lending rate, log business credit, log consumer credit, log retail price index and log non-oil gross domestic product	They pointed out that interest rate channel was not an effective channel for monetary transmission mechanism in Trinidad and Tobago.

Yiping et. al (2009)	China data (2003-2007)	Augmented Dickey Fuller (ADF) test and Error Correction Model (ECM)	10 inter-bank interest rates: 1-day and 7-day inter-bank repo rates, 7-day inter-bank lending Rate, 7-day, 60-day and 1-year central bank bill rates, inter-bank 1-year, 3-year treasury bonds rates, 1-year and 3-year inter-bank financial bonds rates. There are 6 bourse interest rates: 1-day and 7-day bourse repo rates, 1-year and 3-year bourse treasury bond rates 1-year and 3-year bourse corporate bonds rates.	They argued that in the current situation, it was very difficult for people's Bank of China to affect market interest rates through open market operations.
Roseline et. al (2010)	Kenya data (1996-2007)	Two stage least square method	Output gap, real interest rate, bank asset to gross domestic product, bank to DGP*real interest rate, M3*real interest rate.	She showed the ineffectiveness of interest rates channel for monetary transmission mechanism in Kenya
Cambazoglu and Gunes (2011).	Turkey and Argentina data (2003-2010)	Vector autoregression model (VAR)	Overnight rate, bank deposit, bank loans, consumer price index and industrial production index.	According to the findings money channel was important in Turkey when overnight interest rate and unexpected credit shock affected the output and price level. In contrast, the bank credit channel was important channel for monetary policy transmission mechanism in Argentina.
Saibu (2012)	Nigeria data (1986-2009)	Vector autoregression (VAR) model.	Exchange rate, interest rate, domestic credit, asset price index, consumer price index, and sectoral output.	The findings of the study showed that interest rates channel was the most efficient channel for monetary policy transmission to agriculture and manufacturing sectors

				whereas exchange rate channel was efficient channel for building or construction, mining, service, and wholesale or retail sectors
Hsiao (2006)	Malaysian data (1981-2004)	Vector autoregression model (VAR)	Commodity price index, US consumer inflation rate, real output, money supply (M1), 3 month interbank interest rate, exchange rate, stock price index, base lending rate and bank loans.	The result showed the interest rate channel was found to be more important in influencing output and inflation but during inflation, the exchange rate channel was more relevant than the asset price channel.
Tai et. al (2012)	Thailand, Singapore, Philippines, Malaysia, Korea, Indonesia and Hong Kong data (1988-1997) and (1999-2010)	Seemingly Unrelated Regression (SUR) equations.	Deposit rate, lending rate and money market rate.	The authors asserted that the interest rate passed through into lending and deposit rate were different across Asian economies. Interest rates transmission mechanism in lending and deposit rates was slow except for Malaysia, Hong Kong and Singapore. Interest rate passed through into lending and deposit rate were fast in Malaysia meanwhile Hong Kong faced high interest rate passed through into lending rate only during post-crisis period. Thus, this showed that interest rate is an effective and influential tool that can be used by government in transmitting the monetary policy into these economies.

The review on the literatures on the different channels of monetary transmission mechanism across countries is crucial in searching for the influential channels for monetary transmission mechanism in Malaysia which is the objective of this paper. Study

on the importance of bank lending channels in Malaysia had been done by using different macroeconomic variables and econometric methods by (Noor and Aisyah, 2001; Noor and Azlan, 2005; Salina, 2006; Fathin and Ghafar, 2008; Salina and Shabri, 2009; and Zulkefly et. al, 2010). In general, the study revealed that the bank lending channel had become an influential channel in transmitting the monetary policy in Malaysia. Bank lending channel is expected to become crucial channel for monetary policy transmission mechanism as a result of the banking rolein influencing the economic growth in Malaysia. They are the main institutions that provide the source of funds to the deficit units which comprise of individuals and businesses. Meanwhile, the importance of interest rate channel as a mechanism in transmitting the monetary policy into the Malaysian economy had been studied by (Tai et. al, 2012). The study showed that interest rate channel is important channel in influencing inflation and output in the country. Interest rate channel is also expected to become an important channel for transmitting the monetary policy into the economy as it is one of the important tool used by Bank Negara Malaysia in controlling the money supply in the economy. This study attempts to answer the following question: First, can interest rates and bank lending channels become influential channels for monetary transmission mechanism in Malaysia? Second, how these two channels work in affecting the money supply into the economy?

CHAPTER 3

METHODOLOGY

3.0 Introduction

Chapter three presents the methodology used in the study. Section 3.1 provides description on the data and section 3.2 explains the theoretical framework and as well as variables in the study.

3.1 Data

Data in this study consisted of overnight policy rate (OPR), total loans issued by commercial banks (TL), lending rate (LR) and consumer price index (CPI). Other data are in percentage only data for total loans issued by commercial banks transformed into natural logarithm. There are 198 observing covering the period of January, 1996 to June, 2012. These monthly data are obtained from the following sources:

i.   *Monthly Statistical Bulletin* of the Bank Negara Malaysia (various issues)

ii. *Annual Report* of the Bank Negara Malaysia (various issues)

iii. *Data stream*

iv. *Economic Report* of the Ministry of Finance, Malaysia (various issues)

v.   *International Monetary Fund e-library data*

Table 3.1
Sample data use in the study

NO.	SAMPLE DATA	NO. OF DATA USE
1.	Overnight interbank rate and Overnight policy rate (OPR)	198
2.	Lending rate(LR)	198
3.	Total loans by commercial banks (TL)	198
4.	Consumer price index (CPI)	198
Total sample data use		792

3.2 Theoretical Framework

The objective of this study is to determine the most important and influential channel for monetary transmission mechanism in Malaysia. The study focuses on two channels i.e. interest rate and credit channel. Overnight policy rate will be used as proxies for interest rate channel. Whereas, total loans of financial institutions and lending rate will be used as a proxy for bank lending channel or credit channel. However, consumer price index will be used as proxy for inflation and growth rate of the economy respectively.

3.3 Variables and Measurements.

The variables that will be used in this study are as follows:

i. Overnight policy rate (OPR)

Overnight policy rate as defined by Central Bank of Malaysia as a rate at which banking institutions lend immediately available fund (balances within the central bank) to another banking institution overnight. This rate is use as a proxy for interest rate channel because in the mid-1990 Bank Negara Malaysia (BNM) changed policy targeting to interest rate targeting by using interbank rate

meanwhile in the year 2004 Bank Negara Malaysia shifted from interbank rate to overnight policy rate.

ii.   Total loans by commercial banks (TL)

Total loans of financial institutions are total loans available for business, investment and personal expenditure purposes to individual and businesses. Total loans will be used as a proxy for credit channel because Tobin and Brainard (1963) and Brunner and Meltzer (1963) propose the dominant role of banks which was their decision in loan issuance. Furthermore, availability of bank loans assumes a major force that lead to the efficacy of monetary policy.

iii.   Lending rate (LR)

Lending rate as defined by BNM is a minimum interest rate calculated by banking institutions based on formula which takes into account the institutions cost of funds and other administrative costs. Tai et.al (2012) used the rate in their study on interest rate pass through and monetary transmission mechanism in Asia.

iv.   Consumer price index (CPI)

Consumer price index as defined by Bank Negara Malaysia as a measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food and medical care and it is calculated based on price changes for each item and averaging them. Consumer price index will be used as a proxy for inflation because the main objective of monetary policy is to maintain the price stability. Central bank is more interested in changes for general price (increase or decrease) rather than changes in price for particular goods and services in the country. The general price level for each country is measured by

using price index. Consumer price index was most widely used as a measure for price changes since it showed price movements faced by consumers in the country (Central Bank of Sri Lanka, 2005). Consumer price index was also used by Noor and Aisyah (2005), Mala et. al (2009), Salina and Shabri (2009), Abdul et.al (2010) in their study on monetary transmission mechanism in Malaysia.

3.4   Hypotheses Development

Based on the review of the related literature on monetary policy transmission mechanism from the previous chapter, the present project paper attempts to investigate the null hypotheses of no significant causal relationship between the variables so that the objectives of this study can be achieved. Hypotheses of the study are:

a)   Overnight policy rate and total loans by commercial banks:

H_0:There is no significant causal relationship between overnight policy rate and total loans by commercial banks.

H_1: There is significant causal relationship between overnight policy rate and total loans by commercial banks.

b)   Overnight policy rate and lending rate:

H_0: There is no significant causal relationship between overnight policy rate and lending rate.

H_1: There is significant causal relationship between overnight policy rate and lending rate.

c)   Overnight policy rate and consumer price index

H_0: There is no significant causal relationship between overnight policy rate and consumer price index.

H_1: There is significant causal relationship between overnight policy rate and consumer price index

d)   Total loans by commercial banks and overnight policy rate:

H_0: There is no significant causal relationship between total loans by commercial banks and overnight policy rate.

H_1: There is significant causal relationship between total loans by commercial banks and overnight policy rate

e)   Total loans by commercial banks and lending rate:

H_0: There is no significant relationship between total loans by commercial banks and lending rate

H_1: There is significant relationship between total loans by commercial banks and lending rate.

f)   Total loans by commercial banks and consumer price index

H_0: There is no significant relationship between total loans by commercial banks and consumer price index

H_1: There is significant relationship between total loans by commercial banks and consumer price index.

3.5   Econometric Method

Data in section 3.1 will be analyzed using the following procedures:

3.5.1 Stationary and Unit Root Test

In analyzing macroeconomic data, stationary or nonstationary are important because most of macroeconomic data are random walk. To avoid from spurious regression, direct regression analysis on nonstationary economic data cannot be performed. Therefore, unit root test on all variables must be done before granger causality so that the series of economic data are integrated of same order (Wooldridge; 2006 and Harris; 1995). Augmented Dickey Fuller (ADF) test will be used in establishing the order of integration for the variables in the data.

3.5.2   Vector Autoregressive (VAR) Test

Before cointegration test can be performed, vector autoregressive test need to be conducted in order to determine the appropriate lag length for cointegration test. Vector autoregression model was first introduced by Christopher Sims (1980) as an alternative to large scale macro econometric models. According to Hilder (2000) in his paper on VAR model in macroeconomic research; vector autoregressive model are easily interpreted and available. Thus, this project paper structures the model by using VAR.

$$TL_t = \beta_1 + \sum_{i=1}^{k*} \beta_{TLi} TL_{t-1} + \beta_2 OPR_t + \sum_{i=1}^{n*} \beta_{OPRi} OPR_{t-1} + \beta_3 LR_t + \sum_{i=1}^{m*} \beta_{LRi} + LR_{t-1} + \beta_4 CPI_t + \sum_{i=1}^{l*} \beta_{CPIi} CPI_{t-1} + \varepsilon_t$$

(Equation 1)

Where t is time; OPR, TL, LR and CPI are the overnight policy rate, total loans by commercial bank, lending rate and consumer price index respectively; q, α and β terms are coefficient that determine how the variables interact between

each other and ε is the error term that explain the surprise movement in each of the variables.

3.5.3   Testing for Cointegration

According to Johansen (1992 and 1995), cointegration has been widely used in studying the monetary variables. This concept was first introduced by Granger (1981) in testing the long run relationship between two variables. If two or more series are individually integrated (in time series sense) but some linear combinations of them have lower order of integration then the series are said to be cointegrated. Cointegration test was used to test the existence of long term "equilibrium" relationship between two variables and cointegration among the non-stationary data (Hall and Henry, 1989). If the variables are cointegrated between each other than regression analysis will be meaningful test because it would provide more reliable information about the long run relationship.

3.5.4   Granger Causality Test

In determining whether to accept or reject the null hypotheses Granger causality test need to be conducted. Granger causality test was first introduced by Granger (1969). This test is performed in order to determine whether the current and lagged values of one variable affect another. One implication of granger causality test is that if two variables, let say X_t and Y_t are cointegrated and each is individually 1(1), then either X_t must granger cause Y_t or Y_t must granger cause X_t. If the P-value exceeds the 5% critical value than the null hypothesis is accepted which indicate there is no causal relationship between the variable.

Otherwise, the null hypothesis is rejected which indicate there is causal relationship between the variable.

3.6   **CONCLUSION**

This chapter discusses on the description of the data use in the study, theoretical framework, variables and its measurements, hypotheses development and techniques used in analyzing the data. There are 198 samples data representing months from January 1996 to June 2012.

CHAPTER 4

ANALYSIS AND FINDINGS

4.0   INTRODUCTION

This chapter presents the empirical findings of this study. The analysis is

performed using EVIEWS 7.0 and it involves the following step as show in the figure 4.0

below.

```
                              ┌──────────────┐
                              │  Variables   │
                              └──────────────┘
            I(0)                                    I(1)
        ┌──────────────┐                    ┌──────────────┐
        │    Vector    │                    │   VAR Test   │
        │ Autoregressive│                    └──────────────┘
        │  (VAR) Test  │                            │
        └──────────────┘                    ┌──────────────────────┐
                │                            │ Granger Causality Test│
        ┌──────────────┐                    └──────────────────────┘
        │   Granger    │                            │
        │Causality Test│                    ┌──────────────────┐
        └──────────────┘                    │ Lag Determination │
                                            └──────────────────┘
                                                    │
                                            ┌──────────────┐
                                            │   VAR Test   │
                                            └──────────────┘
                                                    │
                                            ┌──────────────┐
                                            │ Cointegration │
                                            └──────────────┘
                                                    │
                                            ┌──────────────────┐
                                            │ Error Correction │
                                            │ Mechanism (ECM)  │
                                            │      Test        │
                                            └──────────────────┘
```
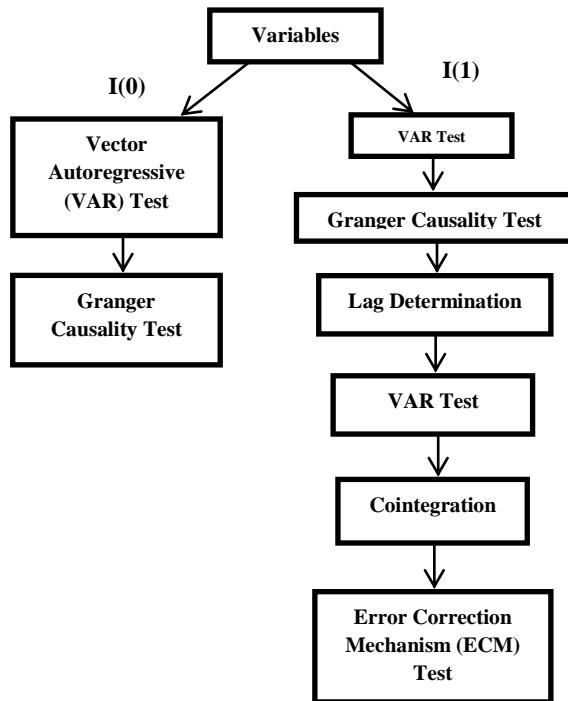
Figure 4.0
Estimation Process

Results on unit root test for overnight policy rate (OPR), total loans by commercial banks

(TL), lending rate (LR) and consumer price index (CPI) are given in the table 4.1.

4.1 Result from Unit Root Test

Table 4.1

Result of Unit Root Test based on Augmented Dickey Fuller (ADF) test

Variables	At level		At First Difference	
	Trend & Intercept	**Intercept**	**Trend & Intercept**	**Intercept**
OPR	-3.4182	-1.6856	-3.8037	-5.2325**
LR	-2.4166	-1.1443	-8.5350*	-8.5563**
TL	-4.0475	-2.3639*	-5.4564*	-7.6849**
CPI	-2.7381	-0.6126	-10.087*	-10.1097**

Notes:
1) Value in the table above present the ADF test result
2) Symbol *, ** and *** denotes the rejection of null hypotheses of unit root test at 1%, 5% and 10% respectively.
3) OPR, LR, TL and CPI represent overnight policy rate, lending rate, total loans by commercial banks and consumer price index respectively.

The unit root test is to determine the level of integration for variables in this study. This test is important for macroeconomic variables because most of macroeconomic series shown random walk processes, it means that is to say they are nonstationary at level. The data is said to be stationary when the probability value is higher than its critical value. For the purpose of this study Augmented Dickey Fuller (ADF) test will be utilized to perform the stationary test.

Table 4.1 above presents the results of unit root test respectively for overnight policy rate (OPR), total loans by commercial banks (TL), lending rate (LR) and consumer price index (CPI). From the results we conclude that, all the variables are integrated at level 1, meaning all of the variables are stationary at first difference. As shown, the ADF test on first difference indicates the rejection of null hypotheses. Thus this indicates to us that the data for overnight policy rate (OPR), total loans by commercial banks (TL), lending rate (LR) and consumer price index (CPI) are stationary and stable. They are said to be integrated of same order.

50

4.2 Result from Vector Autoregressive (VAR) and Cointegration Test

Cointegration analysis is used to determine if there is a significant long run cointegration among all the variables. All the variables are said to be cointegrated when the null hypothesis is accepted i.e. when trace statistic or maximum Eigen value is higher than the value at 5% significance level or value of probability (P-value) is below than 5%. The test on appropriate lag length is conducted before the cointegration test is performed. Result from VAR test as shown in table 4.2 below indicates that the appropriate lag length for cointegration test is between 2 to 8.

Table 4.2
Result from VAR test to determine the appropriate lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	166.3137	NA	2.13e-06	-1.708	-1.640	-1.680
1	1422.212	2445.697	4.57e-12	-14.760	-14.418	-14.621
2	1520.123	186.546	1.93e-12	-15.622	**-15.007***	-15.373
3	1547.371	50.767	1.72e-12	-15.740	-14.852	-15.380
4	1569.488	40.276	1.61e-12	-15.805	-14.643	-15.334
5	1590.136	36.731	1.54e-12	-15.854	-14.418	-15.272
6	1618.211	48.761	1.36e-12	-15.981	-14.272	-15.288
7	1664.556	78.541	9.89e-13	-16.300	-14.318	-15.497
8	1711.850	**78.159***	7.14e-13	**-16.630***	-14.374	**-15.7161***

Notes:
*denotes lag order selected by criterion
LR represent sequential modified LR test statistic (each test at 5%)
FPE represent final prediction error
AIC represent Akaike information criterion
SC represent Schwarz information criterion
HQ represent Hannan-Quinn information criterion

Table 4.3
Result from Cointegration Analysis for OPR, TL, LR and CPI (Trace Statistic& Max Eigen Statistic)

Hypothesized no. of CE(s)	Trace Statistic	Max Eigen Statistic	Critical Value at 5%	Probability
None*	67.7867	36.8615	47.8561	0.0002
At most 1*	30.9251	22.4548	29.7970	0.0369
At most 2	8.4703	8.2924	15.4947	0.4166
At most 3	0.1778	0.1778	3.8414	0.6732

Notes:
Trace statistic and Max Eigen stat value show 2 cointegrating equation at 5% level
*denotes the rejection of hypotheses at the 5% level
Two variables are said to be cointegrated when trace statistic or max Eigen value is higher than the critical value

Table 4.3 above reveals that, overnight policy rate, total loans by commercial banks, lending rate and consumer price index are cointegrated. In other words, there is a long run relationship exists among all the variables.

4.3   Result from Granger Causality Test

Although all the variables are significantly cointegrated we also determine the direction of causality among the variables. This can be done by Granger causality test. Granger Causality test is used to determine whether the current and lagged values of one variable affect another. We reject the null hypothesis at 5% significance level if p-value less than 5%.

Table 4.4
Result from Granger Causality Test

Null Hypothesis	Obs	F-statistic	Probability
TL does not Granger Cause OPR	196	1.1283	0.3219
OPR does not Granger Cause TL		0.8036	**0.0249**
LR does not Granger Cause OPR	196	1.0819	0.3785
OPR does not Granger Cause LR		2.1704	**0.0020**
CPI does not Granger Cause OPR	196	3.7521	0.0899
OPR does not Granger Cause CPI		0.4038	0.6171
LR does not Granger Cause TL	196	0.8559	0.0592
TL does not Granger Cause LR		1.0511	**0.0259**
CPI does not Granger Cause TL	196	0.7554	0.8357
TL does not Granger Cause CPI		1.5541	0.0503
CPI does not Granger Cause LR	196	2.2485	**0.0013**
LR does not Granger Cause CPI		0.7597	0.8307

Notes:
Result above present Granger Causality result at lag 2
Obs represent number of observation
Rejection of null hypothesis at p-value which is less than 5%

Table 4.4 above presents the Granger causality results. The results show that the null hypothesis OPR does not granger cause TL, OPR does not granger cause LR, TL does not granger cause LR and CPI does not granger cause LR are rejected at 5% significance level. The test indicates that OPR unidirectional granger causes TL and LR.

Also, TL and CPI are unidirectional granger cause LR. This, one way causation pattern between OPR, TL and LR supports the importance of interest rate channel whereas one way causation pattern between TL and LR supports the importance of credit channel in Malaysia. Understanding the behavior of these variables and how they affect each other is very important in influencing the Malaysian economic performance. Table 4.5 summarizes the findings of the granger causality test.

Table 4.5
Summary of Granger Causality Test Result

NO.	Summary of Granger Causality Test Result	
1.	OPR ⟶ TL OPR ⟶ LR	Result from the test indicate: • unidirectional causality from OPR to TL and LR • It support the importance of interest rate channel
2.	TL ⟶ LR	Result from the test indicate: • Unidirectional causality from TL to LR • It support the importance of credit channel
3.	CPI ⟶ LR	Result from the test indicate: • Unidirectional causality from CPI to LR

4.4   Conclusion

This chapter presents the results from unit root test, vector autoregressive (VAR) test, cointegration and Granger causality tests. The entire tests are performed using Eviews 7.0. The purpose of this study is to investigate the significant influence of the overnight policy rate (OPR) and total loans by commercial banks (TL) as channels of monetary transmission mechanism and to identify the direction of causality between OPR, LR, TL and CPI. Findings of this study showed one way causation pattern from OPR to LR and TL; and TL to LR which support interest rate and credit as important channels for monetary transmission mechanism in Malaysia respectively.

CHAPTER 5

CONCLUDING COMMENTS

5.0   INTRODUCTION

In this paper, interest rate and credit channels were tested using monthly data for overnight policy rate, total loans by commercial banks, lending rate and consumer price index ranging from January 1996 to June 2012. Four statistical analyses were employed to know the inter-relationship amongst the variables so that important channels for monetary transmission in Malaysia can be determined. The four statistical analyses are: Unit root test, Vector autoregressive (VAR) test, Cointegration test and Granger Causality analyses. It was proven that the findings are related with the literature review and the objectives of the study. The findings summarized below are based on the method used:

i.   Unit Root Test

- Unit root test results have indicated that data for all variables: overnight policy rate, total loans by commercial banks, lending rate and consumer price index are stationary and stable after the first difference which is $I(1)$.

ii.   Vector Autoregressive (VAR) Test

- VAR results indicate that appropriate lag length for cointegration test is between 2 to 8.

- The study employed 2 lags in the test.

iii. Cointegration Test

- Result from Johansen Cointegration test indicated that overnight policy rate, total loans by commercial banks, lending rate and consumer price index were significantly cointegrated at 5% significance level.

- In addition, long run relationship exists amongst the variables.

iv. Granger Causality Analysis

- The test based on 5% significance level.

- Result from Granger causality test has indicated most of the null hypotheses of no granger causality among the variables have been accepted. Only four null hypothesis have been rejected since their p-value is less than 5% they are:

  a) OPR does not granger cause TL

  b) OPR does not granger cause LR

  c) TL does not granger cause LR

  d) CPI does not granger cause LR

Finally, in general, these finding have found that all variables were significantly cointegrated with each other but some variables such as overnight policy rate, total loans by commercial banks and consumer price index are granger cause among each other and this has led to the rejection of null hypothesis.

The granger causality analyses performed support the importance of the credit channel and interest rate channel for monetary transmission mechanism in Malaysia. A one way causation pattern from OPR to TL and LR have support the importance of interest rate channel. In other word, any changes in overnight policy rate will affect the total loans by commercial banks and lending rate. The result obtained by this study

supported and complemented an earlier study by Rania and Andreas (2007) on monetary transmission mechanism in Egypt. Granger causality test performed by them showed one way causation pattern from OPR to deposit rate and lending rate which supported the importance of interest rate channel in Egypt. Whereas, importance of credit channel are supported by the one way causality direction which was from total loans by commercial banks to lending rate. In other words, any changes made in total loans by commercial banks would reflect the lending rate. This finding is similar to the study conducted by Noor and Aisyah (2005) on the transmission mechanism of monetary policy in Malaysia: through bank loans or deposits.

In conclusion, the success of the central bank in achieving its monetary targets and objectives is greatly dependent on effective and efficient channels used as transmission mechanism of monetary policy in Malaysia. This study indicated that the interest rate channel and credit channel proved to be the two most effective means of transmission mechanism of the government's monetary policy. These two channels can therefore be utilized and served to implement government monetary policies to help foster an economic balance and prosperity in the nation.

5.1   Recommendations

Both interest rate channel and credit channel appears to be an effective and efficient means of monetary transmission mechanism in Malaysia. This finding suggests that the central bank to choose interest rate and credit channels in transmitting its policy through which it will be able to achieve its target i.e. low inflation and economic growth.

i) Interest rate channel

- As an effective channel for monetary transmission, interest rate provides an efficient and useful means to the monetary authority to regulate the monetary policies in order to achieve the desired economic outcomes in the domestic country. As such the interest rate channel can be used to influence individuals' savings and consumptions. For instance, an increase in the overnight policy rate (OPR) will pressure up the lending rate (LR) and the effect of this monetary action by the Bank Negara will behaviorally or psychologically drive the people to increase their amount of savings or in order words to keep spending on the minimum and the people will be discouraged from borrowing loans due to high cost of borrowing that resulted from high interest rate as imposed by higher OPR, an effective and influential channel used by Monetary authority in Malaysia to influenced desired economic environment.

- Interest rate channel can function as an efficient mechanism that can influence the economic decisions of businesses. When Bank Negara Malaysia increases the interest rate, cost of borrowing will be expensive thus companies will hold their decision in expanding their business or increasing their level of production. On the contrary, if Bank Negara loosens the interest rate cost of borrowing becomes lower and loans become a cheaper means of financing business expansion and new business endeavors.

- In addition, interest rate will help the government to control the country's currency and the demand for domestic product. For instance during expansionary monetary policy, government will reduce the level of interest rate and foreign investors will be discouraged from investing in the domestic country due to lower return. As a result, the value of domestic currency will fall and this will lead to reduction in price of domestic goods and therefore this will create a demand for domestic products thus resulting in an increase in net export.

ii) Credit channel

- Banks are the financial intermediaries that provide sources of fund or sources of credit to persons or businesses. In Malaysia, banks and financial institutions are the most frequently used channel to supply money to the public through giving of loans or offering of credit facilities to persons or businesses at large. Persons and businesses that require funds or money to acquire any asset or real property or to settle any other financial obligations and making any other financial decisions that involves money or fund, can find that banks and other financial institutions may be the most single important intermediary as a credit channel in Malaysia. Thus, government can use banks and other financial institutions in order to ensure the soundness (stability) of the country's economy. This can be observed through the pumping of money by the government in giving out loans to individual and

businesses under the economic transformation programme which had just been announced in the budget 2013.

- The government through Bank Negara Malaysia controls all banks activities because banks play a major role in financial markets. Furthermore, they are well positioned to engage in information-producing activities that facilitate productive investment for the economy. For instance, bank balance sheets have an important effect on bank lending (Kashyap and Stein, 1994). If banks suffer deterioration in their balance sheets and so have a substantial contraction in their capital, they will have fewer resources to lend and bank lending will decline. This contraction in lending then leads to a decline in investment spending which slows the nation's economic activity.

5.2   Future Research

Since this study only focuses on four types of variables which are overnight policy rate, lending rate, total loans by commercial banks and consumer price index, it is recommended that further studies be carried out by adding variable such as gross domestic product to see the effect of monetary transmission mechanism on real sector of the economy in Malaysia. Furthermore, it is suggested that further research could lengthen the time period of the study since this project paper only focused on monthly data from January 1996 to June 2012 in order to know whether there are any similarities in the findings. Albeit this study focuses on the importance of two channels of monetary transmission mechanism in Malaysia which are interest rate and credit channels, it might

be interesting to explore and also study the importance of other channels in Malaysia for instance exchange rate channel, asset price channel and expectation channel to expand the boundary of knowledge and to contribute to this area of the study so that knowledge on this theory could be use for the goodness and well being of the people of the country and the world globally.

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APPENDICES

Unit Root Test Results for Overnight Policy Rate
At level

Null Hypothesis: OPR has a unit root

Exogenous: Constant

Lag Length: 8 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.685671	0.0258
Test critical values:	1% level	-3.465014	
	5% level	-2.876677	
	10% level	-2.574917	

*MacKinnon (1996) one-sided p-values.

Unit Root Test for Overnight Policy Rate
At First Difference

Null Hypothesis: D(OPR) has a unit root

Exogenous: Constant

Lag Length: 12 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.232535	0.4369
Test critical values:	1% level	-3.465780	
	5% level	-2.877012	
	10% level	-2.575097	

*MacKinnon (1996) one-sided p-values.

**Unit Root Test for Total Loans by Commercial Banks
At Level**

Null Hypothesis: TL has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.363979	0.0031
Test critical values:	1% level	-3.464101	
	5% level	-2.876277	
	10% level	-2.574704	

*MacKinnon (1996) one-sided p-values.

**Unit Root Test for Total Loans by Commercial Banks
At First Difference**

Null Hypothesis: D(TL) has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.684978	0.2135
Test critical values:	1% level	-3.464101	
	5% level	-2.876277	
	10% level	-2.574704	

*MacKinnon (1996) one-sided p-values.

Unit Root Test for Lending Rate
At Level

Null Hypothesis: LR has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.144344	0.0305
Test critical values:	1% level	-3.463749	
	5% level	-2.876123	
	10% level	-2.574622	

*MacKinnon (1996) one-sided p-values.

Unit Root Test for Lending Rate
At First Difference

Null Hypothesis: D(LR) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.556346	0.6980
Test critical values:	1% level	-3.463749	
	5% level	-2.876123	
	10% level	-2.574622	

*MacKinnon (1996) one-sided p-values.

Unit Root Test for Consumer Price Index
At Level

Null Hypothesis: CPI has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.612603	0.0001
Test critical values:	1% level	-3.463749	
	5% level	-2.876123	
	10% level	-2.574622	

*MacKinnon (1996) one-sided p-values.

Unit Root Test for Consumer Price Index
At First Level

Null Hypothesis: D(CPI) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.10972	0.8637
Test critical values:	1% level	-3.463749	
	5% level	-2.876123	
	10% level	-2.574622	

*MacKinnon (1996) one-sided p-values.

Result from Vector Auto regressive (VAR) Test

Vector Autoregression Estimates
Date: 12/25/12   Time: 12:59
Sample (adjusted): 3 198
Included observations: 196 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	OPR	LR	TL	CPI
OPR(-1)	0.463702	-0.000378	0.000997	0.000305
	(0.06808)	(0.02444)	(0.00127)	(0.00022)
	[6.81106]	[-0.01545]	[0.78680]	[1.39045]
OPR(-2)	0.425674	0.075884	0.002854	4.51E-05
	(0.07111)	(0.02552)	(0.00132)	(0.00023)
	[5.98652]	[2.97300]	[2.15568]	[0.19671]
LR(-1)	1.218532	1.322396	-0.009381	5.15E-05
	(0.19281)	(0.06921)	(0.00359)	(0.00062)
	[6.31971]	[19.1059]	[-2.61290]	[0.08299]
LR(-2)	-1.147665	-0.449010	0.005506	-0.000462
	(0.18332)	(0.06580)	(0.00341)	(0.00059)
	[-6.26058]	[-6.82338]	[1.61310]	[-0.78235]
TL(-1)	-7.536072	1.275360	1.465383	0.006987
	(3.43771)	(1.23403)	(0.06401)	(0.01107)
	[-2.19218]	[1.03349]	[22.8918]	[0.63094]
TL(-2)	7.177421	-0.418466	-0.483346	-0.000519
	(3.46107)	(1.24241)	(0.06445)	(0.01115)
	[2.07376]	[-0.33682]	[-7.49972]	[-0.04658]
CPI(-1)	-6.224135	12.96026	-0.061293	1.266708
	(21.6500)	(7.77167)	(0.40315)	(0.06974)
	[-0.28749]	[1.66763]	[-0.15204]	[18.1624]
CPI(-2)	7.638988	-18.42377	0.055925	-0.295017
	(21.4802)	(7.71069)	(0.39998)	(0.06920)
	[0.35563]	[-2.38938]	[0.13982]	[-4.26349]
C	-0.756861	6.283466	0.128125	0.020164
	(3.96310)	(1.42263)	(0.07380)	(0.01277)
	[-0.19098]	[4.41681]	[1.73619]	[1.57939]
R-squared	0.922767	0.992098	0.996702	0.998861

Adj. R-squared	0.919463	0.991760	0.996561	0.998812
Sum sq. resids	49.41985	6.368146	0.017136	0.000513
S.E. equation	0.514079	0.184538	0.009573	0.001656
F-statistic	279.2791	2934.633	7064.620	20491.12
Log likelihood	-143.0912	57.71506	637.6680	981.5450
Akaike AIC	1.551951	-0.497092	-6.414980	-9.923929
Schwarz SC	1.702477	-0.346567	-6.264454	-9.773403
Mean dependent	3.652449	7.035510	5.712569	1.938880
S.D. dependent	1.811469	2.032886	0.163238	0.048043

Determinant resid covariance (dof adj.)	1.98E-12
Determinant resid covariance	1.64E-12
Log likelihood	1546.837
Akaike information criterion	-15.41671
Schwarz criterion	-14.81460

Result from VAR test to determine the appropriate lag

VAR Lag Order Selection Criteria
Endogenous variables: OPR LR TL CPI
Exogenous variables: C
Date: 12/25/12   Time: 13:01
Sample: 1 198
Included observations: 190

Lag	LogL	LR	FPE	AIC	SC	HQ
0	166.3137	NA	2.13e-06	-1.708565	-1.640207	-1.680874
1	1422.212	2445.697	4.57e-12	-14.76013	-14.41833	-14.62167
2	1520.123	186.5464	1.93e-12	-15.62235	-15.00712*	-15.37313
3	1547.371	50.76740	1.72e-12	-15.74075	-14.85209	-15.38076
4	1569.488	40.27691	1.61e-12	-15.80514	-14.64305	-15.33439
5	1590.136	36.73130	1.54e-12	-15.85407	-14.41854	-15.27255
6	1618.211	48.76142	1.36e-12	-15.98117	-14.27221	-15.28889
7	1664.556	78.54189	9.89e-13	-16.30058	-14.31819	-15.49755
8	1711.850	78.15980*	7.14e-13*	-16.63000*	-14.37417	-15.71619*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

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Result for Cointegration Test

Date: 12/25/12   Time: 13:02
Sample (adjusted): 4 198
Included observations: 195 after adjustments
Trend assumption: Linear deterministic trend
Series: OPR LR TL CPI
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.172241	67.78671	47.85613	0.0002
At most 1 *	0.108770	30.92519	29.79707	0.0369
At most 2	0.041634	8.470309	15.49471	0.4166
At most 3	0.000912	0.177881	3.841466	0.6732

Trace test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.172241	36.86152	27.58434	0.0024
At most 1 *	0.108770	22.45488	21.13162	0.0324
At most 2	0.041634	8.292428	14.26460	0.3497
At most 3	0.000912	0.177881	3.841466	0.6732

Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Result For Granger Causality Test

Pairwise Granger Causality Tests
Date: 12/25/12   Time: 13:03
Sample: 1 198
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LR does not Granger Cause OPR	196	18.7602	0.3785
OPR does not Granger Cause LR		3.84003	0.0020
TL does not Granger Cause OPR	196	0.46975	0.3219
OPR does not Granger Cause TL		1.29656	0.0249
CPI does not Granger Cause OPR	196	0.62562	0.0899
OPR does not Granger Cause CPI		1.08987	0.6171
TL does not Granger Cause LR	196	3.72552	0.0259
LR does not Granger Cause TL		2.86982	0.0592
CPI does not Granger Cause LR	196	6.14536	0.0013
LR does not Granger Cause CPI		0.81960	0.8307
CPI does not Granger Cause TL	196	4.36325	0.8357
TL does not Granger Cause CPI		1.46413	0.0503