THE DETERMINANTS OF BANKING CRISIS IN MALAYSIA

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(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

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LIST OF ABBREVIATION

AP	Approved Permits
BNM	Bank Negara Malaysia
CA	Current Account per GDP Ratio
DCPS	Domestic Credit to Private Sector
FSMP	Financial Sector Master Plan
GDP	Gross Domestic Product
GDPPC	Gross Domestic Product Per Capita
IMF	International Monetary Fund
INF	Inflation
LPM	Linear Probability Model
M2R	Money and Quasi Money to Total Reserve Ratio
ML	Maximum Likelihood
MPC	Monetary Policy Committee
NER	Nominal Exchange Rate
OLS	Ordinary Least Square

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Preface

Although many papers have been written about the banking crisis on developed and developing crises, it may be time to consider the crisis in retrospect. Actually, it is our impression that a comprehensive, but reasonably compact description in English of the Malaysian banking crisis is lacking. With this publication, we try to fill this gap.

There are not many research conducted to identify the determinants of the banking crisis specifically on Malaysia. In the light of this, we are motivated by this interesting scenario. Therefore, this research is conducted to investigate the factors of the economic environment that leads to the systemic banking crisis in Malaysia by providing new insights of the determinants of the banking crisis by using newer datasets, time frames and better developed variables.

Hence, we do a research on impact of banking crisis by using the financial indicators, macroeconomic variables and banking variables in the case of Malaysia.

Abstract

The objective of this paper is to determine the elements of the economic environment which make banking sector fragility and finally lead to emergence of systematic banking crisis in Malaysia. We hypothesize inflation, domestic credit to the private sector to GDP, GDP per capita, M2 to reserves, nominal exchange rate and current account balance to have significant impact on the probability of banking crisis in Malaysia from year 1974 to 2010. For this purpose, we study the determinants of the probability of a banking crisis and evaluate the chosen determinants' value by exercising linear probability model, binary logit and probit model with annual data. The econometric approach which is limited dependant variable probability models we use in our study is exactly same as in Bucevska (1997) studies. Non-performing loan (NPL) is being used to measure the banking crisis. In our research, NPL of more than 10% signalled the existence of banking crisis. It has been found that inflation and M2 reserves are insignificant in influencing banking crisis for the first linear probability model. Hence we dropped these two insignificant variables and proceeded our research with the remaining four significant variables. The empirical results of logit and probit model have shown that domestic credit to the private sector to GDP, GDP per capita, nominal exchange rate and current account are significant in influencing banking crisis in probit model. However, current account was found to be insignificant in logit model. Based on our empirical findings, Malaysian government are strongly suggested to speed up their liberalization process in various sectors to improve efficiency of competition and also be flexible in their policies.

CHAPTER 1: INTRODUCTION

1.1 Definition of banking crisis

Banking crisis can be defined as prevalent insolvencies in the financial sector leading to major government interventions. Definition of banking crisis vary with the specific symptoms of the financial crisis was studied by many researchers in the past. In the short run, those definitions that include a demand for reserve money could not simultaneously satisfied all parties (Schwartz, 1985; Miron, 1986; Wolfson 1986); a liquidation of credits that have been built up in a boom (Veblen, 1940; Mitchell, 1941). A banking crisis has direct economic effects. It disrupts normal credit relationships and increases the cost of credit intermediation which causes a flight to quality by both banks and their creditors that leads to deteriorating monetary and budgetary control.

In a systematic banking crisis, one country's banking and financial institution faces significant number of defaults while financial entities experience severe obstacles in meeting financial contracts on time. These caused the particular country's non-performing loans rise, and severe drop in the capital of banking system. A systematic banking crisis involves a large amount of financial institutions and a huge portion of banking system.

Overview of Malaysia Banking Crisis

East Asian Financial Crisis 1997 – 1998

Malaysia was included in one of the main five most severely hit Asian crisis economies in mid-July 1997 where East Asian Financial Crisis begun, other countries included Thailand, Philippines, South Korea and Indonesia. The hit had weakened the

banking system of Malaysia badly. According to the statistics provided by the Governor of Bank Negara Malaysia whom is Tan Sri Ali Abul Hassan delivered his speech at Bank Negara on 15th March 2000 saying that in the early 1990s, two signs of weakening prudential norm was developed by the Malaysian banking system, which are heavy exposure to the broad property area and fast growth of bank loans, such as share trading, real estate, and construction. The annual rate of growth of bank lending to the private sector increases from 18% in 1990 to 33.5% in 1997at a constant rate. Private sector debt in Malaysia climbed by almost 200 times, or, in other words, on average annual growth rate of 61% which is from RM395 million in 1987 to RM75 billion in 1998. On January 2000, the predicate private debt securities sum up to RM120 billion. The outstanding credit relative to GDP during the late 1980s increased from an average of 85% to 120% in 1994 and 160% in 1996-97. The crisis occurred in mid-1997 where the peak achieved at 170%, which was the consistent maximum credit build-up between the four crisis countries.

Two threats are transparent due to the rise in build-up of credit. First of all, the global market considered this point for official decision makers' unwilling to exercise interest rates as a regulation instrument based on the occurrence of a hypothetical hit on the currency. Besides that, the rapid developing of credit at a small period of time suggested an upward share of lending to less creditworthy debtors could have the potential result in failing of the banking system.

This fast credit expansion stimulates a severe rise in the share of total credit going to the extensive property sector. This segment accounted for over 45% of total remaining bank loans by the end of 1996. Another factor that destabilized Malaysia's banking system, which in turn raised its vulnerability, was the increasing domination of local to foreign banks. There was a national plan stated that local banks should govern, thus, new licenses were not issued to carry on banking activities in Malaysia. Only local banks were allowed to open new branches in Malaysia whereas existing foreign banks in Malaysia were banned from opening new branches. Those foreign banks' branches that set up frozen leads the new deposits to settled in local banks. As

a result, the share of foreign banks in total bank deposits decreased in the early 1970s to mid-1990s from over 80% to 30%. Ironically, when the currency crisis was at its worst stage in late 1997 and early 1998, many Malaysians switched their deposits from local banks to foreign banks. There are few events of bank runs at that moment were aligned with Malaysian owned banks or finance companies but fortunately overseas banks were not affected.

The real estate market turned out to be ever more fragile in the years leading up to 1997. Office and retail sub-sectors had been facing oversupply in 1995. Nevertheless, the local authorities approved most of the planning, while credit was liberally extended by banks as well as other financial institutions, companies and businessmen which are all diversified into real property. Hence, if the East Asian Financial Crisis had not happened, this will result in causing the oversupply of office, retail and housing space over the 1999-2000 perspective.

Besides that, during this period of time Malaysia encountered with a large reduction of the ringgit plus an immense capital flight even when there is an increase of domestic interest rate. The government decided to peg RM3.80 against US$1.00 to solve the impossible trinity problem which is controlling both the interest rates and foreign exchange rates under a regime of free capital flow. This allowed the lower interest rates to motivate the economy without distressing the capital flight as well as the currency volatility.

Lastly, there was a rapid development of the share market in Malaysia in the period up to 1997. The Kuala Lumpur Stock Exchange was the third largest in the Asian Pacific region, after Tokyo and Hong Kong before the crisis happened, with a market capitalization of around US$200 billion. Stock market capitalization that hit over 300% of GDP was the highest record at any time in history during that period. According to Prema-Chandra Athukorala, the Malaysian experience is reliable with the forecasted currency crisis literature regarding the excess credit growth is the foundation of weakness to a financial crisis.

Global Financial Crisis 2007

The global financial condition worsen during the year of 2007 due to US subprime crisis and credit crisis that spread across the major financial markets in many countries. This has been convoyed by the prolonged depreciation of U.S dollar and also the perseverance of huge global disparities and surging food and product prices. These had in turn, brought a negative impact to Malaysia banking sector.

The Global Financial Crisis was described with plentiful liquidity fed by extreme and unconsidered credit expansion. The crisis started by financing current account deficits with a large flow of capital into the United States. The result was huge liquidity was then intermediated by financial institutions into consumer credit and mortgages, which then consequently converted into mortgage-backed securities. Banks and investors invested in long-duration whereas compound structured financial products such as collateralized debt obligations and mortgage-backed securities were using short-term funds, with the expectation of access to overturn funding would always be obtainable in the well liquid interbank and money markets. The inveterate problems of agency and moral hazard in this crisis may be a sign that it is systemic. Nonetheless, policymakers are responsible to propose systems and employ policies that could reduce risks and ease its impact.

This crisis has caused a change of policy in the banking sector especially upon the law of Central Bank. The Central Bank of Malaysia Act 2009 was enforced on 25 November 2009, Bank Negara Malaysia (BNM) play an efficient role in controlling risks and challenges. The new Act gives better transparency and vests it with the needed powers and instruments on the Central Bank's authorization, which comprises the formulation of the monetary policy by the Monetary Policy Committee (MPC). The Act stated that monetary policy is to be freely formulated by the MPC and efficiently executed by BNM also provides for a better role for the Syariah Advisory Councilon Islamic Finance to ease the constant application of Islamic law on Islamic

financial matters. Minister of International Trade and Industry, Datuk Mustapa Mohamed told the Dewan Rakyat from August to December 2008 and from March to June 2009, his ministry had performed an audit exercise on all companies that were holders of approved permits (APs). He mentioned the audit exercise was to gauge the financial position and to obtain information of the companies that held APs. In addition to that, Mustapa said the outcomes of the audit exercise would direct his ministry in resolving the number of open APs to be issued to such companies in 2009. Not only that, an improvement upon one of the most well-known policy involving racial favouring in the economy also planned to be cancelled. On April 22nd 2009, the government decided to abolish local-equity requirements for investment in the services sector. The previous rules stated that companies in the services sector had to propose a 30% stake to investors consisting of Bumiputera. Nonetheless now that it has been eliminated, the fairness principle has finally come across in the economy.

Euro Debt Crisis

The European sovereign debt crisis is extremely risky to the worldwide financial system because its potential expansion could have the most important spill over effects on the real financial system and the financial markets. Looking from financial viewpoint, European sovereign debt crisis was impacted by the increased in ambiguity and volatility of the international financial markets as well as the raise in deleveraging activity between European financial institutions. Because of the close association that existed across asset classes and markets, the sensitivity of ambiguity in international financial markets may result in foremost unsteadiness movement of cross-border capital. Ambiguity in the financial markets might jeopardize not only local spending as well as the assurance, but this could also reduce the fund-raising activities of businesses. Meanwhile, the weaker capital situations from various European banks create concerns that deleveraging by these institutions might hold back the accessibility of credit, together with trade credit.

Malaysia, nonetheless, is somehow secluded from the deleveraging by European banks. Based to the Outlook and Policy 2012 in printed by Bank Negara Malaysia, every foreign banks are domestically-incorporated associates with dedicated capital implemented to the Malaysian functions as obligatory under the Malaysian banking legislations. These associates are funded nationwide, well-capitalised and are centre to the identical principles of vigilant administration and parameter that Bank Negara Malaysia forces on local-owned banks. Given the well-built and stable economic performance and sustainable returns of the Malaysian operation of the domestically-incorporated European banks, a substance scale back of Malaysian operations as an outcome of deleveraging by the European parent banks is questionable. Even in the questionable occasion of a wide-scale extract of European banks from the Malaysian market, local intermediation activity would continue to be well-supported by locally-owned as well as non-European banks in Malaysia which are all well-capitalised along with have well-built liquidity positions.

Evolution of Malaysian Banking and Financial Sector

During 1859, the first commercial bank established in Penang, Malaysia was The Chartered Mercantile Bank of India, London and China This bank was a division of British exchange bank. Later in 1875, The Chartered Bank established a branch in Penang. During July 1913, the first domestic bank Kwong Yik (Selangor) Banking Corporation was established to be integrated in Kuala Lumpur. On the other hand, branches of a Singapore-incorporated bank have been establishing divisions in Malacca and Muar. In the late 1920s and 1930s, new local banks have been incorporated by businessman and trades. The Currency Board was introduced in 1907 for the function of issuing currency and lookouts its value.

After that, the World Bank Mission is established in 1955 to evaluate the country's financial condition and potential for development, a plan was established to structure a Central Bank, which has led to the establishment of the Central Bank of Malaya, also known as Bank Negara Malaysia under the Central Bank of Malaya

Ordinance, 1985. Bank Negara Malaysia is at the highest position in Malaysia's monetary and banking system. With the exclusion of the offshore banks, Bank Negara Malaysia has been entrusted with the rule and management of the banking system in Malaysia in order to preserve a well-built monetary system which is significant for Malaysia's economic stability and social growth.

After a complete evolutionary cycle from 1950 to 2004, the financial region is now undergoing a period of consolidation beneath the Financial Sector Master Plan (FSMP). It results in the joint venture of commercial banks with their finance companies which enable the financial foundations to build up a one-stop financial centre so that they can increase the competitiveness and be well equipped for the future liberalization of the financial services region. Apart from these, additional joint venture is expected between the ten anchors banks. At end of 2000, there were 31 commercial banks, 19 finance companies, 12 merchant banks and 7 discount houses. Upon finishing point of the joint venture preparation between domestic banking institutions, the quantity of domestic banking institutions will be expansively reduced to 10 domestic banking groups which made up of 10 commercial banks, 10 finance companies and 9 merchant banks.

Currently, the domestic banking institutions handle around 75% of banking sector's market share, in terms of overall assets and overall deposits. Despite of the control of domestic banking institutions, the 14 wholly foreign-owned banking institutions have created a strong manifestation in the local banking sector. The grouping of foreign banking institutions has normally been at the forefront of domestic players in terms of economic performance as revealed by the superior return on asset and equity, product development and operational proficiency in the domestic market. The present foreign banking establishments have in common functioned based on an aimed market, concentrated on high value corporate clients as adjoining to the accretion purchaser and corporate customers by the local banking institutions. Other features contributing to the superior performance of the present foreign banking establishments include their universal linkage, acquaintance in a variety of markets,

admission to talents as well as their better level of information knowledge. Hence, substantial gaps among foreign and local bank institutions need to be lessened to accomplish the systematic expansion of a sensible and efficient local banking sector.

Financial Sector Blueprint (2011-2020)

The latest Financial Sector Blueprint was released by our Bank Negara Malaysia in 2011 which themed "Strengthening Our Future", visioning and focusing on future direction of Malaysia financial services sector from 2011 – 2020. The objective of blueprint aims to further advance the financial sector development that will drive Malaysia's transition to a high value-added, high-income Malaysian economy, while also playing an increasingly important role in meeting the growing financial needs of emerging Asia.

As Malaysia desires to transition its economy from middle-income to high-income status and to increase high value-added activities, the financial sector is aimed to play an important role to grow as an enabler of growth to be a key driver and catalyst of economic growth. Therefore, the financial sector is aimed to be more competitive, dynamic, inclusive, diversified and integrated, with the ability to offer world class financial services. Based on the growth rate of the economy estimated for the next decade, the financial sector is expected to expand from the current 4.3 times to 6 times of gross domestic product (GDP) by 2020. Meanwhile, the contribution of the financial services sector to nominal GDP is projected to rise from 8.6% of nominal GDP to between 10 and 12% by 2020.

The recommendations in the Blueprint provided by Bank Negara Malaysia (BNM) are focused on nine major areas of improvement.

1. **Effective intermediation for a high value-added and high income economy**

Mobilization of various savings has been introduced to meet the requirements of

businesses and households and to boost up productive investments in Malaysia. To hold up the innovation-driven economic performance as well as the start-up projects in Malaysia, a more vibrant risk-capital ecosystem will be developed. Seeing that Malaysia intensified its trade and investment association, the financial sector is foreseen to have a larger responsibility in supporting the internationalisation of Malaysian businesses. To organize to Malaysia's growing prosperous segment and growing population, prominence will be located on enhancing the stipulation of financial services for wealth management, long-term healthcare and retirement. The expansion of a vibrant private retirement fund industry is significant in enhancing the responsibility of retirement funds as a solution of subsidizing for the longer-term and risk-based financing necessity of the financial system.

2. Development of deep and dynamic financial markets

This area concentrates on recovering the liquidity, depth and contribution in the foreign exchange, money and government securities markets in Malaysia, in order to enable efficient intermediation, relocates of risks and liquidity management, as well as meeting the various needs of the globally integrated financial system. Foreign exchange management regulations will be gradually liberalised to promote our competence in all the financial transactions. The expansion of money markets and domestic foreign exchange, corporate governance practices by financial market players and guarantees sound risk management, will be a significant outline in the growth of Malaysian economy.

3. Financial inclusion for greater shared prosperity

Financial inclusion for larger shared prosperity – This is to make sure that all individuals in the society including those who are underserved, to have an opportunity to access to the essential financial services which are good quality and affordable. Furthermore, in order to enhance the outreach of the financial

services at a lower cost as well as to expand the range of the financial products and services, a great share of efforts will be focused on increasing more advanced delivery channels like agent banking. This will include the launching of more financing products that are flexible, micro-saving product that involves long-term contract, micro insurance and micro takaful products to accommodate different individual's financial requirements.

4. Strengthening regional and international financial integration

Initiatives to build up more international financial linkages in Malaysia will be pursued as Malaysia plays an important role in mobilizing the regional and cross-border funds as well as supporting the financial needs of local and foreign business firms. To move forward, there will be two considerations to guide Malaysia's investment policy. Firstly, prudential criteria and secondly the best interest of Malaysia criteria, which includes the effect of the investment on the economic activity, especially in catalyzing new high value-added activities, efforts to enhance international trade and investment linkages as well as impact on financial stability. On the other hand, the second consideration is the sustained presence of the tough and well-managed local banks that helps to mobilize an important share of resident deposits, for the sake of our financial sector development.

5. To Internationalize Islamic finance

Malaysia set about to put many efforts in making Islamic financial ecosystem better, this is because Malaysia is developing into an international Islamic financial centre. Besides, this will provide a more favourable environment to enhance the mobility of financial flows from various players in financial markets to be channelled via modern financial instruments. Establishment of top authority on Shariah matters is needed to make legal frameworks stronger and make Malaysia leadership more advanced in Islamic finance.

6. **To uphold the stability of the financial system**

In order to make regulatory and supervisory regime more effective, a widespread governmental framework will be enacted. The enactment of framework is to enhance a wise, apparent and accountable system for that particular regime. Attention will be focused on improving financial institution liquidity and capital standards and make sure it is similar to international standards. Besides, the focus point includes boosting risk management and governance standards. Furthermore, the larger cross-border cooperation will be pursued with other supervisory authorities because the financial sector starts growing to be more locally and globally connected.

7. **Electronic payments for greater economic efficiency**

The acceleration of the transitions to more electronic payments would be emphasized. From 2011 – 2020,BNM has targeted to raise the number of e-payment transactions from 44 transactions to 200 transactions, as well as to decrease cheques from 207 million to 100 million per year. In order to accomplish this objective, the measures used will include offering the right price indicators to encourage the customers to transfer from paper-based payments to electronic payments, as well as enabling broader outreach of electronic payments infrastructure, for example point-of-sale (P-O-S) terminals and mobile phone banking.

8. **Empowering consumers**

In collaboration with numerous stakeholders, a more comprehensive and complete method towards consumer protection and education will be pursued. The purpose is to encourage the consumers to build a culture of mutual responsibility shared between each other who are endowed with the financial knowledge, skills and

literacy to manage their own personal wealth, as well as financial service providers, who maintain fair and accountable dealings when conducting their business. More infrastructures will be reinforced to support greater consumer empowerment by establishing single consumer credit legislation, integrated dispute resolution system and an enriched credit information framework. Actions to stimulate financial ability of the consumers through the incorporation of curriculum at schools and targeted financial literacy programs based on life events would be pursued.

9. Talent development to support a more dynamic financial sector

A Financial Services Talent Council will be introduced to drive, to supervise as well as to synchronize the financial sector talent development efforts. Other than that, initiatives such as developing talent during entry level, offering constant learning programmes for the prevailing employees, and attracting more talent abroad will be pursued. In addition, safeguarding a sufficient source of skilled talent in order to meet the new financial landscape challenges will involve greater association and coordination among the financial sector agencies.

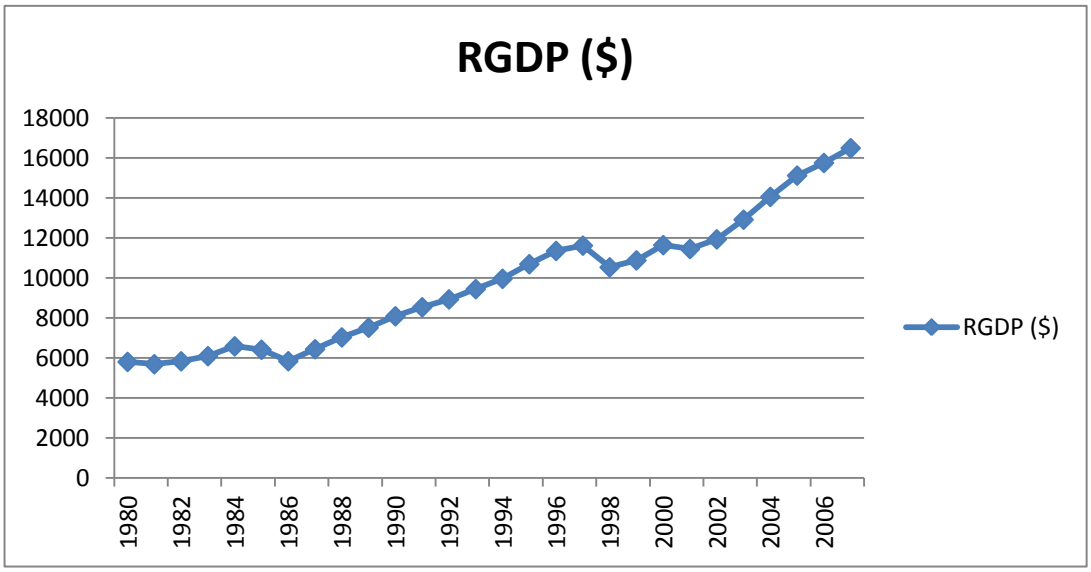
1.2 The Trend of growth in RGDP in Malaysia

The fundamental measure for a country's economic performance is based on Gross Domestic Product (GDP). GDP takes into account the market value of all final goods and services produced by a particular country in a year. GDP can be characterized in three various ways. First of all, GDP is the total expenditures of all final goods and services of production in a country within a stipulated time period. Secondly, GDP is the total value added at every stage of production from all the industries in the country including taxes but subtracting products subsidies. Thirdly, GDP equal to the total income generated by production in the country which consists

of imports less subsidies, compensation of employees, gross operating surplus and taxes on production.

Figure 1 shows the trend of Malaysia's GDP from year 1980 to 2007. GDP of Malaysia rapidly increased from year 1980 to 1984. Then it faced a drop at year 1985 but after that continue increased again. On year 1998 to 2002, Malaysia GDP growth trend is uncertainty. After year 2002, GDP slightly increase every year.

Figure 1: Trend of Malaysia's GDP from year 1980 to year 2007



Source: International Monetary Fund (IMF).

In the early 1980s, the growth in the fiscal deficit buffered the private sector from the effects of adverse events. Despite the deterioration in terms of trade during 1981-84, the growth in real GDP was maintained at 6.7 percent and this was because of the large part expansion in public-sector expenditures. During this period, with no reduction in real incomes, there was simply no reason for households to consider income smoothing during the destabilization. The slight rise in private consumption in the early years of the decade was possibly induced by the appreciation of exchange rate, which would have encouraged current consumption expecting real exchange rate to depreciate in future (Dornbusch, 1985).

In 1983-84, the fiscal adjustments and during 1984-87 periods, the depreciation of real exchange rate led to significant private expenditure adjustments. The declination in real incomes and consumption smoothing behavior were two major forces at work which brought about the needed adjustments in private sector consumption. The negative growth of real GDP in 1985 and the negligible growth in 1986, households were at last obliged to face new external realities, and to experience a decline in real incomes. This inevitably led to a major cut-back in household consumption. Nonetheless, private consumption also fell in proportion to GDP, from 52 percent in 1982 to 45 percent in 1986 to 45 percent in 1986 and 44 percent in 1987. This can be attributed to consumption-smoothing behavior in response to changes in prices. Due to the depreciation of real exchange rate would discourage private consumption, as well as the increment of interest rates would encourage private savings, the decline in private consumption expenditure was greater than that indicated by movements in real GDP.

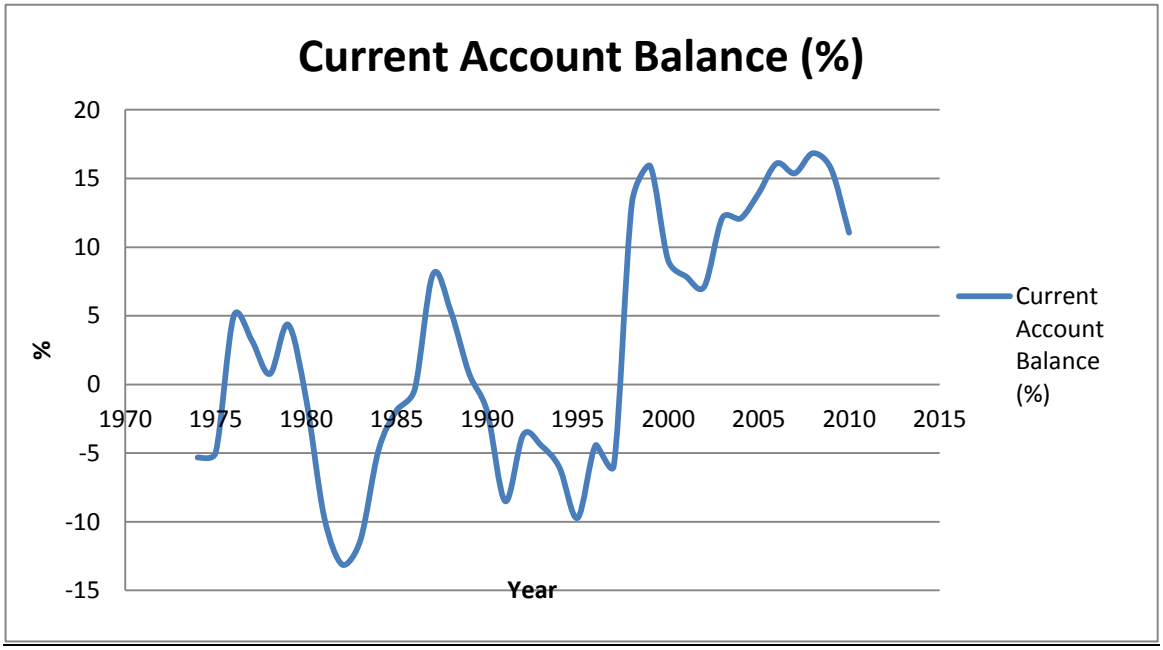
Furthermore, Malaysia experienced an unprecedented decline in private sector investment in the beginning of the Asian financial crisis. After rising constantly between 1987 and 1997 to over 30 percent of GDP eventually private investment collapsed and only began to recover gradually in 2004. However, it still remains substantially below pre-crisis level, approximately 10 percent of GDP in 2005.

1.3 The Trend of Current Account Balance in Malaysia

The current account balance as a percent of GDP provides an indication on the level of international competitiveness of a country. Countries with high export revenues and high savings ratings but weak domestic demand normally have a strong current account surplus. While, countries with a low saving rates, strong imports and high personal consumption rates as a percentage of disposable incomes tends to have a current account deficit.

Figure 2 shows the trend of Malaysia's current account from year 1974 to 2010. Current account of Malaysia rapidly increased from year 1974 to 1976. Then it fluctuates at year 1977 to 1981. It fell sharply at the year of 1982 hit at13.2%. Current account recovered at year 1983 and the trend increase rapidly until 1987 but after that it continue decreased again till 1991. On year 1992 to 1997, Malaysia current account trend fluctuates again. At the year 1998 and 1999, current account increase drastically. After year 1999, current account decrease and fluctuates until the year of 2010. Current Account to GDP in Malaysia from 1980 until 2011 was reported averaged 3.4 percent reaching the highest of 17.5 percent in December of 2008 and a record low of -13.2 percent in December of 1982.

Figure 2: Trend of Malaysia's Current Account from year 1974 to year 2010



Source: World Bank Financial Structure Database.

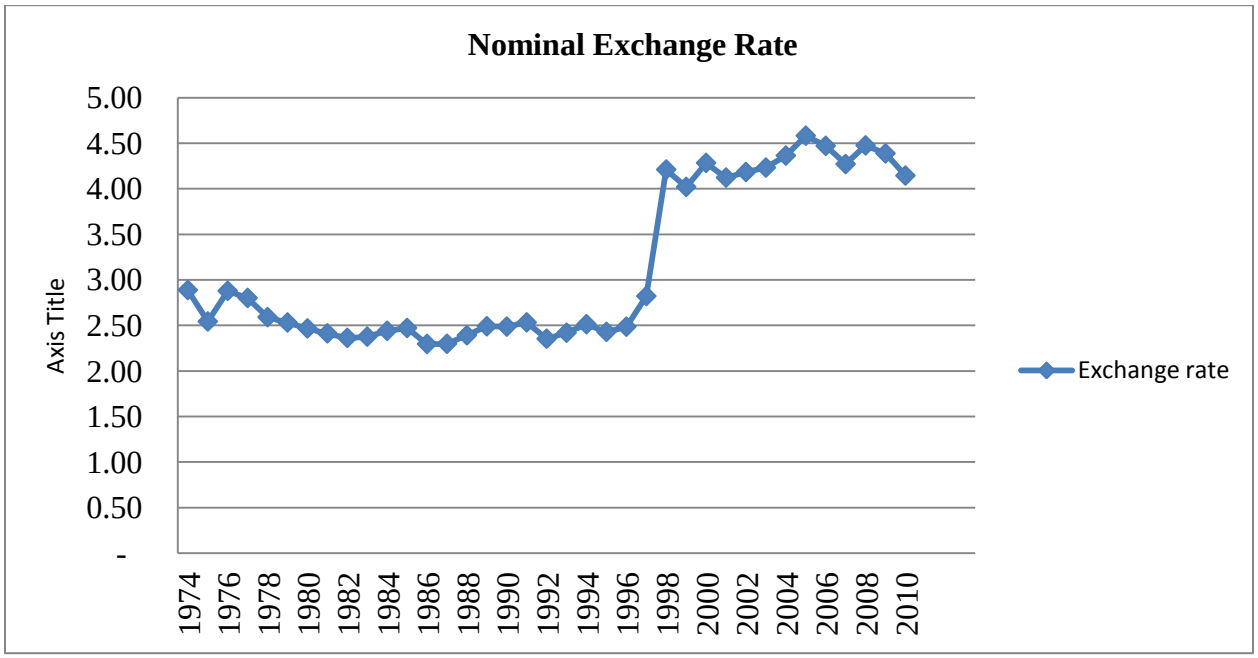
According to Bank Negara (2009), current account balance in Malaysia increased from a deficit of RM17 billion in 1997 to a positive of RM37 billion in 1998. Since 2003 onwards, this surplus exceeded RM50 billion annually. In 2008, when the global financial crisis hit Malaysia, the country's current account surplus

was over RM130 billion, dipping to RM112 billion and RM90 billion in 2009 and 2010 respectively. The foreign exchange reserves had been mounting steadily in the year 1997 to 2010 from RM59 billion to RM328 billion. Reserves peak at RM410 billion in June 2008 and plunged to RM320 billion at the height of the crisis in December 2008, but soon stabilized RM316 billion in 2009, adequate to finance 7.6 months of import and 3.9 times its short term external debt.

1.4 The Trend of Exchange Rate Region in Malaysia

The Malaysian Ringgit (RM), currency of Malaysia, which is formerly known as the Malaysian Dollar (M$). The Bank Negara Malaysia administered exchange controls on behalf of the Malaysian Government throughout Malaysia, with authority delegated to the authorized banks.

Figure 3: Trend of Exchange Rate for Malaysia from year 1974 to year 2010



Source: World Bank Financial Structure Database.

The exchange rate policy of Malaysia has gradually developed over time. According to Lin (1991), the changes in the international monetary system and the increased uncertainty in the international trading environment associated with the large and often random fluctuations in the exchange rates of major currencies will influenced the experience of exchange rate management in Malaysia.

Figure 3 presents the trend of real exchange rate for Malaysia from year 1974 to 2010. In the earliest time, M$ was linked to Pound Sterling. Before 1973, a fixed exchange rate arrangement has been existed in Malaysia and its exchange rate was influenced primarily by developments made on Sterling. The exchange rate of the ringgit was initially pegged to the sterling. Malaysia adopted the U.S. Dollar as the intervention currency in place of the Sterling in June 1972 with the floating of Sterling and dismantling of the Sterling Area.

However, in June 1973, the ringgit was allowed to float upwards against the US Dollar (USD) even if it was confronting continuing uncertainty in the international foreign exchange markets. Malaysia has placed the Effective Rate for ringgit on a controlled and floating basis to maintain orderly market condition and to avoid excessive fluctuations in the value of the ringgit in terms of Malaysia's trading partners and the currencies of settlement. Besides that, by allowing the ringgit to float, it permitted the exchange rate to better reflect the superior power of the market conditions. From the graph, the real exchange rate has gradually decreased from RM 2.88 per unit of USD $ 1 in 1974 to RM2.54 per unit of USD $ 1 in 1975.

Bank Negara Malaysia has adopted a new exchange rate regime in September 1975 whereby the value of the ringgit would be determined in terms of a basket of representative major currencies instead of USD alone as a way to maintain orderly and stable exchange rates. The basket of currencies measured by the basis of the major currencies of settlement and the trade shares of the major trading partners of Malaysia. This exchange rate arrangement has continued to form the basis of the existing exchange rate policy of the country which results in fluctuation of value of

ringgit relative to the basket, according to the prevailing conditions in the economy in general, as well as supply and demand conditions in the foreign exchange market in particular. The policy interventions by the Bank Negara Malaysia in the exchange market were made only for market stabilisation.

A major policy focus in Malaysia was to maintain relative stability and minimise the fluctuation in the exchange rate of the ringgit and it was consistent with the more fundamental objective of preserving the overall price stability in Malaysia, especially by minimising the extent of imported inflation transmitted to the country which could result from sharp exchange rate depreciations.

During the period 1976 to 1980, there were strong improvements in the merchandise and current account balances of the balance of payments. As a result, the ringgit was maintained relatively stable where the composite index fluctuated between 100 and 102 which September 1975 as a base. Nevertheless, since 1979, weakness in the balance of payments began as a result of the global recession took place and resulted in lower demand for Malaysia's export and led to a significantly weaker merchandise balance position. In year 1976, there is a small increase of exchange rate from RM2.99 per unit of USD $ 1 to RM3.26 per unit of USD $ 1 in 1978. After that, the exchange rate decline again starting from 1979.

In year 1982 to 1983, there was current deficit that was peaking which made the deterioration in the balance of payments position worsened further in the period 1981 to 1984. In spite of that, the ringgit gained back the strength in terms of the composite basket even it weakened moderately against USD. During year 1981 to 1984, there was an appreciation of ringgit of up to 5% a year where the official composite index was moved within 103.5 and 109.5.

In early 1980s, government tried to increase its expenditure as a way to ride out the global recession had resulted in large overall budgetary deficit which financed by foreign borrowing. There was large inflows of official long term capital in the

balance of payments as a result of higher foreign borrowing had created a demand for the ringgit, which restrained currency from depreciating despite the poor current account position prevailing during the period.

Apart from this, appreciation of the ringgit during year 1980 to 1984 was due to the intervention on operations of Bank Negara Malaysia. Although the policy was to keep ringgit relatively stable with Singapore Dollar, the ringgit kept relatively strong with the intervention through the USD. This policy had clearly created cost to the economy. Owing to the strong currency, it had helped to contain the impact of imported inflation in Malaysia and to some extent, it sustain confidence in fundamentally weak economy. From year 1980 to 1984, the exchange rate was between RM2.47 to RM2.44 per unit of USD $1.

The appreciation in the ringgit exchange rate did not maintain. When the other ASEAN currencies became weaken together with the nervous foreign exchange markets abroad associated with the strong USD, caused bouts of speculation on the ringgit. The growing deficit in both external and fiscal accounts has further increased the frequency and intensity of these attacks and in the end lead to the speculative burst in October 1984. From 1985, the ringgit depreciated against the composite, Singapore Dollar and all major currencies except for the USD. This progressive depreciation generally continued into 1990, before the ringgit turned around to appreciate against certain major currencies in 1991 and against all major currencies in 1992.

In the first half of 1992, the ringgit had appreciated across the board was due mainly to higher interest rate differentials in favour of ringgit *vis-a-vis* other currencies, which attracted substantial inflows of capital following the tightening of the monetary conditions since 1989 as well as the bearish sentiments for the USD in the international foreign exchange markets, arising from the weak economic recovery of the United States.

During the first half of 1997, the ringgit had move around RM 2.82 against USD. When Thai baht was floated in 2 July 1997, ringgit came under strong pressure because it had maintained large current account deficits during the early and mid-1990s. As a result, the Bank Negara had put effort to defend the ringgit and they managed to strengthened ringgit against USD for few days before the useless ringgit defence effort was abandoned by mid-July 1997. Malaysian policy makers did not seek help from IMF and hoped that they would avoid the crises that overtook Thailand and Indonesia in the second half of 1997. The Malaysian policy maker introduced policies of fiscal and monetary restraint in December 1997 were described as "IMF policy without the IMF", but did not get any support from the Prime Minister Dr. Mahathir at that time which make them reversed it over the next eight months.

In September 1998, Malaysia adopted a mild expansionary fiscal and monetary policies where it pegged the currency at a rate against RM4.21 per unit of USD $1 and severely tightened its capital account controls as a complete break with the IMF's prescription for dealing with the Asian crisis. The ringgit was floated, and the same exchange rate determination was sustained up till the Asian Financial Crisis in 1998. The exchange rate of the Ringgit was no longer determined by demand and supply in foreign exchange market. Malaysia returned to a fixed exchange rate system.

Bank Negara Malaysia has now removed its exchange controls, other than those designed to prevent the use of the ringgit in offshore financial centres. It has continued to keep the ringgit pegged to the dollar up to the present; nevertheless it also sets short-term interest rates. Therefore, it has to sterilise the monetary effects of its exchange market interventions.As a consequence of the crisis, there has therefore been a considerable convergence in the policies of the Bank Negara Malaysia.

1.5 Objectives

In our study, the objective is to determine the elements of the economic environment which make banking sector fragility and finally lead to emergence of systematic banking crisis in Malaysia. We hypothesize inflation, domestic credit to the private sector to GDP, GDP per capita, M2 to reserves, nominal exchange rate and current account balance to have significant impact on the probability of banking crisis in Malaysia. For this purpose, we study the determinants of the probability of a banking crisis and evaluate the chosen determinants' value by exercising linear probability model, binary logit and probit models with annual data. The econometric approach which is limited dependant variable probability models we use in our study is exactly same as in Bucevska (1997) studies.

1.6 Problem Statement

Banking crisis is the financial crisis which affects the banking activity. It includes bank runs, banking panics as well as systemic banking crisis which are a country experiences a large number of defaults while financial institutions and banks faces great difficulties in repaying contracts. A banking crisis is determined either by the event of bank runs which would lead to the demise of financial institutions or by the demise of a financial institution which starts a string of similar demises. Zistler (2010) argues that understanding banking crisis requires the understanding of banking systems and the history financial crisis. Due to the banking crisis, serious question have been raised to the policy makers and researches so that they will be able to determine the factors of the banking crisis in order to have an early warning system which could help with the prediction of the approaching banking crisis.

As most of Malaysia and indeed the world, the Malaysian banking sector was heavily affected by the financial crises. The sector unfortunately began to suffer record deficits during the financial crisis from delivering record profits in the years preceding the financial crises. There were nevertheless differences in the degree to

which the Malaysia banks were impacted by the financial crisis. Some commercial banks collapsed, some merged with others to survive and some experienced a decreasing performance. But even among the banks that merely experienced a decreasing performance, can significant differences be uncovered.

There are not many research conducted to identify the determinants of the banking crisis specifically on Malaysia. However, the results of the determinants of banking crisis obtained by the researchers are conducted based on developed and developing countries.

In the light of this, we are motivated by this interesting scenario. Therefore, this research is conducted to investigate the factors of the economic environment that leads to the systemic banking crisis in Malaysia by providing new insights of the determinants of the banking crisis by using newer datasets, time frames and better developed variables.

Hence, we do a research on impact of banking crisis by using the financial indicators, macroeconomic variables and banking variables in the case of Malaysia.

1.7 Significance of the Study

This thesis' studies the fundamentals which are associated with the emergence of systemic banking crises. Low GDP growth, high inflation, low creditor rights, low GDP per capita as well as financial reforms have been found to increase the possibility of a banking crisis.

Banking crises may interrupt the movement of credit, decrease investments and may force viable firms into liquidation. Therefore, a banking crisis would cause a decline in wealth. Hence, understanding the roots and the mechanism behind banking

crises with the goal of preventing the incidence of a systemic crisis is a key objective for policymakers.

CHAPTER 2: LITERATURE REVIEW

2.1 Relationship between nominal exchange rate and banking crisis

The likelihood of banking crises evaluated as endogenous variable caused by nominal exchange rate which is a important factor to banking crisis. Nominal exchange rate term was significant and negatively associated with banking crises. This is because the appreciation of nominal exchange rate increased the likelihood of banking crises based on Mendis (2000). The behavior of the exchange rate has a high major impact on banking crises in all specifications but it has a negative sign**.** This would be explained by the fact that banking crises are often preceded by an exchange rate appreciation **(**Hardy and Pazarbasioglu, 1998). In fact, exchange rate appreciation may influence the competiveness of the country and cause a corrosion of the corporate sector effectiveness (Boudriga and Ghardallou, 2012).

In a fixed nominal exchange rate regime, a foreign inflow increases international reserves and the money supply. Since the nominal exchange rate was fixed, the price level increases to accommodate the raised in money demand. Increased liquidity in the banking sector may cause an expansion in credit. At the same time, a subsequent impact of a negative shock will result higher interest rates that caused difficulties for borrowers to service their debts with the banking system which leave banks with a large amount of bad debt. According to Mendis (2000), when the exchange rate pegged to the dollar, real exchange rate also appreciates causing exports less competitive. A subsequent economic downturn led to devaluation, followed by capital outflows. Therefore, companies and banks which had borrowed in foreign currency for debt servicing requirements rose in local currency terms leading to several bank failures.

Under a flexible exchange rate, the money supply is exogenous. Any decline in net foreign assets would cause a reduction in the money demand. This will lead to depreciation of currency and raise domestic prices, thus decreasing the demand for real money balances. This causes the reduced in the real value of assets of the banking system facilitating their repayment. In comparison, real value of bank liabilities would also drop, reducing the impact of the negative outflow on banks.

The existence of dollar debt is often presented as an argument in favor of pegged exchange rates (Velasco and Cespedes (1999)). It is argued that a nominal devaluation will radically increase the burden faced by debtors and can create a wave of corporate bankruptcies. This may influence the probability of banking crisis, as banks see their shock of nonperforming loans increase. Calvo (1999) also supports this assumption and claims that "liability-dollarized economies are highly vulnerable to devaluation". According to Calvo (1999) and Calvo and Reinhart (2000a, 2000b), a series of current studies have provided a strong support for the significance the exchange rate stability particularly in the case of developing countries. This is because developing countries are frequently overwhelmed by insufficient of credibility as well as admission to international markets, more prominent unfavorable effects of exchange rate to inflation. Therefore, flexible exchange rate arrangements are not appropriate for developing countries. However, the option of exchange rate regime does not seem to be the only determinant of banking crises in this study.

The determinant of nominal exchange rate is extremely vital since it influences real variables. According to Krugman (1993) "The evidence on the real effects on the change of nominal exchange rate is overwhelming at the primary sight for industrial nations, particularly since 1980, nominal exchange rates have been replicated in almost one-for-one changes in the relative prices of products and labor. From 1980 to 1985 the $US is the most obvious example where its trade-weighted nominal exchange rate increase a percentage of 49%, its real rate by 44% and starting 1985 to 1990, the nominal rate reduced by 47%, and the real rate reduced by 43%,

hence, the changes in nominal exchange rate seems to have a close one-for-one impacts on real exchange rates."

2.2 Relationship between Domestic Credit to Private Sector and Banking Crisis

Rapid development in bank credit to private sector has a relationship in explaining banking crises (Demirgüc-Kunt 1997, Kaminsky 1998-1999). As a matter of fact, there is around 75 percent of credit booms result in banking crisis in rising markets IMF (2004). Credit expansions are generally activated by the good prospects for asset prices,future returns and capital inflow. In the end, individual, family and firms accumulate their debt and their income keeps constant all at once. Declining in asset prices will lead tohigh probability of default loan and non-performing loan. The banking crisis will occur in that particular country if the problem is persistent.

From another point of view, the literature demonstrates that larger credit levels are advantageous for economic growth. Nonetheless, that literature differentiates among two types of credit – household credit along with enterprise credit, with diverse inferences for economic growth. There are a lot of empirical as well as theoretical facts shows that enterprise credits boost economic expansion by limiting the firm liquidity and this leads to new firms development and existing firms as well (Levine 2005). On the other hand, the evidence shows that that the household credit either does not bring any impact on medium and long-term economic development (Beck 2008) or that it even decreases growth. Jappelli and Pagano (1994) dispute that the more the household credit is available, thepersonal savings and economic expansion will decrease.

Based on the research done by Caballero, Hoshi and Kashyap (1943-1977) on Japan, the trend growth rates of money and credit fell radically following the collapse

in stock and land prices in 1990 and 1991. Then, after primarily moving in line with each other, money and credit growth started to deviate with the onset of the Asian crisis in 1997. While broader monetary aggregates continued to boost at a moderate but stable speed, the upturn in economic activity following the Asian crisis was not accompanied by expansion in private sector credit, which contracted for nearly an entire decade. Apart from this, the moderate growth of broad money corresponded with a strong expansion in narrow money and a flow in credit to the public sector. Japan's experience proposes both that money and credit growth may stay subdued for a extended period of time following financial disorder and that credit expansion in particular may stay weak as deficits persist to prevail in the banking system.

2.3 Relationship between M2 Reserve and Banking Crisis

Money supply is a total quantity of monetary assets accessible in a nation at a precise time. Financial Times demonstrates that, money supply M0 and M1, are broadly identified as narrow money which consist of notes and coins in flow and other assets which are effortlessly exchangeable to cash. Money supply M2 includes M1 together with short-term time deposits in banks. On the other hand, money supply M3 consists of M2 and longer-term time deposits. Meanwhile, money supply M4 consists of M3 plus other deposits. Besides, the phrase broad money is used to explain money supply for M2, M3 or M4.

Malaysia money supply M2 averaged at 387407.39 MYR Million getting at all times elevated of 1330934.89 MYR Million in December of 2012 and a record low of 4122.30 MYR Million in December, 1970. Malaysia Money Supply M2 consists of M1 and short-term time deposits in banks. Demirgüc-Kunt and Detragiache (1998) analyse whether systemic banking sector problems are associated with unexpected capital outflows we commence as the ratio of M2 to foreign

exchange reserves. Calvo (1996) once stated that this ratio is a superior forecaster of a nation's exposure to balance-of-payments crises.

According to Zistler (2010), he suggested to determine unexpected capital inflow or outflows and a nation's exposure to balance-of-payment crises (Calvo, 1996) since the ratio of M2 to foreign exchange reserves of the central bank. He expected closely in line with Calvo (1996) and Demirgüc-Kunt and Detragiache (1997), the positive relationship between the variable quantifying M2 to reserves and banking crisis.

The ratio of central bank's M2 to foreign exchange reserves, which is known as M2RESERVES, measuring external exposure to capital outflow, does not appear to amplify the likelihood of a crisis in all the model specifications. This phenomenon is dissimilar with the forecast in presumption and the conclusion of Demirgüc-Kunt and Detragiache (1997). Conversely, M2RESERVES is statistically unimportant and relatively small in resulting there are no strong evidence on the conclusion of the variable's impact on the likelihood of banking crisis.

Concerning the financial variable M2 to reserves that predicts the exposure to capital outflows, no important results were discovered by Zistler (2010). Opposing to theoretical hypotheses and the conclusion drawn by Demirgüc-Kunt and Detragiache (1998), this variable demonstrates negative coefficients in every model specifications. The regression would consequently entail raise in capital outflow decrease the possibility of a banking crisis. This statement could imply that the likelihood of foreign capital outflow is a good instrument to overcome the banking crises.

2.4 Relationship between GDP per capita and Banking Crisis

Gross domestic product (GDP) is described as the market value of the entire authoritatively recognized final goods and services which are produced in a nation in a specified period of time. GDP per capita is frequently measured an indicator of a country's standard of living. As a result, it plays a big role in determining the happening of a banking crisis in a country.

Based on the results of studies on the determinants of a banking crisis performed by Klomp (2009), it was illustrated that GDP per capita is significant in nearly all studies because it not only take a country average income into account, the development of the country in term of financial system and organization as well. Other than that, the real GDP per capita was capable to aid in controlling the differences in the economic development. The results acquired were able to identify that GDP per capita is significant in increasing the likelihood of a systemic crisis as soon as the sample is separated into systemic and non-systemic crisis. In other words, systemic crisis are more prominent in less developed countries.

A research done by Zistler (2010) showed that high GDP per capita drastically raise the likelihood of banking crises which also restructured the research done by Demirgüc-Kunt and Detragiache (1997) and completely change their results. This is because the results of Demirgüc-Kunt and Detragiache (1997) states that low GDP per capita restrains the biggest risks of banking crises. Zistler (2010) was able to create results that suggested that high GDP per capita would cause increase likelihood of banking crisis through the search of higher profits of the nation.

The relationship of this variable is also supported by the research done by Davis and Karim (2008) which specified that enhancement in institutional quality allied with higher GDP reduces the banking crisis risk given that the coefficient on the alter in GDP per capita is negative and important.

However, results from the estimation and forecast based on Roy and Kemme (2012) indicated that declining growth rates of real GDP per capita failed to show

matches across historical banking crises and the recent global crisis. This is because a declining growth rate of real GDP per capita does not offer adequate information to conclude that it will lead to banking crisis if there is no stock or real estate bubble or credit boom.

2.5 Relationship between Current Account and Banking Crisis

Current Account/GDP is the ratio of entire current accounts of corporations, private households and the government which is connected to the country‘s GDP in the pre-crisis year t-1 (t indicates the first year of banking crisis). The current account balance of Malaysia increased from a deficit of RM17 billion in 1997 to a surplus of RM37 billion in 1998. Then, starting from 2003, this positive figure has surpassed RM50 billion every year. When Malaysia was hit by global financial crisis in 2008, its current account surplus was still larger than RM130 billion, falling to RM112 billion and RM90 billion in 2009 and 2010, correspondingly. Furthermore, its foreign exchange reserves have been increasing gradually, from RM59 billion in 1997 to RM328 billion in 2010. In June 2008, reserves peaked at RM410 billion and plunged to RM320 billion at the peak of the crisis in December 2008, but rapidly it was stabilized at RM 316 billion in 2009, sufficient to finance 7.6 months of import and 3.9 times its short-term external balance due (Bank Negara, 2009).

In this research, we would like to measure whether current account/GDP ratio can assist to forecast banking crises in logit models of Malaysia banking crises. Barrell et al (2010a) suggest that deficits in current account may raise the risk of banking crises. The suggestion was nearly alike to Reinhart and Rogoff (2009) who suggested that one of the common forerunners of banking crisis in OECD countries is widening current account imbalances, and an important segment of the international finance literature associates with problems in the external account to financial crises.

There are many possible connections that can be analyzed from current account deficits to the risk of banking crises such as, according to McKinnon and Pill (1994), capital inflows in an inadequately regulated banking system with a security net may cause over lending cycles, extremely high consumption and overheating economy. This is because current account deficits that are associated with monetary inflows that allow banks to increase credit excessively, at the same time as potentially exposing them to unstable international wholesale markets. This may cause a high credit demand and increasing asset prices in a weak manner. Lower real interest rate would further worsen the situation. Foreigners may discontinue financing deficits in home currency if they believe their assets are defenceless to monetization through inflation. This may disturb asset markets and banks' funding. This results to appreciation in exchange rate, deceleration in growth and also a failure of competitiveness. From then on, it's common that this will cause a collapse in the currency that leads to a banking crisis.

However, according to Hardy and Pasarbasioglu (1999), who estimated the logit models of banking crises for developed as well as developing countries, found that the current account was not important, even though the vary in the gross foreign debts of the banking sector (that may come with a current account deficit) was frequently significant with a positive magnitude at a longer lag and a negative magnitude as the crisis is approaching. Via a probit model approach, Eichengreen and Rose (1998) yet again found that the current account is irrelevant to forecast the banking crises in developing countries based on simple statistical calculations.

On the other hand, we believe that there is a bidirectional relationship between current account balances and banking crisis which means the occurrence of banking crises will have definite impact on the current account balance as well. Banking crises are severe and gradually more transmitted across borders. Imports and exports of goods and services, which can be reflected by the current account balance, are one of the transmission channels of banking crises across countries. In recent years, the pattern of worldwide current account imbalances has received substantial attention,

including the U.S. huge deficit and Asian countries surpluses, including China, as well as oil-exporting economies. Rising imbalances on current accounts may cause negative impact to the countries' economy such as threatening economic constancy and the prospects of sustained economic upturn (Sebastian Edward, 2004; Maurice Obstfeld and Kenneth Rogoff, 2009; Obstfeld, 2012).

2.6 Relationship between Inflation and Banking Crisis

According to Janet (2007), banking crisis emerges much more possible in both extremely "low" inflation environments or in extremely "high" inflation environment. Low inflation environments such as the U.S. economic depression or Japan during its "lost decade" of the 1990s, for instance, were renowned for their prevalent banking sector problem. The same banking-sector problems emerge in quite a few economies that attribute very high inflation rates. Theory predicts that there will be a short-run outcome that works through the drop of the home currency. This result is particularly essential for open economies and developing countries (IMF, 1996, Ch. VI and Mohanty and Klau (2001)). If a country has adopted a fixed-exchange-rate system, this system will usually come under substantial stress. In fact, empirical indications demonstrate that there is a strong connection between banking crisis and exchange-rate crisis and that banking crisis is likely to precede exchange-rate crises (Kaminsky and Reinhart, 1999). Based on diverse forms of the transmission instrument, there should be a positive medium-run effect of expansionary monetary policy on aggregate demand and thus on the price level. Nevertheless, there is also a contradictory outcome of banking crises on inflation.

According to English (1996), banking sector problems may pursue triumphant stabilization in country with a record of high rates of inflation. Constant high inflation often allied with exaggerated financial sectors, as financial intermediaries earns from the floats of payments. As inflation is thoroughly decreased, banks' one of the most important basis of revenue disappear, followed by widespread banking problems.

Lately, banking sector problems in Brazil as well as Russia have been clarified in this means (Lindgrenm and Saal, 1996).

On the other hand, there are researches who illustrate that not only inflation lead to banking crisis, there is a underlying relationship between these two variables. A banking crisis usually leads to a loss of production and pretty often to severe recessions (Cecchetti, 2009). The output gap will lead to a reduction in demand; hence, inflationary pressure should reduce. Admittedly, this is a fundamental description of the determinants of inflation. Its purpose is merely to highlight that, from a theoretical point of view; we can anticipate mutually positive and negative effects of banking crises on inflation. A banking crisis should cause a decline of inflation but a powerfully expansionary monetary policy that is carried out to contest the banking crisis might result in a raise in inflation, ceteris paribus. Therefore, it is an open and appealing empirical question on whether inflation decreases or increases in the result of a banking crisis.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Data Sources

We include banking-sector and macroeconomic variables from the existing literature as prospective predictors. Besides the current account/GDP ratio (CA), macroeconomic variables are inflation (INF), and GDP per capita (GDPPC). Banking and financial indicators to banking crisis are the domestic credit to private sector (DCPS), nominal exchange rate (NER) and money and quasi money (M2) to total reserves ratio. Because of data availability, our study is limited to the period 1974 – 2010.

There are several sources for our data on the endogenous and exogenous variables. Data on inflation (INF), GDP per capita (GDPPC), money and quasi money (M2) to total reserves ratio, current account/GDP ratio (CA), domestic credit to private sector (DCPS) and nominal exchange rate (NER) was obtained from World Bank Financial Structure Database whereas data on dependent variables, non-performing loans (NPL), was obtained from Bank Negara Malaysia. The data available for NPL is from 1988 – 2010. To identify banking crisis inception dates for the endogenous variable, we rely on information from previous case studies, including Lindgren, Garcia and Saal (1996), Caprio and Klingebiel (1996), Demirguc-Kunt and Detragiache (1998), Glick and Hutcison (2001), Kaminsky and Reinhart (1999), and Bordo and Schwarz (2000) and Bordo et al who have stated that banking crises occured in the year of 1985 – 88 and 1997 – 99. Following Demirgüç-Kunt and Detragiache (1998), we consider episodes of bank distress to be banking crisis when non-performing loans reached at least 10 percent of the bank assets (refer to Appendix I).

We use INF to denote inflation (%), GDPPC to denote gross domestic product per capita(%), M2 to denote money and quasi money to total reserves ratio (%), NER to denote nominal exchange rate (%), CA to denote current account to GDP (%), DCPS denote domestic credit to private growth (%) and BC for probability of banking crisis.

3.2 Empirical Model

Banking crises stimulate effect towards the economic performance of a country with the macroeconomics and financial variables that are taken into consideration. Mendis (2000) have concentrated to link a measure of the nominal exchange rate with banking crises to determine their effects. They found that exchange rate appreciation tend to increase the likelihood of banking sector problems. The results showed that estimated results for nominal exchange rate have a negative relationship with probability of banking crisis and this is consistent with their expectation.

Besides that, (Demirgüc-Kunt et. al 1997, Kaminsky et. al 1998-1999) examined Domestic Credit to Private Sector (DCPS) and Banking Crisis and found out that speedy development in bank credit to private sector has a relationship with banking crises. According to Zistler (2010), he suggested to measure sudden capital in or outflows and a country's vulnerability to balance-of-payment problems (Calvo, 1996) as ratio of M2 to foreign exchange reserves of the central bank. He expected exactly as Calvo (1996) and Demirgüc-Kunt and Detragiache (1997), the variable measuring M2 to reserves to positively relate to the banking crisis.

Despite that, it was illustrated that GDP per capita is significant in almost all studies because it not only take a country average income into account, the development of the country in term offinancial systemand organization as well which

is reported by Klomp (2009). On the other hand, Barrell et al (2010a) found that current account/GDP ratio in logit models can help to predict banking crises of Malaysia banking crises and suggested that deficits in current account may increase the risk of banking crises. Lastly, as shown by English (1996), banking sector problems may follow successful stabilization in country with a history of high inflation.

Based on the model constructed by Demirgüc-Kunt and Detragiache (1998), the probability of banking crisis was estimated using the multivariate logic model. Hence, our dependent variable which is the crisis dummy takes the value zero if there is no crisis and takes the value one if there is crisis. The coefficients reflect the effect of a change in the exogenous variables. Consequently, the rise in the probability depends on the original probability and also upon the original values of the exogenous variables and their coefficients.

Using all these data, in line with the discussion above, we tested for their effect in Linear Probability Model, Logit and Probit regressions of Malaysia banking crises over 1974 – 2010, starting from a full set of six exogenous variables. Thus our exogenous variables, as above, are the inflation (INF), GDP per capita (GDPPC), money and quasi money (M2) to total reserves ratio, current account/GDP ratio (CA), domestic credit to private sector (DCPS) and nominal exchange rate (NER).

Our initial empirical model is specified as follow:

Model 1:

$$BC_{\mathrm{t}} = \beta_1 + \beta_2 CA_t + \beta_3 DCPS_t + \beta_4 \mathrm{GDPPC_t} + \beta_5 \mathrm{INF_t} + \beta_6 \mathrm{M2R_t} + \beta_7 \mathrm{NER_t} + \mathrm{e_t}$$

It consists of current account/GDP ratio (CA_t),domestic credit to private sector ($DCPS_t$), gross domestic product per capita ($GDPPC_t$), inflation (INF_t), M2/Reserve ($M2R_t$), and nominal exchange rate (NER_t), to explain the banking crisis in Malaysia

for the period between year 1974 to year 2010, while e_t is distributed error term in the empirical model which is estimated by the ordinary least squares estimation technique.

Our logit empirical model is specified as below:

Model 2:

$$BC_t = \frac{1}{1 + e^{-(\beta_1+\beta_2 CA_t+\beta_3 DCPS_t+\beta_4 \mathrm{GDPPC_t}+\beta_5 \mathrm{INF_t}+\beta_6 \mathrm{M2R_t}+\beta_7 \mathrm{NER_t}+e_t)}}$$

It consists of current account/GDP ratio (CA_t),domestic credit to private sector ($DCPS_t$), GDP per capita ($GDPPC_t$), nominal exchange rate (NER_t), to explain the banking crisis in Malaysia for the period between year 1974 to year 2010, while e_t is distributed error term in the empirical model which is estimated by the technique of Maximum Likelihood.

Our probit empirical model is specified as below:

Model 3:

$$BC_t = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\beta_1+\beta_2 CA_t+\beta_3 DCPS_t+\beta_4 \mathrm{GDPPC_t}+\beta_5 \mathrm{INF_t}+\beta_6 \mathrm{M2R_t}+\beta_7 \mathrm{NER_t}+e_t} e^{-(\beta_1+\beta_2 CA_t+\beta_3 DCPS_t+\beta_4 \mathrm{GDPPC_t}+\beta_5 \mathrm{INF_t}+\beta_6 \mathrm{M2R_t}+\beta_7 \mathrm{NER_t}+e_t)^2/2} dz$$

It consists of current account/GDP ratio (CA_t),domestic credit to private sector ($DCPS_t$), gross domestic product per capita ($GDPPC_t$), nominal exchange rate (NER_t), to explain the banking crisis in Malaysia for the period between year 1974 to year 2010, while e_t is distributed error term in the empirical model which is estimated by the technique of Maximum Likelihood.

3.3 Methodology

3.3.1 Linear Probability Model (LPM)

To examine the determinants of banking crisis which is a binary dependent variable that takes the value 1 if one outcome is chosen, and takes the value 0 if otherwise, few types of methods are most commonly used by the researchers which are Linear Probability Model, Logit, Probit Regressions. When estimating the regression models with qualitative dependent variables, we need to know some important differences in the interpretations of the models. First, in a classic OLS model, a slope coefficient is typically interpreted as the increase in the value of a dependent variable given a single unit increase in the associated independent variable. However, this kind of interpretation is no longer hold when the dependent variable is qualitative.

Linear Probability Model (LPM) is an unconstrained qualitative model which can be used to predict the probability of certain event occurs when we assume that the rate of changes in probability is constant or same across different time periods. Given the following linear probability model,

Conditional probability of the event occurs

$$P_i = P(Y_i = 1|X_{1i}) = \beta_0 + \beta_1 X_{1i} + \cdots + \beta_p X_{1p} + \varepsilon_i$$

Conditional Probability of the event not occurs

$$1 - P_i = 1 - P(Y_i = 1|X_{1i}) = P(Y_{1i} = 0|X_{1i}) = 1 - (\beta_0 + \beta_1 X_{1i} + \cdots + \beta_p X_{pi} + \varepsilon_i$$

In this linear probability model, a slope coefficient $\beta_p$can be interpreted as the increase in the probability where the dependent variable observation will equal one given a single unit increase in the associated independent variable, while holding other variables constant.

There is an important drawback in LPM model that we need to take into account which is its error terms will display heteroscedasticity if the variances of the

error term are not constant. Since each observation of the dependent variable y must equal zero or one, therefore all errors will be related to the independent variables. By explaining in this way, given a set of values of x, the dependent variable y can only take one of the two values, and the error terms will be either positive or negative, depending on this y value.

On the other hand, there is no guarantee that all of the predicted value for the dependent variable will fall within the range between 0 and 1 because LPM assumes that the rate of change in probability is constant when the value of the independent variables is changed by 1 unit without setting any constraint for the dependent variable.

Jeff Wooldridge's widely used undergraduate text, Introductory Econometrics: A Modern Approach devotes a section of the chapter on regression with qualitative variables to the LPM. He points out two flaws: computation of the predicted probability and marginal effects—and goes on to state "Even with these problems, the linear probability model is useful and often applied in economics. It usually works well for values of the independent variables that are near the averages in the sample." (2009, p. 249) Besides, Wooldridge also discusses the heteroskedastic nature of the LPM's error, which is binomial by construction, but does not address the issue of the lack of independence that this implies.

LPM is simple to estimate and to interpret; we are able to generate an inference which is the same as for multiple regressions (need heteroscedasticity-robust standard errors). However, it does not make sense that the probability should be linear in X. In addition, the predicted probabilities can be less than zero or more than one. These disadvantages can be solved by using a nonlinear probability model: probit and logit regression.

3.3.2 Logit model

The logit model is a qualitative model which was introduced by Joseph Berkson in 1944. This qualitative model is the alternative model for the LPM model. The logit model is used for predicting the outcome of a categorical dependent variable based on one or more predictor variables. It measures the relationship between a categorical dependent variable and usually a continuous independent variable (or several) by converting the dependent variable to probability scores. The logit model is a constrained qualitative model because it will confirm that the probability of event occur in between 0 and 1. This implies that the probabilities produced by the logit model have an interval on 0 to 1. The logit model is an intrinsically linear regression model (nonlinear regression model). It needs natural logarithms transformation to become a linear regression model.

$$\text{Logit model (1)}: \frac{P_i}{1-P_i} = e^{\beta_0+\beta_2 X_i+\varepsilon_i}$$

$$\text{Logit model (2)}: ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_i + \varepsilon_i$$

Where $\frac{P_i}{1-P_i}$ is the odds ratio, $ln\left(\frac{P_i}{1-P_i}\right)$ is the natural logarithms of odd ratio, e is the exponential, X is the independent variable and ε is the error term. The logit model (1) is a model with not constant unknown parameter values (Intrinsically Linear Regression Model). The logit model (2) is a model with constant unknown parameter values (Linear Regression Model).

There are two methods to estimate the unknown constant parameter. The first method is the Ordinary Least Square (OLS) method. It is a method to estimate unknown constant parameter with minimizing total error squares. It is used when the data involves very large or small sample size. Its estimation process does not involve any iteration procedures. This method provides the unbiased of variance regression. The second method is the Maximum Likelihood (ML) method which is the alternative of the OLS method. It is a method to estimate unknown not constant or constant parameter with maximizing log likelihood. It is used when the data involves very

large sample size. Its estimation process involves iteration procedures with calculus and probability. This method provides biased of variance regression.

There are five features of the logit model. The first feature is when X increases from negative indefinite values to positive indefinite, the ln odds ratio will change from negative indefinite to positive indefinite values. This will lead the probability value to lie between 0 and 1. The second feature is the interpretation of estimated parameter value for logit model is different compared to the LPM model. This is because the LPM assumes that probability is linearly related to X_i and the logit model assumes that the ln odds ratio is linearly related to X_i. The third feature is the probability prediction for logit model is different compared to the LPM model. This is because we cannot predict the probability directly with the logit model. Therefore, we need to take antilog on ln odds ratio to compute the predicted probability of event occur. The fourth feature is the logit model does not necessarily have one independent variable, many independent variables can be added into the qualitative model as indicated by the underlying theory. The fifth feature is if ln odds ratio is positive, it means that there is high possibility of interested event will happen. If ln odds ratio is negative, it means that there is low possibility of interested event will happen.

3.3.3 Probit Model

Probit model was introduced by Chester Bliss in 1935 and developed by McFadden in 1973 based on the utility theory or rational choice perspective on behavior. This qualitative model is the alternative model for LPM and it is a constrained qualitative model because it confirms that the probability event occurs is between 0 and 1. This implies that probabilities produced by probit model have interval of 0 and 1, which is similar to logit model. In our model, 1 indicates that there is a banking crisis during that particular year whereas 0 indicates that there is no banking crisis.

Probit model uses the normal Cumulative Distribution Function (CDF) or standard normal (Z) probability distribution to derive the probability function. In a standard normal curve table, the table matches Z scores with a proportion of the area under the curve between the absolute value of the Z score and the mean Z score of 0. With simple calculations, the standard normal table also identifies the proportion of the area from negative infinity to Z score. The proportion of the curve at or below each of the Z scores defines the cumulative standard normal distribution. Since the proportion is identical with the probability that falls at or below that z score, larger Z scores define greater probabilities in the cumulative standard normal distribution (Pample, 2000). On the contrary, just as any Z score defines a probability in the cumulative standard normal distribution, any probability in the cumulative standard normal distribution translates into a Z score. In sums, the cumulative standard normal curve resembles the logistic curve, only with Z scores instead of logged odds along the horizontal axis (Pample, 2000).

The probability function is stated as

$$P\ (Y_i = 1|\ X_1) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\beta 0 + \beta 1 + \mathcal{E} i} e^{-(\beta 0 + \beta 1 + \mathcal{E} i)^{2/2}}\ dz$$

After the probit model with constant unknown parameter values, The Standard Normal or Z Statistical Table's formula can be shown as below:

$$\begin{aligned} P_i &= P(Y = 1|X_i) \\ &= P\ (Z \leq I_i) \\ &= P\ (Z \leq [\beta_0 + \beta_1 x_i + \mathcal{E}_i]) \\ &= 1 - P\ (Z \geq I_i) \\ &= 1 - P\ (Z \geq [\ \beta\ \beta_0 + \beta_1 x_i + \mathcal{E}_i]) \end{aligned}$$

Probit coefficients show the linear and additive change in Z-score units of the probit transformation (i.e., the inverse of the cumulative standard normal distribution)

for one-unit change in the independent variables (Liao, 1994, p.21). Possibly even less sensitive than the logged odds, standard units of the cumulative normal distribution have little interpretive value (Pample, 2000). Using Eviews, probit model can be estimated with Maximum Likelihood (ML) method. It will lead the standard errors for the estimated parameter become asymptotic.

3.3.4 Expectation-Prediction (Classification) Table

According to Bucevska (2011), to use the estimated logit and probit model as a forecasting model of a financial crisis, it is necessary to evaluate its predictive power, which is also known as expectation-prediction table. Expectation-Prediction (Classification) table is used to estimate the correct prediction of the model. In other words, it can be used to analyze the effect of forecasting (Hu, 2006).

The fraction of y=1 observations that are correctly predicted is termed the sensitivity, while the fraction of y=0 observations that are correctly predicted is known as specificity (Mahadwartha, 2002). When both of these criteria are obtained, the model is said to be correctly specified. Using Eview to run Expectation-Prediction Table, 2 x 2 tables will be shown in the equation window. Each table corresponds to a contingency table of the predicted response classified against the observed dependent variable. The upper table shows that observations are classified as having predicted probabilities that are above or below the cut-off value. The cut-off is set to be 0.5, equal to the threshold of the model, which separates the pre-crisis period from the tranquil period.

In Eviews, the gain in the number of correct predictions obtained in moving from the lower table provides a measure of the predictive ability model. The gain measures are reported in both absolute percentage rises, and as a percentage of the incorrect classifications in the constant probability model.

3.3.5 Goodness-of-fit Test

The reason of any overall goodness-of-fit test is to find out whether a fitted model is sufficiently describing the observed outcome experience in the data (Hosmer, 2000). One concludes that a model fits if the differences between the observed and fitted values are small and if there is no systematic contribution of the differences to the error structure of the model. Goodness-of-fit tests are usually broad tests that measure the fitted model's overall performance from the observed data. There are two types of goodness-of-fit tests can be conducted by using Eviews.

Hosmer-Lemeshow Goodness-of-fit Test

Many of the tests for goodness of fit of a model are conducted by analyzing residuals; nevertheless, such an approach is not feasible for a binary outcome variable. Hosmer and Lemeshow (1989) proposed a statistic that show, throughout simulation, is distributed as chi-square when there is no replication in any of the subpopulations. This test is only available for binary response models.

H_0: There is no significant lack of fit between the dependent and independent variables in the model.
$H_{1:}$ There is significant lack of fit between the dependent and independent variables in the model.

The goodness-of-fit test is carried out by comparing the p-value with pre-specified significance of α. That is, for α level, reject H_0 when p-value associated with HL test statistic is less than α. On the hand, do not reject H_0 when the p-value associated with HL test statistic is bigger than or equal to α. By this, we can conclude that when HL p-value less than α, there is a no significant between the fitted logistic regression model and the observed data, vice versa. When the result shows

insignificancy (p-value lesser than α), it should not be used for making presumption about the relationship between the dependent variable and the independent variables. However, when p-value is greater than α, this does not mean that the model is the correct model nor does it necessarily mean that it fits the data all well. Failing to reject the null hypothesis is a HL goodness of fit test simply means that the logistic regression analysis of the model that was fit should continue. (Richard, 2010)

Andrews Test

The Chi-Square Diagnostic Test developed by Andrews (1988) was used to control the potential of an estimation error. The test compares the sample relative frequencies of the dependent variable with the predicted frequencies from the model using a quadratic form as well as an estimate of the asymptotic variance of the corresponding population moment condition. In opposition to the Hosmer-Lemeshow test, the diagnostic test can be constructed from any regular, asymptotically normal estimator of the conditional expectation of the dependent variable (Manjon-Antolin and Martinez-Ibanez, 2012). The Chi-Square Diagnostic Test developed by Andrews is an extension of the Pearson chi0square testing method of non-dynamic parametric econometric models, particularly to model with covariates. The chi-square test is introduced to be used to test the goodness-of-fit of a parametric model including testing particular aspects of the parametric model that are of interest (Andrews, 1988).

CHAPTER 4: RESEARCH RESULTS AND INTERPRETATION

4.1 Estimation of Linear Probability Model

To identify the determinants of the banking crises in Malaysia from 1974 to 2010, we estimate a few number of explanatory variables suggested by the prior theoretical and empirical analyses of banking crises. The model we used is a Linear Probability Model (LPM).We started our analysis by including all of the six variables. Results for this linear probability model are presented in Table 1 below.

Table 1: Linear Probability Model (LPM) for the determinants of the banking crisis which is estimated by the Ordinary Least Squares (OLS) estimation technique from 1974 to 2010

Explanatory Variables	Model 1		
	Coefficient	t-Statistic	P-Value
Intercept	0.9961 (0.5513)	1.8068	0.0808 *
CA	0.0264 (0.0101)	2.6108	0.0140 **
DCPS	0.0065 (0.0022)	2.9982	0.0054 ***
GDPPC	-0.0419 (0.0171)	-2.4552	0.0201 **
INF	0.0028 (0.0134)	0.2124	0.8332
M2R	0.0815	1.6929	0.1008

	(0.0482)		
NER	-0.5689 (0.1980)	-2.8724	0.0074 ***

*Note: The dependent variable takes the value one if there is a crisis and value of zero otherwise (Banking Crises was defined using cited journals). Standard errors are in parentheses. *, **and *** indicate significance levels of 10%, 5% and 1%, respectively; CA-current account balance to GDP ratio, DCPS – domestic credit to private sector, GDPPC – GDP per capita, INF – inflation, M2R – Money and quasi money (M2) as % of GDP, NER –nominal exchange rate.*

There are two criteria's which is used to define banking crises. The first criterion used is in terms of bank non-performing loans to total gross loans (NPL). When NPL exceeds 10%, it reflects that banking crisis existed in that particular year. Secondly, we use cited journals to determine the occurrence of banking crises in the particular year. When we use the first criteria (NPL) to define banking crises, all independent variables appear to be insignificant, therefore decision regarding which variable to be removed from the model cannot be made. Thus, we tried using another criterion (cited journals) to define banking crises and run a new regression.

Based on the results in Table 1, out of the six independent variables, four of them are statistically significant. Both INF and M2R appear to be insignificant as we failed to reject null hypothesis because their P-values are higher than the 10% of significance level. By using Hendry (2000b, p.1) general-to-specific approach, we manually stepwise removed the insignificant variables each time and repeated the reduced regression. This procedure was terminated when only significant dependent variables were left in our set. Finally we decided to drop both M2R and INF in our model and construct a new model using the remaining four statistically significant variables which are CA, DCPS, GDPPC and NER.

Table 2: Linear Probability Model (LPM) for the determinants of the banking crisis which is estimated by the ordinary least squares estimation technique from 1974 to 2010

	Model 2					
Explanatory Variables	**Scenario 1 (first criteria – NPL)**			**Scenario 2 (second criteria – cited journals)**		
	Coefficient	t-Statistic	P-Value	Coefficient	t-Statistic	P-Value
Intercept	0.2164 (0.7029)	0.3078	0.7602	1.5589 (0.4467)	3.4900	0.0014 ***
CA	-0.0084 (0.0157)	-0.5367	0.5951	0.0240 (0.0100)	2.4067	0.0220 **
DCPS	0.0036 (0.0032)	1.1284	0.2676	0.0077 (0.0020)	3.8307	0.0006 ***
GDPPC	-0.0280 (0.0227)	-1.2360	0.2255	-0.0492 (0.0144)	-3.4159	0.0017 ***
NER	-0.0229 (0.2985)	-0.0768	0.9393	-0.6739 (0.1897)	-3.5523	0.0012 ***

*Note: The dependent variable takes the value one if there is a crisis and value of zero otherwise. (Banking crises was defined using both NPL and cited journals) Standard errors are in parentheses. *, **and *** indicate significance levels of 10%, 5% and 1%, respectively. CA-current account balance to GDP ratio, DCPS – domestic credit to private sector, GDPPC – GDP per capita, NER –nominal exchange rate.*

Table 2 shows our result after removing M2R and INF from the previous model. For this model, we still run the regression model by using both criteria's to confirm the significance of the four independent variables. All the four independent variables appear to be insignificant when we use the first criteria (NPL) to define

banking crisis but statistically significant when we use second criteria (cited journals) to define banking crises. Therefore, we decided not to use the first criteria (NPL) to run the following regression models. Based on our result in Table 2, DCPS, GDPPC, NER are statistically significant at 1% significance level whereas CA is statistically significant at significance level of 5%.

4.2 Estimation of Binary Logit Model

There are some limitations when we use linear probability model (LPM) in explaining our model. First, the predicted probability value will become meaningless and does not make sense because there is no guarantee that all of the predicted probabilities will be between zero and one. Besides, the coefficient of determinant ($R^{2)}$ is no longer a good measure of goodness of fit for whole LPM. Aldrich and Nelson (1984) stated that the use of the R^2 as a summary measure should be avoided in models with qualitative dependent variable.

To overcome the limitation of the LPM which has the possibility to produce estimated probabilities that are negative or greater than one, we use logit and probit model approaches to estimate our model to enhance our results. Spector and Mazzeo (1980) stated that ordinary least squares (OLS) regression analysis has been used wrongly by many economics education researchers. They suggested using probit analysis instead of OLS because OLS is not appropriate in analyzing of binary dependent variables. Besides that, they showed that probit analysis can be employed in an economics education research project.

Table 3: Logit Estimation result for determinants of banking crisis in Malaysia from 1974 – 2010

Explanatory	Model 3

Variables	Coefficient	z-Statistic	P-Value
Intercept	15.5775 (9.9238)	1.5697	0.1165
CA	0.4295 (0.2623)	1.6376	0.1015
DCPS	0.1120 (0.0514)	2.1814	0.0292 **
GDPPC	-0.4071 (0.1830)	-2.2244	0.0261 **
NER	-10.0510 (5.3419)	-1.8815	0.0599 *

*Note: The dependent variable takes the value one if there is a crisis and value of zero otherwise. (Banking crises was defined using both NPL and cited journals) Standard errors are in parentheses. *, **and *** indicate significance levels of 10%, 5% and 1%, respectively. CA-current account balance to GDP ratio, DCPS – domestic credit to private sector, GDPPC – GDP per capita, NER –nominal exchange rate*

Table 3 displays the result of Logit regression model with the estimation technique of Maximum Likelihood. The null hypothesis that each single independent variable is zero is tested with a z-test on each parameter. The results show that domestic credit to private sector and GDP per capita are statistically significant at significance level of 5%. Nominal exchange rate is statistically significant at level of significance of 10% whereas current account is statistically insignificant.

The LR statistic which tests the joint null hypothesis which is all slope coefficients is equal to zero except the intercept and the results show that the null hypothesis is rejected at level of significance of 1%. It implies that the whole estimated qualitative model is significance and the model is meaningful. McFadden R^2 measure goodness-of-fit of the model and our result show that it is relatively good.

4.3 Estimation of Binary Probit Model

Table 4: Probit Estimation result for determinants of banking crisis in Malaysia

Explanatory Variables	Model 4		
	Coefficient	z-Statistic	P-Value
Intercept	9.2375 (5.4643)	1.6905	0.0909 *
CA	0.2504 (0.1453)	1.7238	0.0847 *
DCPS	0.0649 (0.0281)	2.3087	0.0210 **
GDPPC	-0.2453 (0.1062)	-2.3106	0.0209 **
NER	-5.8872 (2.9305)	-2.0090	0.0445 **

*Note: The dependent variable takes the value one if there is a crisis and value of zero otherwise. (Banking crises was defined using both NPL and cited journals) Standard errors are in parentheses. *, **and *** indicate significance levels of 10%, 5% and 1%, respectively. CA-current account balance to GDP ratio, DCPS – domestic credit to private sector, GDPPC – GDP per capita, NER –nominal exchange rate.*

Table 4 represents the result of estimation of the Probit regression model with the estimation technique of Maximum Likelihood. The null hypothesis that each single independent variable is zero is tested with a z-test on each parameter. The results show that domestic credit to private sector, GDP per capita and nominal exchange rate are statistically significant at significance level of 5% while current account is statistically significant at level of significance of 10%.

The LR statistic which tests the joint null hypothesis which is all slope coefficients is equal to zero except the intercept and the results show that the null hypothesis is rejected at level of significance of 1%. It implies that the whole estimated qualitative model is significance and the model is meaningful. McFadden R^2 measure goodness-of-fit of the model and our result show that it is relatively good.

4.4 Discussion of the Major Findings

Based on our results, current account is significant when we run the model using LPM and probit model, showing that there is a positive relationship between banking crises and current account. However, this is inconsistent with the previous studies done by Lagalle and Muhammad (2008) which showing that a current account balances has negative impact on the probability of banking crises. Our current account surplus was caused by a sharp depreciation in 1998 resulting from Asian Financial Crisis. Depreciation caused our export become relatively cheap and we export more than import. This will lead to appreciation of the local currency and lead to inflation. That is why it has to use the foreign reserves to invest in other countries to lower inflation at home, and to keep the exchange rate more stable and compatible. Massive exports means Malaysia is losing resources that they send abroad it also has other more severe effects on the economy.However, some problems can accompany a dramatic increase in exports, depending on the nature of the goods being exported. These problems include excessive expenses, resource depletion, logistical problems and legal problems. Sometimes, increased exports can be accompanied by legal and political issues. Suppose a company starts increasing exports to another country, while that country suffers from high unemployment and a collapsing export industry. This might indirectly linked to banking crises.

Furthermore, Axel Weber, president of the Deutsche Bundesbank (2010) stated that it is rational for the country which has ageing population to save more compared to make local investment, for example, Germany. This is because the

volume of good and potential investment is decreasing, at the same time, the individual and family like to retain their consumption level when they are old. However, not everybody can have a great surplus and they should particularly not do like that if it is a developing country. Conversely, they are more likely to make investment compared to save if the country is under development of economic. They are more likely to gain the funds from foreign countries if there are many investment chances with the limited capital. Therefore, impermanent current account imbalances are basically agreeable. Current account is statistically insignificant when we run logit regression model. This is quite similar to the result of Hardy and Pasarbasioglu (1999) found that the current account was insignificant in the estimated logit models of banking crises for both advanced and developing countries.

Our results show that there is a positive relationship between banking crises and domestic credit to private sector in LPM, logit and probit model. Before the crisis, banks expanded their credit loans because they are overly optimistic on future income and asset price. They predicted that the future income will increase. However, what happened was the other way round. Private sectors borrowed more loans from banks during credit expansion; however, the household income did not increase. During financial crisis, Malaysian economic faced downturn which caused the problems of unemployment and decreased in income level. Borrowers were unable to pay bank their loans and these caused many loans went default. These overwhelmed loans default caused bank run which in turn, caused banking crisis.

Our results and theories are consistent with the findings of Demirgüc-Kunt et. al (1997) and IMF (2004), which stated that positive expectation of banks on future income that caused credit boom, which in turn increased the non-performing loan when income did not increase and hence, raise the probability of banking crisis. Besides, Klomp (2010) finds that domestic credit to private sector is significant in determining banking crisis. Our result is consistent with the previous result; an increase in domestic credit to private sector is more likely to increases the possibility of a banking crisis.

Based on the results obtained from the tests, the Gross Domestic Product Per Capita (GDPPC) variable is found to be negatively correlated with the dependent variable which is Banking Crisis (BC) based on the LPM, Logit and Probit models. Gross Domestic Product Per Capita has been illustrated to be significant in nearly all studies because it not only take a country average income into account, the development of the country in term offinancial systemand organization as well. (Klomp, 2009). The significance of the Gross Domestic Product Per Capita has been proven by the study made by Demirgüc-Kunt and Detragiache (1997) which states that low GDP per capita inhibits the largest risks of banking crises. The relationship of this variable is also consistent with the research done by Davis and Karim (2008) which indicated that improvements in institutional quality associated with higher GDP reduces the banking crisis risk since the coefficient on the change in GDP per capita is strongly negative and significant.

Besides, nominal exchange rate is significant in explaining banking crisis and negatively correlated with the dependent variable based on the results obtained from estimation of LPM, Logit and Probit models. Our result is consistent with the previous study; Mendis (2000) found that nominal exchange rate term was significant and negatively associated with banking crises because appreciation of nominal exchange rate increases the probability of banking crises. The behavior of the exchange rate has a high significant impact on banking crises in all specifications but it has a negative sign. This would be explained by the fact that banking crises are often preceded by an exchange rate appreciation (Hardy and Pazarbasioglu, 1998). In fact, exchange rate appreciation may affect the competiveness of the country and lead to a deterioration of the corporate sector profitability (Boudriga and Ghardallou, 2012).

In conclusion, the results of the logit and probit estimation models showed that there are not many differences in the significance of the independent variables except current account balance. For the majority of the applications, the logit and

probit models will give very similar characterisations of the data because the densities are very similar. Greene (1997) concludes his discussion of the issue and come out the summary of the logit and probit models seems not to make much difference in most applications. Gill (2001) indicated that logit and probit models provide identical substantive conclusions.

4.5 Expectation-Prediction Table of Binary Dependent Variables Model

It is necessary to evaluate the logit and probit model predictive power as we use the estimated logit and probit model as a forecasting model of a banking crisis. The ability of the estimated model to predict banking crisis was evaluated by using Expectation-Prediction (Classification) Table. The cutoff value which separates the banking crisis period and non banking crisis period was set at 0.5.

Table 5: Expectation-Prediction (Classification) Table of the Logit Model

Expectation-Prediction Evaluation for Binary Specification

Date: 03/10/13 Time: 15:40

Success cutoff: C = 0.5

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	28	2	30	30	7	37
P(Dep=1)>C	2	5	7	0	0	0
Total	30	7	37	30	7	37
Correct	28	5	33	30	0	30

% Correct	93.33	71.43	89.19	100.00	0.00	81.08
% Incorrect	6.67	28.57	10.81	0.00	100.00	18.92
Total Gain*	-6.67	71.43	8.11			
Percent Gain**	NA	71.43	42.86			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	27.64	2.36	30.00	24.32	5.68	30.00
E(# of Dep=1)	2.36	4.64	7.00	5.68	1.32	7.00
Total	30.00	7.00	37.00	30.00	7.00	37.00
Correct	27.64	4.64	32.28	24.32	1.32	25.65
% Correct	92.13	66.27	87.24	81.08	18.92	69.32
% Incorrect	7.87	33.73	12.76	18.92	81.08	30.68
Total Gain*	11.05	47.35	17.92			
Percent Gain**	58.40	58.40	58.40			

Note: *Change in "% Correct" from default (constant probability) specification;
**Percent of incorrect (default) prediction corrected by equation.

Table 5 reported the result of Expectation-Prediction (Classification) Table of the Logit Model to analyze the effect of forecast. The logit model accurately predicts there is a banking crisis, as many as 71.43% of the observations and accurately predicts there is no banking crisis, as many as 93.33% of the observations. Overall, the estimated logit model correctly predicts 89.19% of the observations at the selected cut-off value. Besides, the table also provides a measure of the predictive ability of the model. The estimated model improves on there is banking crisis prediction by 71.43%, but does more poorly on there is no banking crisis prediction (-6.67%). Overall, the estimated equation is 8.11% better at predicting responses than the constant probability model. This change shows a 42.86% improvement over the 81.08% correct prediction of the default model. Furthermore, among the 30 observations with

there is no banking crisis, the expected number of these observations in the estimated model is 27.64. Among the 7 observations with there is banking crisis, the expected number of these observations in the estimated model is 4.64. It represents about 17.92% improvement over the constant probability model. So generally speaking, the current model has quite good effect of forecast.

Table 6: Expectation-Prediction (Classification) Table of the Probit Model

Expectation-Prediction Evaluation for Binary Specification

Date: 03/10/13 Time: 16:07

Success cutoff: C = 0.5

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	28	2	30	30	7	37
P(Dep=1)>C	2	5	7	0	0	0
Total	30	7	37	30	7	37
Correct	28	5	33	30	0	30
% Correct	93.33	71.43	89.19	100.00	0.00	81.08
% Incorrect	6.67	28.57	10.81	0.00	100.00	18.92
Total Gain*	-6.67	71.43	8.11			
Percent Gain**	NA	71.43	42.86			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	27.75	2.35	30.09	24.32	5.68	30.00
E(# of Dep=1)	2.25	4.65	6.91	5.68	1.32	7.00
Total	30.00	7.00	37.00	30.00	7.00	37.00

Correct	27.75	4.65	32.40	24.32	1.32	25.65
% Correct	92.49	66.49	87.57	81.08	18.92	69.32
% Incorrect	7.51	33.51	12.43	18.92	81.08	30.68
Total Gain*	11.41	47.57	18.25			
Percent Gain**	60.32	58.67	59.49			

Note: *Change in "% Correct" from default (constant probability) specification;
**Percent of incorrect (default) prediction corrected by equation.

Table 6 shows that the result of Expectation-Prediction (Classification) Table of the Probit Model. Overall, the estimated probit model correctly predicts 89.19% of the observations at the selected cut-off value. Besides, the estimated equation is 8.11% better at predicting responses than the constant probability model. The outcome of table 7 is almost same with the table 6 which show result of Expectation-Prediction (Classification) Table of the Logit Model. Therefore, the probit model also has very good effect of forecast.

4.6 Andrews and Hosmer-Lemeshow Test

Table 7: Andrews and Hosmer-Lemeshow test result for Logit and Probit Estimation on determining banking crisis in Malaysia

	H-L statistic	P-Value
Logit Model (Model 3)	1.4727	0.9932
Probit Model (Model 4)	1.3783	0.9945

	Andrews statistic	P-Value
Logit Model (Model 3)	26.3730	0.0033 ***

Probit Model (Model 4)	24.1776	0.0071 ***

Note: *, **and *** indicate significant at 10%, 5% and 1% levels.

Table 7 is the results of the Andrews and Hosmer-Lemeshow test for our estimated Logit and Probit model. The null hypothesis of H-L test states that there is no significant lack of fit between the dependent and independent variables in the model. From the table 8, the P-Value of H-L test for Logit and Probit model are 0.9932 and 0.9945 respectively. Therefore, we do not reject the null hypothesis. Hence, we can conclude that the goodness-of-fit is acceptable and both models have well-performed forecast ability. Furthermore, the Andrews test is employed to check if there is a systematic relationship between the forecasts and the realizations. The null hypothesis of Andrews test states that the forecasts for our binary event (the possibility of banking crisis and non-banking crisis) are independent from the actual outcomes. From the table 8, the P-Value of Andrews test for Logit and Probit model are 0.0033 and 0.0071 respectively. Therefore, we reject the null hypothesis and conclude that there is a systematic relationship between the forecasts and the realizations. Bucevska (2011) result showed that their forecasts for a binary event (in their case financial crisis and tranquil periods) are dependent from the actual outcomes and our result is consistent with this previous study.

4.7 Estimation of the Probability Index Using Estimated Logit and Probit Models

In logit regression analysis, the dependent variable is the natural log of the odds that the event will occur (ln P/1-P), where P indicates the probability of the event to occur.

Estimated Logit equation:

$$ln\left(\frac{P_i}{1-P_i}\right) = 15.5775 + 0.4295CA_i + 0.1120DCPS_i - 0.4071\ \text{GDPPC}_i - 10.0510\ NER_i + \varepsilon_i$$

On the other hand, the dependent variable in probit model is an unobserved continuous index Z which is presumed to be normally distributed with a mean of 0 and standard deviation of 1.

Estimated Probit equation:

$P_i = P(Y = 1|X_i)$

$= P\ (Z \leq I_i)$

$= P\ (Z \leq [\ 9.2375 + 0.2504CA_i + 0.0649DCPS_i - 0.2455\ \text{GDPPC}_i - 5.8872\ NER_i + \varepsilon_i])$

$= 1 - P\ (Z \geq I_i)$

$= 1 - P\ (Z \geq [9.2375 + 0.2504CA_i + 0.0649DCPS_i - 0.2455\ \text{GDPPC}_i - 5.8872\ NER_i + \varepsilon_i])$

Neither the logit nor probit regression model allows us to compute the probability of banking crisis directly. For example, to compute the probability of banking crisis using a logit regression model, we need to take antilog of the ln odd ratio$ln\left(\frac{P_i}{1-P_i}\right)$, whereas to find the predicted probability of the z score in probit model, we have to refer to a standard z – table, use the Excel formula which is =NORMSDIST(z-score) or use the Z-Score to Percentile Calculator.

Table 8: Results of the estimation of the probability index of Malaysia Banking Crisis

Year	**Banking Crisis (1 =**	**Ln Odd Ratio (Logit)**	**Probability**	**Utility Index (Probit)**	**Probability**

	banking crisis, 0 = otherwise)				
1974	0	-10.2689	3.47E-05	-5.95331	1.3139E-09
1975	0	-6.3754	0.0017	-3.62731	0.00014319
1976	0	-7.92081	0.000363	-4.61628	1.9534E-06
1977	0	-6.1849	0.002056	-3.57335	0.00017622
1978	0	-4.78929	0.00825	-2.74895	0.00298937
1979	0	-2.76977	0.05898	-1.58964	0.05595798
1980	0	-3.26604	0.036755	-1.8665	0.03098604
1981	0	-7.15997	0.000776	-4.13876	1.746E-05
1982	0	-7.98038	0.000342	-4.61158	1.9981E-06
1983	0	-6.31875	0.001799	-3.64728	0.00013252
1984	0	-3.79932	0.021896	-2.19178	0.01419783
1985	1	1.062133	**0.743098**	0.702958	**0.75895905**
1986	1	1.32466	**0.789956**	0.831186	**0.79706573**
1987	1	2.761554	**0.940563**	1.642349	**0.94974112**
1988	1	-1.53833	0.176778	-0.90101	0.18379248
1989	0	-3.01453	0.046774	-1.76138	0.03908709
1990	0	-7.12627	0.000803	-4.14834	1.6744E-05
1991	0	-10.1617	3.86E-05	-5.92607	1.5514E-09
1992	0	-1.92392	0.127425	-1.12726	0.1298165
1993	0	-3.19822	0.039233	-1.87845	0.03015983
1994	0	-3.81517	0.021559	-2.23543	0.01269449
1995	0	-2.72121	0.061734	-1.60508	0.05423826
1996	0	1.309125	**0.787367**	0.736283	**0.76922075**
1997	1	0.611469	**0.648276**	0.335447	**0.63135593**
1998	1	3.480953	**0.970141**	2.091415	**0.98175456**
1999	1	-0.54955	0.365969	-0.35688	0.36059039
2000	0	-6.17818	0.00207	-3.65411	0.00012904

2001	0	-4.05513	0.017038	-2.34956	0.00939775
2002	0	-7.13898	0.000793	-4.18286	1.4394E-05
2003	0	-5.49683	0.004083	-3.22809	0.0006231
2004	0	-6.74804	0.001172	-3.96335	3.6952E-05
2005	0	-5.90833	0.002709	-3.46095	0.00026914
2006	0	-4.35631	0.012663	-2.55682	0.00528171
2007	0	-2.88334	0.052983	-1.69681	0.04486631
2008	0	-1.13732	0.242813	-0.66175	0.25406609
2009	0	0.712693	**0.670996**	0.455891	**0.67576578**
2010	0	-1.88757	0.131522	-1.12063	0.13122371

Note: Banking crisis is likely to happen if the computed probability is close to 1, and it is not likely to happen if the probability is close to 0.

Based on the previous studies, there're seven banking crises happened in our estimation period of 1974 – 2010, which were in the year of 1985 – 1988 and 1997 – 1999. By computing the probability of banking crises using our estimated probit and logit regressions, we found that Malaysia experienced banking crises in 1985 – 1987. 1996 – 1998 and 2009. Both probit and logit regression models show the similar result. This is slightly inconsistent with the studies done by the researchers because our results show that Malaysia experienced banking crises in year 1996 as well as 2009 and no banking crises in year 1988 and 1999. However, our estimated model is able to correctly identify 5 (in year 1985, 1986, 1987, 1997 and 1998) out of the 7 crises in the estimation period.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.1 Summary and Major Findings

In our study, we discussed about the issue on the significance and linkages between domestic credit to private sector, nominal exchange rate, current account and gross domestic product per capita on Malaysian banking crisis from year 1974 to year 2010.

In summary, our first main finding is the significance of the independent variables and the dependent variable based on the nonperforming loan and the journals from previous studies which confirmed the existence of banking crisis. Two tests were run using the LPM model based on two scenarios, the first is using nonperforming loan and the second is based on the cited journals from previous studies. The variable used in our model are domestic credit to private sector, nominal exchange rate, current account, GDP per capita, inflation and M2 reserves. Through the results of both tests, we found that the results are contradicting with each other. This is because the nonperforming loan is insignificant with all the variables whereas the result from the cited journals shows four significant and two insignificant variables in explaining banking crisis. Therefore, we decided to proceed with our research by using the cited journals' result.

For our second LPM model, we have dropped the insignificant variables, which are inflation and M2 reserves, leaving the model with four remaining significant variables. To confirm the significance of our independent variables in banking crisis, we conducted the two tests on our model based on the same scenarios. Through this, we are able to confirm that the four remaining independent variables

are still insignificant based on the first scenarios while the second scenario shows that all the remaining variables are significant in explaining banking crisis. Therefore, we decided to use the second scenario which is based on the cited journals from previous studies and apply it in our LPM model. In order to improve the current LPM model, we continued our research by running the Logit and Probit models.

For the Logit model, current account is found to be insignificant in explaining the banking crisis while other variables are significant. The results show that domestic credit to private sector and GDP per capita are statistically significant at significance level of 5%. Nominal exchange rate is statistically significant at level of significance of 10% whereas current account is statistically insignificant. Although the current account is statistically insignificant when we run the Logit regression model, the Probit model showed that all the independent variables are significant in explaining banking crisis in Malaysia, which is consistent with the previous studies. Through this, we were able to show that there is a positive relationship between banking crises and current account.

Next, we tested the Goodness-of-fit of the model by using Expectation-Prediction (Classification) Table as well as the Andrews and Hosmer-Lemeshow test. Using the Expectation-Prediction (Classification) Table, the Logit model accurately predicts there is a banking crisis, as many as 71.43% of the observations and accurately predicts there is no banking crisis, as many as 93.33% of the observations. Overall, the estimated Logit model correctly predicts 89.19% of the observations at the selected cut-off value. On the other hand, the estimated Probit model correctly predicts 89.19% of the observations at the selected cut-off value. Besides, the estimated equation is 8.11% better at predicting responses than the constant probability model. The outcome for the Probit model was found to be almost the same as the outcome for Logit model. Therefore, the Probit model can be said to have a very good effect on forecast.

Based on the Andrews and Hosmer-Lemeshow test for our estimated Logit and Probit model, we were able to obtain results showing that the P-Value of Logit and Probit value are 0.9932 and 0.9945 respectively. Since the null hypothesis states that there is no significant lack of fit between the dependent and independent variables in the model, we cannot reject the null hypothesis. Therefore, we can conclude that the goodness-of-fit result is acceptable and both models have well-performed forecast ability.

5.2 Policy Implications and Recommendation

Recently, the financial crisis in some advanced economies has been a wake-up call for the academics as well as policymakers. However, we can consider it as an opportunity for the country to restructure its development approaches in order to build up a stronger and resistant economic fundamental. This will not just lead Malaysia towards recovery, but also towards the achievement of desired outcomes in the future.

To reduce the risk posed by external imbalances, emphasizes should be given to the domestic demand which consist of consumption and investment. Although government has implemented some policies to offset fall in export demand through public investment, it can only temporarily increase our domestic demand. Thus, government needs to create an environment to encourage domestic consumption and investment with price stability in order to sustain growth in longer term. To increase domestic consumption, people's income should be increased. Furthermore, government should put more effort in enhancing social security net such as healthcare system, education, benefits to the elderly and the disabled individuals to reduce the need for precautionary savings.

Other than that, a serious attention should be given to investment components because it is one of the major sources of growth in Malaysia. According to Goh and

Lim (2009), Malaysia total investment decreased since Asian Financial Crisis and never recovered to its pre-crisis level. There is a need to create a favourite investment climate to attract more foreign investors. This is because Malaysia private investment has been declined due to a decrease in the foreign direct investment (FDI) as well as increase in domestic outflow investment.

However, Malaysia's financial market size is relatively small compared to other countries. Hence, it is insufficient to attract the attention of foreign investors. They choose other more bright investment destinations instead. Thus, the government is suggested to implement a policy to enlarge the domestic market size in terms of expansion of financial institutions. In order to increase the market size, domestic financial institutions can form strategic partnerships with foreign counterparts to assist a larger information exchange and counterparty risks assessments. Financial institutions should also form more physical branches in the average term, with the objective of promoting greater outreach of financial services. In addition, Malaysia should focus more on new area of growth for those investors especially in non-manufacturing areas such as banking and others financial services.

As a tool for capital formation, government should reduce taxation rates for corporate investment as a way to attract foreign enterprises and provide them with incentives to invest. Government can adopt efficiency policies such as offering deductions or tax credits against profits for reinvestment in the host economy. Since the repatriation will reduce the capital flows in domestic market and affect the economy activities. Therefore, foreign investors are encouraged to reinvest their profits in our country rather than sending their profit back to home countries.

In our study, we found that GDPPC can influence the likelihood of banking crisis to occur. Davis and Karim (2008) indicated that improvements in institutional quality associated with higher GDP reduce the banking crisis risk. The policy approach which is the expansionary fiscal policy should be expanded by the government to stabilize the economic growth. This is because monetary policy effectiveness will be

reduced with financial sector fragility and it can be used as a strategy to maintain the competitiveness of Malaysia'seconomy. The government could also impose import taxes on certain goods and services more strictly. Besides that, the government could reduce the cost of doing business through subsidiary on capital and reduce tax incentives to boost the manufacturing, agriculture, and services sectors. Ariff & Abubakar (1999) stated that embarking on expansionary fiscal policies is useful in developments within the domestic economy and it will cause improvement of growth prospects for the Malaysian economy.

Government should speed up the liberalization process in different areas to improve the efficiency through competition. Other than that, Malaysia also faces intensified competition from countries such as China, Vietnam, Indonesia and Thailand. Hence, Malaysia should emphasize on its competitive edges in order to sustain development in the future. Implementation of the fiscal and monetary policies with strong corporate governance and transparency in the process would also helpin assisting the economy. Apart from that, the government also needs to speed up the implementation process and ensure that all the budget expenditures have been allocated to the targeted sectors by continuously monitoring on the allocation progress.

Last but not least, policymakers should also be rational and adaptable in their policies as well as guided by the overall national objectives instead of being tied to IMF orthodoxy. They could try using instruments other than the normal monetary policy to attain these objectives. Today, as many emerging countries faces the asset inflationary pressure resulting from excess liquidity created by quantitative easing and carry trades, policymakers should be able to use alternative tools to manage their capital flows and currencies.

5.3 Limitations and Further Research

There are some problems and limitations during the process of the research which need to be discussed and improved further. First, since the sample size is relatively small, where we had only 35 observations causing the degrees of freedom to be small in size. This may ties degrees of freedom to falsifiability which may provide biased result.

Apart from that, the exogenous variable such as nominal exchange rate (NER) that we employed into our model could not capture the domestic and international inflation so well compared to real exchange rate even though they are highly correlated. Therefore, real exchange rate is encouraged to be used for further studies in order to obtain precise results.

The indicator of non-performing loan that we used in the regression Model 2, which is typically believed to be useful indicator of determining the endogenous variable in the event of occurring banking crises. In our studies, the data availability of nonperforming loan is limited which we only able to obtained from Bank Negara Malaysia for the period of 1988 – 2010 due to the non-informative for outsiders and probably because banks either do not want to report it or report a manipulated version of it. Therefore, the limited data observations could cause a biased result in our study for Model 2 where we used nonperforming loan to determine the event of banking crisis.

For further research, there are more thresholds to define a banking crisis besides nonperforming loan such as the cost of the rescue of operation must be at least 2% of GDP, there must be a large scale reorganization and nationalization of banks or the enactment of various emergency measures, for instance, deposit freezes, prolonged bank holidays, deposit guarantees and etc according to Demiriguc-Kunt and Detragiache (1997). Instead of the exogenous variables that we used, it is also vital to note that there are few other factors that can contribute significantly to banking crises such as real interest rates, inflation and ratio of gross external debt to export for future researchers to study on.

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