DETERMINANTS OF THE DEMAND FOR BANKNOTES IN MALAYSIA: A PARTIAL LEAST EQUATION (PLS) APPROACH

By

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ABSTRACT

The objective of this study is to investigate factors influencing the demand for banknotes in Malaysia. The factors examined are Gross Domestic Product (GDP), interest rates, inflation rates, exchange rates and market sentiments. Using data obtained from Bank Negara Malaysia, Malaysian Institute of Economic Research and Department of Statistics, Malaysia for the periods from Q1 2007 to Q2 2014 and analyzed using Partial Least Squares (PLS) method, the study found that, out of the five factors, only GDP and interest rates have significant influence on the demand for banknotes in Malaysia. The R^2 value of 94% indicates that the five variables explain over 90% of the changes in the demand for banknotes in Malaysia. This study contributes to allowing Bank Negara Malaysia to predict more accurately the banknote demand behavior and consequently helps them to propose appropriate policy actions in order to manage the cash supply chains more efficiently.

Keywords: demand for banknotes, Malaysia, Partial Least Squares, Gross Domestic Product (GDP), interest rates

ABSTRAK

Kajian ini dijalankan untuk meneliti faktor-faktor yang mempengaruhi permintaan wang kertas di Malaysia. Faktor-faktor yang dikaji adalah Keluaran Dalam Negara Kasar (KDNK), kadar faedah, kadar inflasi, kadar tukaran matawang dan sentiment pasaran. Dengan menggunakan data-data yang diperolehi daripada Bank Negara Malaysia, Institut Kajian Ekonomi Malaysia dan Jabatan Perangkaan Malaysia bagi tempoh Q1 2007 hingga Q2 2014 dan dianalisa menggunakan kaedah "*Partial Least Equation*" (PLS), dapatan kajian menunjukkan bahawa, daripada lima faktor yang dikaji, hanya KDNK dan kadar faedah yang mempengaruhi permintaan wang kertas di Malaysia. Nilai R^2 sebanyak 94% menunjukkan bahawa kelima-lima variabel menjelaskan lebih daripada 90% perubahan dalam permintaan wang kertas di Malaysia. Kajian ini memberi manfaat kepada Bank Negara Malaysia dalam membuat anggaran ke atas permintaan wang kertas dengan lebih tepat lagi dan selanjutnya dapat membantu mereka dalam merangka polisi yang bersesuaian yang dapat meningkatkan lagi tahap keberkesanan rantaian nilai (*value chain*) wang tunai.

Kata Kunci: permintaan wang kertas, Malaysia, *Partial Least Squares*, Keluaran Dalam Negara Kasar (KDNK), kadar faedah

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LIST OF ABBREVIATIONS

1G	First Generation
ARDL	Autoregressive Distributed Lag
AVE	Average Variance Extracted
BNM	Bank Negara Malaysia
BT	Bound Testing
CIC	Currency in Circulation
CPI	Consumer Price Index
CR	Composite Reliability
CUSUM	Cumulative Sum
ECB	European Central Bank
ECM	Error Correction Model
FSB	Financial Sector Blueprint
GDP	Gross Domestic Production
GNI	Gross National Income
GNP	Gross National Production
KDNK	Keluaran Dalam Negara Kasar
ML	Maximum Likelihood
MGS	Malaysian Government Securities
OLS	Ordinary Least Square
PLS	Partial Least Squares
PPI	Producer Price Index
SEM	Structural Equation Modeling
T-Bills	Treasury Bills
VECM	Vector Error Correction Modeling

CHAPTER ONE
INTRODUCTION

1.1 Introduction

Cash[1] by far is the most preferred means of payment in terms of volume of transactions (Salmony, 2011). In fact, for many people worldwide, cash is the sole means of payment to carry out retail transactions. The reasons for the use of cash may vary from person to person, but cash is heavily used in people's everyday life. Cash is a simple and straightforward payment option (Siddiqui & Siddiqui, 2011). It is used more frequently than any other types of payment instrument, including debit or credit cards, particularly for small-value transactions (Bennet et. al., 2014).

Today's digital age offers electronic payment options. With that, one might expect the use of cash to be on the decline. Despite all the efforts, consumers continue to prefer cash over electronic transactions resulting in the demand for cash growing strong worldwide. In a recent study by Currency Research (2014: 32), it was observed that cash "has yet to show signs of decline in

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[1] The words "cash", "currency", "currency notes" and "banknotes" are used interchangeably in this thesis. They refer to "anything that is generally accepted as a means of exchange and that at the same time, acts as a measure and as a store of value" (Siddiqui & Siddiqui, 2011: 374)

either use of preference". The report continue to suggest that cash will remain as an essential part of the payment system for the foreseeable future.

However, as noted by Thomas and Mellyn (2012: 9), there is currently too much cash in the financial system which "appears to be symptomatic of broader economic problems and bad behaviour". They observed that "cash usage in many economies far outstrips what would be expected of consumers making rational micro-economic choices" and continued saying that "this preference for cash is not a good thing".

The demand for cash, particularly in cash-intensive countries, has grown more quickly than the growth of the economy (Banuso, 2013; Sisak, 2011). The ratio of cash in circulation relative to the nominal gross domestic product (GDP) [CIC/GDP] – used to measure cash efficiency, in these countries is high by international comparison. In these countries, the CIC/GDP ratio could be two or three times higher than in the more developed countries (Sisak, 2011). A high CIC/GDP ratio suggests people use cash more than any other payment instrument; which reflects the high dominance of cash in the economy. In Nigeria, for example, cash-related transactions accounted for 99% of customer's retail activity (Banuso, 2013). In comparison, in Sweden, the ratio of CIC/GDP is just 3%, with only 16% of the transactions are in cash (Bank of International Settlements, 2013).

Too much cash in the financial system is inefficient (Currency Research, 2014; Thomas & Mellyn, 2012). Too much cash circulating in the system may, firstly, reflect how ineffective the monetary policies being adopted by

the central banks in promoting the country's economic growth (Banuso, 2013). Secondly, it may also result in significant wastage of resources along the cash value chain (Currency Research, 2014). The high cost of cash can be explained by its higher production costs, costs of handling, storing, distribution, processing and insurance, as well as other costs to the society, such as fraud and tax evasion (Salmony, 2011; Sia Partners, 2012). According to a study conducted by the European Central Bank (ECB) on a sample of 13 main European countries, the total cost of cash is estimated close to 0.5% of the participating countries' GDP (Schmidel, Kostova, & Ruttenberg, 2012). These costs are primarily borne by banks and retail businesses, as shown in Figure 1.1. Members of the public, on the other hand, use cash for free.

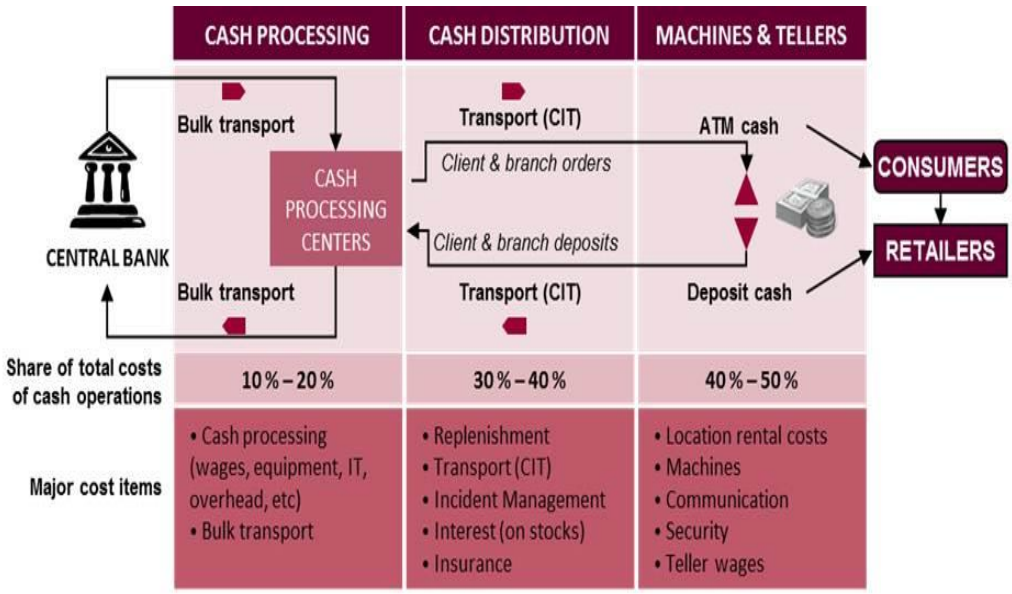

Figure 1.1
Share of cost of cash along the cash value chain
Source: Sia Partners (2012)

In Malaysia, the enduringly high cash usage in the economy over the years is a cause of concern. Recent figure shows that cash remains the most popular

payment instrument in Malaysia, despite all the extensive efforts to encourage people to move towards e-payment (Ibrahim, 2013). According to a global payment study published by McKinsey & Company in 2010, cash accounted for more than 90% of the transactions in Malaysia (Vinayak, Istace, & Kamal, 2012). By comparison, cheques, credit card and internet banking, for example, accounted for only 1.3%, 1.8% and 0.6% of transactions, respectively (Bank Negara Malaysia, 2011b).

Cash has contributed towards making Malaysia a competitive and an efficient economy. However, usage of cash it is very costly to the economy as a whole. In Malaysia, the cost of managing cash is estimated about 1% of the country's GDP (Bank Negara Malaysia, 2011). Successful migration to e-payment, on the other hand, could potentially save the country about 1% of GDP annually.

To realize this benefit, Bank Negara Malaysia (BNM) has initiated many strategies to transform the country's payment landscape and coordinated various efforts (e.g. introduction of internet banking, m-banking, reduce fee for Interbank Giro etc.) with the industry to accelerate the adoption of the e-payments. BNM aspires to make e-payment as the preferred medium for economic transactions in Malaysia moving forward (Bank Negara Malaysia, 2011b). One key measure contained in the Financial Sector Blueprint (FSB), a key document that charts the future direction of Malaysia's financial system over the next ten years from 2011 to 2020, is to increase usage of e-payment by increasing the number of e-payment transactions per capita from 44 transactions in 2010 to 200 transactions by the end of 2020. This is

comparable to the e-payment transactions per capita in the developed countries (Bank Negara Malaysia, 2011b).

Table 1.1
Summary of BNM's strategies to increase usage of e-payment

- Increase the number of e-payment transactions per capita from 44 to 200 by end 2020.
- Increase the use of debit cards from 0.56 transactions per capita to 30 transactions per capita by 2020.
- Reduce the use of checks from 207 million in 2010 to 100 million by 2020.

Source: Bank Negara Malaysia (2011)

One measure of success of the e-payment migration in Malaysia, according to Ibrahim (2013), is in the reduction in the CIC/GDP ratio from 6-7% currently to about 4% within the next ten years. Thus, there is a need to monitor closely the trend of high cash usage in Malaysia and revisit factors contributing to this pattern of high usage, especially in the light of the increasing sophistication of the economy and the huge potential cost saving benefits that cash-substitution offer.

1.2 Background of the Study

Bank Negara Malaysia, as the country's central bank, has many roles and responsibilities in the financial systems and in the economy at large (Bank Negara Malaysia, 1999). The principal objective of BNM, as stipulated in the Central Bank of Malaysia Act 2009 (Act), is to promote monetary stability

and financial stability conducive to the sustainable growth of the Malaysian economy. This objective is subsequently translated in terms of few key roles, as summarized in Table 1.2.

Table 1.2
Key roles of BNM under Central Bank of Malaysia Act, 2009

- to formulate and conduct monetary policy in Malaysia;
- to issue currency in Malaysia;
- to regulate and supervise financial institutions which are subject to the laws enforced by BNM;
- to provide oversight over money and foreign exchange markets;
- to exercise oversight over payment systems;
- to promote a sound, progressive and inclusive financial system;
- to hold and manage the foreign reserves of Malaysia;
- to promote an exchange rate regime consistent with the fundamentals of the economy; and
- to act as financial adviser, banker and financial agent of the Government.

Source: SEACEN (2012)

Clearly, the roles and responsibilities of BNM are multiple, inter-related and complementary (Bank Negara Malaysia, 1999). With respect to the issuance of currency, the Act gives BNM the mandate as the sole issuer of currency notes and coins in Malaysia.

As the sole currency issuing authority in Malaysia, BNM is responsible to manage the whole process of currency issuance. This includes the processes

of designing, planning, forecasting, procuring, storing, issuing and disposing banknotes and coins. This requires BNM to ensure and maintain a sufficient supply of banknotes and coins to meet the public's demands at all times.

In fulfilling its statutory mandates, BNM has since 1967 issued four series of banknotes and three series of coins. The first banknote series was introduced in 1967, comprising six denominations namely $1, $5, $10, $50, $100 and $1,000. The second series was introduced on a staggered basis, commencing with the $20 and $500 banknotes in September 1982, followed by $10, $50 and $100 banknotes in September 1983 and subsequently the $1, $5 and $1,000 banknotes in January 1984.

The third series was introduced from 1996 comprising six denominations namely RM1, RM2, RM5, RM10, RM50 and RM100 banknotes. In September 1998, the Government decided to demonetize the RM500 and RM1,000 banknotes to complement the exchange control measures (Bank Negara Malaysia, 1998). In 2011, BNM introduced the country's fourth banknote series to incorporate numerous innovations and security features that are more technologically advanced (Bank Negara Malaysia, 2011a). The RM20 banknote was re-introduced in this series to serve as an intermediary denomination between RM10 and RM50 banknotes for greater convenience in making payments. The old RM20 banknote was discontinued in the third series of the Malaysian banknotes.

As for coins, the first coins series was introduced in 1967 and comprised of five denominations; namely 1, 5, 10, 20 and 50 sen. The sixth coin

denomination of $1 was issued in 1971. In 1989, BNM introduced the second coins series comprised of six denominations; namely 1, 5, 10, 20, 50 sen and $1 in September 1989. However, in 2005, BNM announced the demonetization of the $1 coins. The third coin series was launched on 25 July 2011 and was introduced into circulation on 16 January 2012. The new coins, in denominations of 5, 10, 20 and 50 sen, will gradually replace the older coin series.

As at 30 June 2014, the total value of CIC is RM70.6 billion; comprising RM68.2 billion banknotes and RM2.4 billion coins (Bank Negara Malaysia, 2014c). In terms of percentage, banknotes accounts for 97% of the total currency in circulation, with the remaining 3% in coins.

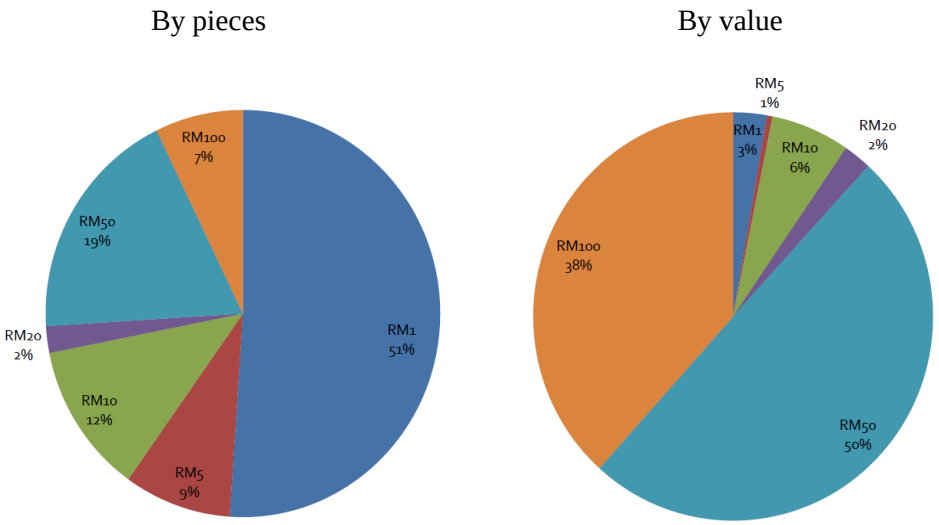

Figure 1.2
Total pieces and values of banknotes as at 30 June 2014
Source: Bank Negara Malaysia (2014b)

The RM50 and RM100 banknotes account for 88% in value, but only 26% in terms of pieces. In contrast, the low-denomination of RM1 banknote accounts for 51% of the total pieces in circulation, but only 3% in terms of value. As for the coins, internal BNM figures suggest that, despite there are around 18.8 billion pieces of coins in circulation, only 16-18%, or around 3.0 billion, are in active circulation and used in transactions. The remaining is considered as non-active, as a result of public's habit of keeping the coins in drawers, jars, piggy banks instead of using them as payment for goods and services.

Further analysis of data shows that 87.8% of total banknotes issued are in circulation, with the remaining 12.2% held by financial institutions. This is not surprising given the high cash spending pattern by public: nine of out ten transactions in Malaysia are paid using cash (Vinayak et al., 2012).

Taken together, the banknotes and coins made up the currency in circulation (CIC). The CIC in Malaysia has been characterized by a consistently high growth since 1970s; largely driven by the growth in the domestic economy. Their levels have risen drastically in terms of both value and pieces over the recent 10 years. To give it a perspective, in 1975, there were just 0.2 billion pieces of banknotes in circulation and this number has increased to 3.2 billion pieces as at end December 2013 (Bank Negara Malaysia, 2014c). This corresponds to a Compounded Annual Growth Rate (CAGR) of 8.2%; which is above the global growth rate of about 6% per year (Currency Research, 2014).

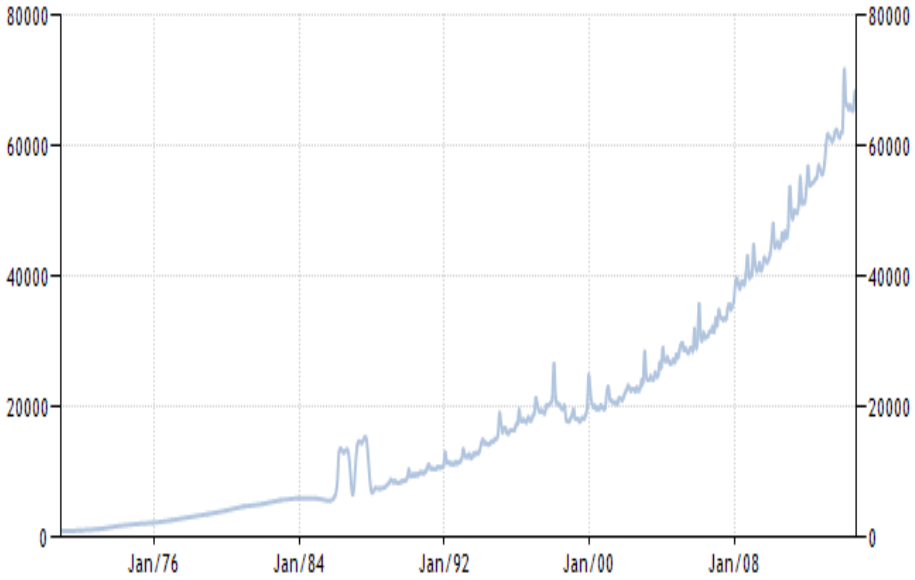

Figure 1.3
Growth in currency in circulation in Malaysia, 1970:1 to 2014:6
Source: Bank Negara Malaysia (2014b)

1.2.1 Managing Currency Supply

One statutory mandate of BNM is to issue and manage legal tender currency. In this respect, BNM drives to ensure optimum availability, quality and integrity of the Malaysian currency by promoting an efficient currency management system.

From the central bank's perspective, it is very critical to satisfy the demand for cash in the most efficient way in order to accommodate the volume needed to facilitate transactions in the economy (Norat, 2008). Any deviation between the desired and actual volume supplied could result in a mismatch, which may result in negative consequences. The biggest challenge for the central bank, however, is to forecast the volume of cash in circulation as many of the factors influencing the demand are beyond the control of the central bank (Norat, 2008).

In Malaysia, the banknote in circulation typically displays very strong cyclical and seasonality pattern. The volume of banknotes in circulation in Malaysia follows an inverted-V shaped pattern. On a weekly basis, the volume of banknotes in circulation typically increases before weekends, reflecting increased demand for use in shopping and leisure activities during the weekends, while the amount decreases at the beginning of the week. On a monthly basis, the volume of banknotes in circulation increases at the end of the month due to payment of salaries, and the volume decreases early in the following month. On a yearly basis, the amount of banknotes in circulation usually increases in December due to the payment of bonuses, year-end sales and withdrawal of extra cash to prepare for the New Year (especially for parents with school-going children).

The volume of banknotes in circulation also increases very significantly around Hari Raya Aidilfitri and Chinese New Year every year. This is attributed to the deeply rooted culture of using only new banknotes during the festive season by members of the public (Lai, 2011). For example, every year, BNM issues about 750 million pieces of new RM1 and RM5 banknotes to meet the festive demand. However, about 70% of the issued banknotes will be returned to BNM as excess soon after the festive season resulting in continuous accumulation of the stock (Bank Negara Malaysia, 2014b). The demand for banknote will gradually return to the normal levels after each of this peak period.

1.2.2 Managing Liquidity

According to Dr. Sukhdave Singh, now a Deputy Governor at Bank Negara Malaysia, the monetary policy objective of BNM is to promote "maximum sustainable growth in an environment of price stability" (Singh, 2006: 204). Like other central banks, this objective can be achieved by "implementing appropriate monetary policy tools in an effort to effectively and efficiently manage the liquidity levels" (Barabas & Major, 2001: 21). In the case of Malaysia, BNM monitors the money supply (and, by extension, money demand) through direct and/or indirect (market-based) monetary policy instruments, such as through statutory reserve requirement, minimum liquidity requirement, volume and direction of credit, interest rates and moral suasion (Mohamadpour, Behravan, Espahbodi, & Karimi, 2012). Insofar management of banknotes is relevant, BNM manages the liquidity function by either supplying or withdrawing liquidity from the banking sector.

The CIC is one of the major liquidity factors in a central bank's balance sheet (Norat, 2008). Central banks manipulate the volume of banknotes in circulation in order to manage the liquidity in the financial system (Barabas & Major, 2001). This requires the central bank to predict the behavior of the demand for money as accurately as possible.

The volume of money in the economy, by and large, is the result of a demand and supply process interaction. These factors are independent because they are beyond the control of the central bank. On the demand side, commercial banks can withdraw cash from the central bank at any time, in order to satisfy the demand of their clients. Central banks, on the supply side, try to achieve

the macroeconomic stability and control of the demand for money through the use of monetary policy instrument. In doing so, central bank relies on the daily assessment of the liquidity conditions in the banking system, so as to determine the liquidity needs and, therefore, the volume of liquidity that needs to be injected or withdrawn from the economy.

1.3 Problem Statement

As the sole issuer of banknotes and coins in Malaysia, it is the statutory responsibility of BNM to satisfy the demand for cash in the most efficient way. However, as shown ealier, the banknotes in circulation have exhibited a high growth pattern since 1970s and their levels have risen drastically in terms of both value and pieces over the years.

By international comparison, the amount of cash in circulation in Malaysia, as measured in terms of the CIC/GDP ratio, is considered to be high (Ibrahim, 2013). Countries such as Australia, Belgium, Canada, Netherland and Sweden have a ratio of below 4%, whereas Malaysia's ratio has remained around 6-7% in the last ten years.

With the world witnessing an upsurge interests in electronic payment instruments, there has been much talk about a cashless society. Plastic and digital forms of money are touted to replace cash (Al-Laham, Al-Tarawneh, & Abdallat, 2009; Birch, 1998; Treiblmaier, Pinterits, & Floh, 2008). Many new payment services have been developed to replace or, at least, reduce paper-based payments. However, despite all these efforts, the usage of cash is

still high in the Malaysian economy. This suggests that the cashless society in Malaysia has not yet materializes.

BNM accepts that the increase in banknote in circulation is, in part, a reflection of the country's economic growth (Lastrapes & Selgin, 2012). However, it is now a key strategic agenda of BNM to drive down the volume of banknotes in circulation for efficiency and cost reasons. This is to be achieved by accelerating the e-payments adoption in the country. The faster the e-payments replace the cash, the less would be the need for the costly printing and supply of banknotes. The higher the adoption of the e-payments, the better the economic efficiency stands to gain. As previously mentioned, widespread utilization of e-payments would have saved at least 1% of Malaysia's GDP annually. This will undoubtedly drive further efficiency gains which will improve the country's competitive position.

The question arises, and is central to this study, as to what factors are continuing to influence the demand for banknotes in Malaysia.

1.4 Research Questions

The research question of this study is "What are the relationships between the dependent variable (i.e. demand for banknotes) and the independent variables (i.e. GDP, inflation, interest rates, exchange rates and market sentiments) within the Malaysian context". Specifically,

(i) Is there any significant relationship between the demand for banknotes and GDP;

(ii) Is there any significant relationship between the demand for banknotes and interest rates;

(iii) Is there any significant relationship between the demand for banknotes and inflation rates;

(iv) Is there any significant relationship between the demand for banknotes and exchange rates; and

(v) Is there any significant relationship between the demand for banknotes and market sentiments.

1.5 Research Objectives

The objective of this study is to investigate factors determining the demand for banknotes in Malaysia and to identify significant relationships among the five factors examined in this study, namely, GDP, interest rates, inflation rates, exchange rates and market sentiments. Specifically,

(i) To investigate the relationship between the demand for banknotes and GDP;

(ii) To investigate the relationship between the demand for banknotes and interest rates;

(iii) To investigate the relationship between the demand for banknotes and inflation rates;

(iv) To investigate the relationship between the demand for banknotes and exchange rates; and

(v) To investigate the relationship between the demand for banknotes and market sentiments.

1.6 Significance of the Study

This study will be of interest to the central bank as it looks into the relationship between selected macroeconomic and non-economic factors and the demand for banknotes in Malaysia. The findings of this study allow policy makers to be better informed as to which variable(s) has significant influence on the demand for banknotes and, therefore, able to predict more accurately the demand behaviour. This consequently helps policy makers to propose appropriate policy actions to manage the cash supply chains more efficiently.

Theoretically, this study extends similar studies on Malaysia in several interesting ways. First, the study period includes data from 2007:1 to 2014:2, which allows the analysis of the demand for money in the face of newly emerging data. Second, following literature on this subject, this study incorporates non-economic factor as the determinant of the long term money demand, which is consistent with the suggestions by authors such as Al-Rabbaie, Baniata and Al-Qalawi (2011) who advocated for more non-economic variables to be considered when modelling the demand for money. Finally, this study uses Partial Least Square (PLS) approach in analyzing and testing the data, which is different from the typical econometric technique used in previous studies.

1.7 Scope and Limitations of the Study

This study focuses on the demand for banknotes in Malaysia, which therefore excludes coins. This is because the demand for coins is considered to be "artificially created" due to the perceived shortage of coins in circulation as a

result of people's habit hoarding them in jars, drawers and cars, instead of putting the coins back into circulation for productive use. This problem is significant not only in Malaysia but also in countries such as the Philippines, India, Ireland, Colombia, etc. (Agcaoili, 2010; Baker, 2014; Begue, 2014; Chakraborty, 2014). The gravity of the problem has led the Government of Philippines, for example, to recently introduce a law to declare the hoarding of coins as a crime and impose 8 years of imprisonment and a fine on offenders (Sazon, 2014). Back to Malaysia; of the 18.8 billion coins currently in circulation, only 3.0 billion coins are active. As at 30 June 2014, coins constitute just 3% of total CIC (Bank Negara Malaysia, 2014c).

The RM20 banknote was re-introduced only in June 2012. Due to it being a new denomination, this study intentionally excludes the RM20 banknote. The exclusion of RM20 does not significantly impair the analysis and result as the RM20 banknote only constitutes 2%, both in terms of pieces and value, out of the total banknotes in circulation (Bank Negara Malaysia, 2014c).

1.8 Organization of the Thesis

This study consists of five chapters. Chapter Two provides a brief theoretical and empirical overview of the theory of demand for money. The review of the theoretical and empirical literature allows the development of hypotheses in Chapter Three. Chapter Three is all about the research methodology. It also introduces the basic concepts of Partial Least Squares (PLS), a multivariate technique, which is used to test the hypotheses. In Chapter Four, the results of this study are presented. It reports the results of the descriptive, factor and

correlation analysis as well as the PLS procedures. Chapter Five discusses the results and concludes. Being the last chapter, it summarizes the major findings and proposes some recommendations for further research in the future.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

The objective of this chapter is to discuss briefly some theoretical perspectives and empirical studies on the demand for money. The first section presents the conceptual definitions of money. The theoretical literature reviews the relevant theories on the demand for money, while the empirical literature looks at some recent empirical studies on this topic, with emphasis on the developing countries. This chapter examines the various relationship between the dependent and independent variables, which forms the basis for the development of hypotheses described in the next chapter.

2.1 Conceptualization of Money in Modern Economy

Money can be broadly defined as "anything that is generally accepted as a medium of exchange" (Siddiqui & Siddiqui, 2011: 374). Previously, the question of which assets constitute the "medium of exchange" varied from one society to another and varied over time. Cowrie shells, beads, furs, gold, silver and several other precious metals have been used as "money" during the primitive days to pay for goods and services (Dutta, 2006). Today, the use of cash as money is more common and, in fact, has become an indispensable part of the modern economic system

Cash, according to definition by Mankiw (2007: 73), is the "stock of assets that can be readily used to make transactions". Banknote is one form of cash, typically issued by a central bank. A more legalistic definition define a banknote as "a type of negotiable instrument known as a promissory note, which is payable to the bearer on demand" (Dumais, 2012: 6). It is a type of financial asset for its holders, but is a liability to the issuing central banks (Jha, 2003).

Banknote is a unique type of assets and it differs from other payment instruments (such as credit card, debit card, e-payment, m-banking, payment transfers etc.) in the sense that it offers the some differentiating values, such as anonymity, universality and trust.

Anonymity: Anonymity is a value is a specific to cash as it is the only payment instrument which does not require the transmission of identity data between the payer and the payee (Bennet et al., 2014). This allows cash being passed from hand to hand without the individual payment being recorded or tracked.

Universality: Universality means that the cash is widely accepted, in a variety of situations (Siddiqui & Siddiqui, 2011). Cash does not require technology and infrastructure to pay or be paid, therefore allowing people – young and old; poor and rich - to use it for a broad range of transactions.

Trust: Cash issued by the central banks (e.g. Bank of Thailand, Central Bank of the Philippines, Bank Negara Malaysia etc.) or monetary authorities (e.g. Autoriti Monetari Brunei Darussalam, Monetary Authority of Singapore, etc.)

is a legal tender (Wolla, 2013). As a legal tender, the banknote is recognized under the law for payment of transactions and for meeting a financial obligation (Dumais, 2012)

Money can also be defined by the functions it fulfils (Dutta, 2006; Mankiw, 2012). In enabling the modern, money-based economies, money serves four major functions: medium of exchange, unit of account, store of value and standard for deferred payment (Dutta, 2006; Mankiw, 2012; Mishkin, 2009; Siddiqui & Siddiqui, 2011).

Medium of exchange: The most obvious function of money is as a medium of exchange. As a medium of exchange, money facilitates trade and transactions between parties, compared to the previous barter system where one good or service is exchanged directly for other goods or services (Siddiqui & Siddiqui, 2011). One limitation of the barter system is to satisfy the double coincidence of wants between two or more trading parties. The search for the other party to exchange goods or services is difficult and time-consuming (Wolla, 2013). Money, however, frees people from the need to barter and provides simplification where money, instead of a physical good, is used to pay for goods and services. The efficiency gain is that money allows for transactions to be made faster, easier and universally accepted in all transactions and by all parties.

Unit of account: As a unit of account (*numéraire*), money acts as a standard measure of value, thereby allowing people to quote the relative price of goods and services in the entire economy in terms of units of money, say, ringgit,

rather than in quantity of goods or services. This simplification reduces transaction costs and allows both the sellers and buyers to make decisions based on a common base of comparison. According to Mishkin (2009), this function of money is especially important as the economy grows and becoming more complex.

Store of value: Money can also be used to buy goods and services, not only for today but also in the future. In other words, money allows people to trade current consumption for future consumption (Mishkin, 2009). This function of money is useful because some people prefer to spend their income a later point in time, instead at the time the money is received (Wolla, 2013). A store of value, money represents future purchasing power. This gives the holder "economic freedom through time", giving the holder the power to delay the purchase of goods and services to a convenient time (Belke & Polleit, 2009: 3).

Standard for deferred payment**:** Money is used as a standard for specifying future payments for current purchases, that is, buying now and paying later (Belke & Polleit, 2009). Because there is the element of inflation, money allows for the amount of those future payments to be maintained in such a way that both creditors and debtors do not stand to lose.

Another way to define money is in terms of monetary aggregates (Belke & Polleit, 2009; Mishkin, 2009). Monetary aggregate refers to the aggregation of all assets that can fulfil the function of money (Belke & Polleit, 2009). The

definition, however, tends to vary from country to country. In Malaysia, for example, the monetary aggregate is defined as follows:

M1 = Currency in circulation + Demand deposits

Currency in circulation	Refers to the banknotes and coins issued by BNM less the amount held by the commercial banks and Islamic banks
Demand deposits	Refers to the current accounts of the non-bank private sector placed with the commercial banks and Islamic banks

M2 = M1 + Narrow Quasi-money

Narrow Quasi-money	Equals to Savings deposits + Fixed deposits + NDs + Repos + Foreign Currency deposits

M3 = M2 + Deposits placed with other banking institutions

Deposits placed with other banking institutions	Refers to the sum of deposits/interest bearing instruments placed by the non-bank private sector with finance companies, merchant banks and discount houses

Source: Bank Negara Malaysia (2014a)

M1 is the narrowest measure of monetary aggregates and includes currency such as banknotes and coins, traveller's checks, demand deposits etc. It is the most liquid components of the money supply. M2 includes everything in M1 plus quasi-money such as saving accounts, time deposits and balances in

money market. The quasi-money can be turned into cash quickly at a little cost. M3 includes M2 and other less-liquid assets such as larger time deposits, repurchase agreement. In a way, M3 includes other forms of long-term money and is regarded as the broadest measure of the money supply in the economy.

2.2 Demand for Money

Demand for money broadly refers to the relationship between the quantity of money that people wish to hold and the variables which determine that quantity (Mankiw, 2007). In theory, the money that is supplied by the central bank should always be sufficient to accommodate the volume of transactions in the economy (Norat, 2008). Any deviation between the actual and the desired money balances could have an impact on the output and the price level.

At the operational level, the demand for money function is a key element in the analysis, design and conduct of an efficient monetary policy (Sriram, 2001). Central banks in many countries rely mainly on the demand for money function both as a means of identifying medium-term growth targets for money supply and also as a way of manipulating interest rates and the reserve money for the purpose of controlling total liquidity in the economy (Banuso, 2013; Biswas, 2013).

The effectiveness of the monetary policy depends crucially on the stability[2] of the demand for money function (Sriram, 2001). The stability of the demand for money function is crucial because a stable demand allows for better prediction of the effects of monetary policy on interest rates, output and inflation. The more stable the demand for money function is, the more predictable the outcome of any policy action is expected to be. Hence, a stable money demand function is regarded as a precondition for an effective monetary policy (Sriram, 2001). The knowledge on the behaviour of the demand for money function makes it possible for central banks to select appropriate monetary policy actions and, if required, modify their monetary policy instruments to achieve the expected reaction in the target economic variable (e.g. interest rates, output and inflation, unemployment rates etc.).

From the monetary view, an unstable demand for money function is deemed 'useless' and lost their influence in the conduct of monetary policy (Handa, 2009). There are many factors that cause the demand for money function to become unstable over time in any county. For this reason, considerable efforts have been made over the last few decades, in both developed and developing countries, to investigate the relationship between the demand for money function and its determinants, given the fact that demand for money function plays an important role in the decision making process of central banks in dealing with monetary and exchange rate policies.

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[2] Three key elements usually characterize a stable demand function: the demand for money should be well-specified, parsimonious and reflect developments in the real sector of the economy (Judd & Scadding, 1982).

Understanding the sources of instability in the demand for money function is, indeed, one of the fundamental questions in economic policy. If the central bank knows the factors affecting the demand for banknotes, policy makers will be able to implement a sound and effective monetary policy. This is, as described earlier, the core focus of this thesis. To allow the researcher to derive at the factors and specifications of the relationships, a literature review was conducted on the related theories relevant to the demand for money.

2.3 Theoretical Literature Review on the Demand for Money

There are three dominant theoretical perspectives on the demand for money, namely, the classical, Keynesian and post-Keynesian views (Belke & Polleit, 2009; Bitrus, 2011b; Mishkin, 2009; Snowdon & Vane, 2005; Sriram, 2001).

2.3.1 Classical Views

The classical school dates back to the quantity theory of money. The quantity theory of money holds that all markets are in equilibrium. In such an economy, prices are assumed to be flexible and the economy in full employment. According to this classical theory, money is "neutral" and it has no effect on the real economic activities such as in the determination of real interest rates and relative prices (Snowdon & Vane, 2005). The role of money is simply a medium of exchange which is used as a *numéraire* to express prices and value of various goods and services (Sriram, 2001).

The quantity theory postulates a direct and proportional relationship between the price level and the quantity of money. In other words, the quantity theory

posits that a change in the money supply causes a proportionate change in the price level (Handa, 2009). It has two alternatives but equivalent expressions. The first version is associated with the work of the American economist, Irving Fisher. The second version, associated with two Cambridge economists, Alfred Marshall and A. C. Pigou, is known as the Cambridge cash-balance approach.

Fisher's equation of exchange: Fisher's approach holds that money is simply held to facilitate transactions. Therefore, the demand for money is a function of the volume of transactions in an economy (Handa, 2009; Snowdon & Vane, 2005). The demand arises as a result of the individual's needs to trade with one another. Given this, the more people do transactions, the more money is demanded. In Fisher's theory, the equation of exchange is expressed by the amount of spending on goods and services produced in the economy (M) multiplied by the average number of times it changes hands over the same time period (V). This value must equal to the nominal income (PQ), denoting by price level (P) and level of output (Q).

Because money is simply held to facilitate transactions, therefore, under this theory, the quantity of money supplied must equal to the quantity demanded. This gives to the total quantity of money in circulation.

There are two important implications of this theory. First, other things being equal, the theory states that the quantity of money increases in a direct proportion with the price levels. Second, the volume of transactions, at the

aggregate level, is related to the aggregated income of all individuals, or the national income.

Cambridge cash-balance approach**:** The Cambridge approach addresses from the perspective on what determines the amount of money that individuals wish to hold money, rather than the amount of money that an economy needs to carry to facilitate transactions (Snowdon & Vane, 2005). In this approach, money is held not only as a medium of exchange (as in Fisher's proposition) but also as a store of value (Handa, 2009). In other words, the theory proposes that individuals hold money for two reasons, namely for transactions' purposes and for enhancing their wealth. Individual's decision to keep money for wealth purposes links to the gains and the opportunity cost of holding money. The opportunity cost of holding money simply refers to the income forgone by not holding other assets (Mishkin, 2009). With the wealth of individual increasing, the volume of money held for wealth purposes would equally increased.

In addition to income being the most important determinant of the demand for money (as in income version of Fisher's equation), the Cambridge's equation also considers other variables, such as the interest rates and wealth, as might having an important influence on the money demand. Unlike Fisher, they also did not assume a direct and proportionate relationship between income and demand for money.

2.3.2 Keynesian Views

Introduced by John Maynard Keynes, he reasoned that people's need to hold money arises out of liquidity considerations (Belke & Polleit, 2009; Snowdon & Vane, 2005). He identified three motives that lead people to hold money.

Transactions motive: In connection with the function of money as a medium of exchange, Keynes said that people hold money in order to meet day-to-day personal and business exchanges. The demand for money arises out of the need to bridge the gap between receipts and payments (Handa, 2009). Hence, Keynes proposed that the transaction demand for money depends on income and varies in direct proportion to the changes in money income.

Precautionary motive: Precautionary motive also relates to the function of money as a medium of exchange. People hold money or some part of it to cover sudden or unexpected events, such as medical emergencies. This arises out of the uncertainty of future income and consumption needs (Belke & Polleit, 2009; Bitrus, 2011b). The desire to hold money for the precautionary motive is simply to reduce risks (Snowdon & Vane, 2005). Accordingly, the precautionary demand for money varies with the level of income.

Speculative motive**:** The speculative motive relates to the desire of people to hold money as a store of value; primarily as part of an expanded investment portfolio (Handa, 2009). People hold money above their needs in order to earn some form of gains by speculating on alternative assets' prices, e.g. bond (Taiwo, 2012). According to Keynes, there is an inverse relationship between the speculative demand for money and interest rates. Therefore, money can

serve as an alternative to interest-bearing bonds. For this reason, people will choose to hold a higher amount of money temporarily when they believe that the current interest rates for bonds are too low and, at the same time, they expect a future increase in the interest rates. This results in the quantity of money held for speculative motive becomes perfectly elastic with respect to the interest rates (Snowdon & Vane, 2005; Taiwo, 2012). Keynes called this "liquidity preference".

Summarizing the discussion above, in Keynes' perspective, the demand for money is a positive function with respect to income, but a negative function with respect to interest rates.

2.3.3 Post-Keynesian Views

Following Keynes' contributions, there are a number of newer theories proposed to examine the nature and determinants of the money demand function. The following sub-section discusses briefly some of these newer theories.

Tobin's Speculative Demand for Money: Extending Keynes' liquidity preference model, Tobin developed a formal model of the speculative demand for money. Tobin used the theory of portfolio choice to demonstrate why people held their investment balances in cash, instead in other monetary assets (Belke & Polleit, 2009) and looked at the demand for money from the risk angle (Sanya, 2013). In Tobin's model, there is an assumption of portfolio choice between money and bonds and the asset allocation between the two is based on each asset's relative benefits and risks (Bitrus, 2011b).

People are generally uncertain about the future of the rates of interest and their accompanying risks. Due to these uncertainties, people tend to hold both cash and bonds as they seek to diversify their portfolio (Sanya, 2013). By holding cash, it reduces the total amount of risk because the rate of return on holding money is more certain than the rate of return on bonds. Holding other financial assets is much riskier due to the market price volatility, while money is not.

Friedman's Restatement of Quantity Theory of Money: Friedman assumes that people hold money with the intention of using it for future purchases of goods and services (Belke & Polleit, 2009). However, Friedman treats money as a consumer good that needs to compete with the other types of assets such as stocks, bonds and physical assets. The demand for money is, therefore, limited by the resources at the disposal of the individual. On a higher level, Friedman's theory states that the demand for money depends on the overall wealth of the society in various forms, such as money, bonds, equity shares, commodities, materials and human resources; which he categorized into human and non-human wealth (Handa, 2009; Rasheed, 2011). In Friedman's formulation, income and wealth are expected have positive effects, while the rest of the factors (e.g. inflation rates, interest rates, equity yields etc.) are expected to have negative effects on the demand for money.

Baumol-Tobin's Inventory-Theoretic Approach**:** The Baumol-Tobin model analyzes the costs and benefits of money holding (Belke & Polleit, 2009). "The benefit is convenience, while the cost of this convenience is the interest

foregone" (Atingi-ego, 2007: 7). An individual can choose to balance his allocation of money in either money (which does not earn interest) or an interest-earning alternative asset, e.g. bonds, security equities. There is, however, a trade-off between income in holding of money and the transaction costs (e.g. brokerage fees) that need to be incurred when converting these interest-earning assets into money. While higher holdings of money may help to minimize transaction costs, it also comes at a cost in the form of foregone interest income (Handa, 2009; Mankiw, 2007). Clearly, the money demand function under the Baumol-Tobin model is a function of interest rates.

2.4 Empirical Literature Review on the Demand for Money

While the literature on the demand for money is voluminous, empirical studies that deal specifically with the demand for banknotes, to the researcher's knowledge, are very few. Because of this gap, this section will review empirical literature relating to the broad area of the demand for money. This approach is appropriate given banknote is one key component of the monetary aggregates.

It is generally agreed that the demand for money is a function of a scale variable (related to the impacts of income and wealth as well as the level of transactions in the economy), opportunity cost (related to substitution based on relative attractiveness of other assets regarded as substitutes of money) and other qualitative factors, such as political stability, economic crisis, banking liberalization etc. (Bitrus, 2011b; Handa, 2009; Mall, 2013; Sriram, 2001).

From the brief review of the empirical literature, it is noted that there are variations in the existing studies, in terms of the background against which the studies were conducted; ranging from increasing globalization of capital markets, financial liberalization, development stage of the country and innovations in domestic markets or due to the country-specific events (e.g. political instability, change in policy) and the dependent (e.g. real income, M0, M1, M2, M3 etc.) and independent variables (e.g. [income/wealth] GDP, GNP etc., [inflation] CPI, GDP deflator etc., [interest rates] Treasury Bills rate, Government Bond Yield rate, Time Deposit rate etc.) examined in the different studies.

There are also differences in terms of the subject of the studies (whether it is cross-country, between countries or individual country's studies), period of studies and data frequency used for analysis (ranging from monthly, quarterly and annually) and the methodological approaches adopted for analysis (such as Ordinary Least Squares (OLS), Autoregressive Distributed Lag (ARDL), Error Correction Methodology (ECM), Vector Auto–Regression (VAR) etc.).

2.4.1 Studies on Developing Countries

The focus of this study is on the factors influencing the demand the money and, below, is a brief discussion drawn from recent empirical studies in this area, with emphasis on the developing countries. This is summarized in Table 2.3.

Table 2.3
Summary of review of selected empirical literature on money demand

Author	Country	Period (Data)[1]	Type of model[2]	Money agg.[3]	GDP[4]	Interest rate[4]	Inflation rate[4]	Exchange rate[4]	Other factor[4]
Abdullah, Chani, & Ali (2013)	Pakistan	1972-2010 (A)	VECM	M2			-		
Abdulkheir (2013)	Saudi Arabia	1987-2009 (A)	VECM	M2 (SR)	+	+	+	+	
				M2 (LR)	NS	+	+	-	
Adikari (2013)	Sri Lanka	1977-2011 (A)	OLS	M2	+	+		+	Financial liberalization +
Bahmani & Kutan (2010)	7 countries	1994-2006	EMC	M2	+	+		+/-	
Bashier & Dahlah (2011)	Jordan	1975-2009 (A)	CUSUM	M2	+	-		-	
Baye (2011)	Cameroon	1948-1965 (A)	ECM	M2	+			+/-	
Dahmardeh, Pourshahabi, & Mahmoudinia (2011)	Iran	1976-2007 (A)	ARDL	M2	+	-			Economic uncertainty -
Dritsakis (2011)	Hungary	1995-2010 (Q)	ARDL	M1	+	-		-	

Table 2.3 (Continued)

Author	Country	Period (Data)[1]	Type of model[2]	Money agg.[3]	GDP[4]	Interest rate[4]	Inflation rate[4]	Exchange rate[4]	Other factor[4]
Dube (2013)	South Africa	1980-2010 (Q)	ARDL	M3	+	-		-	Stock price -
Gungor & Berk (2006)	Turkey	1996-2006 (M)	NN	M2			+		
Ioan & Ioan (2011)	Romania	2001-2011 (A)	OLS	M2	+	-			
Kaznovsky (2008)	Romania	1992-2005 (M)	ECM	M2	+	-	-	+	
Mall (2013)	Pakistan	1973-2010 (A)	BT	M2	+	-		+	
Miah (2011)	Bangladesh	1999-2005 (Q)	CUSUM	M1	+	+		+	
				M2	+	+		+	
				M3	NS	NS		NS	
Narayan & Narayan (2008)	Fiji	1971-2002 (A)	BT	M2	-				Political instability -
Pasaribu (2002)	Indonesia	1970-2001 (Q)	ECM	M2 (SR)	+	-			
				M2 (LR)	+	-			
Femi (2014)	Nigeria	1970-2003 (A)	OLS	M1	+	-	+	-	
				M2	+	-	-	-	

Table 2.3 (Continued)

Author	Country	Period (Data)[1]	Type of model[2]	Money agg.[3]	GDP[4]	Interest rate[4]	Inflation rate[4]	Exchange rate[4]	Other factor[4]
Okonkwo, Ajudua, & Alozie (2014)	Nigeria	1981-2012 (A)	ECM	M2	+	-	-	-	
Opolot (2007)	Uganda	1990-2004 (Q)	ARDL	M2	+		-	-	
Siliverstovs (2008)	Latvia	1996-2006 (Q)	ECM	M2	+	-	-		
Sheefeni (2013)	Namibia	2000-2012 (Q)	ARDL	M2	NS	NS	NS		
Taiwo (2012)	Nigeria	1970-2008 (A)	OLS	M2	+	-			

Source: Developed by author

[1] A = Annually, Q = Quarterly, M = Monthly
[2] R = Regression, OLS = Ordinary Least Squares, ARDL = Autoregressive Distributed Lag, ECM = Error Correction Model, VECM = Vector Error Correction Model, BT = Bound Testing, CUSUM = Cumulative Sum, J = Johansen, NN =Neural Network
[3] SR = Short Run, LR = Long Run
[4] + = Positive, - = Negative, +/- = Mixed, NS = No statistically significant relationship

Pasaribu (2002) specified the money demand in Indonesia as the functions of real income and domestic interest rates for quarterly samples, 1970-2001. He used Error Correction Model (ECM) test and found that in the short-run, real income and rates of interest have significant impacts on the Indonesia's demand for narrow money (M1). The elasticity of real income and rate of interest was 0.7 and –0.3, respectively. In the long-run, the elasticity of real income and rate of interest to the demand for narrow money increased to 1.1 and –0.5, respectively.

Okonkwo, Ajudua, and Alozie (2014) carried out a study to examine the influence of GDP, inflation, exchange rates and interest rates on the demand for money in Nigeria. Of the four, three variables, namely, GDP, interest rate and inflation were found to be rightly signed but not significant. The only significant relationship was between exchange rates and the demand for money. It has a negative relationship. In all, the four variables examined accounted for 94% of the variance.

In another similar study, Taiwo (2012) examined the effects of GDP and interest rates in Nigeria between 1970-2008. The study concluded that GDP has a major effect on the money demand. As also expected, the relationship between interest rates and the demand for money was one of a negative: a 1% change in interest rate would induce a -45% unit change in money demand.

In Saudi Arabia, Abdulkheir (2013) modelled the demand for money (M2) function from 1987-2009. He used the Vector Error Correction Model (VECM) and found that the long run relationships between money demand and interest rate, inflation rate and exchange rate were significant. However, the relationship between money demand and GDP was not significant statistically, in the long run. GDP was only significant in the short term. Relating to this, Abdulkheir reasoned the findings to be the result of the large government expenditure linked to the oil revenues, making the demand for money insensitive to the GDP.

In neigbouring Jordan, Bashier and Dahlah (2011) studied the determinants of money demand function over the period 1975-2009. In consistent the wisdom of the economic theory, the empirical results of this study showed that GDP has a significant positive relationship, interest rate has a significant negative impact and exchange rate has a significant negative effect on the money demand.

Miah (2011) analyzed the stability of the narrow and broad money demand functions (M1, M2, and M3) in Bangladesh for the period 1999-2005. The results demonstrated that there was a significant long-run relationship between the narrow (M1 and M2) money aggregates and its determinants: GDP, interest rate and exchange rates. There was no statistically significant relationship between the determinants and the broad (M3) money aggregate.

Adikari (2013) examined the impact of financial liberalization on the demand for money. He estimated the demand for M2 function in Sri Lanka for 1977-2011. He used 10 major policy components of the financial liberalization package. His study showed that there was a positive relationship between broad money and financial liberalization in Sri Lanka. Additionally, he investigated the relationships between the demand for money and GDP, interest rates and exchange rates. The OLS results indicated that the coefficients for all three parameters were positively related to the broad money.

In another study, Dharmada and Makoto (2013) estimated the demand for money for Sri Lanka during a period of international financial crisis. The study found that the demand for money was positively influenced by GDP during the financial crisis.

In Cameroon, Baye (2011) found that GDP and foreign interest rates have significant influence on the demand for money. The effects of the bilateral exchange rates on the money demand were mixed. Depreciation of the Cameroonian's CFA franc vis-à-vis the US dollar, resulted in the demand for CFA franc to increase. But with France, the depreciation of the CFA franc reduced the demand for the domestic money.

Gungor and Berk (2006) used a neural network model to investigate the relationship between money supply and inflation in Turkey. The results of the

study indicated that the levels of inflation influenced the growth rate of money supply in Turkey.

Dahmardeh, Pourshahabi and Mahmoudinia (2011) presented empirical findings of the relationship between economic uncertainty, income and interest rate on the demand for money in Iran for the periods 1976 to 2007. Economic uncertainty reduced the demand for money because the uncertainty leads public to reduce in holding of money. The study found that a 1% increase in economic uncertainty led to a 0.34% decrease in money demand. During the period, interest rate was found to have a negative and significant effect on the demand for money, but income was positive and significant.

Bahmani and Kutan (2010) considered the experiences of seven emerging economies (Armenia, Bulgaria, the Czech Republic, Hungary, Poland, Russia, and the Slovak Republic) in order to estimate the demand for money. The study used GDP, inflation rate and exchange rate as the three main determinants of money demand. GDP has a positive elasticity but inflation rate has a negative elasticity in all seven countries. On the other hand, the result for exchange rate was mixed: the exchange rate carried a significant positive coefficient in the cases of Bulgaria and Hungary, implying that a depreciation results in currency substitution away from domestic currency. However, it carried a negative coefficient in the cases of Poland, Russia and the Slovak Republic, implying that if domestic residents perceive an increase in the value of their foreign assets, they will tend to spend more, thus demanding more domestic currency.

Ioan and Ioan (2011) analysis using Romanian data showed that the demand for money was positively influenced by GDP, but negatively influenced by interest rate. Their study showed that a 1-billion lei increase in GDP contributed to an increase in the money demand by 184.4 million lei. However, a 1% increase in interest rate decreased the money demand by 93.79 million lei. The two factors, GDP and interest rate, explained 96% of the variance in the model.

Using monthly data for the periods between 1992 to 2005 in Romania, Kaznovsky (2008) found that the depreciation of national currency influences the growth of money demand; attributable this to the process of substitution effect, which the author noted as a typical characteristic for emerging market. The study also confirmed the negative relationship between inflation rate and M2.

Narayan and Narayan's (2008) work for Fiji showed a negative effect of GDP on money demand. The authors attributed this to the weak political climate for business activity and investment. During 1971-2012, Fiji had undergone a sustained period of political unrest. The climate for business activity and investments was weak due to political coups and a sustained period of political instability beginning in 1987. In such an environment, business activity is risky. Negative income elasticity is not uncommon.

Ozturk and Acaravci (2008) investigated the determinants of the demand for money in ten transition countries (Bulgaria, Croatia, Czech Republic, Hungary,

Macedonia, Poland, Romania, Russian Federation, Slovak Republic and Ukraine) for 1994-2005. The results showed that GDP increased the demand for money. On the other hand, the study found evidence that inflation negatively influenced the demand of money.

In Pakistan, Abdullah et al. (2013) analyzed the effect of government expenditures, household expenditures, investment expenditures, export expenditures and price levels on the money demand. The results of this study showed that household, investment and export expenditures have positive and significant relationships on money demand in Pakistan. But, the results also showed that government expenditures and price levels in the country have significant negative relationships on money demand. For example, a 1% increase in the price level resulted in the demand for money reduced by 0.025%.

In another study, Mall (2013) used GDP, interest rate and exchange rate as the determinants and annual time series data from 1973 to 2010 to estimate money demand. In consistent with literature, two factors, namely, GDP and exchange rate have positive relationships with the demand for money. However, the third factor, interest rate has a negative influence on the money demand. Based on his econometric analysis, he showed that a 1% increase in the GDP led to 0.76% increase in the demand for money in the long run.

For Latvia, Siliverstovs (2008) modelled the money demand function using GDP, interest rate and inflation rate as the explanatory variables. The results showed that a positive relation between GDP and demand for money. On the other hand, interest rate and inflation rates have negative relationships.

Dube (2013) estimated the demand for M3 in South Africa. The results of Dube's study conformed to economic theory: the income elasticity was 1.51, the inflation elasticity was -0.13, the exchange rate elasticity was -0.04 and the stock price elasticity was 0.29.

In Hungary, Dritsakis (2011) examined the relationships between the demand for money and three explanatory variables, namely, GDP, inflation rate and exchange rates. Dritsakis found that the income elasticity coefficient was positive. The elasticity coefficients for inflation and exchange rate were both negative.

Using quarterly data for the period 1990 to 2004 in Uganda, Opolot (2007) demonstrated that M2 were positively related to GDP (elasticity of 1.5) and negatively related to the interest rate (elasticity of -0.01) and the exchange rate (elasticity of –1.2).

2.4.2 Selected Studies on Malaysia

The study on the causality between factors and the influence on the demand for money have been carried in Malaysia, albeit comparatively few in number.

Azali, Baharumshah and Habibullah (2001) found a positive relationship between exchange rate and money demand, which is in agreement with the monetarist view.

Malaysia financial system is unique in that it operates a dual banking system: conventional and Islamic system. Kaleem and Isa (2006) estimated the demand for money function in the presence of Islamic banking. They found two motivating results. Firstly, the coefficient of inflation appears with positive sign which indicated that depositors prefer to stay with Islamic banking even at increasing prices. Secondly, the results found that the financial crisis affects Islamic and conventional intermediate aggregates in the same manners.

Abdul Majid (2007) assessed the relationship between monetary aggregate, output and prices with respect to the conduct of monetary policy in Malaysia. The empirical evidence showed a statistically significant relationship between inflation and money growth in Malaysia.

The focus of the study by Eileen, Jusoh, and Md Tahir (2010) was on the relationship between inflation and money demand; specifically to determine whether the relationship between inflation and money demand is non-linear. The authors found that the relationship between inflation and money demand follows a quadratic function. Further, they concluded that the demand for M2 in Malaysia was a function of the rate of inflation and income.

Abdullah, Ali and Matahir (2010) conducted an empirical analysis to examine the relationship between relationship among broad monetary aggregate, income, interest rate, exchange rate, foreign interest rate, and inflation for five ASEAN economies: Indonesia, Malaysia, the Philippines, Singapore, and Thailand. In consistent with the economic theory, they found that the income elasticity and the exchange rate coefficient were positive while the inflation elasticity was negative. The authors noted that, with respect to Malaysia, there had been a strong incentive for persons to switch out of money into real assets when there are strong inflationary expectations.

Ooi and Brahmana (2011) examined the factors of monetary policy transmission that affecting output and inflation variability in Malaysia. By using quarterly data from 1980 to 2008, the results supported the conclusion of the quantity theory of money; whereby "money supply expansions only cause price inflation". Interest rate was also found as another important intermediate target in the monetary policy transmission mechanism in affecting output variability.

2.5 Conclusion

This chapter provided a brief review on the theoretical and empirical discussion on money demand. The theoretical literature reviewed three relevant theories on the demand for money, namely classic, Keynesian and post-Keynesian views on the demand for money. The empirical literature summarized some recent studies on this topic, with emphasis on the developing countries. This chapter

highlighted the various relationships between the dependent and independent variables. This forms the basis for the development of hypotheses which will be undertaken in Chapter 3.

CHAPTER THREE
METHODOLOGY

3.0 Introduction

The purpose of this chapter is to present the research methodology used in this study. The first section of the chapter deals with hypotheses development, which is the result of the theoretical and empirical literature in the previous chapter. Following this, it explains the research design and sources of data. This chapter also describes the key concepts of the Partial Least Square (PLS) method, which is used for analysis.

3.1 Hypotheses Development

The demand for banknotes in Malaysia is influenced by combination of both economic and non-economic factors. This proposition is grounded on the findings of empirical studies, discussed earlier, which found significant relationships exist between macro-economic variables such as GDP, inflation, interest rates and foreign exchange rates and the demand for money. In addition, it is also argued that non-economic factor, represented by the market sentiment in this study, may be relevant in determining the demand for banknotes in Malaysia. This is in line with the call by Al-Rabbaie et al. (2011) who proposed

for unobserved variables (e.g. financial innovations, deregulation, political stability etc.) to also be considered when modelling the demand for money.

3.1.1 Volume of Banknotes in Circulation

As explained by Bashier and Dahlah (2011), the choice of the monetary aggregate as the dependent variable depends on the goals of the study and approach used to model the demand function. In this study, volume of banknotes issued into circulation is used as the proxy for money demand. This is consistent with the assumptions of the quantity theory of money that the demand for money must be equal to the money supply in equilibrium in the economy.

3.1.2 GDP

It is widely accepted that the demand for money is closely related to the overall economic activity. Money is a key payment instrument and is used for the various economic transactions. Intuitively, the demand for banknotes will be related to the level of income, wealth and economic activities.

GDP, by definition, refers to the total value of goods and services produced within the borders of a country in one year (Mankiw, 2012). It is a popular indicator to represent the economic conditions and growth. The rise in GDP signals a favourable the economic growth and, by extension, income.

A priori, with an increase in income, consumers and businesses would generally demand for more goods and services. This increases the level of transactions, therefore, increases the demand for money required to finance the high level of transactions in the economy. Through this linkage, it is expected GDP to exhibit a strong and positive correlation between income and the demand for banknotes. Many previous studies (Dritsakis, 2011; Dube, 2013; Ioan & Ioan, 2011; Mall, 2013; Pasaribu, 2002; Taiwo, 2012) have supported a positive relationship between GDP and the demand for money. For this study, Hypothesis 1 is as follows:

H1: The demand for banknotes has a positive relationship with GDP.

Gross Domestic Product (GDP) and Gross National Product (GNP) are used as the proxies for wealth and income. The coefficients of the GDP and GNP are expected to carry a positive sign.

3.1.3 Interest Rates

The theoretical postulations of Keynes, Friedman, Baumol and Tobin have elaborated the influence of interest rates on the demand for money. The demand for money is expected to be negatively related with the returns (i.e. interest rate) of other financial assets. As cost of capital, interest rates represent the opportunity cost of holding money; hence influence the profitability and value of the assets. Thus, during times of higher interest rates, the public would generally prefer to hold more of other types of non-monetary financial assets

(such as saving accounts, bonds, treasury bills etc.) as the earning potential through cash eroded.

Many previous studies that have included interest rates in modelling the money demand functions. The results of these studies have shown the existence of an inverse relationship between the domestic interest rates and the demand for money (e.g. Dahmardeh et al., 2011; Ioan & Ioan, 2011; Mall, 2013; Opolot, 2007; Pasaribu, 2002; Siliverstovs, 2008; Taiwo, 2012). This is due to the fact that an increase in the interest rate will make non-monetary financial assets more attractive, thus will lead to a decline in the demand for money. Interest rates can be seen as the price of money. Thus, higher interest rates would discourage consumption. This consequently would reduce the demand for money. On this basis, it is hypothesized a negative influence on the demand for banknotes when the interest rate increases.

> H2: The demand for banknotes has a negative relationship with interest rates.

One short and one long interest rate are used as proxies for interest rates. The 91-day Treasury Bills (T-Bills) rate and 3-year Malaysian Government Securities (MGS) were used as a proxy to represent the short- and long-term domestic interest rate, respectively. It is expected that an inverse negative relationship exists between the demand for banknotes and interest rates. Hence,

the coefficient of 91-day T-Bills rate and MGS are expected to carry negative signs.

3.1.4 Inflation Rates

The demand for banknotes is also expected to be influenced by the rates of inflation. Inflation is broadly defined as a sustained rise in the general level of prices as a result of excessive increase in the quantity of money (Mankiw, 2012). Inflation leads money to lose its value rapidly.

Friedman treated inflation rates as the opportunity cost of holding money. Therefore, an increase in inflation rates is considered a "bad" news as it reduces the purchasing power of the real value of money. The strong inflationary expectations induce people to switch out of money to real assets. By people doing this, it would lower the demand for money.

Based on this theoretical postulation, and supported by findings from many previous studies (e.g Abdullah et al., 2013; Bahmani & Kutan, 2010; Dube, 2013; Siliverstovs, 2008), it is hypothesized that the inflation rate is expected to have a negative influence on the demand for banknotes.

> H3**:** The demand for banknotes has a negative relationship with inflation rates.

The Consumer Price Index is commonly used to measure inflation in Malaysia and is also used in the study. CPI data for the evaluation period were obtained from BNM. In addition, two alternative price data are used as the price measures, namely GDP Deflator and Producer Prices. The coefficients for all three proxies for inflation rates are expected to carry a negative sign.

3.1.5 Exchange Rates

Malaysia is a very open economy. Its economic growth has long been dependent on exports. Given the openness and internationalization of the economy, the exchange rate becomes an important variable in the money demand function. It is included in this study to capture the degree of currency substitution in the economy.

Exchange rate has an undetermined effect on money demand, which depends on how the public anticipate the future currency depreciation. If the public anticipates an increase in the expected exchange rate, the effect of the currency depreciation on money demand is negative, as this will lead to the substitution of domestic currency for foreign currency since the expected returns from holding foreign currency will increase. On the other hand, the anticipation of currency appreciation has a positive impact on money demand.

Based on this effect, it can be postulated that exchange rates may have a negative effect on the demand for the Malaysian banknotes.

H4: The demand for banknotes has a negative relationship with exchange rates.

The exchange rate used in this study is defined in terms of the amount of Malaysian Ringgit per one unit of the U.S Dollar. An appreciation of the Malaysian Ringgit is the same as a decrease in the exchange rate. Similar approach was adopted by Opolot (2007), Bashier and Dahlah (2011) and Femi (2014).

Another proxy used is Import Prices. Import prices correspond to the rate of change in the prices of goods and services purchased by residents of a country from foreign sellers. As an example, a weaker Ringgit would increase the cost of foreign goods for Malaysian consumers, thereby reducing Malaysian demand for imports, while boosting foreign demand for Malaysian goods by making exports more price-competitive abroad. Clearly, import prices are heavily affected by exchange rates.

3.1.6 Market Sentiments

The demand for banknotes can also be influenced by other factors that are essentially qualitative, such as political stability (Narayan & Narayan, 2008), economic uncertainty (Dahmardeh et al., 2011), financial liberalization (Adikari, 2013) etc. One qualitative indicator is included in the model of this study in the form of market sentiment. A market sentiment index signals how optimistic or pessimistic people are about the market and economic conditions

(Bormann, 2013). Under a normal market condition, if consumers feel better about the economy (by extension, their job and earnings expectations), they tend to spend more. Similarly, from the business perspective, optimism about the economy boosts investment. This increases the demand for money as more money is needed to finance the high level of expenditure and investments. Based on this effect, it is hypothesized that

> H5: The demand for banknotes has a positive relationship with market sentiments.

Three indicators are used as the proxies for market sentiments: Consumer Sentiments Index, Business Conditions Index and Retail Trade Index. The first two indicators were obtained from Malaysian Institute of Economic Research (MIER) and the latter from Department of Statistics, Malaysia (DOSM).

3.2 Conceptual Model

The macroeconomic and non-economic variables selected for this study were deemed to be major influences on the demand for banknotes, according to previous empirical studies on the demand for money. Figure 3.4 summarizes the specifications of relationships between the dependent and independent variables examined in this thesis.

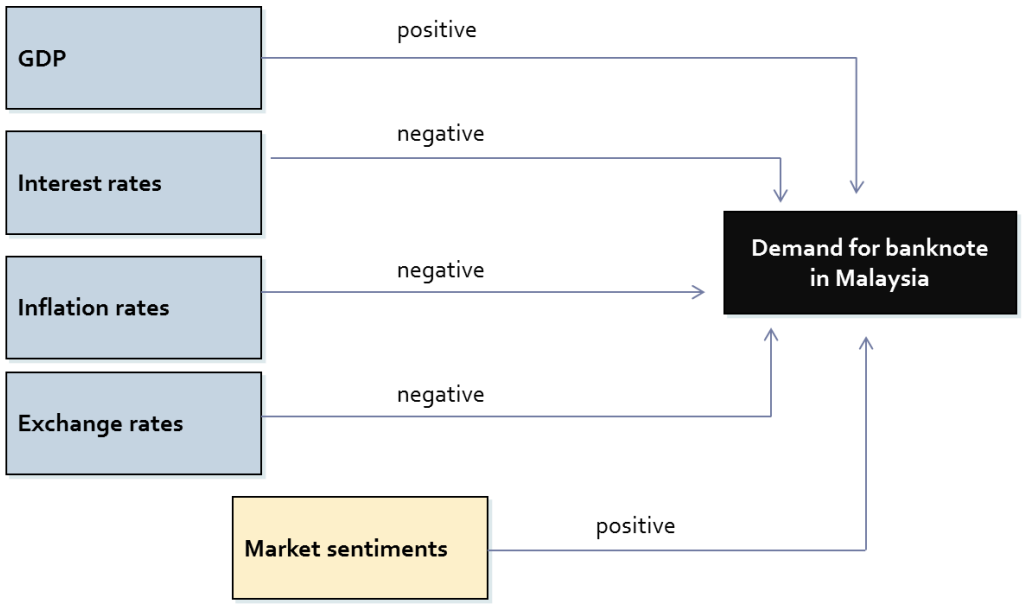

Figure 3.4
Conceptual Framework

3.3 Research Design

This study used an ex-post facto research design. Ex-post facto research is a type of research design that allows researchers to use existing data, rather than new data, to study the cause and effect relationships (Silva, 2010; Vogt, 2005). In an ex-post facto research, there is no manipulation of the data. The role of researcher is to report on what has happened. The ex-post facto research design has been used in many similar previous studies (e.g. Abd Karim & Tang, 2004; Abdullah et al., 2010; Abdullah et al., 2013; Dritsakis, 2011; Narayan & Narayan, 2008; Niyimbanira & Dubihlela, 2013; Opolot, 2007; Sarwar et al., 2013) and all are accepted for both credibility and reliability.

3.4 Sources of Data

A key advantage of conducting an ex-post facto study is that secondary data can be used as a source of information (Black, 2002; Silva, 2010). For this study, the macroeconomic data (i.e. GDP, interest rates, CPI and exchange rates) were obtained from the Quarterly Bulletin issued by Bank Negara Malaysia (BNM), drawn for various quarters (Q1 2007 to Q2 2013). The data on Consumer Sentiments Index, Business Conditions Index and Retail Trade Index were obtained from Malaysian Institute of Economic Research (MIER) and Department of Statistics, Malaysia (DOSM). The dependent variable in this study is the volume of banknotes in circulation; the data of which were obtained from the Monthly Statistically Bulletin, also issued by BNM. The bulletin reports the related statistics as at 30 June 2014.

The study used recent quarterly data, covering the periods between 2007:1 to 2014:2 - a total of 30 observations. This period was selected for study because a lot of developments had taken place in the Malaysian economy (e.g. financial crisis, extensive change in the payment landscape, etc.) within this period (Bank Negara Malaysia, 2011b). The choice of the study period was also driven by the availability of the data series.

3.5 Operational Definitions

3.5.1 Demand of banknote

Demand of banknotes refers to the volume of banknotes issued into circulation. This is consistent with the assumptions of the quantity theory of money that the demand for money must be equal to the money supply in equilibrium in the economy (Handa, 2009).

3.5.2 Gross Domestic Product

Gross Domestic Product (GDP) measures the total income of a country as well as the total expenditure on the economy's output of goods and services. Operationally, GDP is the "market value of all final goods and services produced within a country in a given period of time" (Mankiw, 2012: 94). Increase in the production and consumption of goods and services is an indicator of economic growth, which is measured by GDP.

3.5.3 Gross National Product

Gross National Product (GNP) is the "total income earned by a nation's permanent residents (called nationals)" (Mankiw, 2012: 95). GNP differs from GDP in the sense that GNP includes incomes earned by the country's citizen abroad and excludes incomes that foreigners earned within the country.

3.5.3 Treasury Bills (T-Bills)

Malaysian Treasury Bills (T-Bills) refer to the short-term debt instrument issued by the Malaysian Federal Government to raise funds as working capital (Bank Negara Malaysia & Securities Commission, 2009). The bills are sold at discount through competitive auction, facilitated by Bank Negara Malaysia, and redeemed at par upon maturity. T-bills have original maturities of less than a year (91 days, 182 days and 365 days).

3.5.4 Malaysian Government Securities (MGS)

Malaysian Government Securities (MGS) are long-term bonds issued by the Government of Malaysia for financing long term developmental expenditure capital (Bank Negara Malaysia & Securities Commission, 2009). It has a tenor of between 3 to 20 years. MGS are issued by tender auction via appointed principal dealers, but can also be bought in the secondary market.

3.5.5 Consumer Price Index (CPI)

Mankiw (2012: 114) defines Consumer Price Index (CPI) as a "measure of the overall cost of the goods and services bought by a typical consumer". Similarly, in the Malaysian context, (Bank Negara Malaysia, 2014a) defines CPI as the "measure of the average rate of change in prices of a fixed basket of goods and services which represents the expenditure pattern of all households in Malaysia". It is a composite index and uses 2005 as the base year.

3.5.6 GDP Deflator

GDP deflator is the ratio of nominal GDP to real GDP (Mankiw, 2012). Nominal GDP is the total current output measured at current prices, unadjusted for inflation, whereas real GDP is the total current output measured at the constant base-year price, which is adjusted for inflation to reflect changes in the real output. Therefore, GDP deflator is able to show how much a change in the current year's price relative to the base-year price. Like CPI, GDP deflator is useful to gauge how quickly prices are rising. However, it is different from CPI in the sense the GDP deflator is not based on a fixed basket of goods and services; but based on year people's consumption and investment patterns.

3.5.6 Producer Price Index

The Producer Price Index (PPI) measures the "average rate of change in price charged by domestic producers of commodities and products and those paid by exporters in Malaysia" (Bank Negara Malaysia, 2014c). In other words, this index measures the average change in price of goods and services sold by manufacturers and producers in the wholesale market during a given period. The index takes into account commodities or products originating from four industrial sectors, namely, agriculture, forestry, logging and fishing; mining and quarrying; manufacturing; and water, gas and electricity.

3.5.6 Exchange rate

Exchange rate refers to the rate at which a person can trade the currency of one country for the currency of another (Mankiw, 2012). In this study, the exchange rate is defined in terms of the amount of Malaysian Ringgit per one unit of the U.S Dollar.

3.5.7 Import Price Index

Department of Statistic Malaysia (Department of Statistics Malaysia, 2014: 67) defines Import Price Index (IPI) as an index that "measures the change over time the prices paid by importers for goods imported into Malaysia". As a measure the change in price, this corresponds to the rate of change in the prices of goods and services purchased by residents of a country from foreign sellers.

3.5.8 Consumer Sentiments Index

Consumer Sentiments Index is the result of a survey conducted quarterly on a sample of over 1,200 households. Respondents are asked to evaluate on their household's current and expected financial positions and their employment outlook. Hence, this index reflects the degree of optimism on the state of the economy that consumers are expressing through their activities of savings and spending (Malaysian Institue of Economic Research, 2014). A value above 100 indicates expected improvement in conditions, below 100 shows a lack of confidence and 100 indicates neutrality.

3.5.9 Business Conditions Index

Business Conditions Index covers a survey of 11 industries represented by 350 manufacturing businesses, incorporated locally and overseas. In this survey, respondents are asked questions relating to production level, new order bookings, sales performance, inventory build-up and new job openings (Malaysian Institue of Economic Research, 2014). A value above 100 indicates expected improvement in conditions, below 100 shows a lack of confidence and 100 indicates neutrality. This survey is carried out in Malaysia by the Malaysian Institute of Economic Research.

3.5.10 Retail Trade Index

Retail Trade Index refers to the sale of new and used goods to the general public for personal or household consumption (Department of Statistics Malaysia, 2014b). This index measures the changes in sales with year 2010 being designated as the base year that equals to 100. As such, it produces a quick indication of the changes in the trend of consumer spending.

3.6 Technique of Data Analysis

3.6.1 Structural Equation Modelling

Structural Equation Modelling (SEM) is a statistical technique that allows simultaneous testing of the statistical relationships, either direct or indirect, between multiple constructs (Chin, 1998b; Gefen, Straub, & Boudreau, 2000; Haenlein & Kaplan, 2004). The structural model associated with the SEM techniques can be used to assess the overall fit and the structural of a model together (Anderson & Gerbing, 1998). In contrast with the first generation techniques (such as regression analysis, factor analysis, ANOVA etc.), SEM helps researchers to answer a set of interrelated research questions in a single and holistic analysis by simultaneously modelling the relationships between the constructs (Gefen et al., 2000). SEM is a better methodological tool as it "offers extensive, scalable, and flexible causal-modelling capabilities beyond those offered by 1G (first-generation) techniques" (Lowry & Gaskin, 2014: 125).

There are currently two major approaches to SEM, namely, covariance-based approach such as LISREL, AMOS and component-based approach such as PLS. These approaches are different from one another; particularly in terms of their underlying statistical assumptions and objective of the analysis.

In terms of assumption, the covariance-based SEM uses a function called Maximum Likelihood (ML) in order to minimize the difference between sample covariance and the covariance predicted by the theoretical model. By contrast,

the component-based SEM uses an iterative sequence of ordinary least squares (OLS) regression to minimize the explained variance of the endogenous latent variables (Fornell & Bookstein, 1982). In terms of applicability and suitability of the approach, the covariance-based SEM is suitable for theory testing, while the component-based SEM is more appropriate for theory development and predictive applications (Chin, 1998a; Lowry & Gaskin, 2014).

The decision to select one of the approaches depends on the design of the research and the characteristics of the sample. For the purpose of this study, Partial Least Square (PLS), a component-based modelling, was used to predict variables that may have influenced the demand for banknotes in Malaysia.

3.6.2 Partial Least Squares (PLS)

Developed in 1970s by Wold, Partial Least Squares is a second-generation structural equation modelling technique (Anderson & Gerbing, 1998) that has been widely used in recent years and is a well-accepted statistical analysis technique in many disciplines, including strategic management, human resources, marketing, banking and finance.

PLS is conceptually similar to using multiple regression analysis, but, with PLS, it allows for a simultaneous and holistic structural equations testing "to explain the relationships between indicators and constructs, and to confirm the theoretical rationale that was specified by a model" (Davcik, 2014: 51). According to Haenlein and Kaplan (2004) and Chin (2010), the PLS approach

is useful for theory development, prediction and confirmation. For theory confirmation, PLS can be used to investigate the causal relationships between independent and dependent variables.

PLS has been established as a robust approach (Chin, 1998a; Gefen et al., 2000; Hair, Ringle, & Sarstedt, 2011; Hair, Sarstedt, Ringle, & Mena, 2011; Lowry & Gaskin, 2014). It can be used to analyze data with non-normal distribution (because PLS is essentially a non-parametric statistical method) and with small sample sizes (Chin & Newsted, 1999; Goodhue, Lewis, & Thompson, 2012; Hair, Ringle, & Sarstedt, 2013).

PLS also exerts minimal demands on the type of measurement scales, data and model requirements. In this sense, PLS can be used to estimate models using different types of scales as well as models with different degree of complexity (Hair, Ringle, et al., 2011). PLS has also been shown to be a better methodological choice in dealing with complex models and secondary data (Hair, Ringle, & Sarstedt, 2013) .

A further advantage of PLS (as opposed to the covariance-based approaches, e.g. LISREL, AMOS etc.) is that PLS supports both reflective and formative indicators (Diamantopoulus & Siguaw, 2006).

According to Jarvis, Mackenzie and Podsakoff (2003), reflective indicators are considered as a construct that is affected by the same underlying construct. In other words, they represent the effects of the latent variable and, such that, they

measure the same underlying phenomenon. For a reflective indicator, any change in the underlying latent variable results in changing the values of all reflective indicators (Fornell & Bookstein, 1982). Hence, high correlations between the indicators are expected for high internal consistency.

By contrast, formative indicators are assumed to form or cause the latent variable. Unlike reflective indicators, the formative indicators measure the different dimensions of an underlying construct. In this case, formative indicators are not expected to be correlated nor have high internal consistency because they do they represent the same underlying dimension (Gefen et al., 2000). Any changes in the formative indicators will cause changes in the underlying construct (Fornell & Bookstein, 1982).

The choice of whether to use reflective or formative indicators should be based on the research goals and data characteristics (Chin, 1998a, 2010). In this study, all latent variables are modelled as reflective indicators.

The decision to use PLS in this thesis was driven by a few reasons. Firstly, the number of observations in this study is small (N=30), hence, the PLS approach was found to be robust for a study with a small data set. Secondly, the present study is carried out on a predictive basis, using secondary data for the purpose of analysis. On the basis of the opinions of Haenlein and Kaplan (2004), Chin (2010) and Hair et al. (2013), the use of the PLS approach is considered suitable to meet the objective of this research.

Thirdly, the majority of the studies on the demand for money adopted one of the different economic-based approaches such as Autoregressive Distributed Lag (ARDL), Error Correction Model (ECM), Vector Error Correction Model (VECM) Bound Testing (BT) and Cumulative Sum (CUSUM). Given the objective of this study is to investigate the factors determining the demand for banknotes in Malaysia, the use of PLS is particularly attractive in view of the PLS approach, insofar our literature review suggests, has not been used before to study this topic. Finally, the PLS technique is fairly easy to use; thereby allowing this Masters project to be completed within the time allocated.

SmartPLS 2.0 (Ringle, Wende, & Will, 2005) was used to estimate the model. This software application allows simultaneous graphical path modelling of the latent variables.

3.7 PLS Model Assessment

PLS is a two-step model where the analysis informs, firstly, how well the indicators are related to each construct and, secondly, whether the hypothesized relationship are empirically confirmed. As described in Fornell and Bookstein (1982), the model is assessed using a measurement model and structural model.

The objective of the measurement model is to test the relationships between a latent, i.e. an unobserved, variable with a set of indicators, or observed, variable. It shows the relations between latent variables and observed variables. The structural model, on the other hand, is used to test the causal relationship

among the latent variables and/or the indicators. In other words, the structural model examines the relations between latent variables.

A construct in a PLS model can either be reflective or formative ones. Accordingly, there are two types of measurement models, namely, reflective and formative measurement model (Henseler, Ringle, & Sinkovics, 2009). The statistical requirements to check for reliability and validity of the reflective constructs are different from that of the formative constructs.

3.7.1 Assessment of Measurement Model

Reflective indicators are expected to have high reliability simply because all the indicators are assumed to measure the same underlying latent variable. In PLS, the reflective indicators for the reflective measurement model are assessed for validity, reliability and consistency using the following criteria.

Indicator Reliability: It measures how much of the indicators' variance is explained by the corresponding latent variable that they measure (Hair, Hult, Ringle, & Sarstedt, 2014). In other words, this measure explains the degree of the indicators' consistency regarding what they intend to measure. According to Chin (2010), the indicator loadings should be greater than 0.7 for it be meaningful. However, lower values, e.g. 0.5, are acceptable, especially for exploratory research (Field, 2009).

Internal Consistency Reliability: It measures whether the scores of all indicators measuring one construct are similar in their scores. In PLS, this is measured using Composite Reliability (CR). According to Hair et al., (2014), CR values of 0.6 to 0.7 are adequate for exploratory research and values between 0.7 to 0.8 are desirable for confirmatory research.

Convergent Validity: It measures "the degree to which a measure correlates positively with alternative measures of the same construct" (Hair, Hult, Ringle, & Sarstedt, 2014: 102). Convergent Validity is assessed by a measure called Average Variance Extracted (AVE), which measures the amount of variance captured by the indicators of a construct versus the amount of variance caused by the measurement error. AVE values above 0.5 are acceptable to demonstrate sufficient convergent validity.

Discriminant Validity: It measures "the degree to which a construct is truly distinct from other constructs" (Hair et al., 2014: 102), thereby implying that the construct is unique. This is assessed by examining the cross loading scores of the constructs. Discriminant Validity can be inferred when an indicator's loading is higher for the construct it intends to measure than for any other constructs and each construct loads highest with its assigned indicators (Chin, 2010).

Whereas, the formative indicators can be independent of one another. High internal consistency is not necessarily required and, in fact, considered

"meaningless" in a formative model (Rossiter, 2002). This is because strong correlations between two formative indicators suggest the issue of multicollinearity, which can be "problematic from a methodological and interpretational standpoint" (Hair et al., 2014: 123). On the same basis, checking for reliability is irrelevant because, as explained previously, formative indicators do not have to be strongly interrelated. Furthermore, formative indicators are assumed to be error free (Diamantopoulus & Siguaw, 2006), which means checking for internal consistency reliability is not appropriate (Hair et al., 2014).

Therefore, for formative measurement model, the assessment of reliability and validity is based on their substantive content (Chin, 1998b; Hair et al., 2014). This is achieved by examining the weight of the formative indicator and its significance.

Indicator Weight: It measures the magnitude of the path coefficient between the indicator and the latent variable. The accepted value of the path coefficient (ß) should be above 0.10 (Chin, 2010) and the sign of the path coefficient should match the initial hypothesis. Low indicator weight may indicate wrong specifications of the indicator.

Significance of Indicators' Weights: It measures the statistical relevance of the indicator for the formative index construction. The measure of significance is calculated in PLS using a bootstrapping procedure. The path coefficient from

the indicators to the construct should be statistically significant under a t-test. The accepted significance level (or the t-values) should be above 0.05 in order to demonstrate sufficient validity of the formative measurement model.

3.7.2 Assessment of Structural Model

The objectives of the structural model assessment are, firstly, to examine the extent of explained and unexplained variances and, secondly, to specify the causal relationships among the constructs. There are two aspects in assessing the structural model, i.e. explanatory and predictive power.

The explanatory power is represented by the coefficient of determination, which measures the relationships between the latent variables of the model. It uses R^2, which is defined as the "amount of variance in the construct in question that is explained by the model" (Chin, 2010: 674). This value can be interpreted as standardized beta coefficients similar to the traditional multiple regression analysis. In the case of a perfect prediction, R^2 will be 1 and unexplained variation will be zero. Thus, the bigger the R^2, the more explanatory power the model possesses. According to Chin (1998b), R^2 values of around 0.670 are considered substantial, 0.333 average and 0.190 (or lower) weak.

For predictive power, path coefficient and predictive relevance are used. The path coefficient measures the magnitude, sign and significance of the structural model (Chin, 1998b; Hair et al., 2014). The magnitude of the path coefficient

indicates the strengths of the relationship between the latent variables, whereas the sign of the path coefficient indicates the direction of the relationships. It needs to be corresponding to the pre-proposed hypothesis in order for it to provide an empirical validation of the relationships. If the signs are contrary to the theoretically assumed relationships, it is interpreted as does not support the pre-proposed hypotheses. The significance refers to the statistical significance which is determined by employing re-sampling technique, such as bootstrap procedure. The path coefficient should be significant at least at the 0.05 level (Hair et al., 2014). Hair et al. recommend the t-values to be above 1.96, which indicates that the path estimates are significant at the 5% level.

The predictive relevance measures the model's ability to predict (Chin, 2010). To achieve this, the Stone-Geisser (Q^2) test is used to generate an index of goodness of reconstruction. This is achieved by performing blindfolding procedures to create estimates of residual variances. A positive Q^2 confirms the model's predictive relevance.

3.8 Conclusion

This chapter discussed the methodology adopted in this study. The first section of the chapter dealt with the hypotheses development. Hypotheses of this study were developed in order to align with research objective. The researcher also explained in this chapter the research design, sources of data and described the

key concepts of the Partial Least Square (PLS) method, which is used for analysis.

CHAPTER FOUR
RESULTS

4.0 Introduction

In this chapter, empirical results of this study will be presented. Here, the results of the descriptive analysis, factor analysis and correlation analysis are described. IBM SPSS Statistics version 20 was used to analyze the data. In the last section, the results of the PLS analysis are reported.

4.1 Descriptive Analysis

The results of the descriptive statistics for the independent variables are presented in Table 4.4.

Table 4.4
Descriptive statistics for the independent variables

	N	Mean	Min	Max	Std. Dev.
GDP					
– GDP (RM million)	30	205,249	126,538	265,053	38,393
– GNP (RM million)	30	163.2	140.9	190.1	14.78
Interest rates					
– 3-year MGS (%)	30	3.35	2.51	3.87	0.38
– 91-day T-Bills (%)	30	2.92	1.94	3.56	0.48
Inflation rates					
– CPI (%, 2005 base year)	30	101.5	92.2	110.2	5.10
– GDP Deflator (%)	30	119.8	103.0	129.0	7.09
– Producer Prices (%)	30	120.6	105.2	130.6	7.84

Table 4.4 (Continued)

	N	Mean	Min	Max	Std. Dev.
Exchange rates					
– MYR/USD Rates (RM)	30	3.26	3.02	3.65	0.17
– Import Prices (RM)	30	119.1	98.5	132.8	10.77
Market sentiments					
– Business Condition (%)	30	104.1	70.6	124.1	14.1
– Consumer Confidence (%)	30	106.1	70.5	124.1	14.3
– Retail Trade Index (%)	30	106.9	52.3	145.9	23.61

Next, the data were standardized using Z-scores due to the different bases (e.g. percentages, absolute numbers etc.) used in the initial data. All Z-scores have a mean of 0 and standard deviation of 1. The Z-scores transform the data to the same metric, therefore allowing for a more meaningful data interpretation (Black, 2002). The analysis subsequent to this will be based on the standardized Z-scores data.

4.2 Factor Analysis

A Principal Component Analysis with Varimax Rotation was performed on all 12 items in order to examine the underlying dimensions of the scale. Factor analyses are generally performed with a larger sample size. With a sample size of 30, it is considered small. However, the applicability of a factor analysis in a study characterized by small sample size, such as this present study, could refer to the findings of Mundfrom, Shaw and Ke (2005). Their study showed that if communalities are high and the number of factors is small, factor analysis can be reliable for a study with a sample sizes below 50. Similar support was drawn

from Preacher and MacCallum (2002: 160). According to the authors, a "good factor recovery" for a small sample size study is possible if the "communalities are high, model error is low and few factors are retained" and proceeded to advise researchers "not to be overly concerned about small sample sizes".

The results of the factor analysis are presented in Table 4.5.

Table 4.5
KMO and Bartlett's Test for Items

KMO Measure of Sampling Adequacy		0.76
Bartlett's Test of Sphericity	Approx. Chi-square	492.65
	df	66
	Significance	.000

The KMO value of 0.76 is above the accepted minimum value of 0.5 as proposed by Kaiser. The Bartlett's Test of Sphericity ($p<.05$), which examines if the items are correlated with one another, indicates a significant correlation ($p<.001$). These two tests suggest a satisfactory analysis and indicate that the data are appropriate for a factor analysis procedure.

To determine the number of components to retain, the Kaiser criterion suggests retaining factors with an eigenvalue greater than 1.0. The results of the communalities, extraction of factors, eigenvalues and percentage of variance explained are presented in Table 4.6.

Table 4.6
Factors of banknote demand with variance explaining and reliability measures

	Communalities	**I**	**II**	**III**
GDP	0.98	0.98		
CPI	0.97	0.96		
GDP Deflator	0.95	0.95		
Producer Index	0.90	0.93		
Import Prices	0.98	0.92		
GNP	0.82	0.90		
MYR/USD Rates	0.79	0.73		
Consumer Confidence	0.89		0.94	
Business Condition	0.76		0.86	
Retail Trade Index	0.75		0.81	
3-Year MGS	0.92			0.95
91-Days T-Bills	0.91			0.95
Eigenvalue		5.92	2.77	1.93
Percentage of total variance explained		49.28	72.39	88.50
Reliability		**0.85**	**0.84**	**0.92**

Note: Factor loadings less than 0.5 have been omitted in order to improve clarity.

The coefficient Cronbach's α for all 12 items is 60.2%, indicating sufficiently high internal consistency and, therefore, the instruments are reliable. From the scree plot in Figure 4.7 below, it can be seen that three factors had an eigenvalue greater than 1.00 and, therefore, were extracted. Together, they account for 88.5% of the variance. A factor loading of 0.5, as suggested by Field (2009), was used in order to determine which items to extract from the factor loadings.

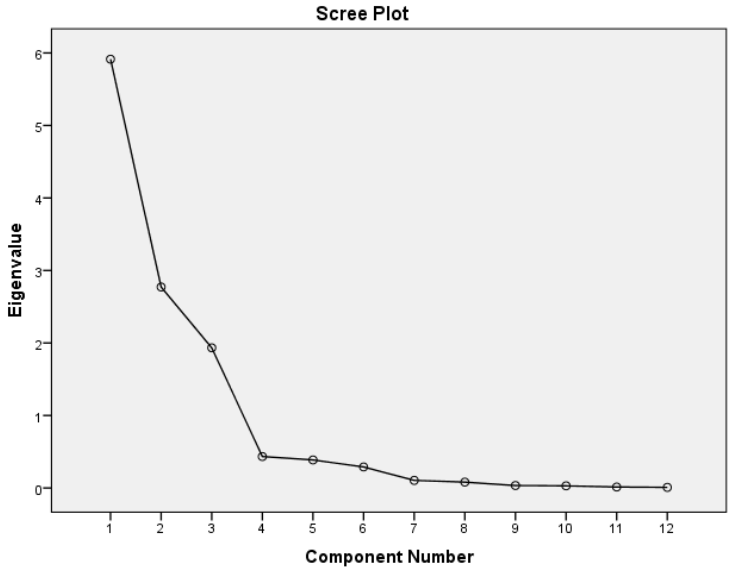

Figure 4.5
Scree Plot

Component I is represented by 7 items. The 7 items are related to, in the initial conceptualization, wealth, inflation rates and exchange rates. In a larger scheme of things, this may be reflective of "disposal income" (after having considered the effects of both inflation and exchange rates on wealth). Disposable income, in the broadest sense, refers to the portion of income which the recipient has complete discretion (Dutta, 2006). It is the amount left for consumption or savings. From a macroeconomic perspective, disposal income refers to the amount of money available after adjusted for inflation (Mankiw, 2007; Siddiqui & Siddiqui, 2011). This component explains 49.3% - i.e. the majority - of the variance, with a Cronbach's α of 0.85.

Component II is represented by 3 items. These items relate to the market sentiments, represented by three indicators: consumer confidence, business confidence and retail trade index. As described in the initial conceptualization, market sentiment broadly refers to the prevailing attitude and feelings of public and businesses about the current and future development of a market or the economy, in general (Bormann, 2013). The sentiment indicators, in a way, reflect how optimistic or pessimistic people are about the market conditions. Although the indicators may be interpreted merely as a "signal" but they may have strong implications on the consumption and spending patterns of consumers and businesses. This factor explains 23.1% of the variance. The reliability is Cronbach's α 0.84.

Component III is related to interest rates, represented by 3-Year MGS and 91-Days T-Bills. At an eigenvalue of 1.93, it accounts for 16.1% of the variance. The Cronbach's α is 0.92.

As indicated in Table 4.6 above, the values of Cronbach's alpha for all the three emergent factors are greater than 0.50; which indicate that the emergent factors are valid and reliable (Field, 2009). The value of Cronbach's α of less than 0.50 is generally considered poor.

4.3 Correlation Analysis

To examine if the economic and non-economic factors affect the demand for banknotes in Malaysia, a correlation analysis was performed to identify significant relationships.

A Pearson's Correlation analysis was computed for each of the five variables: GDP, interest rates, inflation rates, exchange rates and market sentiment. The results of the correlation analysis (presented in Table 4.7) indicated there are significant statistical relationships between GDP and banknotes volume [r=.84, n=30, p<0.01] as well as between inflation rates and banknotes volume [r=.75, n=30, p<0.01]. Between the two relationships, the Pearson's r for GDP is much stronger than for interest rates.

Table 4.7
Intercorrelations of the variables, at the aggregated banknotes volume

Variable	GDP	Inflation rates	Interest rates	Exchange rates	Market sentiments	Banknote volume
GDP	1.00					
Inflation rates	0.68**	1.00				
Interest rates	-0.32	-0.07	1.00			
Exchange rates	0.32	0.13	-0.66**	1.00		
Market sentiments	0.03	-0.29	0.16	-0.52**	1.00	
Banknotes volume	0.84**	0.75**	-0.46*	0.42*	-0.09	1.00

*p<0.05, **p<0.01

The correlation for interest rates is statistically significant (at p<0.05) with a medium strength Pearson's r of -.46 [n=30, p<0.01]. However, the negative sign

indicates that interest rate is negatively correlated with the demand for banknotes.

The relationship between exchange rates and banknotes volume is a positive one, at the α level 0.05 [r=.42, n=30, p<0.02]. However, the results indicate that there is no correlation between market sentiment and the demand for banknotes [r=-.09, n=30, p<0.65].

In the original hypotheses, it is expected that GDP and market sentiment to have a positive relationship on the demand for banknotes, with the remaining three (namely, interest rates, inflation rates and exchange rates) to have a negative relationship each. The results indicate that only four significant correlations exist, at the alpha level .05. A significant positive correlation was found to exist between GDP, inflation rates and exchange rates. However, the relationship between interest rates and the demand for banknotes is a negative one.

In the factor analysis described earlier, a three-factor was extracted. The emergent factors were subjected to the same correlation analysis. The results of this analysis are presented in Table 4.8.

Of the three factors, a significant positive correlation was only found between disposal income and the demand for banknotes [r=.94, n=30, p<0.01]. In fact, at Pearson's r of .94, this is close to 1; indicating a very strong correlation indeed. There is no correlation for the remaining two factors: market sentiments [r=-.09, n=30, p<0.65] and interest rates [r=-.19, n=30, p<0.31]. It is interesting, yet

puzzling, to note that the relationship between interest rates and the demand for banknotes changed from a significant negative correlation to no relationship, statistically; although the direction of influence remained negative.

Table 4.8
Intercorrelations of the (3-factor) variables, at the aggregated banknotes volume

Variable	Disposable income	Market sentiments	Interest rates	Banknote volume
Disposal income	1.00			
Market sentiments	-0.25	1.00		
Interest rates	-0.14	0.17	1.00	
Banknote volume	0.94**	-0.09	-0.19	1.00

*p<0.05, **p<0.01

To examine in what way and to what extent the factors examined affect the demand for the different banknote denominations, a Pearson correlation was performed and the results of which are reported in Table 4.9.

Table 4.9
Intercorrelations of the variables, at banknote denomination level

Variable	RM1	RM5	RM10	RM50	RM100
GDP	0.83**	0.78**	0.77**	0.83**	0.76**
Inflation rates	0.75**	0.72**	0.70**	0.74**	0.69**
Interest rates	-0.45*	-0.44*	-0.49**	-0.48**	-0.37*
Exchange rates	0.43*	0.42*	0.30	0.33	0.51**
Market sentiments	-0.69	-0.09	0.00	-0.08	-0.20

*p<0.05, **p<0.01

GDP and inflation rates, each, are found to exhibit a very strong and significant positive correlation on all banknote denominations, at the alpha level 0.01. Each exhibited a very strong Pearson's r. The correlation between interest rates and

the demand for the different banknote denominations is a negative one: RM1 [r=-.45, n=30, p<0.02]; RM5 [r=-.44, n=30, p<0.02]; RM10 [r=-.49, n=30, p<0.00]; RM50 [r=-.48, n=30, p<0.00] and RM100 [r=-.37, n=30, p<0.04].

There are positive significant correlation between exchange rates and the demand for RM1[r=.43, n=30, p<0.02], RM5 [r=.42, n=30, p<0.02] and RM100 [r=.51, n=30, p<0.00], but no correlation with RM10 [r=.30, n=30, p<0.11] and RM50 [r=.33, n=30, p<0.07]. The variance dispersion was greater for the RM100 banknote (than other banknote denominations) and this was evident in its Pearson's r of .51.

No significant correlation was found between market sentiments and the different types of banknote denominations.

Analysis of the results indicated there were varying degrees of significance between the examined variables and the different types of banknote denominations. GDP, inflation rates and interest rates exhibited significant positive correlations on the demands for all five denominations, namely RM1, RM5, RM10, RM50 and RM100 banknotes, at the alpha level .01. The variance dispersion was highest for the RM1 and RM50 banknotes, compared with other denominations. This may well be explained by the fact that RM1 is the highest-used banknote denomination for transactional purposes and RM50 is the highest-value banknote denomination in majority of the ATMs. The demand for both banknote denominations has been traditionally high.

Exchange rates, based on the results, affect only the demands for RM1, RM5 and RM100 banknotes; but not RM10 and RM50. A stronger correlation was found in the RM100 banknotes, compared with the other two denominations. And, interestingly, the demands for all types of banknotes are not affected by market sentiments, statistically.

4.4 Results of PLS Analysis

To test the hypotheses, the data was run using Partial Least Squares (PLS). By running the PLS algorithm, the study's model as shown in Figure 4.6 below was created.

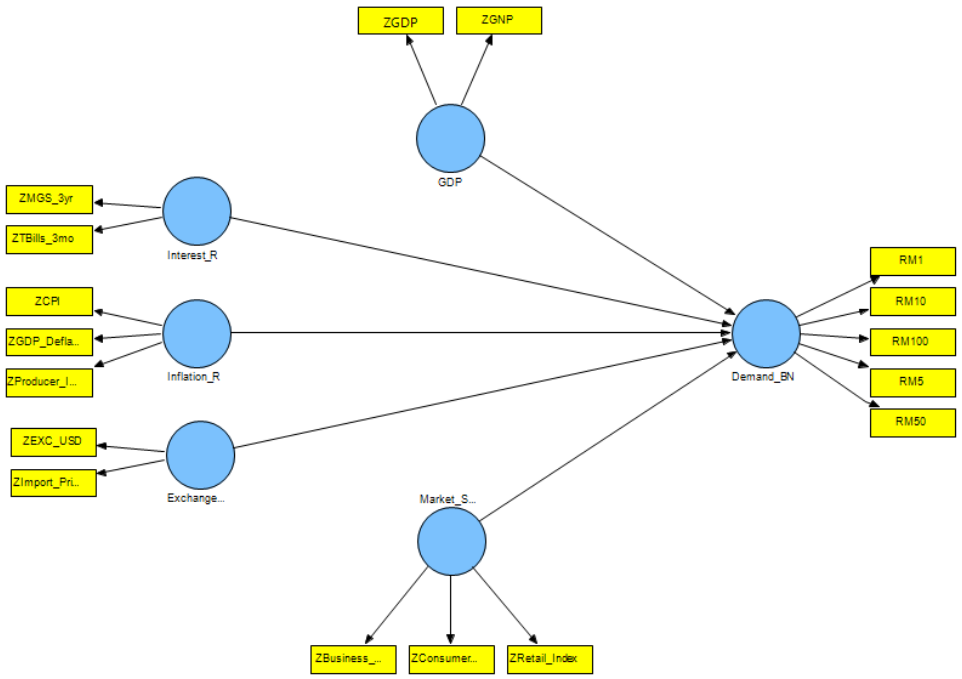

Figure 4.6
Model on the demand for banknotes in Malaysia

PLS comprises of two models: a measurement model and a structural model. As covered in the chapter before, the reliability and validity of the measurement model must be assessed first before assessing the nature of the relationships between the latent variables in the structural model.

4.4.1 Assessment of Measurement Model

As can be seen from Table 4.10 below, all items loaded on their related constructs, with loadings substantially higher than 0.7 as recommended by Chin (2010); with a single exception for Consumer Confidence [factor loading of 0.656]. Notwithstanding, the researcher decided to retain this item as it is still above the lower acceptable value of 0.5 (Field, 2009) and correctly loaded onto its related construct.

Table 4.10
Factor loadings

Variable	GDP	Interest rates	Inflation rates	Exchange rates	Market sentiments	Banknote volume
GDP	0.977					
GNP	0.977					
3-year MGS		0.997				
91-days T-Bills		0.888				
CPI			0.945			
GDP Deflator			0.980			
Producer Prices			0.958			
MYR/USD Rates				0.821		
Import Prices				0.941		
Business Condition					0.715	
Consumer Confidence					0.656	

Table 4.10 (Continued)

Variable	GDP	Interest rates	Inflation rates	Exchange rates	Market sentiments	Banknote volume
Retail Trade Index					0.966	
RM1						0.983
RM5						0.978
RM10						0.958
RM50						0.942
RM100						0.911

Note: Factor loadings less than 0.5 have been omitted in order to improve clarity.

In order to demonstrate sufficient convergent validity, the Composite Reliability (CR) values should be above 0.7 and the Average Variance Extracted (AVE), should be above 0.5. As can be seen in Table 4.11, all items met the requirements for an adequate convergent validity: Composite Reliability (CR) above 0.7 and AVE above 0.5.

Table 4.11
Results of internal reliability and convergent validity

	Composite Reliability	R Square	Cronbach's alpha	AVE
GDP	0.977		0.952	0.955
Interest rates	0.942		0.918	0.891
Inflation rates	0.973		0.959	0.924
Exchange rates	0.876		0.734	0.799
Market sentiments	0.829		0.843	0.625
Banknote volume	0.981	0.940	0.975	0.911

The discriminant validity can be inferred when an indicator's loading is higher for the construct than for cross-loadings. Gefen and Straub (2005) state that this can be achieved by considering the correlation among the construct. The square

root of AVE values of each construct should be higher than the correlations of the latent variables.

Table 4.12 below shows that all of the constructs were different from each other. The diagonals, which shows the AVE values, are higher than the squared correlations and all other variables. Therefore, it can be concluded that all the constructs demonstrat sufficient discriminant validity.

Table 4.12
Results of discriminant validity

	GDP	Interest rates	Inflation rates	Exchange rates	Market sentiments	Banknote volume
GDP	**0.955**					
Interest rates	0.039	**0.891**				
Inflation rates	0.859	0.006	**0.924**			
Exchange rates	0.788	0.077	0.768	**0.799**		
Market sentiments	0.042	0.117	0.034	0.06	**0.625**	
Banknote volume	0.900	0.088	0.805	0.796	0.047	**0.911**

Note: Diagonals (in bold) represent the average variance extracted (AVE) while the other entries represent the squared correlations.

4.4.2 Assessment of Structural Model

After validating the measurement model, the next step is to examine the structural model. There were two aspects of this analysis: (i) examination of the path loadings and (ii) assessment of the structural path coefficients.

The PLS algorithm was run to find out the path loadings between the latent variables. The strengths of these path relations, measured in terms of its beta (ß)

values, help to determine the most significant relationships within a larger network of variables. According to Chin (1998a) ,the ß values can be grouped into the following categories: ß < 0.2 is a weak effect, ß between 0.2 to 0.5 is a moderate effect and ß > 0.5 is a strong effect.

Figure 4.7 illustrates the path coefficients for each hypothesized relationship and the variance explained in the dependent construct, which in the case is the demand for banknotes.

The results suggest that 94% of the variance in the demand for banknotes in Malaysia can be explained by the research model. According to Chin (2010), R^2 above the cut-off values of 0.67, 0.33 and 0.19 can be described as "substantial", "moderate" and "weak", respectively. Based on this guideline, the present model can be said to have a significant explanatory power in explaining the factors that affect the demand for banknotes in Malaysia.

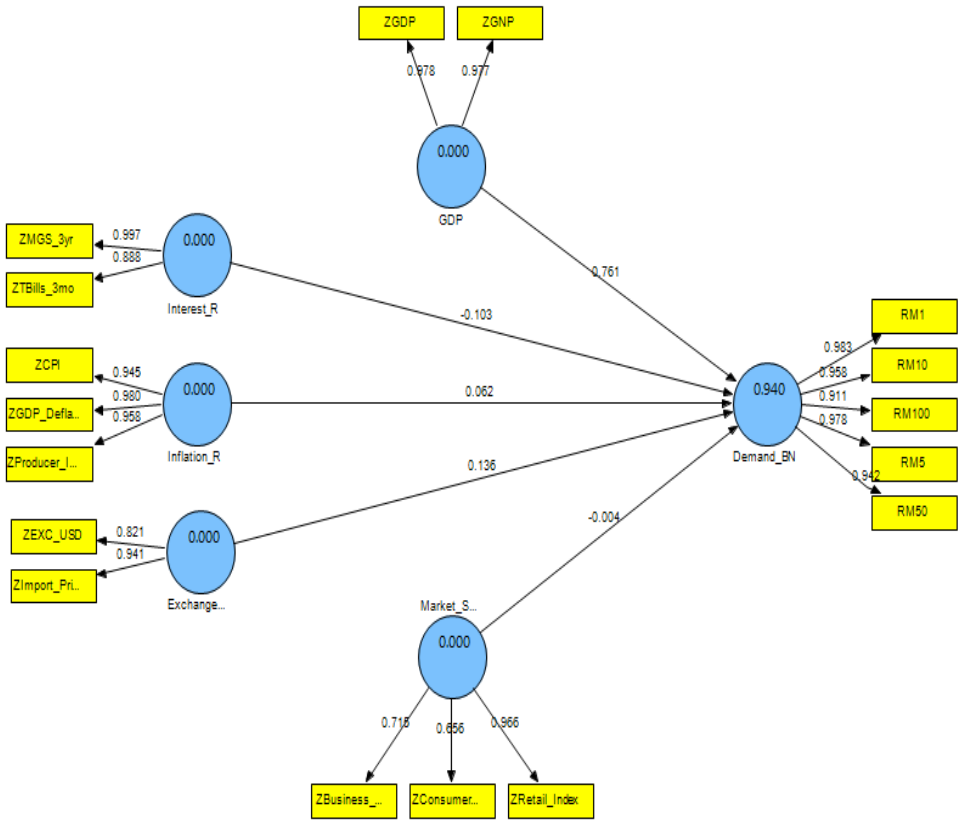

Figure 4.6
Results of the measurement model

As discussed previously, PLS does not assume that the data is normally distributed. Therefore, in order to establish the significance of the paths, a Bootstrap procedure (using 200 iterations) was performed. The bootstrap procedure provides the t-value, which is an estimate of the standard error. Figure 4.8 reports the results of the Bootstrap procedure.

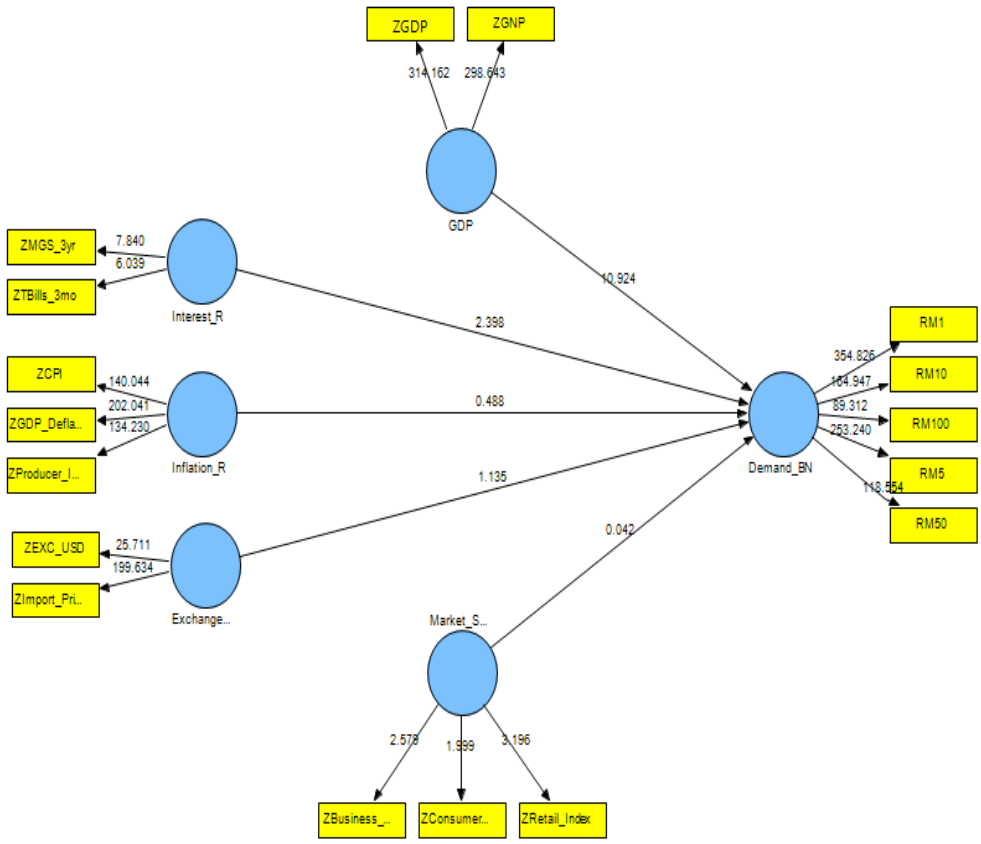

Figure 4.7
Results of the structural model

The results of the hypothesis testing are discussed below.

H1: The demand for banknotes has a positive relationship with GDP. The structural path from GDP to the total volume of banknotes is positive and significant: $\gamma = 0.761$, $t = 10.924$; $p < .05$. H1 is supported.

H2: The demand for banknotes has a negative relationship with interest rates. The relationship is statistically significant: $\gamma = -0.103$, $t = 2.398$; $p < .05$ and at the direction as hypothesized. H2 is, therefore, supported.

H3: The demand for banknotes has a negative relationship with inflation rates. The structural path is positive ($\gamma = 0.062$) but not significant ($t = 0.488$; $p < .05$). The relationship between inflation rates and demand for banknotes, therefore, is not supported due to the inverse direction and the strength of the relations was not statistically significant. H3 is not supported.

H4: The demand for banknotes has a negative relationship with exchange rates. With $\gamma = 0.181$, $t = 1.135$; $p < .05$, the structural path from the exchange rate to the total volume of banknotes issued into circulation can be assessed as positive but not significant; as the t-value is lower than 1.96. Therefore, H4 is not supported.

H5: The demand for banknotes has a positive relationship with market sentiments. Contrary to the hypothesized relationship, the structural path from market sentiments to the total volume of banknotes is negative ($\gamma = -0.004$) and not significant ($t = 0.042$; $p < .05$). H5 is not supported.

A total of five hypotheses were developed for this study. Of the five, only two are found to be supported by the findings. The remaining three hypotheses are rejected. This is summarized in Table 4.13.

Table 4.13
Summary of PLS results

Variable	Hypothesized Direction	Coefficient	t-value	Result
GDP → Banknote volume	Positive	+0.761	10.924**	Supported
Interest rates → Banknote volume	Negative	-0.103	2.398**	Supported
Inflation rates → Banknote volume	Negative	+0.062	0.488	Not Supported
Exchange rates → Banknote volume	Negative	+0.181	1.135	Not Supported
Market sentiment → Banknote volume	Positive	-0.004	0.042	Not Supported

*p<0.05, **p<0.01

To determine the predictive relevance of this model, a blindfolding method, or also referred to as Q^2, was performed. A rule of thumb to interpret Q^2 is that 0.35, 0.15 and 0.02 indicate the constructs exhibited large, medium and small, predictive ability respectively. Hair et. al (2014) suggested cross-validated redundancy method as the best approach to estimate the Q^2 value. The results of the blindfolding give a Q^2 value of 0.85, therefore indicating that this present model has a very strong predictive ability.

In the earlier section of this chapter, a Pearson's correlation was performed on the data to find out in what way and to what extent the factors affect the demand for the different banknote denominations. The same date is now subjected to a PLS testing.

The results are summarized in Table 4.14 below.

Table 4.14
Results on the impacts of the factors on different denominations

	GDP	Interest rates	Inflation rates	Exchange rates	Market sentiments
RM1	0.974**	-0.125**	-0.057	0.006	0.060
RM5	0.917**	-0.105**	-0.038	0.013	0.005
RM10	0.171*	-0.095	0.403**	0.353**	0.191
RM50	0.380**	-0.095**	0.220	0.375**	-0.044
RM100	1.216**	-0.085	-0.028	-0.361**	-0.062

*p<0.05, **p<0.01

It can be seen from Table 4.14 that only GDP shows statistically significant relationship with the demand for all types of the banknote denominations. The interest rate is consistent with its negative influence on all denominations, but it fails to exhibit any level of significance for the RM10 banknotes. The exchange rate is found to be statistically significant in terms of its impact on the high-value banknotes (RM10, RM50 and RM100). But, interestingly, it shows an inverse relationship with the RM100 banknotes. The effects of the inflation rates for the different types of banknote denomination are mixed. And, the only certainty that came out of market sentiment was that the relationship is not statistically significant for all banknote denominations.

4.5 Conclusion

In this chapter, the results of descriptive analysis, factor analysis and correlation analysis were described. In order to test the hypotheses, the data were subjected to a PLS testing and the results of which were presented. A total of five hypotheses were developed for this study. Of the five, only two are found to be supported by the findings. The remaining three hypotheses are rejected. The next chapter will discuss these findings.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This is the last chapter of this thesis. This chapter will summarize the major findings and propose implications as well as recommendations for further research in the future.

5.1 Research Findings

The topic on money demand has long and extensively been studied. Despite its long history, this subject remains topical because of its high importance in today's economic environment, particularly in managing the economy.

This study was motivated by the high cash usage in Malaysia. The objective of this study is to investigate the factors determining the demand for banknotes in Malaysia and to identify significant relationships among the five factors examined in this study, namely, GDP, interest rates, inflation rates, exchange rates and market sentiments. Specifically,

(i) To investigate the relationship between the demand for banknotes and GDP;

(ii) To investigate the relationship between the demand for banknotes and interest rates;

(iii) To investigate the relationship between the demand for banknotes and inflation rates;

(iv) To investigate the relationship between the demand for banknotes and exchange rates; and

(v) To investigate the relationship between the demand for banknotes and market sentiments.

For the purpose of investigation, the researcher hypothesized the following relationships between the dependent and independent variables.

(i) The demand for banknotes has a positive relationship with GDP.

(ii) The demand for banknotes has a negative relationship with interest rates.

(iii) The demand for banknotes has a negative relationship with inflation rates.

(iv) The demand for banknotes has a negative relationship with exchange rates.

(v) The demand for banknotes has a positive relationship with market sentiments

The findings of this study are summarized below, in the form of Q&A.

(i) Do economic (e.g. GDP, inflation rates, interest rates and exchange rates) and non-economic (e.g. market sentiments) factors affect the demand for banknotes in Malaysia? If yes, which factors are significant?

To answer this question, a Pearson's Correlation was performed and the results are summarized below in Table 5.15 below.

Table 5.15
Summary of results of correlation analysis

Variable	Hypothesized Direction	Results	Statistically Significant
GDP → Banknote volume	Positive	Positive	Yes
Interest rates → Banknote volume	Negative	Negative	Yes
Inflation rates → Banknote volume	Negative	Positive	Yes
Exchange rates → Banknote volume	Negative	Positive	No
Market sentiments → Banknote volume	Positive	Negative	No

In the original hypotheses, it is expected that there is a positive correlation between GDP and market sentiment on the demand for banknotes. The remaining three factors (namely, interest rates, inflation rates and exchange rates) are expected to have a negative correlation each. The results indicate only four factors have significant correlations, at the alpha level .05.

As hypothesized, a significant positive correlation between GDP, and a negative correlation between interest rates, and the demand for banknotes. Our study shows that two factors, namely inflation rates and exchange rates,

are also statistically significant but they are wrongly signed. The study finds no statistically significant correlation between market sentiment and the demand for banknotes

(ii) In what way and to what extent do the factors affect the demand for the different banknote denominations?

Based on the results of the Pearson's correlation analysis, there are varying degrees of significance between the factors and the different types of banknote denominations. GDP, inflation rates and interest rates exhibit significant correlations on the demands for all the five denominations, namely RM1, RM5, RM10, RM50 and RM100 banknotes, at the alpha level .01. The positive relationship between GDP and inflation rates indicates that the demand for banknotes (regardless of denomination) increases as GDP increase, as with an increase in inflation rates.

The relationship between interest rates and the demand for the different banknote denominations is a negative one. The results for exchange rates are mixed. There is positive significant relationship between exchange rates and the demand for RM1, RM5 and RM100; but no relationship with RM10 and RM50.

The result for market sentiment on the demand for banknotes is obvious: no correlation, statistically speaking.

(iii) What are the learning points from this analysis?

Insofar as the analysis permits, one can conclude the following:

a. economic factors (represented by GDP, interest rates, inflation rates and exchange rates) have significant implications on the demand for the different types of banknote denominations, while non-economic factor (represented by market sentiment) do not;

b. the degree and direction of influence of the factors are varied; some have a significant positive correlation while some significant negative. And, for some others show no significant correlation; and

c. GDP and inflation rates exhibit consistent positive and significant correlation on all five banknote denominations; at the alpha level of 0.01.

(iv) What are the various relationships that exist between the demand for banknotes and GDP, inflation rates, interest rates, exchange rates and market sentiment?

A total of five hypotheses were developed for this study. Of the five, only two are found to be supported by the findings. The remaining three hypotheses are rejected. The results are illustrated in Figure 5.9.

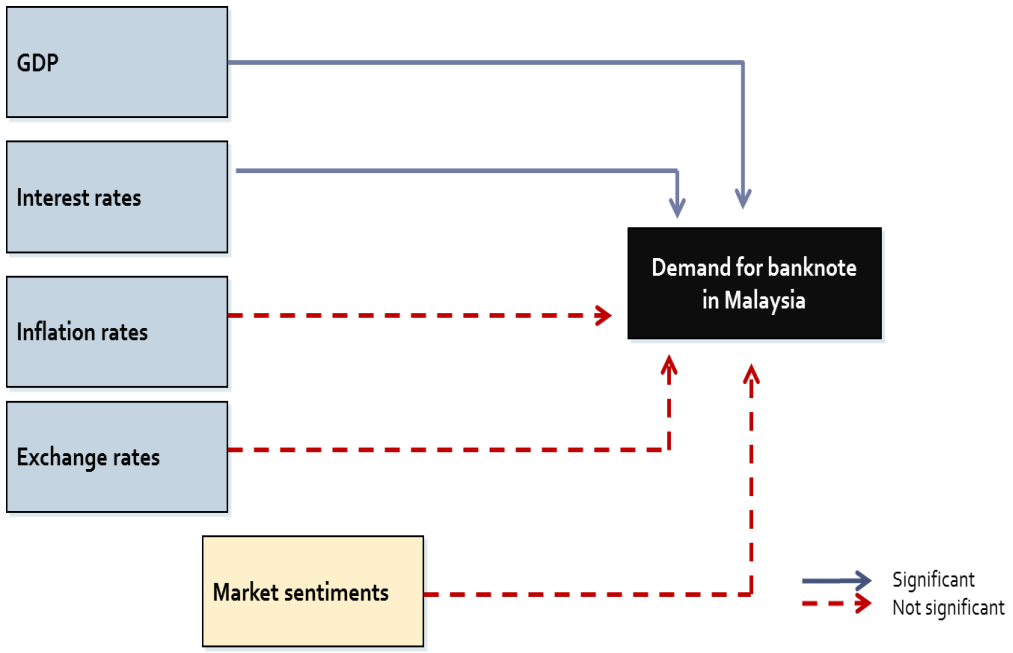

Figure 5.8
Summary of results of the model

a. GDP

This study hypothesized that the demand for banknotes has a positive relationship with GDP. The results of PLS analysis supported this positive proposition, at alpha level of .01, and, therefore, complemented the findings of many earlier authors such as Dritsakis (2011), Dube (2013), Ioan and Ioan (2011), Mall (2013), Pasaribu (2002), Siliverstovs (2008) and Taiwo (2012).

This study's finding is consistent with economic theory, which postulates that the higher the level of income, the greater the economic activity. This results in a greater the demand for money in order to finance the high level of transactions in the economy.

The finding above also supports the relationship between income and country's development. In developing countries, income is found to be the most significant determinant of money demand: an increase of income typically will induce greater demand for money (Bitrus, 2011a). In other words, an increase in income will create higher purchasing power. The residents in these developing countries are capable to spend more money on both goods and services in order to maximize their desires. This, therefore, increases the demand for money. And, Malaysia is one example of a developing country.

b. Interest rates

This study puts forward a hypothesis stating that the demand for banknotes has a negative relationship with interest rates. This view is supported by many previous authors such as Dahmardeh et al. (2011), Ioan and Ioan (2011), Kaznovsky (2008), Mall (2013), Opolot (2007), Pasaribu (2002) and Taiwo (2012). PLS results of this study support this proposition.

The finding is also consistent with the economic theory. The theory holds that the higher the level of interest, the lower will be the individual's desire to hold cash because of the increase in the opportunity cost of holding cash as opposed to other interest bearing assets, such as deposit rate, government securities, bonds etc. Put it another way, the higher the interest rates for alternative assets, the higher the opportunity cost of holding money. This, in turn, will lower the demand for money.

c. Inflation rates

The expectation of higher inflation rate, which according to the economic theory, will reduce the individual's desire to hold more cash by increasing demand for other assets whose expected returns are higher relative to money. The uncertainty and instability in the level of prices will result in people switching of money into other asset. This shift will result in a lower the demand for money. In this regard, the researcher's initial hypothesis is that the demand for banknotes has a negative relationship with the inflation rate. Authors such as Abdullah et al. (2013), Bahmani & Kutan (2010), Dube (2013) and Siliverstovs (2008) supported an inverse relationship between inflation and demand for money.

Contrary to the initial hypothesis, the structural path from inflation rates to demand for banknotes is positive ($\gamma = 0.062$) but not statistically significant ($t = 0.488$; $p < .05$). This finding – positive relationship between inflation and demand for money exists, albeit not statistically significant – is consistent with the studies of Gungor and Berk (2006), Bozkurt (2014), Femi (2014) and Mbutor (2014). This positive relationship between inflation and money demand can be interpreted as a result of a decrease in uncertainty in the macroeconomic environment over the sample (Eileen et al., 2010).

Inflation in the current model has a wrong sign and not statistically significant. This may mean that inflation rate over the years has not had any influence on

demand for money or, alternatively, the demand for money is insensitive to the inflation rate (Handa, 2009). This could also imply that inflation cannot be used to control the amount of money people hold, reliably.

d. Exchange rates

Authors such as Bashier & Dahlah (2011), Dritsakis (2011), Abdulkheir (2013), Dube (2013) and Farazmand and Nazari (2014) reported exchange rates played a significant negative relationship on the demand for money. Thus, it is hypothesized that the demand for banknotes has a negative relationship with exchange rate. The structural path from exchange rate to the total volume of banknotes issued into circulation is positive and but not significant, as the t-value ($t = 1.135$) was lower than 1.96. While the results of the current PLS analysis did not find support to the hypothesis, it is however consistent with the findings of Azali, Baharumshah and Habibullah (2001), who had earlier investigated the long-run relationship between exchange rate and money demand in Malaysia, as well as with the findings of Femi (2014) in Nigeria.

The positive relationship that was found between the demand for money and exchange rate implies that, over the study period, the values of the Malaysian Ringgit have strengthened with respect to the U.S Dollar. This also indicates that domestic and foreign moneys are imperfect substitutes (Heung, 1998).

e. Market sentiments

To assess the impact of non-economic factors on money demand, market sentiment – an essentially qualitative factor – was added into the present model. Market sentiment broadly refers to the prevailing attitude and feelings of public and businesses about the current and future development of a market or the economy. The sentiment indicators, in a way, reflect the consumption and spending patterns depending on how the public perceives the market. It is, therefore, hypothesized that the demand for banknotes has a positive relationship with market sentiments. This is to say, if people and businesses are optimism about the market, they generally spend, consume or invest more (Dahmardeh et al., 2011; Narayan & Narayan, 2008). And, in contrast, in a pessimistic market, the spending and consumption patterns will be noticeably much lower. However, this study found no evidence to support the researcher's initial hypothesis.

5.2 Contributions

5.2.1 Theoretical Contributions

Theoretically, this study extends similar studies on Malaysia in several interesting ways. First, the study period includes data from 2007:1 to 2014:2, which allows the analysis of the demand for money in the face of newly emerging data. Second, following literature on this subject, this study incorporates non-economic factor as the determinant of the long term money

demand, which is consistent with the suggestions by authors such as Al-Rabbaie et. Al (2011) who advocated for more non-economic variables to be considered when modelling the demand for money.

While there are many factors that could influence the demand for money, in this thesis, the results indicate that GDP and interest rates are the two factors that have significant influence on the demand for banknotes in Malaysia. The non-economic factor, in this case market sentiment, seems not to have an influence on the demand for banknotes.

The results also contribute to enriching literature. As argued by Lastrapes and Selgin (2012), the increase in banknote in circulation is a reflection of the country's economic growth. The finding herein clearly supports the relationship between income and country's economic growth and development.

5.2.2 Methodological Contributions

Most of the previous study on similar topic was conducted using one of the different economic-based approaches such as Autoregressive Distributed Lag (ARDL), Error Correction Model (ECM), Vector Error Correction Model (VECM) Bound Testing (BT) and Cumulative Sum (CUSUM). In this study, PLS was used as the method for analysis. The results demonstrated that PLS can, in fact, be used to investigate the factors determining the demand for money. The use of PLS is particularly attractive in view of the PLS approach,

insofar our literature review suggests, has not been used before to study this topic.

5.2.3 Managerial Contributions

Firstly, in the introductory chapter, it was proposed that this study will be of interest to the central bank as it examined the relationship between economic and non-economic variables and the demand for banknotes in Malaysia. One key managerial implication of this study concern with the ability to forecast the banknote needs more efficiently and accurately. The findings of this study will allow policy makers to be better informed as to which variable(s) has significant influence on the demand for banknotes and, therefore, able to predict more accurately the demand behaviour of both the household and businesses in the financial system. This certainly helps policy makers to propose appropriate policy actions to manage the cash supply chains more efficiently.

Secondly, the study also showed that the five variables already accounted for 94% of the variance in the demand for banknotes in Malaysia. Removing the non-economic factor, however, did not change the R^2. Hence, if policy makers concentrate on managing the four economic variables effectively, namely GDP, interest rates, inflation rates and exchange rates, they would have considered more than 90% of the factors affecting the demand. Other factors contribute very marginally – not more than 6%.

Thirdly, with respect to BNM's strategy to drive down the volume of banknotes in circulation, the findings suggest the complete switch-over to using e-payment for business transactions may be difficult and may take a longer time than expected as the economic factors are the major cause of public demanding for more banknotes to meet their needs. Perhaps, BNM may need to consider other alternative ways to expedite the adoption of e-payment, such as mandating the use of e-payment through law or providing attractive tax and other incentives for businesses using e-payment. For example, some central banks in the European Union have in recent year started to impose legal limits to cash payments. In 2014, Belgium banned cash transactions above €3,000 and, earlier, in 20111, Greece banned cash transactions above €1,500. Above this amount, the law mandates the transactions to be conducted using e-payment channels.

Table 5.16
Cash payment restrictions in the European Union

Country	Cash limit	Effective date
Belgium	€3,000	1 January 2014
Bulgaria	BGN10,000/€5,112	1 January 2013
Czech Republic	DKK10,000//€12,763	1 July 2012
France	€3,000	1 January 2012
Greece	€1,500	1 January 2011
Hungary	HUF1.5million/€5,000	1 January 2013
Portugal	€1,000	14 May 2012
Spain	€2,500	19 November 2012

Source: European Consumer Centre France (2014)

5.3 Limitations and Recommendations for Further Study

The demand for money is one of the most important components of the transmission mechanism of monetary policy. Better understanding of the causes and consequences of money demand gives useful insight into the formulation of monetary policy.

In this study, the influence of non-economic factor on the demand for banknotes via market sentiments did not find support. Perhaps, other more appropriate non-economic variables may have influenced the demand for banknotes. Technology (Cassino, Misich, & Barry, 1997; Hasani, Nadri, Biabani, & Akhlaghi, 2013), financial innovations (Rauf, 2012) and payment habits (Gresvik & Haare, 2008; Sabri, Hayhoe, & Goh, 2006) are some of the many factors that are said to have changed the payment landscape in recent years. One foreseeable challenge in studying these variables is to find appropriate proxies to represent these variables.

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