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The Motives for International Reserves Holding in Indonesia

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List of Acronyms

ADF	: Augmented Dicky Fuller	
API	: Average Propensity to Import	
ARDL	: Autoregressive Distributed Lag	
ASEAN	: Association of Southeast Asian Nations	
BI	: Bank Indonesia (The Central Bank of Indonesia)	
BPS	: Badan Pusat Statistik (The Statistics Bureau of Indonesia)	
CMI	: Chiang Mai Initiative	
CMIM	: Chiang Mai Initiative Multilateralization	
CPI	: Consumer Price Index	
CUSUM	: Cumulative Sum of Recursive Residual	
DOLS	: Direct Ordinary Least Square	
ECM	: Error Correction Model	
FDI	: Foreign Direct Investment	
FPI	: Foreign Portfolio Investment	
GDP	: Gross Domestic Product	
IFS	: International Financial Statistics	
IMF	: International Monetary Fund	
OLS	: Ordinary Least Square	
PP	: Phillips-Perron	
RPF	: Reserve Position in the Fund	
SDRs	: Special Drawing Rights	
SEKI	: Statistik Ekonomi dan Keuangan Indonesia	
UECM	: Unrestricted Error Correction Model	
WTO	: World Trade Organization	

Abstract

This research paper analyses long run motives for and the determinants of international reserves holdings in Indonesia. Using data from 1984:Q1 to 2009:Q4, an unrestricted error correction model (UECM) based on the Autoregressive Distributed Lag (ARDL) is employed to analyse the long run relationship between the demand of international reserve and its determinant. This research also takes the financial crisis in Indonesia from the third quarter of 1997 to the fourth quarter of 1999 and the application of the floating exchange rate system since August 14th 1997 into consideration.

This research paper finds the determinant of the international reserves holding in Indonesia. This suggests that Indonesia has not only hold a precautionary motive, but also a mercantile motive in the long term. The precautionary motive in Indonesia exists as a self insurance of the external payment imbalances due to trade flows and the foreign portfolio investments. The precautionary motive is also visible from the increase of international reserves during the application of a floating exchange rate system. Thus international reserve becomes a buffer to maintain exchange rate flexibility and as an instrument against negative consequences of financial crisis. The mercantile motive can explain why Indonesian export growth and foreign portfolio investment in the long term are positively correlated with foreign reserves holding aimed at managing exchange rate to support export growth activities.

Relevance to Development Studies

International reserves have been a key determinant of self insurance against financial crises and external imbalances in a country. They can also be used in exchange rate intervention in order to increase export growth. Identifying the motives of international reserves holding is necessary to analyze the motives of the central bank on guarantee economic stability and supporting development while facing many different influence factors, policies and economic crises.

Keywords

International Reserves, Indonesia, Bank Indonesia, Precautionary Motive, Mercantile Motive.

Chapter One: Introduction

1.1. Background

International reserves holding is an issue that has been debated a lot for many years, both with respect to the adequate level and the cost of reserves holding. In the past, when most countries applied fixed exchange rate, international reserves were very important because international reserves were used to control the exchange rate at a certain level. The traditional policy determined the adequate level of international reserves equal to three months of import. The currency crises that occurred on some emerging markets like in East Asian countries in 1997 have been an important lesson for the international reserves adequacy because these crises had drained international reserves which had been used to peg its currency. Since the late of 1990s, the flexible exchange rate which allows the exchange rate to fluctuate and be solely determined by the market has been applied. In this system, international reserves are, in theory, not as crucial as under fixed exchange rate.

Under a floating exchange rate regime, less international reserves are required to peg the exchange rate continually. Because its exchange rate regime has been changed into a floating exchanges rate system on August 14th 1997, Indonesia should hold less international reserve than in the fixed exchange rate regime. In addition, free trade regime which was applied on January 1st, 1995 when Indonesia joined the World Trade Organization (WTO) also influenced the level of the international reserves. This regime led Indonesia to reform its trade policy to be more liberal on its export and import transactions. For developing countries, free trade can trigger increasing imports rather than exports because of the market penetration from strong foreign companies. Free trade will also increase the degree of trade openness which may affect on the increasing of the international reserves holding as a cushion against foreign payment. Moreover, the application of a floating exchange rate system increases the uncertainty of foreign exchange rates and this can possibly decrease export transactions and thus also influence the optimal level of international reserves.

At the same time, free global capital markets expose a country to large fluctuations in capital inflows and outflows. Therefore international reserves must be held by the central bank to minimize the risk of the speculative attacks on a country's currency which usually comes from the short term investment like portfolio investment. As a result, the traditional adequate level of international reserves, three months of import, may not be relevant for countries which apply free capital mobility. Following the Guidotti-Greenspan rule that claim a country should hold international reserves to an amount equals to its short term debt, Ruiz-Arranz and Zavandjil (2008) stated that the ratio of external debt maturing within a year to international reserves should be employed as an indicator of international reserves adequacy in a highly capital mobility which increases the possibility of a sudden stop and capital outflows. Moreover, a high level of international reserves is also being debated because of its

high cost. Therefore the central bank must calculate the best proportion of the international reserves by considering all these influencing factors.

As can be seen in Figure 1.1, based on the conventional approach of the reserves adequacy, the international reserves to import ratio of Indonesia between 1984: Q1 to 2009:Q4 on average is always above 3 months of import, the minimum standard of the adequate level of international reserves.

Figure 1.1 International Reserves in Months of Imports of Indonesia (1984Q1-2009Q4)
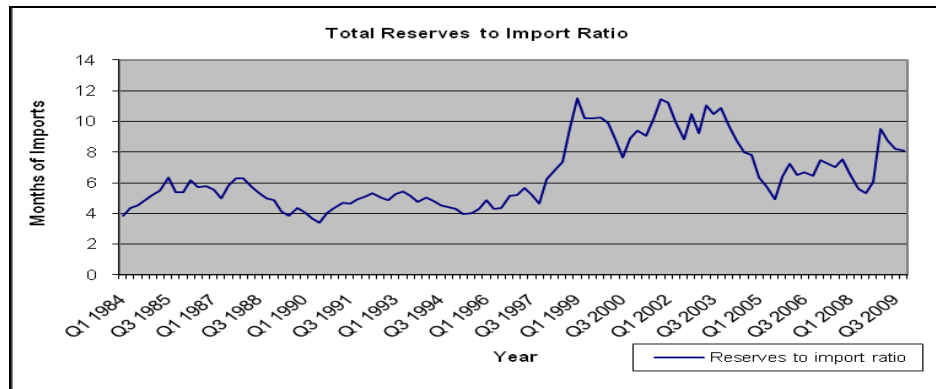
Data source: International Financial Statistics, *http://www.imfstatistics.org/imf/* last updated May 17th 2010; date accessed May 18th 2010, calculated by author

However, Figure 1.1 shows a significant change on reserves holding behaviour in 1997. The Indonesian financial crisis that started in July 1997 (Unit Khusus Museum Bank Indonesia , 2010) when the Rupiah exchange rate had been depreciated drastically vis-à-vis the US Dollar drained the international reserves that were needed to stabilize the exchange rate. Therefore, Indonesia had to borrow from the International Monetary Fund (IMF) on October 31th 1997 to recover Indonesian monetary crisis. Then, those conditions could also be induced by the increasing degree of precautionary as a self insurance to against the financial crisis.

Following the financial crisis in 1997, based on the Law No. 23 of 1999, since May 17th 1999 Bank Indonesia has no longer been influenced by the government and became independent. Consequently, Bank Indonesia has an authority to decide the supply of base money, to manage the money supply and credit and also to determine the interest rate. Together with other institution or independently, Bank Indonesia also has a responsibility to manage exchange rate for certain purpose (Djiwandono 2005:198). Managing the money base also means managing international reserves and bonds as tools to manage the money base. Therefore its independency also may affect its decision on the optimal level of international reserves holding.

As illustrated in Figure 1.1 the international reserves levels increased to higher levels during 1999 to 2004, the period after the financial crisis. It had even reached 11 months import, coverage well in excess of the minimum standard. The reserves accumulation beyond the adequate level of three months of import could be the result of a mercantile motive, where international reserves are employed to facilitate export growth by preventing exchange rate appreciation in order and support export competitiveness. However, after

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2003 the international reserves levels tend to decline to a lower level than in the period 1998 to 2003. This shows that there are different factors which influence the decision of the central bank to hold international reserves since 1984 to 2009.

1.2. Relevance and Justification

Based on the different level of international reserves holding in Indonesia since 1984 to 2009 there are different determinants and policies affecting decisions regarding the international reserves holding. Therefore research on factors which determine the international reserves holding is equally as important as to analyze the motives for international reserves holding by the Central Bank of Indonesia in the long term. This research can be used to reveal the motive of the Central Bank of Indonesia.

Regarding the determinants of international reserves in Indonesia there are studies employing panel data or cross section like Aizenman and Marion (2002) and Lane and Burke (2001), but only a limited number of researchers study the behaviour of the determinants of the international reserves in Indonesia using time series. An example of a study on the determinant of the international reserves of Indonesia using time series data is Eliza et al. (2008). They use time series data for Indonesia, Malaysia, Philippines, Singapore and Thailand to study the determinant of international reserves from the demand side. The study employed annual data from 1970 to 2005. Although this research employs time series data, it does not use the change of exchange rate system to explain the effect of the change of monetary policy on the demand for international reserves in all ASEAN five countries including Indonesia. Neither do Eliza et al. (2008) consider the effect of the Asian financial crisis even though it had impacted most of Asian countries during 1997-1999.

This paper studies the motives of international reserves in the long term by analyzing the factors influencing the international reserves holding in Indonesia including monetary policies and also the financial crises. This research focuses on the analysis of the motives of international reserves in the long term to analyze the consistency of the central bank in managing international reserves in order to guarantee domestic economy condition in the long term.

1.3. Research Objective, Research Questions and Research Hypotheses

Research Objective

This research paper will analyze the motives of international reserves holding in Indonesia in 1984Q1-2009Q4 in the long term. It does so by considering two research questions and research hypothesis.

Research Questions

  1. What are the determinants of international reserves holding in Indonesia in the long term?

2. Do a precautionary motive and a mercantile motive affect the international reserves holding in Indonesia in the long term?

Research Hypotheses

Considering the precautionary motives of the international reserves holding, the level of international reserves is expected to be influenced by average propensity to import, foreign debt, foreign direct investment and foreign portfolio investment positively. In addition, the financial crises and the application of the floating exchange rate system will also have a positive influence on the international reserve holding. Considering the mercantile motives, the level of international reserves is determined by the export growth positively in the long term. In addition considering the cost of international reserves holding, the level of international reserves will be negatively influenced by the opportunity cost.

1.4. Scope and Limitations of the Study

There are many factors which affect the international reserves in Indonesia such as factors affecting the supply of international reserves and the demand for international reserves which after all determine the level of international reserves. The scope of this paper is to analyze the motives for international reserves holding in Indonesia by taking a closer look at the determinant of international reserves holding.

Due to the unavailability of data for quarterly short term debt from 1984 to 2009, foreign debt is employed as a proxy of short term debt in the model. Similarly, the unavailability of GDP deflator and the import and export prices indices on quarterly basis from 1984 to 2009 causes this research to employ consumer price index (CPI) to convert nominal values for quarterly data related to GDP, exports and imports into real term. This real term is needed to capture the inflation effect on the behavior of each variable. Exchange rate data will not be included in the model because of the endogeneity between variables which can cause bias estimation.

In addition, regarding the application of floating exchange rate system since August 14th 1997, this research wants to look at the effect of the application of the floating exchange rate system. It can also reflect the increasing volatility of exchange rate since the application of floating of exchange rate system. Therefore the volatility of exchange rate will not be included as an independent variable in the model.

This research will only analyze the factors which determine the international reserves holding which can illustrate the motives of international reserves holding in Indonesia from 1984 Q1 to 2009 Q4 in the long term. This will be useful to know the activities of Indonesia in order to protect its country from external payment imbalances, future shock and financial crisis while support the economic growth in the long period.

1.5. Organization of the Paper

This paper is divided into six chapters including the introduction in the first chapter. The second chapter is conceptual framework including literature reviews. While the overview of the determinant of the international reserves holding in Indonesia will be explained in the third chapter, the fourth chapter will explain the data and methodology used. Following the empirical analysis which discusses result and analysis in the fifth chapter, the conclusion will be presented in the sixth chapter.

Chapter Two: Theoretical Framework

2.1. Motives for International Reserves Holding

In a small open economy, there are two kinds of assets which are held by the central bank to change the monetary base. The central bank can purchase or sell government bonds in the bonds market to change the monetary base. In addition, purchasing or selling foreign currencies which are held by the central bank in the foreign exchange reserves, another name of international reserves, in the foreign exchange market can also change the monetary base (Blanchard 2000). Those activities happen in the open market operation, the main instrument of the monetary policy of the central bank.

Referring to the *The IMF's Balance Of Payments and International Investment Position Manual* (2009:111) the international reserves can be defined as:

> those external assets that are readily available to and controlled by monetary authorities for meeting balance of payments financing needs, for intervention in exchange markets to affect the currency exchange rate, and for other related purposes (such as maintaining confidence in the currency and the economy, and serving as a basis for foreign borrowing)

For developed countries using floating exchange rate system, reserves management is about maintaining economy and financial stability since exchange rates are determined solely by market. However, international reserves management still plays an important role in developing and transition countries which are applying a floating exchange rate system. It happens because international reserves are still needed to smooth the fluctuation of the exchange rate by intervention policies. Consequently, the international reserves must be held at a secure level to control exchange rates from the economic shock.

A developing country with higher liquidity which is provided by international reserves can reduce its vulnerability to external shock and financial crisis. However, its international reserves must be managed in the appropriate level because the international reserves holding are costly. If the level of international reserves is too high, according to Williams (2006) a country could lose an opportunity to build domestic investment capital because the resources have been used to buy reserves. Conversely, if the level is too low, it will reduce the security of the country to the international payment and to face the external vulnerability. Because of its functions, then the adequate level will be influenced by many factors which some time they influence in contrary ways. As a result to manage the adequate level, the central bank has to consider many factors.

Kim et al. (2005) stated that international reserves holding are influenced by the motive of reserves holding. Here, international reserves holding can be viewed as the result of a precautionary motive and a mercantile motive. The precautionary motive reflects the need for self protection to possible future abrupt shocks in the external sector and also to currency crises prevention

(Aizenman and Lee 2005). Kim et al. (2005) detect that there are different reasons of precautionary demand such as to finance the payment imbalance, to provide liquidity to face a run on the currency and also to reduce the probability of the runs on the currency. Payment imbalances occur when there is a balance of payment (BOP) deficit because of a trade deficit when capital outflows are higher than capital inflows. The central bank will not so much consider the cost of the international reserves until the level to provide the liquidity and keep the security of the country from the financial shock in adequate.

On the other hand, a mercantile motive is present when a country wants to promote exports and FDI inflows by reserves accumulation. In order to maintain its competitiveness by preventing appreciation, to keep export products on lower price when there is a high level of foreign currency inflow which can induce domestic exchange rate to appreciate, the central bank will intervene to buy foreign reserves to maintain domestic exchange rate at a favourable level. It aims to maintain an undervalued exchange rate to increase employment (Kim et al. 2005). As an effect of the mercantile motive, international reserves tend to be accumulated to a high level. This happens because the undervalued of exchange rate can be employed to maintain competitiveness of export. As a result, the competitiveness can increase export growth which can support domestic income and employment.

The motives of reserves holding therefore determine the international reserves holding in a country, whether it is only for self protection under precautionary motive or it is employed to support growth of a country through export which is captured under mercantile motives.

In order to know the motives of the central bank to manage international reserves holding, this research paper will analyze the motives for international reserves holding by looking at the determinants of the international reserves holding.

2.2. Determinants of International Reserves Holding

The main purpose of international reserves according to Carbaugh (2009) is to finance the balance of payment disequilibrium. It also can be used to facilitate government intervention in the exchange market to stabilize the currency. Therefore the demand for international reserves depends on the monetary value of international transactions and the disequilibrium that can arise in the Balance of Payment positions (Carbaugh 2009:515).

On the other hand, Carbaugh(2009:518) mentions that the supply of international reserves consist of two different categories, namely owned reserves and borrowed reserves. Generally, reserves assets such as gold, acceptable foreign currencies and special drawing rights (SDRs) are considered to be owned reserves by the holding nations. However, when countries have a payments deficit and their owned reserves falls to unacceptably low levels, they may able to borrow international reserves as a cushioning device (Carbaugh 2009:518).

Many factors determine the international reserves holding by the central bank, from the demand and the supply side. They can be viewed as factors of

precautionary motive and/or the mercantile motive. Based on the theory and literature, those factors are:

2.2.1. Exchange Rate and the Exchange Rate System

The central bank is an institution which is responsible for monetary policy. Consequently the independency of the central bank will have an important impact on monetary policy including liquidity decisions. The independency of the central bank usually relates to the information relationship among the central bank, the government and the parliament. Related to the exchange rate policy, the central bank can be said to be an independent institution when it formulates and implements exchange rate and foreign exchange policy consistent with monetary policy objectives rather than following government instructions in case of policy inconsistency. On the other hand, it can be said that the central bank is not independent when the central bank decides and implements exchange rate and foreign exchange policy based on instructions given by the government (Mathew 2010).

There are three kinds of exchange rate systems:

1. Fixed Exchange Rate System

In the fixed exchange rate regime, the central bank keeps the currency exchange rate at a fixed level to the other currencies and it is adjusted infrequently (Blanchard 2000). Therefore the central bank needs to use its monetary policies to maintain its currency exchange rate when there is a change of factors which influence its currency exchange rate. International reserves are used in the intervention of the foreign exchange market to manage the currency exchange rate.

2. Managed Floating Exchange Rate System

In a managed floating exchange rate system, the central bank smoothes exchange rate movements but the exchange rate is not kept fixed rigidly. Here, the central bank influences the exchange rate by intervention in the currency market (Krugman and Obstfeld 2003).

3. Floating Exchange Rate System

In the floating exchange rate system the market solely determines the level of the exchange rate. When there is an increasing demand of foreign currency in the market, the central bank accepts that the domestic currency depreciates and does not intervene (Blanchard 2000).

The exchange rate system determines the intervention level of the central bank to control the exchange rate in the foreign exchange market. Because the intervention mostly uses international reserves, the exchange rate system will determine the optimal level of the international reserves held by the central bank. Here, international reserves also function as a buffer to protect a country's currency from speculation. Demand for international reserves is also determined by the degree of exchange rate flexibility of the international monetary system (Carbaugh 2009:515), as illustrated in the Figure 2.1

Figure 2.1 The Demand for International Reserves and Exchange Rate Flexibility
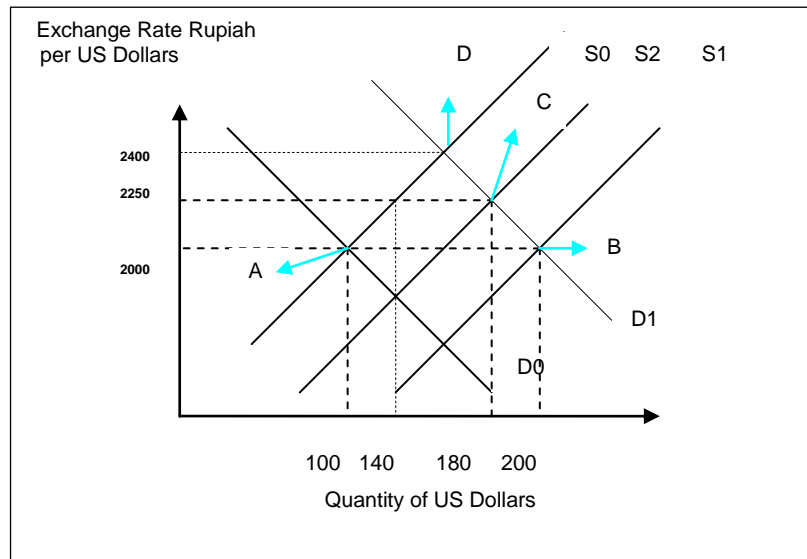
Source: Carbaugh (2009: 516), redrawn by author

The Figure 2.1 represents the demand for US Dollars as international reserves in the foreign exchange market of Indonesia which reflects Indonesia in trade with the United States. Point A represents the initial condition, while B represents the effect of import transaction by Indonesia from United States on the increasing demand (from D0 to D1) for US Dollar in the fixed exchange rate. Here the monetary authority has to intervene the foreign exchange market by increasing US Dollars supply (from S0 to S1) to peg the exchange rate at the same level with A. Meanwhile, C represent the condition when the monetary authority allows the exchange rate to float smoothly, then less international reserves(from S1 to S2) will be supplied to intervene the foreign exchange market, as a result the exchange rate will depreciate to 2,250 Rupiah per US Dollars. In addition, its exchange rate will depreciate further to 2,400 Rupiah per US Dollars when the central bank applies free floating exchange rate system because it does not supply US Dollars as an intervention. Therefore under free floating exchange rate the central bank needs to hold less international reserves holding than in managed exchange rate system or fixed exchange rate system.

Bahmani-Oskooee and Malixi (1987) found that when the exchange rate becomes more flexible, the demand for international reserves will be lower because the external payment imbalances will be corrected by the adjustment of the exchange rate. Therefore under free floating exchange rate the central bank may hold less international reserves holding than in managed exchange rate system or fixed exchange rate system. The expected sign of the application of floating exchange rate on the demand for international reserves holding during the period of free floating exchange rate system is negative.

On the other hand, Aizeman et al. (2004) argue that it only happens in theories; in fact a floating exchange rate system regime induces the monetary authority to use international reserves more often to stabilize the exchange rate which becomes more volatile. Under the precautionary motive, the more vola-

tile exchange rate induces the central bank to hold more international reserves. Therefore the expected sign of the period of free floating exchange rate system could also be positive, depending on the motives.

2.2.2. Trade

Considering the global economy, free trade is believed to stimulate growth by increasing exports because of the larger market. However, most developing countries have no ability to compete with manufactured products which are produced massively by multinational companies. Indeed, the domestic production might be depending on imported products which come from highly technological production. Because of the dependence of the imported product, the exported product may also still depend on the imported product. These conditions sometime generate the increasing import level while the export volumes increase.

Related to the exchange rate system, a floating exchange rate system will bring the currencies to easily fluctuate. This condition could result in a high volatility of the exchange rate which would cause the uncertainty of import and export activities. These conditions will generate uncertain about the price which has to be paid for goods by importers and which will be received by exporter. International trade then becomes more costly and the quantity of goods traded decreases (Krugman and Obstefld 2003:575). This highly dependency of imported product because of the uncertainty of exchange rate therefore requires a guarantee to avoid the disturbance on its external payment.

Under the precautionary motive, the uncertainty of both trade and the deficit can cause payment imbalances therefore the increasing import will increase the international reserves holding. Average propensity to import can also be a proxy of trade openness. As a result the expected sign of the average propensity to import which represents the import level is positive with respect to the international reserves holding.

Export is a factor which can increase growth and also can supply foreign currency. The increasing supply of foreign currency can be used to off set the need of foreign currency for external payment such as import and foreign debt. On the other hand, the increasing foreign currency earnings can create domestic currency appreciation which can reduce export competitiveness because of the higher export price. Under the mercantile motive, to support the competitiveness of export, the central bank needs to control foreign currencies circulation so that the exchange rate does not fluctuate largely and appreciate. The competitiveness of export price then can increase the export level and simultaneously provide foreign currencies which affect to the increasing level of international reserves. Because of this motive, while export activities increase, international reserves level is increased to keep the exchange rate and competitiveness of export. Therefore, under mercantile motive the expected sign of variable export growth is positive.

2.2.3. Foreign Debt

Among those strategies to increase liquidity in order to avoid the financial crisis, most of developing countries increase their international reserves. According to Rodrik (2006), in the beginning of 1990s most emerging market countries had short term foreign liabilities in excess of their international reserves. On 1999 Pablo Guidotti supported by Fed Chairman Alan Greenspan stated the Guidotti-Greenspan rule that a country should hold reserves in the same amount as its short term debt. Therefore most countries increased their reserves. Later these expanding reserves became a phenomenon even on the poor countries in the world (Rodrik 2006).

Under precautionary motive, in order to face a run on the currency the increasing foreign debt will induce the increasing of international reserves holding to provide liquidity. This increasing of international reserve holding will also be used as a protection of the external payment imbalances. Because international reserves will be used as a buffer for external payment, under precautionary motive, the expected sign of foreign debt is positive.

2.2.4. Financial and Capital Flows

According to Aizenman and Lee (2005), the precautionary motive relates international reserves holding to the exposure to sudden stops, capital flight and volatility. Regarding the precautionary motive in term of capital flight, there are two kinds of capital flows which have significant relationship with international reserves, Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI). According to *The IMF's Balance Of Payments and International Investment Position Manual* (2009:101), Direct Investment can be defined as:

> A cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy.

Meanwhile, according to *The IMF's Balance Of Payments and International Investment Position Manual* (2009:110), Portfolio Investment can be defined as:

> Cross border transactions and positions involving debt or equity securities, other than those included in direct investment or reserves assets.

Conventional policy in holding foreign exchange reserves indicates that the adequate level of foreign exchange reserves must be equal to at least three months of import. This policy is not relevant for emerging markets which participate in the current global capital market because these countries are exposed to capital flows which fluctuate tremendously (Feldstein, 2002). In addition, Feldstein (1999) also indicates that international reserves which equals to six month of import is only concern on trade financing and rejects the fact that currency crises is about capitals flows.

Capital flows are considered in relation to the international reserves holding because of the capital account liberalization risk. Capital account liberalization means that a country accepts capital flows without restriction. Thus, domestic investor will invest in foreign asset more freely. A high capital outflow

can cause a lack of foreign currencies and external payment imbalances. However, capital inflows like foreign direct investments (FDI) are more attractive for emerging market economies than portfolio investment because it is more stable and also can bring technological transfer and managerial expertise (Prasad and Rajan 2008).

The better economic conditions of emerging market countries attract foreign investors to invest more, in term of FDI or Portfolio investment. Consequently the high capital inflow increases foreign exchange reserves indirectly when the central bank attempt to hold off high exchange rate appreciation by intervening the foreign exchange market (Prasad and Rajan 2008).

On the other hand, bad economic conditions induce investors to leave and to withdraw their investment. This mostly happens in the case of portfolio investment which can be withdrawn easily anytime. Moreover, financial openness increases the volatility of short term investments like portfolio investment. Under precautionary motive, the more volatile behaviour of portfolio investment then directly stimulate international reserves holding more than foreign direct investment. As a result, increasing financial flows will increase the foreign exchange reserves. The expected signs of these variables are positive with respect to international reserves holding.

2.2.5. Opportunity Cost

The accumulating foreign exchange reserves can increase the liquidity as a cushion against economic shock, but it will also increase the social cost of self insurance. According to Williams (2006:6), the opportunity cost of holding international reserves is:

> The foregone investment of resources which have been used to purchase reserves rather than towards building domestic investment capital.

Moreover, Feldstein (1999) states that the social cost of self insurance emerge for two reasons. First, accumulating reserves by increasing export in exceed of imports will decrease domestic consumption and investment. Secondly, the yield of liquid reserves assets usually is less than the external cost of funds generated from domestic bonds. This happens because usually international reserves are held in low-yielding short term US treasury. Those international reserves invested in foreign asset become an opportunity cost that equals the cost of external borrowing for that country.

Rodrik (2006) argued that liquidity cannot depend on the international reserves holding only. It can also be achieved through combination of reserves accumulation and short term liabilities reduction, However short term liabilities reduction can be achieved when the cost of reducing short term debt is more costly than building up reserves.

Based on Prabheesh et al. (2007) and Aizenman and Marion (2004) opportunity cost of international reserves holding can be calculated using the interest rate differential:

$$interest\_rate\_differential = \frac{(1 + domestic\_interest\_rate)}{(1 + foreign\_interest\_rate)}$$

This formula implies that a lower foreign interest rate will generate a lower return and then increases the opportunity costs of international reserves. As a result, the expected sign of the opportunity costs is negative with respect to international reserve holding.

2.2.6. Financial Crises

International reserves are necessary under the precautionary motive, because it provides self protection to possible future abrupt shocks in the external sector and also to crises prevention (Aizenman and Lee 2005). Financial and currency crises have taken place in emerging market economies for many years. Since the 1990s, global capital markets expanded private debt and equity flows and also increased foreign direct investments rapidly. Consequently recent crises have been more harmful to economic and political stability than the past crises. As they learned from Asian financial crisis which hit East Asia in 1997, to protect themselves from such crisis developing countries, they cannot depend on the International Monetary Fund. It is better for countries to protect themselves and increase their liquidity by expanding their level of foreign assets. Three strategies which can be applied to increase liquidity are: reducing short term debt, creating a collateral credit facility and increasing international reserves of the central bank (Feldstein 1999).

According to Aizenman and Lee (2005), financial crises ultimately increase the international reserves holdings of a country. The 1994 crisis in Latin America had increased the international reserves by Mexico, but East Asian countries were not affected. Similarly, the 1997 crisis of East Asian countries only affected the increasing of international reserves holding in East Asian countries. Therefore a financial crisis is expected to increase the international reserves holding in the long run.

2.3. What Do the Determinants of International Reserves Tell About the Motives of International Reserves Holding?

As discussed on the subchapter 2.2.1 to 2.2.6 the international reserves holding are determined by exchange rate, trade, foreign debt, financial and capital flow, opportunity cost and also financial crises. Those determinants can be related to the precautionary motive and the mercantile motive as illustrated in table 2.1:

Table 2.1 Determinant and Motives of International Reserves

Determinants	Precautionary Motives	Mercantile Motives
Floating Exchange Rate	(+)	
Export		(+)
Import	(+)	
Foreign Debt	(+)	
Foreign Direct Investment	(+)	(+)
Foreign Portfolio Investment	(+)	(+)
Financial Crisis	(+)	

From table 2.1, it can be said that under precautionary motives, as a self insurance from the external payment imbalance, a country will tend to increase its international reserves when there are an increasing import and foreign debt. In addition to anticipate the sudden capital outflow, the increasing foreign direct investment and foreign portfolio investment inflow will tend to increase the international reserves accumulation.

Under the floating exchange rate regime, a country should hold less international reserves because it is less required to steer the exchange rate which determined solely by market. However, under a precautionary motive, during the floating exchange rate system, a country tends to increase its international reserves level. This aims to manage exchange rate volatility, to provide liquidity to face the run of the currency and also to reduce the probability of the runs of the currency. In addition, as a self protection from the future shock, when there is a financial crisis, a country will also add its international reserves.

The increasing foreign currency supplied by export activities will create the appreciation of domestic currency which affect to the decreasing export price competitiveness. Therefore, under the mercantile motive, when export growth increases, a country tends to accumulate its international reserves more. This condition occurs in order to manage its exchange rate on the favour level to support the export price competitiveness.

In addition, the foreign direct investment and portfolio investment also increase the supply of foreign currency in the domestic market. Therefore to hold off exchange rate appreciation, under the mercantile motive, the high capital inflow had increased foreign exchange reserves.

2.4. Empirical Studies of International Reserves

Many literatures have studied the determinants of the demand for international reserves in the world. Those studies are conducted by employing cross section analysis and individual country data

2.4.1. General Studies of the Determinants of International Reserves

The determinants of international reserves have been studied by many researchers in decades, but most of them are studied the demand for international reserves. Kelly (1970) studied using Ordinary Least Square (OLS) and annual cross section data of 46 countries under fixed exchange rate regime in 1953-1965. He concluded that export variability, average propensity to import, per capita income, foreign liabilities and foreign assets determine the demand for international reserves. On his study, Frenkel (1974) employed OLS and using cross section data of 56 developed and less developed countries in 1963-1967. He analyzed that holding reserves is positively related to the international receipts and payments, the volume of imports and also the size of foreign trade sector. He found that import per GDP, variability measure and level of import are significant variables.

Go (1981) described that import is the primary factor influencing the required level of reserves demand. The ideal level of reserves, reserves ratio to import, is three to four month lower than period 1954-1965 which use five to nine months of import. Edwards (1984) using OLS and cross section data of 23 developing countries which applied a fixed exchange rate system between 1965 and 1972 concluded that real income, openness variable which is measured by average propensity to import (API), variability measure, and real money demanded and previous reserves have significantly determined the international reserves demand.

Badinger (2004) using quarterly time series data of Austria between 1985:1-1997:4 on Error Correction Model (ECM) resulted that demand for international reserves under fixed exchange rate regime are affected by real import, standard deviation of past reserves change and the difference of domestic interest rate with foreign interest rate. While Aizenman et al. (2004) using OLS studied time series data of Korea from 1990 to 1997 in a flexible exchange rate regime. They concluded that real GDP, API, volatility to export, ratio of foreign equity to GDP and short term debt to GDP determine the demand for international reserves.

Craigwell et al. (2006) studied Barbados using time series data from 1975 to 2005 and direct ordinary least square (DOLS) and ECM. They indicated that the propensity to import, real income and capital account liberalisation has positively influenced the demand for international reserves in the long run. However, central bank lending to the central government also has a negative relation to international reserves.

Moreover, Prabheesh et al.(2007) using cointegration and quarterly data from 1983:1 to 2005:1 show that the demand from international reserve in India in the long term is positively influenced by the import to GDP ratio and ratio of broad money to GDP. It is negatively affected by the interest rate differential and the exchange rate flexibility. The interest rate differential is employed to represent the opportunity cost of international reserves holding. Another research is conducted by Sehgal and Sharma (2008) utilising time series quarterly data of India from 1990:2-2006:1 and using co-integration and VECM approach. They concluded that income, portfolio investment, short term external debts, degree of openness, export growth significantly determine the demand for international reserves.

2.4.2. Empirical Studies on the Determinants of International Reserves in Indonesia

An example study of the determinant of international reserves of Indonesia using time series is Eliza et al. (2008) who uses time series data for Indonesia, Malaysia, Philippines, Singapore and Thailand to study the demand for international reserves. This study employed annual data between 1970-2005 using Autoregressive Distributive Lag (ARDL). ARDL is employed to analyze short run and long run relationship of the demand of international reserves with its influencing factors.

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As can be seen in Table 2.2, this research shows the long run coefficients of the unrestricted error correction model (UECM) in case of Indonesia. It shows that the previous reserves (lnRt-1), GDP per capita (lnYCAPt-1), export volatility (lnXVOLt-1), and the ratio of current account balance to GDP (lnCAt-1) are significant. On the other hand, average propensity to import (lnPIMt-1) and external debt (lnDEBTt-1) are insignificant.

Table 2.2 The Long Run Coefficients of The UECM Result of Indonesia Period 1970-2005[1]:

Variable	Coefficient	Significance	t statistic
Constant	-7.2662	**	-2.1898
lnRt-1	-1.2229	***	-4.0165
lnYCAP t-1	0.9284	**	-24.470
lnPIM t-1	0.4991		-11.606
lnXVOL t-1	0.2357	***	-30.022
lnCA t-1	0.6853	**	-32.721
lnDEBTt-1	0.2010		-0.760
Adj R2	0.6255		

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

From the UECM result, Eliza et al. (2008) calculate its long run elasticity's by dividing the coefficient of the first lag of long run independent variables as presented in table 2.1 by the coefficient of the first lag of the dependent variable, lnRt-1. The result of the long run elasticity's is described in Table 2.3.

Table 2.3 Long Run Elasticity

Dependent Variable: Reserves to GDP (lnR)

Variables	lnYCAP	lnPIM	lnXVOL	lnCA	lnDEBT
Long Run Elasticities	0.7951 **	0.4081	0.1928 ***	0.5604 ***	0.1644

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

Based on table 2.3, they conclude that on the long run the demand for international reserves in Indonesia is affected by real GDP per capita, real export receipt and ratio of current account balance to GDP. On the other hand, the average propensity to import and the ratio of total external debt to GDP have no effect on the demand for international reserves in Indonesia for period 1970 to 2005.

This research employs time series data, but it does not employ the variable of monetary policy regime in a specific country to analyse the effect of the change of monetary regime such as exchange rate systems or free trade regimes on all ASEAN 5 countries including Indonesia. The study does not consider the effect of the Asian financial crisis either even though financial crisis had impacted most Asian countries during 1997-1999.

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[1] Eliza, N., M. Azali, S. H. Law, and C. Lee (2008), *Demand for International Reserves in ASEAN-5 Economies*, MPRA Paper No.11735, p. 6

2.5. Conclusion

The studies of the determinant of the demand for international reserves indicate that trade plays a significant role to determine the demand for international reserves. Average Propensity to Import (API) is considered as an important factor influencing the level of international reserves. The export sector is also a significant factor that determines international reserve level. However, those researchers employ different variables to represent the effect of export on the demand for international reserve holding.

Regarding external payment, short term debt has a significant role on the decision of international reserves holding. Moreover, interest rate differential has also been considered as an important factor to represent opportunity cost of international reserves holding

Considering international capital flows, it is important to employ foreign portfolio investment and foreign direct investment (FDI) to study the effect of capital mobility on the determinant of the international reserves holding. In addition the policy of exchange rate flexibility is also an important factor of the level of international reserve holding.

The relationship and significance level of the variables which determine the demand for international reserves can be used to see which of the motives of international reserves holding is partially relevant. The motives of reserves holding is then determine the consistency of the central bank to guarantee the economic security and stability and also to support the export growth.

Chapter Three : Overview of the Level of International Reserves in Indonesia and Its Determinant

3.1. International reserves

As a developing country which has applied free trade and also free capital mobility, international reserves are highly needed by Indonesia. The financial crisis in 1997 taught the importance of the availability of liquidity which can be used against the financial shock during the financial crisis. Because of the limited stock of international reserves in 1997, Indonesia had to take more debt which then worsened its financial crisis.

Based on the Central Bank Act no.23/1999 on Bank Indonesia enacted on May 17th 1999 and has been amended with Act No.3/2004 on January 15th 2004, Bank Indonesia, Indonesian Central Bank, as a monetary authority has an authority to hold and manage the level of international reserves. According to Gandhi (2006) the international reserves management of Bank Indonesia aims to support the monetary policies as part of exchange rate management, support the debt repayment of the government and fund import activities to support the domestic economic activities. In addition, on managing the level of international reserves, security and liquidity principles are applied without abiding the profitability principle. It means that in order to manage the adequacy of international reserves holding, the central bank has also to consider the opportunity cost.

Based on Statistik Ekonomi dan Keuangan Indonesia(SEKI), international reserves which are hold by Bank Indonesia consist of monetary gold, foreign currency reserves such as currencies, deposits and securities, Reserves Position in the Fund (RPF), Special Drawing Rights (SDRs), and Other Reserves Assets which can be used for external payment and easily withdrawal. To support the monetary policies, Bank Indonesia should manage the adequate level of international reserves while considering its influencing factors.

Regarding the supply of international reserves, Indonesia has together with ASEAN Members States, China, Japan and Korea (ASEAN+3) discussed a network of bilateral currency swap agreements, the Chiang Mai Initiative (CMI) on 6 May 2000. By establishing CMI, international reserves can be accessible by participating central banks to fight currency speculation and can be used to avoid a future recurrence of the 1997 Asian Financial Crisis (Crampton 2000). However, according to Kim et al. (2005) CMI still has a limited progress on pooling international reserves in the ASEAN+3 regions. Moreover, a limited foreign exchange reserves is still available before 2009.

In addition, its foreign exchange reserves is expanded and the Chiang Mai Initiative Multilateralisation (CMIM) Agreement was established by ASEAN countries, China, Japan and Korea (ASEAN+3) and Monetary Authority of

Hongkong, China on 28 December 2009. The CMIM has a core objective to provide financial support to CMIM participants which facing balance-of-payments and short-term liquidity difficulties through currency swap transactions. It also aims to supplement the existing international financial arrangements (Bank Indonesia 2009).

3.2. Factors Influencing International Reserves Holding in Indonesia

Since 1984, many economic policies related to international reserves in Indonesia have been taken following the economic incidents which have been happened. The different patterns of the fluctuation on the Figure 1.1 show the change of the behaviour of the international reserves holding in Indonesia from 1984 to 2009. This change occurred for many reasons because during this time many financial condition and economic policies have been changed which then influenced the behaviour of international reserves holding.

3.2.1. Financial Crises

Many financial crises have impacted Indonesian economic conditions. The Asian financial crisis is the biggest financial crisis. It hit Indonesia in July 1997(Unit Khusus Museum Bank Indonesia 2010) when the Rupiah exchange rate has been depreciated drastically vis-à-vis the US Dollar. This condition had drained the international reserves to stabilize the exchange rate. Therefore, Indonesia had to take foreign debt from the International Monetary Fund (IMF) on October, 31th 1997 to recover from the monetary crisis. This condition also forced Indonesia to change its exchange rate regime into floating exchange rate system on August 14th 1997 to secure its reserves, from the large usage to intervene the foreign exchange market.

This Financial Crisis of 1997-1999 had a high impact on Indonesia as shown by the decrease of real GDP in the Figure 3.1.

Figure 3.1 Real GDP of Indonesia 1984-2009(Quarterly)
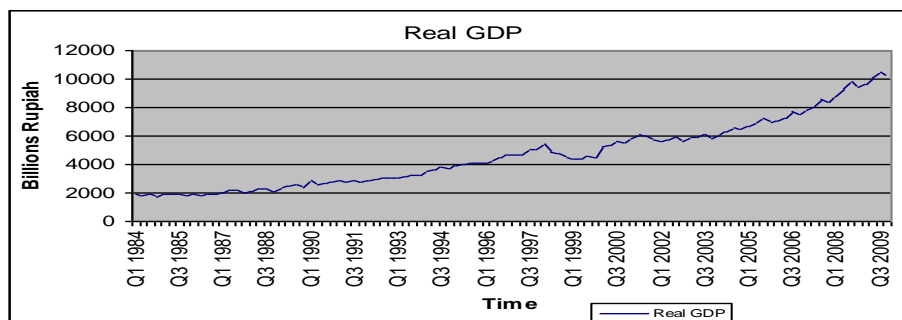
Data source: Data GDP from Statistic Bureau of Indonesia

Data of Indonesian CPI from IFS *http://www.imfstatistics.org/imf/* last updated May 17th 2010; date accessed May 18th 2010, calculated by author.

As illustrated in figure 3.1, GDP of Indonesia had reached a high level at the beginning of 1997. The Asian Financial crisis from 1997 to 1999 damaged

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Indonesian economy and resulted in the decrease of the GDP from the third quarter of 1997 to the fourth quarter of 1999, though GDP started to increase again afterwards.

The global financial crisis started in 2007 in the United States also had some impact to Indonesia even though as illustrated in figure 3.1, its impact on the Indonesian economy is much smaller than the Asian financial crisis.

3.2.2. Exchange Rate and the Exchange Rate System

The change of behaviour of international reserves holding was also most likely related to the exchange rate system, because before the increasing level of international reserves period the government also had changed its exchange rate regime into a floating exchange rate system. As can be seen in the Table 3.1, until 1978, Indonesia had used a fixed exchange rate system (Simorangkir and Suseno 2005). Here the monetary authority had been forced to stabilize the exchange rate on a certain and fixed rate. From 1978-1997, a managed floating exchange rate system had been applied. Following the financial crisis of July 1997, Bank Indonesia, still under the government, has from August 14th 1997 changed the exchange rate system to a floating exchange rate system, where international reserves is less required to peg the exchange rate continually.

Table 3.1 Indonesian Exchange Rate System [2]

Period	Exchange Rate System
1945 - November 14th, 1978	Fixed Exchange Rate
November 15th, 1978 - August 13th, 1997	Managed Floating Exchange Rate
August 14th, 1997 – now	Floating Exchange Rate System

Table 3.1 shows the different applications of the exchange rate systems which can lead the change of the behaviour of the exchange rate which presented in the Figure 3.2.

Figure 3.2 presents the movement of the real effective exchange rate. It indicates that during the managed floating exchange rate period, the movement of the exchange rate was very small except at the end of 1986, when Bank Indonesia devaluated the Rupiah to US Dollar in 12 September 1986. On the other hand, the exchange rate behaviour changes significantly after the application of the floating exchange rate in August 1997, when the exchange rate has fluctuated significantly. However, at the same time tremendous capital outflows created a depreciation of the Rupiah vis-à-vis the US Dollar and financial crisis in Indonesia.

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[2] Simorangkir , I. and Suseno (2005), *Sistem Dan Kebijakan Nilai Tukar*, BI, Jakarta, page appendix

Figure 3.2 Real Effective Exchange Rate 1984Q1-2009Q4 (Quarterly)
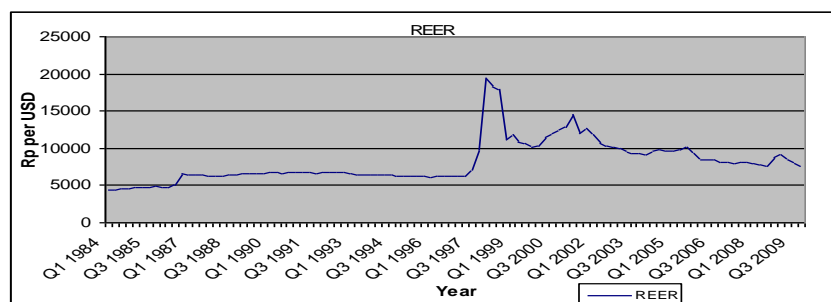
Data source: International Financial Statistics, *http://www.imfstatistics.org/imf/*
Last updated May 17th 2010; date accessed May 18th 2010, calculated by author.

Figure 3.2 also illustrates that since the application of floating exchange rate, the Rupiah exchange rate vis-à-vis the US Dollar has become more volatile. It can be said that since the application of a floating exchange rate, the monetary authority let the exchange rate fluctuate as the market determine.

3.2.3. The Independency of Bank Indonesia

Based on the Law No. 23 of 1999, since May 17th 1999 the central bank of Indonesia which is Bank Indonesia has no longer been influenced by the government or other parties because it has received its independency. This status also amended with Act No.3/2004 on January 15th 2004. As a result Bank Indonesia has the authority to decide on the supply of base money, on managing the money supply and credit and also to determine the interest rate. Together with other institutions or independently, Bank Indonesia also has a responsibility to manage the exchange rate for certain purposes (Djiwandono 2005). Managing the money base also means managing international reserves and bonds as tools to manage money base. Therefore its independency also may affect its decision on the optimal level of reserves holding.

According to Artha and de Haan (2010) during 1999-2003 Bank Indonesia has reached its highest level of independency when the central bank was legally mandated as an independent institution. Although Bank Indonesia has a responsibility to supervise banking sectors, the government is still burdened by banking crises cost such as expenses of the banking liquidity crisis in 1997.

Regarding the financial independency, Bank Indonesia could determine its budget solely without any interventions from government or Parliament, but since 2004 Bank Indonesia could no longer determine its budget solely as approval by the legislative was required. However, actual independence of Bank Indonesia had decreased during 2004-2008 since Burhanuddin Abdullah and Boediono who had a background as a former minister of economy became governors of Bank Indonesia. Moreover, the dismissal of the governor Burhanuddin Abdullah due to corruption reduced the actual independence of Bank Indonesia.

Related to policy making, government decided on the inflation and exchange rate assumptions based on the government budget plans. Furthermore,

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the tax removal on the primary government bond market transactions of Bank Indonesia increased the attractiveness of the central bank to buy government bonds in the primary market.

3.2.4. Capital and Financial Account

One of the possible factors which influence the international reserves holding in Indonesia is the capital account regime which has been applied to attract foreign investment since 1967 when the Foreign Capital Investment Law No. 1 of 1967 was governed and then amended by Law No. 11 of 1970. Here the business operations of foreign companies which have foreign direct investment, like other companies, are still subject to industrial policies as required by the corresponding minister.

In addition, the government issued government regulation PP-20/1994 in May 19th 1994 which allows foreign investor to own companies in Indonesia. This regulation supports the investment environment in Indonesia to be more conducive and attractive to foreign investors because they can own 100**%** of the company.

As can be seen on the Figure 3.3, the more free capital mobility has induced the higher investment in Indonesia until 1997. Yet, the Indonesian financial crisis in 1997 which decreased company profitability has reduced the level of foreign direct investment in Indonesia from 1998 until 2004, when the direct investment level started to increase again following the stability of Indonesian economic condition.

Figure 3.3 Real Direct Investments and Real Portfolio Investment 1984Q41 to 2009Q4 (Quarterly)
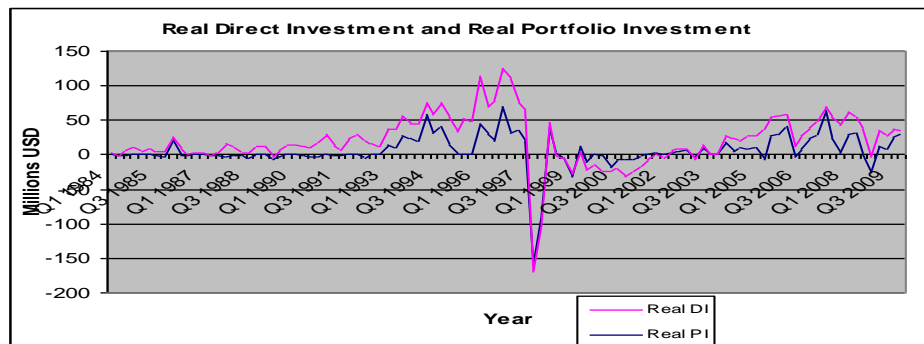
Data source: International Financial Statistics, *http://www.imfstatistics.org/imf/* last updated May 17th 2010; date accessed May 18th 2010, calculated by author.

According to Gultom (2008) there has been a financial account surplus during 1980 to 1996 in Indonesia with average of USD 4,886 million per year. The higher growth rate and huge capital inflow during this period then had increased the international reserves holding to USD 17.8 billion in 1996. However, its surplus has been no longer hold after the capital account surplus in 1996, which had reached USD 11 billions, decreased drastically to USD 2.5 billion in 1997. These conditions continued to the capital account deficit during 1997 to 2003.

From Figure 3.3 it can be seen that capital liberalisation can increase the foreign direct investment, but also can create financial vulnerability. This vulnerability happens when there is an increasing capital outflow. Even long term investment like foreign direct investment can create financial vulnerability when it is withdrawn from a country when no profitable company to invest or no guarantee of the economic condition. This vulnerability because of the capital outflow then can create economic shock.

Moreover, the portfolio investment as the short term investment shows a different pattern. As illustrated in Figure 3.3 the movement of portfolio investment in the beginning of the period is very small and then it started to increase in 1992. It then, together with foreign direct investment, decreased into less than -150% in 1997; therefore the capital outflow is blamed as a factor which caused the financial crisis. On this period, the high decreasing level of portfolio investment might be influenced by the high capital outflow since the portfolio investment can be easily withdrawn.

Related to capital liberalization, Figure 3.3 shows that in Indonesia, portfolio investment has more sharp fluctuations because its short term characteristic and high volatility.

3.2.5. Trade

Free trade regime has been applied on January 1st, 1995 when Indonesia joined the World Trade Organization (WTO), the organization for liberalizing trade between countries. It has also influenced international reserves fluctuation. This regime forced Indonesia to reform its trade policy to be more liberal in its export and import transaction. Furthermore the application of floating exchange rate system on August 14th, 1997 increases the uncertainty of foreign exchange. Then, it can also possibly decrease export transaction and in the same time the optimal level of reserves may change.

As can be seen on the Figure 3.4, there is no significant change on the behaviour of the international trade since the beginning of 1995, yet it has happened since the late of 1997. It might be occurred following financial crisis in 1997 and the depreciation of Rupiah currency as shown in Figure 3.1.

Figure 3.4 Real Export and Real Import 1984Q1-2009Q4 (Quarterly)
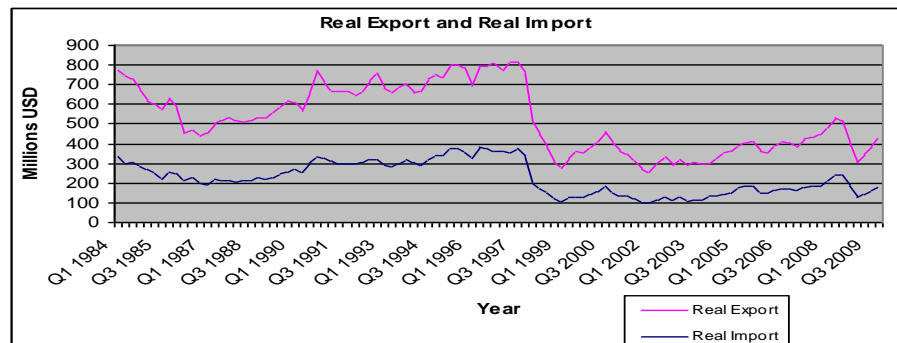
From Figure 3.4, the behaviour of real export and import has also changed significantly on 1997, together with the decreasing of GDP as illustrated in Figure 3.1. This condition shows that there is a relationship with international reserves which at the same time has changed significantly as can be seen on the Figure 1.1. However, it can be seen that the export levels still exceed the import levels even though after Indonesia join the WTO in 1995.

3.2.6. Foreign Debt

External debt has been generally used for financing the domestic economy or to accelerate growth. At the same time taking external debt also makes Indonesia more vulnerable to external shock because of its external exposure. Once an external shock happens, the domestic economy might be disturbed.

Foreign debt has been a big problem in Indonesia since the mid 1980s when the debt service ratio reached 30 percent (Prasetyantono 1996). To solve its public external debt problem, the government of Indonesia has been relying on the foreign debt rescheduling, particularly under the London Club and Paris Club frameworks.

As shown on the Figure 3.5 the real foreign debt started to decrease at the end of 1995. It continued to decrease during the financial crisis. This condition could happen because of the increasing inflation rate. However, the nominal foreign debt keeps increasing since 1998 when Indonesian financial crisis in 1997 had impacted to the decreasing of Rupiah currency to US Dollar in longer period and multiplied the position of the external debt <*http://www.bi.go.id*>.

Figure 3.5 Real Foreign Debt and Real International Reserves 1984Q1-2009Q4
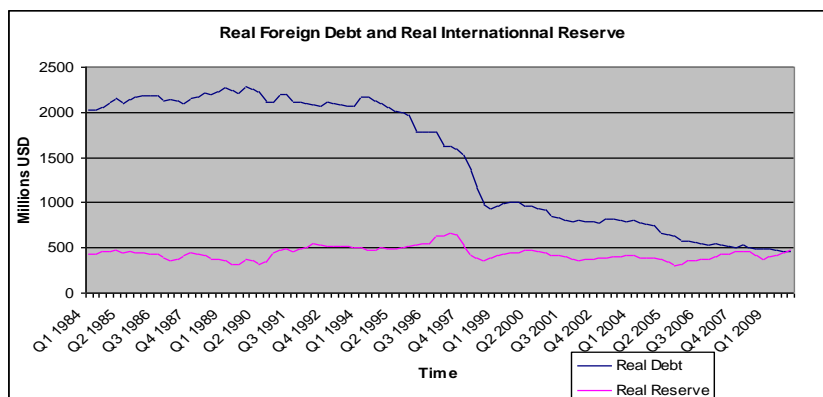
Data source: Foreign Debt data is from Debt Management Office, Ministry of Finance of Republic Indonesia (2010), GDP is from Statistical Bureau (BPS) of Indonesia(2010), calculated by author.

Although the government rescheduled the foreign debt repayment through Paris Club II in 12-13 April 2000 to be paid in 2010, as can be seen on Figure 3.5, the foreign debt decreased in 2006. At the same time, Bank Indonesia had paid government debt on 2010 to IMF on June 2006 as 3.7 billion USD and 3.2 billion USD in September 2006(Qomariah 2006).

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3.2.7. Opportunity cost

The difference between the domestic interest rate and the foreign interest rate is considered as a factor determining international reserves holding in respect with the profitability factor. The movement of opportunity cost is illustrated in Figure 3.6.

Figure 3.6 Opportunity Cost 1984Q1-2009Q4 (Quarterly)
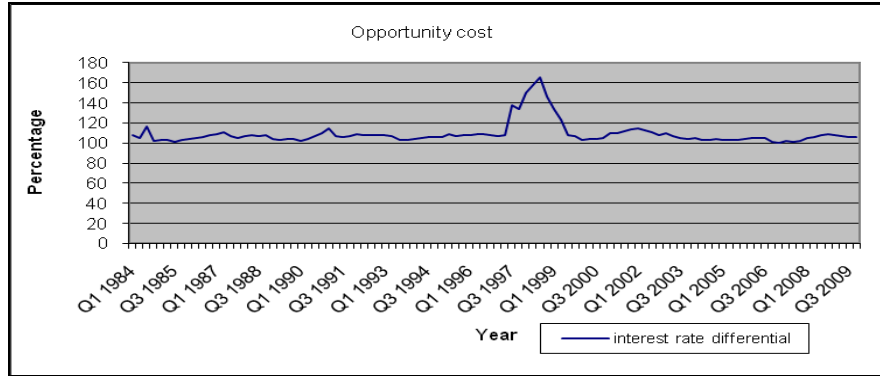
Data source: International Financial Statistics, *http://www.imfstatistics.org/imf/*

Last updated May 17th 2010; date accessed May 18th 2010 calculated by author.

Figure 3.6 shows that there is a high spread of domestic interest rate with the foreign interest rate during second quarter of 1997 until the third quarter of 1999. At the same time the financial crisis had affected to Indonesian economy, the high capital flight from Indonesia and the decreasing of exchange rate. During the financial crisis 1997-1999 interest rates in Indonesia increased sharply, even its call money rate reached 74% in third quarter 1998 which then created the large difference of the domestic interest rate with the foreign interest rate until 158%. This condition aimed to attract foreign investment, because of the increasing capital flight whether from domestic investor or foreign investor during the financial crisis. However, in the fourth quarter of 1999, the domestic interest rate started to be back to the normal rate.

Chapter Four: Data and Research Methodology

This chapter will discuss the data, the research methodology and the model specification which will be used in order to answer research question. Econometric method will be employed to answer the first question. In addition the determinant of international reserve holding resulted from the econometric analysis will be analyzed to view the motives for international reserves which is the second research question.

4.1. Econometrics Method

This econometric method will discuss the data, the research methodology and the model specification which will be used in order to test the hypothesis about the determinants of international reserves holding in Indonesia.

4.1.1. Model

This research aims to examine which factors determine the international reserves holding in Indonesia in the long term. In the second step these determinant will be related to the motive of reserves holding in Indonesia.

As the dependent variable, following Sehgal and Sharma (2008), the ratio of international reserves minus gold to GDP is employed. In order to know the relationship of external payment and international reserves, this research is also intended to examine Average Propensity to Import(API) according to Kelly (1970), Frankel (1974), Aizenman et al. (2004), Sehgal and Sharmaa (2008) and Eliza et al. (2008). To provide an indicator to test the mercantile motive, we also employ the growth of export following Sehgal and Sharmaa (2008). It will confirm the mercantile motive if coefficient is positive.

To capture the cost of holding international reserves, based on Prabheesh et al (2007) and Aizenman and Marion (2004) interest rate differential is employed to represent the opportunity cost of holding reserves. In addition to capture the effect of foreign debt on international reserves, Aizenman et al. (2004) employed short term debt to GDP, while Eliza et al. (2008) used external debt to GDP. Because of the limited quarterly data of short term debt from 1984 to 2009, this research paper employs foreign debt to GDP

Regarding Craigwell et al. (2006) who studied the effect of the capital account liberalisation on the demand for international reserves, foreign portfolio investment and foreign direct investment (FDI) are also employed in this research paper to study the effect of capital mobility to the international reserves holding.

This model employed dummy variables to capture the effect of different policies applied by Indonesia during 1984 to 2009 like the application of floating exchange rate system in 1997 and the devaluation of Rupiah in 1986. They are also employed to capture the effect of the financial crisis which attack Indonesia from 1997 to 1999 and also the global financial crisis. Dummy varia-

bles can be used to solve the structural breaks without splitting the data and as a proxy to test structural stability of the estimated parameters in the regression equation.

Based on the discussion of theory and overview of the determinant of international reserve holding in Indonesia from 1984 to 2009, the proposed model of the determinant of international reserves holding is as follow:

$$\log\_R\_y_t = \theta_0 + \beta_1\ API_t + \beta_2 Xgrowth_t + \beta_3 \log\_Debt\_y_t + \beta_4 \log\_FPI_t$$
$$+ \beta_5 \log\_FDI_t + \beta_6 \log\_ird_t + \gamma_1 D1 + \gamma_2 D2 + \gamma_3 D3 + \gamma_4 D4 + e_t \quad (1)$$

Where:

- $\log\_R\_y$ is ratio of international reserves minus gold to GDP, logged. Both international reserves minus gold and GDP are presented in millions USD.

- API is average propensity to import. Average propensity to import is formed by ratio of import to GDP. API is presented in percentage. The expected sign is positive.

- Xgrowth is export growth, obtained by subtracting the recent export by the previous export and divided by the previous export. Export growth is presented in percentage. Under mercantile motive, this Xgrowth variable has a positive expected sign.

- $\log\_Debt\_y$ is real government debt to GDP which is employed as a proxy of the short term external debt to GDP, logged. Both foreign debt and GDP are presented in millions USD. This variable's expected sign is positive.

- $\log\_FPI$ is Foreign Portfolio Investment which is represented by the foreigner's portfolio investment flow in Indonesia, logged. FPI is presented in millions USD. This expected sign is positive.

- $\log\_FDI$ is foreign direct investment, which is represented by the foreigner's direct investment flow in Indonesia, logged. FDI is presented in millions USD. This expected sign is positive.

- $\log\_ird$ is interest rate differential as a proxy of opportunity cost of holding reserves, obtained by using interest rate differential calculated by (1+Indonesian call money rate) divided by (1+US T-bills rate), logged. Both Indonesian call money rate and US T-Bills rate are presented in percentage. This expected sign is negative.

- D1 is a dummy variable which is employed to analyze the effect of the application of floating exchange rate system since August 14th 1997. D2 equals 1 for the period 1997:Q3 to 2009:Q4 and zero otherwise. The expected sign of this variable is negative.

- D2 is a dummy variable for financial crisis period in Indonesia to capture the economic shock of the financial crises period. Dummy variable D2 equals 1 for period 1997:3 to 1999:4 when Indonesia had a financial crisis following the Asian Crisis on June 1997, otherwise D2 equals zero. This expected sign is positive.

- D3 is a dummy variable for the global financial crisis since the end of August 2007 to 2009 on the demand of international reserves holding in Indonesia. D3 equals 1 for the period of the global financial crisis on period 2007:3 to 2009:4, otherwise D3 equals zero. This expected sign is positive.

- D4 is a dummy variable which is employed to capture the effect of devaluation of Rupiah vis-à-vis the US Dollar on September 12th 1986 to international reserves holding in Indonesia. D4 equals 1 for period after September 12th 1986, otherwise equal zero. The expected sign of D4 is negative, represents that the devaluation will let the exchange rate devaluate and less international reserves is required.

4.1.2. Research Methodology

Time series data will be employed to analyse the long term relationship between the internationals reserves and its determinants. It also will employ unit root test and cointegration test in order to know the long run motives of international reserves holding in Indonesia.

4.1.2.1. Unit Root Tests

The unit root is used to examine the non stationary of a time series data. Unit root test which can be employed are the Augmented Dickey Fuller (ADF test) and Philips-Perron (PP) Tests. The stationary of the data occurs when ADF or Phillips-Perron absolute value of t-statistic is higher than their critical value. Knowing the stationary of variables is important in order to decide the regression which will be taken. If all variables are stationary, then Ordinary Least Square (OLS) can be used. But, if there are no stationary variables, the OLS could produce spurious regression. In order to get stationary data, differencing the variables can be conducted to get integrated variables in order I(1). Moreover cointegration test should be used to examine its relationship in the long run.

4.1.2.2. Cointegration Test

Cointegration test is examined in order to examine long-term equilibrium relations and ensure that the causality tests do not produce spurious results. Several methods available to conduct the cointegration test like Engle Granger's method and Johansen's method (Narayan 2004). The Engle Granger's method and Johansen's method are employed to examine cointegration if all variables are integrated in the same order. However, when variables are combination between order I(0) and I(1), they cannot be employed (Narayan 2004). Autoregressive Distributed Lag (ARDL) approach developed by Pesaran and Shin(1997) and Pesaran, Shin and Smith(2001)is being employed for analyzing the long run relationship of variables since it can be applied whether the regressors are purely I(0), purely I(1) or mutually cointegrated irrespectively with same and also different order of integration. According to Pesaran (2001), ARDL bound testing is also appropriate with small or limited data.

In order to estimate the existence of cointegration relationship on the determinant of the international reserves holding based on equation (1), Autoregressive Distributed Lag (ARDL) bound test developed by Pesaran, Shin, and Smith (2001) is employed. Unrestricted error correction model (UECM) version of ARDL model based on equation (1) is constructed as follows:

$$\Delta(\log\_R\_y)_t = \theta_0 + \theta_1(\log\_R\_y)_{t-1} + \theta_2(API)_{t-1} + \theta_3(Xgrowth)_{t-1} + \theta_4(\log\_Debt\_y)_{t-1}$$

$$+\theta_5(\log\_FPI)_{t-1} + \theta_6(\log\_FDI)_{t-1} + \theta_7(\log\_ird)_{t-1}$$

$$+ \sum_{k=1}^{a} \lambda_{1,k}\Delta(\log\_R\_y)_{t-k} + \sum_{k=0}^{b} \lambda_{2,k}\Delta(Xgrowth)_{t-k} + \sum_{k=0}^{c} \lambda_{3,k}\Delta(API)_{t-k}$$

$$+ \sum_{k=0}^{d} \lambda_{4,k}\Delta(\log\_Debt\_y)_{t-k} + \sum_{k=0}^{e} \lambda_{5,k}\Delta(\log\_FPI)_{t-k}$$

$$+ \sum_{k=0}^{f} \lambda_{6,k}\Delta(\log\_FDI)_{t-k} + \sum_{k=0}^{g} \lambda_{7,k}(\log\_ird)_{t-k}$$

$$+ \gamma_1 D1 + \gamma_2 D2 + \gamma_3 D3 + \gamma_4 D4 + e_t \qquad (2)$$

ARDL bound test uses ordinary least square (OLS) to estimate equation (2) in order to know the cointegration. ARDL approach employs F-test for testing the existence of long run relationship among variables by imposing restrictions on the long run coefficient. The null hypothesis and the alternative hypothesis for equation (2) are constructed as follow:

$H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = \theta_7 = 0$(The model has no long run level relationship)

$H_1: \theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq \theta_6 \neq \theta_7 \neq 0$(Long run relationship exist in the model)

To test the null hypothesis, Pesaran, Shin and Smith (2001) provide two sets of asymptotic critical value bounds for the F-Statistic and also for the t-statistic to test the existence of a level relationship. The I(0) represents the lower bound values and the I(1) represents the upper values.

By comparing the Wald test or F-statistic to the sets of asymptotic critical value bounds for the F-Statistic, cointegration exists when F statistic is greater than the upper bound or I(1) then the null hypothesis is rejected. On the other hand when the F-statistic is lower than the lower bound or I(0), the null hypothesis cannot be rejected and therefore no long run relationship exist between variables. When F statistic falls between the lower bounds and upper bounds, the tests are inconclusive (Pesaran, Shin and Smith 2001).

Moreover, the long run elasticity of the variables are calculated from the estimated coefficient of the first lag of the independent variables except the dummy variables divided by the coefficient of first lag dependent variable log_R_y and then multiplied with negative sign (Eliza et al. 2008). The value of the dummy variables coefficient is the original coefficient (Hoque and Yusop 2010)

The stability of the model in each equation is tested by the cumulative sum of the recursive residuals, CUSUM and $CUSUM^2$. This method plots the cumulative sum of recursive reside together with the 5% critical lines. The result of CUSUM and $CUSUM^2$ shows parameter instability if CUSUM and $CUSUM^2$ go outside the area between the two critical lines.

4.1.3. Data

In this research, quarterly time series data will be used for international reserves excluding gold, GDP, export growth, average propensity to import (API), foreign debt, foreign direct investment (FDI), portfolio investment of Indonesia and opportunity cost. The average propensity to import is generated from the nominal vale of the imports series divided by GDP and presented as a percentage. Similar with API, export growth, presented in percentage, is obtained by subtracting the recent export by the previous export and divided by the previous export.

Opportunity cost of holding reserves, following Prabheesh et al. (2007) and Aizenman and Marion(2004), is calculated by interest rate differential. It is measured by (1+Indonesian call money rate) divided by (1+US T-bills rate). Foreign Portfolio Investment in Indonesia is obtained from data of the foreigner's portfolio investment flow to Indonesia divided by GDP. FDI is obtained from foreigner's direct investment flow to Indonesia

Quarterly data on all variables are available from 1984:1 to 2009:4, period of application of managed exchange rate system and floating exchange rate system after the devaluation of the Rupiah to US Dollar in March 30th 1983. The data source is as follows:

Table 4.1 Data Source

Data	Unit	Source
International Reserves minus Gold	Millions USD	IFS series code 536.1L.DZF...
Gold	Millions USD	IFS series code 536.1ANDZF...
GDP	Billions Rp *	Statistical Bureau of Indonesia(BPS)
Import	Millions USD	IFS series code 53678ABDZF...
Export	Millions USD	IFS series code 53678AADZF...
Foreign Debt	Millions USD	Debt Management Office of Indonesia
Foreign Direct Investment	Millions USD	IFS series code 53678BEDZF...
Foreign Portfolio Investment	Millions USD	IFS series code 53678BGDZF...
Indonesian Call Money Rate	Percent per annum	IFS series code 53660B..ZF...
US T Bills Rate	Percent per annum	IFS series code 11160CS.ZF...
Indonesian Consumer Price Index	Units	IFS series code 53664...ZF...
US Consumer Price Index	Units	IFS series code 11164...ZF...
Exchange Rate	Rupiah per USD	IFS series code 536..RF.ZF...

* the primary source is in Billions Rp, converted to millions USD for econometric analysis

Table 4.1 shows that quarterly data of GDP are provided by Statistical Bureau of Indonesia (Badan Pusat Statistik). Quarterly data of external debt are provided by Debt Management Office of Indonesia (Direktorat Jenderal Pengelolaan Utang) of Ministry of Finance of Republic of Indonesia. Other data like Export, Import, Consumer Price Index, domestic call money rate, Treasury Bills rate, Foreigner's Direct Investment, Foreigner's Portfolio Investment are extracted from International Financial Statistic of IMF.

The graph presented in Chapter 3 is presented in real term to capture the inflation effect of the long period regression which is used quarterly data from 1984 to 2009.To convert the nominal term, this research employ consumer price index because of the limited quarterly data of GDP Deflator, Export index and Import Index. However, the econometric model will use nominal data because it already employs data in logarithmic term.

Independent variables export growth and Average propensity to import will be presented in percentage. Moreover variables international reserves excluding Gold to GDP, FDI, portfolio investment of Indonesia and foreign debt to GDP, which are presented in millions US Dollar and also the interest rate differential will be presented in the logarithmic term. Since no quarterly data on short term debt are available, external debts which are expressed in million US Dollar are employed as a proxy of short term debt.

4.2. Descriptive Method

This descriptive method will be employed to answer the second research question which will analyze the motives for international reserves holding in Indonesia. In order to describe the motives for international reserves holding in Indonesia, this method will employ the determinants of international reserves holding which are resulted from the econometric method. Finally, this research paper will relate those determinants of international reserves holding with the motives for international reserves holding in Indonesia in the long term based on Table 2.1.

Chapter Five: Empirical Analysis

This chapter will first discuss the result of empirical analysis of factors affecting the level of international reserves in Indonesia in the long term. Then it discusses how these determinants relate to the motives for the international reserves holding in Indonesia.

5.1. Empirical Result of the Determinants of International Reserve in Indonesia

A Unit Root Test can be conducted by Augmented Dicky Fuller (ADF) test and also Phillips-Perron test in order to know the order of integration of these variables. Comparing the ADF statistic or Phillips-Perron statistic with its critical value, the stationary is indicated when the ADF statistic or Phillips-Perron statistic is higher than its critical value. For the period 1984:Q1-2009:Q4, the stationary test results are as follows:

Tabel 5.1 Stationary Test of Variables Period 1984:Q1-2009:Q4

Variables		ADF Test Statistic	PP Test Statistic	Critical Value			Stationary
				1%	5%	10%	
Log_R_y	level	-1.813	-1.854	-3.509	-2.890	-2.580	No
	trend	-1.637	-1.799	-4.039	-3.450	-3.150	No
	difference	-9.464	-9.452	-3.509	-2.890	-2.580	1%
Xgrowth	level	-9.099	-9.068	-3.509	-2.890	-2.580	1%
	trend	-9.102	-9.073	-4.039	-3.450	-3.150	1%
	difference	-13.865	-18.367	-3.509	-2.890	-2.580	1%
API	Level	-3.294	-3.429	-3.509	-2.890	-2.580	5%
	Trend	-3.340	-3.521	-4.039	-3.450	-3.150	5%, PP
	difference	-9.344	-9.338	-3.509	-2.890	-2.580	1%
log_Debt_y	Level	-0.304	-0.435	-3.509	-2.890	-2.580	No
	trend	-1.828	-1.920	-4.039	-3.450	-3.150	No
	difference	-9.027	-8.988	-3.509	-2.890	-2.580	1%
log_FDI	level	-4.137	-3.995	-3.509	-2.890	-2.580	1%
	trend	-4.114	-3.972	-4.039	-3.450	-3.150	1%
	difference	-15.149	-16.992	-3.509	-2.890	-2.580	1%
log_FPI	level	-6.391	-6.580	-3.509	-2.890	-2.580	1%
	trend	-7.021	-7.211	-4.039	-3.450	-3.150	1%
	difference	-14.470	-19.039	-3.509	-2.890	-2.580	1%
log_ird	level	-2.019	-2.685	-3.509	-2.890	-2.580	10 % PP
	trend	-2.361	-2.361	-4.039	-3.450	-3.150	No
	difference	-8.941	-8.941	-3.509	-2.890	-2.580	1%

The unit root test shows that variables are integrated of different order. Independent variables API, export growth, log of Foreign Debt per GDP and also the dependent variable Reserves to GDP are integrated of order I(1). However, variables Foreign Direct Investment and Foreign Portfolio Investment and the interest rate differential are integrated in order I(0). As a result, Engle Granger and Johansen cointegration methods cannot be employed because they can only be employed for variables with the same order of integration. In order to capture all variables with different order of integration, this research employs the Autoregressive Distributed Lag (ARDL) method. Therefore the unrestricted error correction model (UECM) version of ARDL model is being employed to establish the cointegration relationship.

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The unrestricted error correction model (UECM) based on ARDL model for equation (2) is estimated using OLS regression. Equation (2) is estimated using three models with different lags in the variable log_Debt_y and API to show the effects of the lagged foreign debt and lagged import on the level of international reserves holding. Based on the regression result as presented on Appendix 3, the model (3) is chosen as the best result based on its better normality test even though its value of Akaike Information Criterion (AIC) and Bayesian Information criterion (BIC) is bigger than the other models. The probability value of the normality test of model 3 is 62.36% substantially larger than model 1 and 2 which have probabilities of 36.53% and 36.39%. Respectively, the Jarque-Bera for normality test is conducted to confirm the normality behaviour of the estimated residual series of the equation (Hoque and Yusop, 2010). Therefore the model (3) of equation (2) is selected as the best model to explain the determinant of international reserves holding in the long term.

To test the validity of the model, beside Jarque-Bera for normality test, Breusch-Godfrey LM for serial correlation test, Ramsey Reset for model specification and ARCHLM for heteroscedasticities are employed. The results of the validity tests are presented as follows:

Table 5.2 Result of Validity test of (2) model (3)

Validity Test	Result
R squared	0.7224
Jarque-Bera	0.9446(0.6236)
AIC	-250.5455
BIC	-195.628
Ramsey RESET	F(3.77)=0.339(0.8046)
archlm	0.859(0.3541)
Breusch-Godfrey	0.063(0.8017)

As can be seen from the Table 5.2, the value 72.24% of the R-squared confirms that the model has an acceptable goodness of fit of the specification. The validity test also result 62.36% probability value of Jarque-Bera which confirm that the validity test cannot reject the normality of residual. Ramsey Reset of 80.46% also confirms that in 80.46% respectively we cannot reject that the model has no omitted variables. ARCHLM, the LM test for autoregressive conditional heteroscedasticity (ARCH) also still cannot reject that the model has no autoregressive conditional heteroscedasticity even though the probability value is only 35.41%.The probability value 80.17% of Breusch-Godfrey for autocorelation test also confirm that the model has no serial correlation. In addition, the higher value of Akaike information criterion (AIC) and Bayesian Information Criterion (BIC) shows the other models has better criterion for models selection. However, the less probability values of the other model's normality test imply that the model (3) is the best model.

In order to know the cointegration of equation (2) model (3), the F statistic of its long run variables are tested and compared with the Asymptotic Critical Value Bonds for the F statistic developed by Pesaran, Shin, Smith (2001). The long run variables excluding dummy variable result that the value of F statistics is F(7, 80) = 3.61(0.0020). Compared with its critical value bounds for the F statistic developed by Pesaran, Shin, Smith (2001) in Appendix 2, this

calculated F statistic value is above 3.5, the critical value of the upper level or I(1) in 0,05 significance, therefore null hypothesis is rejected. As a result it can be said that this model is cointegrated and has a long run relationship with significance of 95% respectively.

The selected result of unrestricted error correction model (UECM) version of ARDL form equation (2) which covers short run relationship and long run relationship is presented in table 5.3.

Table 5.3 Estimated Result of Unrestricted Error Correction Model (UECM) Version Of ARDL Based On Equation (2) Model (3)

Dependent Variable: Log International Reserves to GDP ($\Delta log\_R\_y_t$)

VARIABLES	Coefficient	Standard Error
$\Delta log\_R\_y_{t-1}$	0.303***	(0.103)
ΔAPI_{t-1}	-0.0101**	(0.00463)
$\Delta Xgrowth_t$	0.00276***	(0.000852)
$\Delta log\_Debt\_y_t$	0.829***	(0.0836)
$\Delta log\_Debt\_y_{t-1}$	-0.213	(0.139)
$\Delta log\_Debt\_y_{t-2}$	-0.113	(0.0742)
Δlog_ird_t	-0.0213	(0.0302)
Δlog_FDI_t	0.00311	(0.00535)
Δlog_FPI_t	0.00992**	(0.00396)
$log\_R\_y_{t-1}$	-0.229***	(0.0590)
API_{t-1}	0.0126***	(0.00304)
$Xgrowth_{t-1}$	0.00344**	(0.00136)
$log\_Debt\_y_{t-1}$	0.0250	(0.0515)
log_ird_{t-1}	0.0234	(0.0184)
log_FDI_{t-1}	-0.0145**	(0.00639)
log_FPI_{t-1}	0.0114**	(0.00535)
D1	0.111**	(0.0454)
D2	-0.0480	(0.0353)
D3	0.00830	(0.0399)
D4	-0.0268	(0.0325)
Constant	-0.514***	(0.120)
Observations	101	
R-squared	0.722	
F test	F(20, 80) = 10.41	

Note: Significant level *** p<0.01, ** p<0.05, * p<0.1

In addition, to test the stability of the model, the Cumulative Sum of Recursive Residual of the equation (2) model (3) are tested using CUSUM which is employed to test Cumulative Sum of Recursive Residual and CUSUM of Square for testing the square of Cumulative Sum of Recursive Residual (CUSUMSQ). The results of the CUSUM and CUSUM[2] from equation (2) model (3) are presented in Figure 5.1.

Figure 5.1 Cumulative Sum of Recursive Residual for Equation (2) Model (3)

CUSUM and CUSUMSQUARE Period 1984Q1-2009Q4
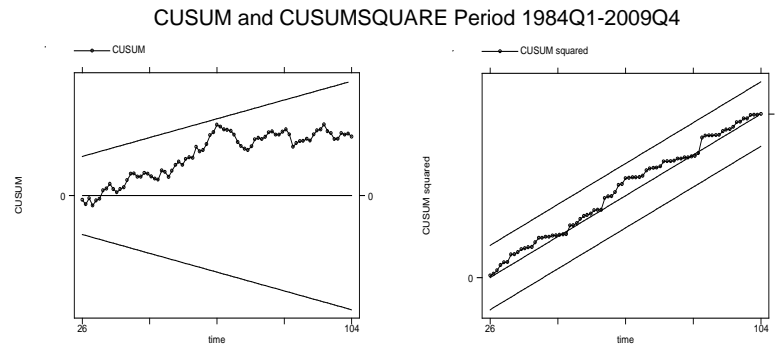
Graph 5.1 shows that CUSUM and the CUSUM² plots that both of Cumulative Sum of Recursive Residual and the square of Cumulative Sum of Recursive Residual stay within the critical bounds. As a result both plots indicate a parameter stability of the determinant of international reserves holding function.

From the estimated coefficient presented in Table 5.3, the long run elasticities of variables are calculated from the estimated coefficient of the first lag of independent variables except dummy variables divided by the coefficient of first lag dependent variable log_R_y and then multiplied with a negative sign (Eliza et al. (2008) and Tang (2003)). The value of the dummy variables coefficient is derived from the original coefficient. As a result, the calculated long run elasticity of the equation (2) model (3) is presented as follows:

Table 5.4 Long Run Elasticities Based On Equation (2) Model (3)

Dependent Variable: Log International Reserves to GDP (log_R_y)

Variables	Long Run Elasticities
Constant	-0.514***
log_API	0.0550***
log_Xgrowth	0.0150**
log_Debt_y	0.1092
log_ird	0.1022
log_FDI	-0.0633**
log_FPI	0.0498**
D1	0.291219**
D2	-0.10464
D3	0.019295
D4	0.019295

Note: Significant level *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Based on the result of the long run elasticity based on equation (2) model (3) which is presented in table 5.4, export growth has influenced the demand for international reserves positively in the long term. The coefficient of the export growth variable has a positive sign and significant. It implies that a 1% increase of export growth will increase the level of international reserves by 0.0150%. This result is comparable with the result of Sehgal and Sharma (2008)

who study for India. The positive sign shows that the demand for international reserves in Indonesia rises when there is an increasing export growth.

Unlike Eliza et al. (2008), this research paper shows that the average propensity to import (API) influences the decision of international reserves holding in the long term. This significant sign implies that a 1% increase of the average propensity to import, which can also be employed as a proxy of trade openness, will increase the level of international reserves holding by 0.0550% in the long term. This result implies that import sector is still has a significant role in the international reserves holding decision in the free capital mobility era.

However, this research does not show that foreign debt to GDP (log_Debt_y) and interest rate differential (log_ird) influence the central bank on deciding its international reserves level in the long term. The insignificant sign of the interest rate differential implies that the central bank does not really consider the opportunity cost while deciding the international reserves level in the long term.

The insignificant coefficient of the Foreign Debt to GDP supports the finding of Eliza et al. (2008). This finding implies that the international reserve holding is not mainly to anticipate the foreign debt in the long term. As Eliza et al. (2008) argue, foreign debt has no effect on the demand for international reserves in Indonesia since Indonesia has reduced its foreign debt from 151 billion USD which is 97%of GDP in 1998 to 1999 and 136 billion USD(74% of GDP) in 2001 to 2004.

Williams (2006) mentions that the level of reserves to short term debt is considered as an important measurement of the reserves adequacy. However the ratio of debt service to gross domestic product is mostly used. Based on the insignificant sign of foreign debt ratio to GDP in this result, it can be said that it would be better to use the short term debt directly as a determinant factor of international reserves holding.

Williams (2006) also states that the government debt service obligation conventionally has been the major consideration for international reserves holding. However, increasing globalization has pressured the central bank to provide foreign exchange to service the private sector foreign debt also. Therefore, it can be said that the government foreign debt which is employed in this model is not enough to explain foreign debt as a major consideration on the international reserves holding by the central bank.

Considering free capital mobility, as mentioned by Williams (2006), international reserves adequacy should consider capital account vulnerability. From the regression result, the log_FPI shows that Foreign Portfolio Investment flows have played important role on the decision of international reserves holding by the central bank in the long term. When there is an increase of foreign portfolio investment by 1%, the international reserves holding by the central bank will also increase by 0.05%. The high capital outflow in 1997 had been suspected as a factor inducing the Indonesian financial crisis. Therefore the high volatility of foreign portfolio investment influences the decision of the central bank on international reserves holding. The central bank aims to antici-

pate the sudden capital outflow in order to protect the domestic economy from the possibility of future economic shock and financial crisis.

Related to foreign direct investment (FDI), this research finds that foreign direct investment negatively affected international reserves holding in the long term. The variable log_FDI implies that the increasing of FDI by 1% will be followed by the decreasing of international reserves holding by the central bank as 0.0633%. This result has a different sign that is expected by the theories under the precautionary motive, namely that the international reserves will increase as a self insurance from the external payment. This could happen because FDI is more stabile and more difficult to be withdrawn by the foreign investor. Therefore the central bank does not consider to the highly abrupt FDI outflow. In addition, increasing FDI also increases the supply of the foreign currency in the market which can also be used to off set the need of foreign currency for external payment such as import and foreign debt by the private sector. This condition then could influence the central bank to decrease the international reserves holding because of the adequacy of foreign currency in the market.

Similarly the average propensity to import and export growth, the change of the exchange rate system has a significant influence on the international reserves holding. The dummy variable, D1, shows that the application of the floating exchange rate since August 14th 1997 has influenced the reserves holding by the central bank in the long term significantly. The positive sign of the variable D1 implies that after the change of the exchange rate system into the floating exchange rate system on August 14th 1997, the Central Bank holds more international reserves as 29.12% compared to the period of the managed exchange rate system. This condition is different from the theory which claims that in the floating exchange rate case, the required international reserves are less. It could be because Bank Indonesia continues to use international reserves to intervene the foreign exchange market to reduce the high volatility of exchange rate and also support the export growth.

This result supports Aizeman et al. (2004) who argued that a floating exchange rate system regime induces the monetary authority's demand for international reserves in order to stabilize the exchange rate which has become more volatile and to face the foreign exchange transaction which grow faster. Based on this theory, it can also be said that the higher volatility of exchange rate which happens after the application of floating exchange rate in Indonesia in 14th August 1997, increases the international reserves holding.

Considering the financial crisis of Indonesia during 1997Q3-1999Q4, the dummy variable D2 emerges with insignificant coefficient which shows that Asian financial crisis has no direct effect on the decision of the international reserves holding. Similarly Asian Financial crisis, the Dummy variables D3 shows that the global crisis which has started from United States has no effect on the level of international reserves either. The result implies that during the global crisis since the third quarter 2007 to the end of 2009 Bank Indonesia has no tendency to change its level of international reserves. This condition is different with the theory which mentions that during financial crisis, international reserves will be hold more.

However, the Asian financial crisis forced Indonesia to change its exchange rate system into floating exchange rate system on August 14th 1997. The dummy variable D1, the application of floating exchange rate which has the value 1 since third quarter of 1997, then could capture not only the effect of the application of floating exchange rate system, but also the period of the Asian financial crisis, the period after the Asian financial crisis, and the global financial crisis period. Therefore it could be said that since the financial crisis in third quarter of 1997, Indonesia also hold more international reserve to increase its self sufficiency from the future shock.

The insignificant sign of D4, which has value 1 for the time period after the devaluation of Rupiah in 12 September 1986 shows that there is no different behavior in the level for international reserves between before and after the devaluation of Rupiah vis-à-vis the US Dollar.

5.2. The Analysis of the Motives of International Reserves Holding in Indonesia

The determinant of international reserves holding can be viewed as a precautionary motive mercantile motive. Based on the motive of international reserves holding, the statistical results can be viewed on the following table:

Table 5.5 Motives for International Reserve Holding In Indonesia

Determinants	Precautionary Motives	Mercantile Motives	Econometrics Result	Motives of International Reserve Holding
Floating Exchange Rate	(+)		(+)	Precautionary Motive
Export Growth		(+)	(+)	Mercantile Motive
Average Propensity to Import	(+)		(+)	Precautionary Motive
Foreign Debt	(+)		(0)	(0)
Foreign Direct Investment	(+)	(+)	(-)	(0)
Foreign Portfolio Investment	(+)	(+)	(+)	Precautionary Motive and Mercantile motives
Financial Crisis				
-During Asian Financial Crisis	(+)		(0)	(0)
- During Global Financial Crisis	(+)		(0)	(0)
-Since Asian Financial Crisis 1997	(+)		(+)	Precautionary Motive

In mercantile motive, the export growth variable which usually is employed as a proxy of the mercantile motive will have a positive sign. This condition shows that when there is an increase of exports growth, the level of international reserves by the central bank will increase to maintain the exchange rate on the certain value. From the Table 5.5, the coefficient of export variable shows the positive influence on the level of international reserves. It indicates that Indonesia applies the mercantile motive in the international reserves holding in the long term. Therefore, even though Indonesia has a floating exchange rate system since August 14th 1997 Bank Indonesia still intervenes the foreign exchange market. It aims to prevent the appreciation of domestic currency which can reduce the competitiveness of export price. Therefore, while the

export growth increases, the central bank accumulates the international reserves to maintain the exchange rate at the favored level in order to support export activities.

This conclusion is also supported by the positive significant sign of dummy variable, D1 the floating exchange rate system. It confirms that Indonesia has not fully let financial market determine the exchange rate after the application of the floating exchange rate system. Therefore it cannot confirm that the less international reserves are held to maintain the exchange rate level during the application of floating exchange rate system. Under the precautionary motive view, it could happen as a buffer to protect country's currency from speculation that might attack the country. It could also happen because the central bank wants to reduce the volatility of Rupiah vis-à-vis foreign currency which can cause the external payment uncertainty.

The precautionary motives imply that a country accumulates international reserves in order to finance the payment imbalance. This happen when there is a balance of payment (BOP) deficit because of trade deficit or as a buffer when capital outflow is higher than capital inflow (Kim et al. 2005). Even though foreign debt has no effect on the level of international reserves in Indonesia, the significantly positive influence of average propensity to import (API) indicates that Indonesia holds a precautionary motive. As a result, when the average propensity to imports increase, Bank Indonesia tends to the increase international reserves more. It aims to prevent the lack of foreign currency which will be used for external payment.

Considering the capital mobility, Kim et al. (2005) also mention that the precautionary motive also exists as a buffer when the capital inflow is less than capital outflow. This research paper confirms that Indonesia hold precautionary motive in term of capital account mobility. To prevent the sudden capital outflow by foreign investors, when there is an increasing foreign portfolio investment, Bank Indonesia will increase international reserves more as a buffer against the suddenly capital outflow.

As mentioned by Prasad and Rajan (2008), the high capital inflow had increased foreign exchange reserves indirectly because the central bank attempts to hold off high exchange rate appreciation by intervening in the foreign exchange market. The positive correlation between international reserves and foreign portfolio investment implies that Indonesia also holds mercantile motives in term of portfolio investment.

However, both motives are not emerged when the increasing foreign direct investments happen. Under precautionary motives, it could happen because foreign direct investment has a longer term period and cannot be withdrawn easily. The increasing of foreign direct investment inflow will supply foreign currency which is demanded on the domestic market for external payment. Therefore it implies when the need of foreign currency for external payment could be supplied by foreign direct investment inflow, the international reserves could be less required as a buffer for external payment imbalances as under precautionary motives.

The precautionary motives in term of foreign portfolio investment suggest that when there is a highly sudden foreign portfolio investment outflow which was blamed as a factor which induce Indonesian financial crisis in 1997, Bank Indonesia will be more anticipate the need of foreign currency in the market by its sufficient international reserves holding, so that it can prevent the future shock and the next financial crisis.

Regarding the financial crisis, the findings do not show that during the financial crisis, Indonesia hold more international reserves. This could happen because during the financial crisis, international reserves holding are drained to stabilize the exchange rate. Moreover, the Asian financial crisis happened at the same time with the application of floating exchange rate regime. Therefore this result shows that since the Asian Financial Crisis, Indonesia hold more international reserve as a precautionary motive to prevent the future financial crisis.

The mercantile motive in term of export growth and foreign portfolio investment which is hold by the central bank implies that Bank Indonesia has supported the export growth in the long term. The precautionary motive in term of average propensity to import, foreign portfolio investment and financial crisis confirm the consistency of the central bank to guarantee the economic stability and security from the financial crisis and support growth in the long term.

As a result, regarding to the determinant of the international reserves in the long term and the motives of the international reserve holding, it can be said that Indonesia is not hold one motives exclusively. But, both motives of international reserves holding appear to be a guidance of Bank Indonesia's behaviour.

Chapter Six: Conclusion

According to the empirical analysis, regarding to the different policies and financial crisis in Indonesia, international reserves holding in Indonesia from 1984:Q1 to 2009:Q4 is determined by the level of trade sector, capital mobility, and flexibility of the exchange rate system. From the trade sector results, both export growth and average propensity to import can be said to determine the international reserves holding in the long term.

Capital mobility also has a significant influence on the international reserves holding by Bank Indonesia in the long term. The increasing foreign portfolio investment inflow will induce Bank Indonesia to increase its international reserves holding in order to anticipate sudden capital outflows. However, more foreign direct investment will decrease the international reserves holding. This may happen because the central bank more strongly anticipates the foreign portfolio investment outflow because foreign portfolio investments are highly volatile.

Regarding the monetary policies related to the international reserves, the model confirms that the change of the floating exchange rate system influences the international reserves holding in the long term but in an unexpected direction. Unlike theories which assume that under the floating exchange rate system the central bank will hold less international reserves holding, this research paper suggests that during the application of the floating exchange rate system the central bank hold international reserves more.

Considering the Asian financial crisis which attacked Indonesia from the third quarter of 1997 to end of 1999 and the global crisis which happened since the third quarter of 2007, the model finds that in the long term during financial crisis international reserves holding will not be influenced significantly. However, the floating exchange rate system was applied following the financial crisis which happens on the same quarter shows that since the financial crisis 1997, Bank Indonesia hold international reserves more.

The devaluation of Rupiah exchange rate vis-à-vis the US Dollar in September 1986 has no effect on the international reserves holding in Indonesia. In addition foreign debt has not significantly influenced the international reserves holding by the central bank in the long term either. Opportunity cost is not considered as an important factor on the decision of the international reserves holding in the long term.

The significantly positive influence of the average propensity to import and foreign portfolio investment to the international reserves holding can be seen as an indicator that Indonesia holds the precautionary motive in term of trade and capital account. It means that to anticipate the lack of foreign currency for external payment because of the increasing import level, the central bank will tend to increase the international reserves holding. Bank Indonesia will also tend to increase international reserves holding as a precaution against the sudden stop or high capital outflow when there is an increasing foreign portfolio investment inflow. The precautionary motive hold of the central bank

may be due to the role of the central bank to maintain the stability and the security of the economic conditions in Indonesia.

In addition, the increasing level of international reserve since the application of the floating exchange rate system shows unexpected direction with the general theories. However, it shows that Indonesia hold precautionary motive in term of reducing the exchange rate volatility. It also shows that Indonesia hold precautionary motives in term of anticipation for the future financial crisis since the application of the floating exchange rate system happened following and in the same time with the Asian financial crisis 1997.

At the same time, the mercantile motive is also held by Indonesia since the export growth influences the international reserves holding positively in the long term. The increasing international reserves when the foreign portfolio investment inflows increase also show that mercantile motive has been relevant in term of capital inflow in the long term. This mercantile motive is held in order to support the export growth by maintaining the exchange rate in favour level to increase export competitiveness in the long term. Therefore, in the long term Indonesia holds the precautionary motive and the mercantile motive at the same time.

Finally, it can be concluded that in the long term, the level of international reserves in Indonesia are determined by average propensity to import, export growth and foreign portfolio investment positively. However, it is negatively influenced by foreign direct investment. In addition the policy application of the floating exchange rate system induces the increase of the international reserve holding in Indonesia. It can also be said that Indonesia hold international reserves since the Asian financial crisis 1997. Based on those factors, it can be said that Indonesia not only hold one motives of international reserves holding exclusively, but both motives of international reserves holding are held by Bank Indonesia to guarantee and support the economic conditions.

Appendices

Appendix 1. Definitions of the Regression Variables

Variables	Explanation
Log_R_y	Log of international reserves minus gold per GDP. International reserves minus gold and GDP are presented in millions USD.
API	Average propensity to import(API) presented in percentage, calculated from import divided by GDP
Xgrowth	Export growth presented in percentage, measured by (recent export minus previous export) divided by previous export.
log_Debt_y	Log of foreign debt flow per GDP. Foreign debt and GDP are presented in millions USD.
log_FDI	Log of foreign direct Investment. FDI is presented in millions USD.
log_FPI	Log of foreign portfolio Investment. Foreign Portfolio Investment is presented in millions USD.
log_ird	Log of interest rate differential.
ird	Interest rate differential, obtained by (1+Indonesian call money rate) divided by (1+US T-bills rate)
D1	Dummy Variable for the application of floating exchange rate in August 14th 1997
D2	Dummy Variable for the Asian Financial Crisis during 1997:Q3 to 1999:Q4
D3	Dummy variable for global crisis 2007:Q3-2009:Q4
D4	Dummy variable a period after the devaluation of Rupiah in 12 September 1986

Appendix 2. Asymptotic Critical Value Bounds for the F statistic.

Table Ci(iii) Case III: Unrestricted Intercept and No Trend by Pesaran, Shin, Smith (2001)

k	0,100		0,050		0,025		0,010	
	I(0) Lower Bound	I(1) Upper bound	I(0) Lower Bound	I(1) Upper bound	I(0) Lower Bound	I(1) Upper bound	I(0) Lower Bound	I(1) Upper bound
5	2.26	3.35	2.62	3.79	2.96	4.18	3.41	4.68
6	2.12	3.23	2.45	3.61	2.75	3.99	3.15	4.43
7	2.03	3.13	2.32	3.5	2.60	3.84	2.96	4.26
8	1.95	3.06	2.22	3.39	2.48	3.70	2.79	4.10
9	1.88	2.99	2.14	3.30	2.37	3.6	2.65	3.97

Note: k= number of long run variables

Appendix 3. Result of UECM Based On Equation (2)

VARIABLES	(1) d.log_R_y	(2) d.log_R_y	(3) d.log_R_y
LD.log_R_y	0.283**	0.310***	0.303***
	(0.110)	(0.108)	(0.103)
D.API	0.00327	0.00327	
	(0.00455)	(0.00448)	
LD.API	-0.00963**	-0.0106**	-0.0101**
	(0.00475)	(0.00470)	(0.00463)
D.Xgrowth	0.00193*	0.00239**	0.00276***
	(0.00108)	(0.00102)	(0.000852)
D.log_Debt_y	0.741***	0.790***	0.829***
	(0.123)	(0.116)	(0.0836)
LD.log_Debt_y	-0.162	-0.221	-0.213
	(0.151)	(0.143)	(0.139)
L2D.log_Debt_y	-0.0777	-0.120	-0.113
	(0.0832)	(0.0769)	(0.0742)
L3D.log_Debt_y	0.0155	0.00314	
	(0.0746)	(0.0738)	
L4D.log_Debt_y	0.112		
	(0.0850)		
D.log_ird	-0.0354	-0.0354	-0.0213
	(0.0332)	(0.0331)	(0.0302)
D.log_FDI	0.000355	0.00301	0.00311
	(0.00580)	(0.00541)	(0.00535)
D.log_FPI	0.0100**	0.00990**	0.00992**
	(0.00404)	(0.00403)	(0.00396)
L.log_R_y	-0.224***	-0.242***	-0.229***
	(0.0632)	(0.0619)	(0.0590)
L.API	0.0125***	0.0138***	0.0126***
	(0.00351)	(0.00337)	(0.00304)
L.Xgrowth	0.00294*	0.00306**	0.00344**
	(0.00149)	(0.00149)	(0.00136)
L.log_Debt_y	-0.0121	0.0202	0.0250
	(0.0596)	(0.0541)	(0.0515)
L.log_ird	0.0214	0.0285	0.0234
	(0.0210)	(0.0202)	(0.0184)
L.log_FDI	-0.0174**	-0.0157**	-0.0145**
	(0.00666)	(0.00653)	(0.00639)
L.log_FPI	0.0104*	0.0112**	0.0114**
	(0.00547)	(0.00544)	(0.00535)
d1	0.0977**	0.113**	0.111**
	(0.0481)	(0.0467)	(0.0454)
d2	-0.0490	-0.0551	-0.0480
	(0.0364)	(0.0361)	(0.0353)
d3	-0.00603	0.00838	0.00830
	(0.0422)	(0.0408)	(0.0399)
d4	-0.0171	-0.0406	-0.0268
	(0.0397)	(0.0355)	(0.0325)
Constant	-0.493***	-0.540***	-0.514***
	(0.134)	(0.128)	(0.120)
Observations	99	100	101
R-squared	0.731	0.724	0.722
F test	F(23,75) = 8.87(0.000)	F(22, 77) = 9.19(0.000)	F(20, 80) =10.41(0.000)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix 4. Validity Test Result of Equation (2)

| Validity Test	(1)	(2)	(3)
Jarque-Bera for normality test	2.014(0.3653)	2.022(0.3639)	.9446(0.6236)
AIC	-241.3112	-244.6269	-250.5455
BIC	-179.0283	-184.708	-195.628
Ramsey RESET	F(3,72)= 0.59(0.6226)	F(3,74)= 0.21(0.8862)	F(3,77)=0.339(0.8046)
archlm	0.578(0.4469)	0.859(0.3541)	0.859(0.3541)
Breusch-Godfrey	0.118(0.7309)	0.049(0.8254)	0.063(0.8017)
F test for long term variables	F(7,75) = 3.42(0.0032)	F(7,77) = 3.69(0.0017)	F(7, 80) = 3.61(0.0020)

Note: Parentheses in validity test represent probability value

Appendix 5. Graphics of Cumulative Sum of Recursive Residual (Cusum) and the square of Cumulative Sum of Recursive Residual (Cusum squared) of equation (2)
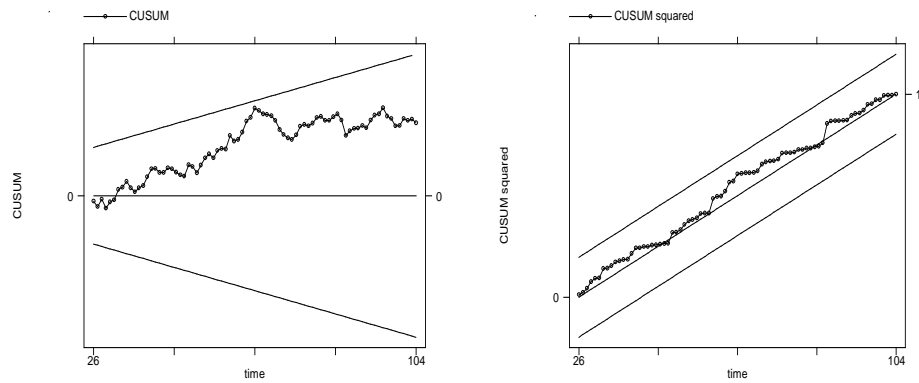
(1) Cusum and Cusum Squared of equation 2(1)
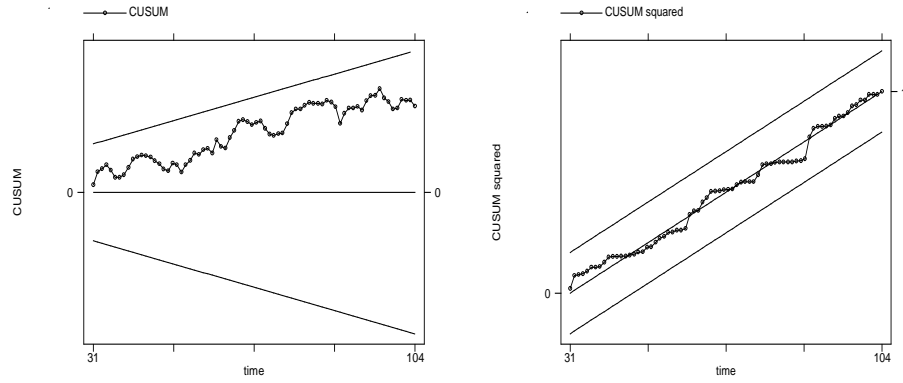
(2) Cusum and Cusum of Square of equation 2(2)
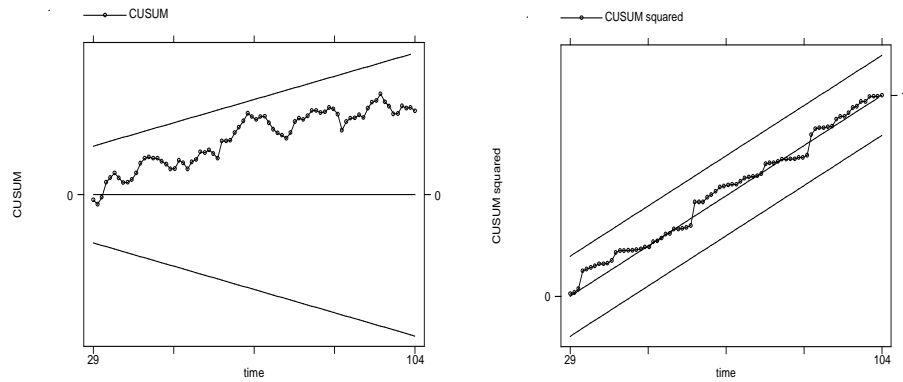
(3) Cusum and Cusum of Square of equation 2(3)

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