Precautionary and Mercantilist Approaches to Accumulation of Foreign Exchange Reserves in Pakistan

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MS
332.1
ASP

Foreign Exchange reserves

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APPROVAL SHEET

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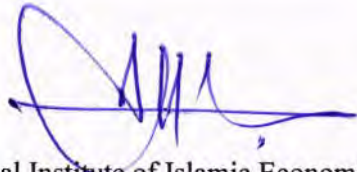
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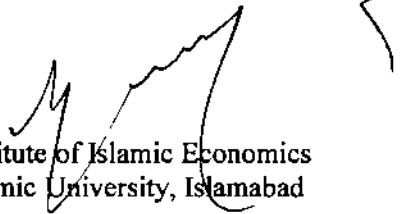COMSATS University, Islamabad

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Date of Viva Voce: October 18, 2017

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ABSTRACT

This study explores the validity of precautionary and mercantilist approaches to accumulation of foreign exchange reserves (FER) in Pakistan. FER are the financial resources held by central banks for the exchange rate and monetary policies adjustment in an economy. According to 5th edition of the IMF's Balance of Payment (BOP) Manuals "FER are assets that consists of those foreign assets or foreign money that are easily accessible to monetary authorities and also controlled by these authorities for directly financing imbalances in BOP, for indirectly controlling the size and extent of such BOP imbalances by intervening in exchanges markets to effect exchange rates, and for several other purposes".

Recently, there has been a growing trend in reserves accumulation among developing and developed countries. The IMF assess that the world wide FER holding has increased from US$1.58 trillion to US$11.60 during the period from 1996 to 2015, with the shares of under developed economies has increased from US$0.45 trillion to US$7.97 trillion (30-72%). This has occurred despite of the vast majority of the economies moving from a fixed to a flexible exchange rates regime, which requires nations to keep up lower levels of FER to prevent currency crisis.

A large stock of FER shows the financial strength of a country. In under developed economy like Pakistan, an extensive amount of international reserves can be helpful not just for the handling of exchange rate strategies, but also for the general macroeconomic policies such as exports promotion, repayment of foreign debts, funding development projects, safeguarding capital flights, maintaining employment opportunities and financial sector improvement.

While a limited number of studies have empirically investigated the behavior of demand for international reserves in Pakistan but no work has been done on testing the relative importance of mercantilist and precautionary motives in driving the accumulation of foreign exchange reserves.

In this study we used quarterly data from 1990-1 to 2015-4. In this study we have to choose between two rival models, where neither can be nested within the other i.e neither is a restricted version of other. We have two rival models called precautionary model and mercantilist model and one hybrid model as combination of both precautionary and mercantilist models. We employ J-test proposed by Davidson and MacKinnon (1981). This test is used for testing hybrid model.

The results show that mercantilist model is unsuccessfully challenges the precautionary model. The econometric estimate show that Pakistan accumulates FER with a view of precautionary motive like other developing countries. The variables associated with precautionary motives are statistically and economically important in explaining FER accumulation. In contrast, variables associated with mercantilist motives are statistically significant, but economically insignificant in accounting for the patterns of FER accumulation. These results supports other studies like Aizenman and Lee (2007), Prabeesh and Madhumathi (2009), where they find out that countries accumulate FER mainly for precautionary motive, and the variables associated with this motive are mostly significant.

Dedicated

to

My Sweet Parents who are the

precious pearls in the

deep Oceans of my Heart.

ACKNOWLEDGMENTS

ABBREVIATIONS

APM	Average Propensity To Import
ASEAN	Association Of South East Asian Nations
ADF	Augmented Dickey Fuller
ARDL	Autoregressive Distributed Lags
BOP	Balance Of Payment
BOT	Balance Of Trade
ECM	Error Correction Mechanism
ECT	Error Correction Term
ER	Exchange Rate
FDI	Foreign Direct Investment
FER/RES	Foreign Exchange Reserves
FII	Foreign Institutional Investment
GDP	Gross Domestic Product
IFS	International Financial Statistics
IM	Imports
IMF	International Monetary Fund
IBCR	Inter Bank Call Rate
MPI	Marginal Propensity To Import
NEER	Nominal Effective Exchange Rate
OLS	Ordinary Least Square
PCI	Per Capita Income
PPP	Purchasing Power Parity
REER	Real Effective Exchange Rate
SBP	State Bank Of Pakistan
TOT	Term Of Trade
UPI	Unit Price Index
VAR	Vector Autoregression
VECM	Vector Error Correction Model

Chapter 1

Introduction

1.1 Background and Motivation

This study explores the validity of precautionary and mercantilist approaches to accumulation of foreign exchange reserves (FER) in Pakistan. FER are the financial resources held by central banks for the exchange rate and monetary policies adjustment in an economy. According to 5th edition of the IMF's Balance of Payment (BOP) Manuals "FER are assets that consists of those foreign assets or foreign money that are easily accessible to monetary authorities and also controlled by these authorities for directly financing imbalances in BOP, for indirectly controlling the size and extent of such BOP imbalances by intervening in exchanges markets to effect exchange rates, and for several purposes".

There is a disagreement among stakeholders about FER holdings; some believed that FER are unutilized and useless as Friedmen (1953) criticized fixed exchange rate with a view that it involves unutilized FER. The proponents of FER holdings argued that FER should be accumulated to smooth the BOP imbalances (Kemail 2002). Recently, there has been a growing pattern in reserves accumulation amongst under developed countries and developed countries. The IMF assesses that the world wide FER holding has increased from US$1.58 trillion to US$11.60during the period from 1996 to 2014, with the shares of under developed economies has increased from US$0.45 trillion to US$7.97 trillion (30-72%). This has occurred despite of the vast majority of the economies moving from a fixed to a flexible exchange rates regime, which requires nations to keep up lower levels of FER to prevent

currency crisis. This unprecedented rise in FER is a reason for worry among central banks for reserves management policies.

FER are accumulated by countries with a perspective to make a buffer against unexpected withdrawal of foreign exchange (precautionary motive) or to control exchange rates to support the export sector (mercantilist motive). According to the precautionary approach, the financial integration of under developed countries has expanded their exposure to volatile capital streams or hot money, which are liable to sudden stop and inversion. (Edwards 2004 and Calvo 1998).The depletion of growth rates caused by the crisis persuade the policy makers to adopt tight external and internal adjustment policies for stabilizing output. In these circumstances, holdings FER can be considered as output stabilizer. According to the mercantilist approach, the FER accumulation is the aftermath of the undervalued exchange rate strategies adopted by some Asian countries to boost their exports, and target domestic investment and FDI to export industries.

The East-Asian catastrophe of 1997-98 resulted in diminishing the approachability of these countries to the global capital market and disclosed their unseen vulnerabilities. This enforced the market to upgrade the chances of sudden stop influencing all countries (Aizenman and Lee 2005). This East-Asian catastrophe of 1997-1998 resulted in large demand for FER in the East Asian developing economies. These economies have increased their FER stock twice their old stocks. By the end of 2006 the total FER holdings of Japan, China, South Korea, Taiwan, Hong Kong and Singapore was about $30 millions. The depletion in growth rates caused by the crisis persuade the policy-makers to obey tight external and internal adjustment policies to balance the output. Under such situations,

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holding FER can be considered as a precautionary saving to resist volatile capital flow, its sudden stop and its turn around or as output stabilizer.

An alternative reason for the recent FER build-up is the mercantilist view. Dooley, *et al* (2003) argued that reserve build-up is the out-growth of the undervalued exchange rate strategies followed by Asian economies to boost their exports, and channel domestic investment and foreign direct investment (FDI) to the export industries. These mercantilist approaches resulted in continuing current account excess and FER build-up with the central banks of these economies. A good example is provided by China, which has been adopting an undervalued exchange rate. Hence, FER provide two principle benefits: self-protection against financial instability and mercantilist exports boosting. Empirical literature on the importance of both precautionary approach and mercantilist approach is very finite. Aizenman and Lee (2005) examined the importance of both mercantilist and precautionary motives in under developed countries and found out statistically significant results for mercantilist motive though; its impact on of FER accumulation was quite small. The variables associated with precautionary approach show significant results in FER accumulation.

FER in large stock shows the financial strength of a country. In under developed economy like Pakistan, an extensive amount of international reserves can be helpful not just for the handling of exchange rate strategies, but also for the general macroeconomic policies such as exports promotion, repayment of foreign debts, funding development projects, safeguarding capital flights, maintaining employment opportunities and financial sector improvement. The arrival of the new millennium witnessed a historic accumulation of FER in Pakistan, from an average of US $1.5bn in 1990's to US $10bn in 2003 and $20bn in

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September 2015. After at the end of 2015 FER further increase to $20.6bn and now the current FER is $22bn in April 2017. Current debates on the manageability of these recently acquired reserves brought up the more relevant issue of identifying the elements that influence the central bank's decision of holding these reserves.

While a limited number of studies have empirically investigated the behavior of Pakistan accumulation of FER, no work has been done on testing the relative importance of mercantilist and precautionary motives. Khan and Ahmad (2005) argued that FER demand in Pakistan is highly sensitive to capital account vulnerability during the period 1983–2005. They argued that FER accumulation in Pakistan seems to be the result of asymmetric intervention of SBP in foreign exchange market. There is a dearth of studies examining the reserve accumulation process from the view of precautionary savings against the volatility of short-term capital flows and the implication of keeping an undervalued real exchange rate on the reserve accumulation. This study makes an attempt to test the relevance of the two alternative views that seek to explain FER accumulation in the context of single country Pakistan, by including specific variables to capture these motives, namely, the BOP uncertainty, imports, average propensity to imports (APM), inter bank call rate (Inter Bank Call Rate), exchange rate uncertainty for the precautionary motive and a measure of the real effective exchange rate (REER) and balance of trade (BOT) for the mercantilist motive. This study used J-test proposed by Davidson & Mackinnon (1981) to test the hybrid model by merging precautionary and mercantilist models. Our results show that accumulation of FER in Pakistan supports precautionary motive and reject the mercantilist motive. These results are in line with Aizenman and Lee (2007) and Prabeesh *et al* (2008) and several other studies.

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1.2 Trends in FER holdings

Recently, the area of FER holdings is getting an increasing interest in developing countries. This interest is motivated by the experience of recent Asian financial crises. In the aftermath of the Asian financial crises, the developing countries in general and the emerging markets of the Far East in particular have built up large stockpile of FER. At the end of 1994, the developing countries held 49.5 percent of the world FER while this share increased to 60.1 percent in 2013 and 60.3 percent in 2015 (IMF World Economics Outlook 2013-15). This pattern of FER holding in developing countries is salient feature in their overall macro and monetary outlook after the Asian financial crises.

In the same way, Pakistan is giving more emphasis on FER accumulation in recent years. However the trends in the country's FER show wide fluctuations in the 1990s. The FER of the country increased from $529 million in 1990 to $2737 million in 1995. Thereafter it gradually declined to $1597 million in 1999. After the structural shifts like the military take-over and September 11, the FER started increased to $3.2 billion by September 2001. After that in 2010 and 2011 FER touched all time high of $18 billion which fell down to $12 billion in 2013. With the decrease in oil prices and some other events the FER rise to $18.6 billion in 2015 (SBP publications). One of the purposes of this study is to explore the implication so these high stockpiles of FER while keeping in view the opportunity cost of FER holdings.

1.3 Gap in the Literature

While a limited number of studies have empirically investigated the behavior of demand for international reserves in Pakistan but no work has been done on testing the relative

importance of mercantilist and precautionary motives in driving the accumulation of foreign reserves.

1.4 Objectives of the study

To investigate the basis of demand for FER held by the State Bank of Pakistan (SBP).

1.5 Research Question

Is precautionary approach more relevant than mercantilist approach in explaining the variation in foreign reserves held by the State Bank of Pakistan (SBP).

1.6 Hypothesis of the Study

Precautionary approach is more important relative to mercantilist approach.

1.7 Organization of the Study

Chapter 1 consists of introduction, gap in the literature, objectives of the study, research question, hypothesis of the study and organization of the study while Chapter 2 consists of importance of FER, basic definitions, accumulation of FER: theoretical frame work, related empirical studies and demand for FER in Pakistan related studies. Chapter 3 consist of econometric model, data description, methodology and variables construction. Chapter 4 present the obtained regression results. Chapter 5 sums up the main findings of this study and attacbes some policy recommendations to it.

Chapter 2

Literature Review

2.1 Introduction

A number of theoretical and empirical studies can be found in the literature undertaken for the analysis of FER accumulation. However, no common view exists on the modeling of FER. Some studies mention that FER holdings in both the developed and developing countries are the result of their precautionary motives, however, others support the mercantilist view.

The present chapter discusses various studies that have been undertaken by different authors to analyzed the demand for FER. In conjunction with presenting the main findings of previous studies, thought to be most relevant to present study, focus of the present chapter is rested on gaining deeper theoretical and empirical underpinnings of the nature and determinants of FER.

The present chapter is divided in sections as follows. Section 2.2 discusses importance of FER. Section 2.3 covers basic concepts and definitions. Section 2.4 presents theoretical studies on the accumulation of FER. Section 2.5 presents empirical evidences of FER from the previous works done from all over the world. Section 2.6 describes the previous studies and their main findings on accumulation of FER in Pakistan.

2.2 Importance of FER

➢ The presence of sufficient FER in a central bank is essential to gain confidence in the monetary and exchange rate policies of a government. It enhances the capacity of the central bank of the country to intervene in the foreign exchange market and control any adverse movement and stabilize the foreign exchange rates to provide a more favorable

economic environment for the progress of the country. In particular, during time of any crisis FER come to the rescue of any country so as to absorb the distress related to such crisis.

➢ FER also add to the comfort of market participants that domestic currency is backed by external assets and hence it also helps the equity markets of the country, because due to strong reserves many people from foreign countries are willing to invest in the country having strong FER. Central banks generally are thought to hold stocks of foreign reserves so their economies can avoid incurring the costs of adjusting to every' international imbalance that would be transmitted to the domestic economy through changes in exchange rates.

2.3 Basic Concepts and Definitions

FER: According to 5th Edition of the IMF's BOP Manual "FER are assets that consists of those foreign assets or foreign money that are easily accessible to monetary authorities and also controlled by these authorities for directly financing imbalances in BOP, for indirectly controlling the size and extent of such BOP imbalances by intervening in exchanges markets to effect the exchange rates, and for other several purposes".

BOP: The BOP, also called balance of international payment, of a specific country is define as the records of overall economic transactions in a specific period (year or quarter)between the citizens of one country and those of rest of the world. The government bodies, firms and individuals made these transactions. Thus a country's BOP comprise of all external observable and non-observable transactions with other countries. (IMF 2005).

Exchange Rate: An exchange rate is the rate at which one currency can be exchanged for another. In other words, it is the value of another country's currency compared to that of your own. If you are traveling to another country, you need to "buy" the local currency. Just like the price of any asset, the exchange rate is the price at which you can buy that currency. If you are traveling to Egypt, for example, and the exchange rate for U.S. dollars is 1:5.5 Egyptian pounds, this means that for every U.S. dollar, you can buy five and a half Egyptian pounds. Theoretically, identical assets should sell at the same price in different countries, because the exchange rate must maintain the inherent value of one currency against the other.

Balance Of Trade: BOT is the difference between the value of goods and services exported out of a country and the value of goods and services imported into the country. The balance of trade is the official term for net exports that makes up the balance of payments. The balance of trade can be a "favorable" surplus (exports exceed imports) or an "unfavorable" deficit (imports exceed exports).

Imports: Imports are goods and services produced by other countries and purchased by the domestic economy. In other words, imports are goods purchased from other countries. The United States, for example, buys many goods and services produced in other countries. Imports, together with exports, are the essence of foreign trade--goods and services that are traded among the citizens of different nations.

Exports: Exports are the sale of goods to a foreign country. In general, domestic producers (and their workers) sell their goods to foreign countries leading to more buyers, a higher price, and more profit. The higher price, however, is harmful for domestic consumers.

REER: REER (Real Effective Exchange Rate) is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. An increase in REER implies that exports become more expensive and imports become cheaper; therefore, an increase indicates a loss in trade competitiveness.

2.4 Accumulation of FER: Theoretical Framework

Economists have classified many theories of FER demand into three categories. The first most important theoretical method for examining a nation's demand for FER was buffer stock method, which was widely used in the literature since early-1960s through mid-1980s. The buffer-stock theory concentrate exclusively on the utilization of reserves to face unexpected and short-term imbalances in international liquidation. This theoretical method was applicable in both developing and industrial economies. The buffer-stock theory assumes that without FER, BOP deficits must be corrected by a decrease in total expenditure. The majority of referenced work in buffer-stock literature comprises Heller (1966), Clarke(1970a), Clarke(1970b), Frenkel(1974), Frenkel and Jovanovic(1981), Edwards (1983), Edwards (1984a), and Edwards (1984b).

The basic objective of buffer-stock model is to adjust external imbalances by adjustment cost with the expense of holding FER. Most models suggests that FER holdings bear opportunity-cost as long as low-yielding liquid assets could be utilized for making investments in financial assets or high-yielding capital formation. By minimizing the opportunity and adjustment cost of FER, the buffer-stock models looks to accomplish the ideal level of FER holdings. In particular, the buffer-stock theory focuses on current account or trade balance and overlooks financial accounts. (Clarke 1970b).

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Important changes in world wide economy during early 1990s have declare the buffer-stock as a suitable model for measuring FER holdings. As explained by Aizenman (2006), the buffer-stock model is more suitable for those countries which have fixed or peg exchange rates or adjustable peg exchange rate, with limited world wide financial integration, and for those countries where the most important external vulnerability is trade openness. These attributes do not describe accurately most developing market economies and industrial economies of today. Finally, many developing market economies have shifts from fixed exchange rates to flexible rate since the mid-1990s. (Flood and Marion 2002). Since most of the countries that suffered from 1990s crisis had peg or fixed exchange rate, the new emerging consent was that countries with unrestricted financial markets prefer flexible exchange rates. However, most of the countries have publicized fear of floating and have certain or fixed exchange rate variation, in other words *de facto* targeted exchange rates.(Cavo and Reinhart 2002). Hence, in this situation, the utilization of FER or expenditure-changing continues to be the major policy in developing market countries for adjustments.

Precautionary motive was the second theoretical approach of holding FER, developed as alternative approach relative to buffer-stock approach for examining the accumulation of FER in the start of 2000s. According to precautionary approach, FER serve as stocks/funds for those economies which have imperfect capital market access. The precautionary approach has two dimensions, crisis mitigation (mitigating welfare cost of crisis) and crisis prevention (lessening the probability of crisis). This precautionary approach is not accepted by many observers. The majority of referenced work in the precautionary view literature comprise Aizenman and Marion (2003), Lee and Aizenman (2007), Qian and Cheung (2009), Sharma (2007), Choi (2007), Jeanne and Ranciere (2008) and Stromqvist (2007). The major critics argue by most of the

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observers is that the recent accumulation of foreign exchange reserve by countries in particular emerging Asia cannot entirely associated to savings against sudden capital stop or reversal, especially accepted that the important opportunity-cost of this approach.

Mercantilist motive was the third approach of holding FER. Dooley et al (2004) argued that accumulation of FER by countries, in particular Asian economies is the by-product of industrial policy to promote exports, channel domestic and FDI to exports industries. Maintaining an undervalued exchange rate to promote export and make their exports more cheaper in the international markets, which encourage country manufacturing sector. This practice, accredit as monetary mercantilism, imposes essential costs in accretion to opportunity cost for holding FER. (Aizenman 2006).

2.5 Accumulation of FER: Empirical Studies

Since 1960s, different studies examined the adequacy of FER and subsequently the FER determinants. Among the works done by different authors, the analysis done by Heller (1966) distinguishes his study from others by the way that it showed a clear formula for determining the ideal and optimal levels of FER. The formula presented by Heller showed that in case the actual or real level of FER is higher or lower than the ideal or optimal levels of FER; while most of the various studies showed only the quantitative and relative nature of FER. Heller (1966) developed a model to analyzed the impacts of changes in external imbalance. The study examined different factors that affects the number of FER holding. The study articulate the three variables with the ideal levels of FER namely MPI, opportunity costs of holding FER, measured as difference among return on government bonds and return on liquids FER and average of yearly BOP imbalances. The study utilized data for sixty countries from 1949 to 1963, and test the ideal levels of FER model. The ideal levels of FER for the particular nations are ascertained, and the

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amount of real or actual FER to the ascertained optimal FER are used as measure for FER adequacy. The ascertained amount showed that how much the amount of actual FER exceeds or less than the ideal or optimal FER. The results showed that the total level of FER in the World is adequate. However, the problem prevails in the distribution of FER across various countries. The study further concluded that European countries and North American countries have more FER than optimal, while Latin America, Africa and Asia have aggregate level of FER which are below the ideal or optimal level. The study further compared the actual to optimum FER and FER to imports to test crediability of estimates. Finally the results showed that the actual/optimum FER compare to (FER to imports) is better in predicting adjustments in FER volume.

In addition Kenen and Yudin.(1965) find that adjustments in FER can be expressed as simple autoregressive plan. To show it in another way, BOP variations as calculated by the adjustments in FER reflects current disturbances and the 'carry-forward' or 'duration' of all the past disturbances. They asserts the hypothesis, that country BOP can be expressed by three parameters, that is the mean, the variance of net disturbances and the duration or carry-forward. The study utilized data of 14 countries to test the hypothesis. They found a positive and significant result in 8 countries for duration parameter, while the results are insignificant in the remaining 8 countries. They further find that the mean for disturbances variable showed negative sign and also insignificant. Lastly, the variance for disturbances variable showed positive sign and significant in all countries. They further examined the FER demand substituting domestic (internal) money supply instead of net disturbances. This domestic (internal) money supply was used for domestic legislation impact on FER demand. The final results showed significance of only net disturbances variance, and showed insignificant for remaining variables.

Following Heller (1966); Clark (1970) attempt to analyzed the ideal relation between FER holding and the BOP imbalances. The study focused on two different views regarding FER holdings. The supporter of holdings FER said that without FER holding, countries would take measures for adjusting BOP imbalances, which restrict foreign payments, trade and involved with the accomplishment of domestics policy objectives. Contrary to the above, the opponents or rivals of holdings FERs stress that BOP deficits should be eliminated through domestic adjustments as changes in deflation, government spending and so on. The study then combines these two views and construct a simple model to find-out the ideal relationship between adjustment policies and FERs holdings. The study concentrates on adjustment rate policies and FERs as variables to maximize country welfare. The results demonstrated that FER are viewed desirable as target variable as well as regarding achieving other basic goals through reduction in income level fluctuations and also reduction in probability of country turning out to be totally illiquid. Notwithstanding, the study have few shortcomings. Firstly it focuses only on the changes and adjustments in government spending and ignores the changes and adjustments in additional policy measures e.g deflation, quotas, tariffs, and so forth. Secondly, it presume that the random disturbances having constant variance and zero mean caused deficits in BOP.

In another study Clark (1970b) analyzed the trade off between FER holdings and tools of adjustment rates for eradicating deficits in BOP. The study stated that FER variations have two major components. The first component take place with the strategies of adjustments to maintain a given level of desired FER. The second component is FERs disturbances, that occurs in utilizing FERs for financing BOP deficit. The study indicates that the speed of adjustment in all most all of the countries is positive and significance in sample of 38 countries. However, the study indicates that the model of stock adjustments for FER in some of the countries cannot be

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rejected. On the basis of above results, the study then used cross area review to analyzed the average level of FER and the policies of adjustments speed. The study then indicates that the dependent variables for both adjustments speed and FER, the independents variables are PCI, BOP standard deviation and MPI. The overall results of significance showed by F-statistics indicates significance of FER and insignificance for adjustments speed. However, variations in standard deviation of FER coefficient was very significant.

Kelly (1970) develops a model that yields optimal FER for a government attempting to maintain internal and external balance under fixed/peg exchange rate system. The assumption of the model is that government maximizes welfare subject to the trade-off between FER holding and the adjustment policies for financing deficits in the international transactions. The holding of a huge build up of FERs causes low national income levels while in contrast small level of FERs causes fluctuations in the national income because the government has to use the adjustment policies for eliminating deficit in the BOP. The study, selected 46 countries utilizing the dataset from 1953-1965, links the demand for FER with risk and uncertainty (standard deviation for exports), the APM, dummy variable for a specific country, PCI and foreign assets and liabilities. The study classifies the countries into various groups based on factors like development status of countries and openness and estimates separate as well as pooled demand for FER for all countries. The data shows that FER are positively related with variations in exports and negatively with the APM and PCI in all cases. However, the only variable that is significant in all cases is standard deviation for exports, which is used as a proxy for variation in the BOP.

In addition to Kelly (1970); Frenkal (1974) estimated two separate FER demand functions for developed countries and developing countries. The study utilized data for 55 countries starting from 1963 to 1967 and links FER with the following three variables; levels of

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imports to represent scaling variable, variability measure of international payments and receipts, and APM used as proxy for foreign trade size. Firstly the study estimates demand for FERs determinants for the full sample of countries and then divided the sample of countries into 2 two groups namely developed countries and developing countries. The study then utilized cross-section analysis for the selected sample of countries. The empirical results shows that FER vary positively with all variables and the relationships are significant in all cases. The positive association between FER and the variability measure and between FER and imports is clear from the literature. However, the positive sign of the coefficient of APM contradicts the prediction of the standard priceless Keynesian model and is consistent with the prediction of the price-adjustment model. The results of the separate analysis for developed and less developed countries also show that FER vary positively with all its determinants. The size of the coefficient of the APM is almost the same for both groups and is also significant in both cases. The variability measure is also significant in both cases but the size of the coefficient is larger for developed countries than for less developed countries. And the inverse is true for the scale variable that is its size is larger of less developed countries than for developed countries, though it is significant in both cases. The covariance analysis is also used to test the stability of the coefficients over time and it is found that the coefficients do not differ significantly over different years at 5 per cent level of significance. After the stability test, the study also checks the results by making use of the pooled data in which all the coefficients are positive and significant at the 5 per cent level of significance. The overall conclusion of this study is that the holding FER is positively related to variability measure, imports and the APM. The relation between FER and the APM is consistent with the implications of the price-adjustment model, but is inconsistent with those of the simplifies priceless Keynesian model. The study also suggests that

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the behavior of the developed countries with respect to FER holdings differs from that of the less developed countries. But the study lacks in considering the opportunity cost variable.

As a result of its importance in the new system of floating rates, the research on holding of international FER has not stopped with the beginning of the new system. The first attempt in the era of flexible exchange rate system with regard to the research on FERs investigates to see whether the demand for FER remains stable during this structural change. In this regard the first effort comes from Heller and Khan (1978). They analyzed the demand for FERs during the time period when the international monetary system shifted from fixed exchange rate system to the regime of flexible exchange rate system. The motivation behind the study is to investigate whether the flexible exchange rate system reduces the need for FERs or not. The study links the demand for FER with three variables that are the variability measure of the international transactions, the APMs and the level of imports. The study using the data from 1960-76 in pooled form estimates the demand for FERs six times for different classifications of world countries. Second-order autoregressive process is used for four groups while first-order autoregressive process is used for the remaining two groups.The results of all groups show that FERs vary positively with the variations measure and imports and negatively with the APM. All the coefficients are significant for all specifications. The negative sign of the APM is consistent with the prediction of the priceless Keynesian model.The stability tests are employed to determine whether countries' holdings of FER during the period of floating or manage floating exchange rate regime continued to be determined by the same forces that had governed their behavior in the period of fixed exchange rate system. On the basis of the results of stability tests, the study indicates that the function explaining the behavior of FERs remains stable in the periods of managed floating. However, the demand for FER indicates a shift in case of

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industrialized countries while there appears to be no shifts for the remaining five groups of countries. Finally, the results verify the hypothesis that the demand for FERs should be reduced in the floating exchange rate system in the case of industrial countries. The case of non-oil developing countries, on the other hand, shows that their holdings of FERs during the managed float system have tended to be higher than the levels that would have been held during the fixed exchange rate system.

Similar to Heller and Khan (1978) ; Frenkel and Jovanovic (1981) also develop a simple model of the demand for FER to analyze the structural shift in exchange rate system. The model takes into account the role of two variables: the stochastic nature of external transactions ie variation in the BOP and the foregone earnings i.e the opportunity cost of holding FERs. The stochastic nature of external transactions means that on average the difference between international receipts and international payments in equal to zero. The optimal solution for FERs is derived in the study and FERs are shown as function of the above two variables. The derived model is tested by taking data of 22 developed countries over the period 1971-75. The cross-section and time series data are pooled and for capturing the impact of the behavior of different countries with respect to FER holding, separate constant term is allowed in the empirical analysis. The results indicate that both the explanatory variables are highly significant and the signs of their coefficients reflect the theory of the demand for FER. The results of the model are also verified by the inclusion of the scale variable in the form of imports and the model present s the same results and imports are found significant in determining FERs. The empirical analysis further indicates that no significant change in the behavioral function of the demand for FER occurred during the period of 1973-75, when the exchange rate system shifted from the fixed to managed-float system.

After the strong theoretical and empirical interpretations given in favor of the stability of demand for FER, there arose another shock in the form of monetary approach to BOP for the theories of FERs demand. The monetary approach to BOP popularized by Johnson (1976 and 1977) views the imbalances in the international transactions as a monetary phenomenon. The approach asserts that imbalances in the BOP occur because of the temporary disequilibrium in the money market. According to this approach the excess demand for money in the domestic economy not satisfied by the domestic monetary authorities will result in the increase of FER while and excess supply of money leads to excess domestic demand for goods and services. This excess demand in the domestic economy is channeled into the foreign markets and results in the outflow of FER from the domestic money market.So the implication of monetary approach to BOP for the demand for FER is that the domestic monetary disequilibrium has a short-run positive or negative impact on FERs, depending on the direction of disequilibrium, however, in the long run its effect vanishes. So according to this proposition the earlier literature on FERs produced biased estimates of the FER demand function as these studies estimated the demand for FERs taking the domestic monetary disequilibrium as exogenous.

For the first time Edwards (1984) integrated the two approaches of the dynamic analysis of FERs; the FER demand theory and the monetary approach to BOP. Following Johnson (1976-77), Edwards (1984) combines the theories of the demand for FER and the monetary approach to the BOP by estimating the dynamic equation to capture the effects of monetary disequilibrium on FER. The study takes FERs as a function of the variability measure, FER, APM and the domestic monetary disequilibrium. The results obtained, using data for 23 developing countries over the period 1965-72 shows that FER movements respond both to discrepancies between desired and actual FERs and to monetary disequilibrium situations. The coefficient of the monetary

disequilibrium is significant at 10%, indicating that in these countries money market disequilibrium have had an important role in determining the movement of FER through time.So the results indicate that the dynamic analysis of FERs that excludes monetary disequilibrium yields biased estimates and concludes that as long as there is a will-defined demand for FER, domestic credit can not be considered to be completely exogenous.

In the same way Courcehene and Youseg (1967) also apply monetary approach to test the functioning of FER in nine countries by utilizing data from 1958-64. They compares the effects of money supply and imports on FER holding. The study analyzed FER demand for individual countries as function of long-run interest rate and money supply. The empirical results showed that FER vary inversely with interest rate and positively with the money supply. The (interest rates) coefficient was significant in 5 countries out of 9 countries and the (money supply) coefficient was significant in 7 countries out of 9 countries. Finally the study concluded that (money supply) works better than imports level as determinant of FER demand, because money supply has larger t-statistics than imports t-statistics in 7 out of 9 estimated countries. A study by Rizvi *et al* (2011) also analyzed the accumulation of FER in a monetary framework. They selected annual data from 2001 to 2006. The results are same in line with the study of Courcehene and Youseg (1967).

Mishra and Sharma (2011) investigated FER demand and monetary disequilibrium impact on FER movements in India. The study utilized data from 1991:q1 to 2009:q2 on quarterly basis. The variables employed are FER, imports, API, volatility of Indian exchange rate, Federal Funds rate, GDP, Foreign Portfolios Investment, short-term foreign debt, and M3 broad money. The study applied co-integration and VECM techniques for estimation. The estimates of FER demand function indicates an important role of precautionary motive in

determining FER demand in India. Further more, the results they found, showed a positive relation between FER and other explanatory variables except Foreign Portfolios Investment in context of India. Moreover the results showed that monetary disequilibrium played an important role in FER movements in short-run.

The introduction of spurious regression problem and revolution in econometric and latest techniques of computer lead to the application of ECM and cointegration to the demand for FER. In this regard various studies are undertaken. (see Elbadawi (1990); Ford and Huangg (1994); Shen and Huangg (1999); Badinger (2002); Khan and Ahamd (2005) and several other studies.

Elbadawi (1990) applies ECM to the demand for FERs in a case study of Sudan. The study incorporates remittances along with domestic monetary disequilibrium as explanatory variables of nominal FER in its model. Other variables of the model include the variability measure, the APM and FER. The model is tested by using quarterly data over the period 1971-82 and the test for cointegration. The results indicate that there exists a stable demand for FER. Additionally, the FERs demand behavior is characterized by constant returns to scale and the APM is characterized by unit long run elasticity. The findings verify the short run role of domestic monetary disequilibrium in explaining the changes in FERs. Finally, remittances play a significant role in reducing the need for FER in case of Sudan.

Based on the work of Elbadwi (1990); Ford and Huang (1994) use ECM to estimate the demand for FERs in China. And the results are same with the results of Elbadwi (1990). In addition Huang and Shen (1999) work with seasonal ECM to analyze the demand for FER in Taiwan. The study derives a dynamic demand function for FER based on seasonal difference. Using quarterly data over the period 1961:1—1995-2, and Lee's procedure for seasonal cointegration, the study shows that there is a stable long-run relationship among FERs, income,

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the APM, and a measure of the variability of the BOP. Based on the results of the cointegration test the study further estimated error correction model for dynamic analysis. The error correction model is estimated for both seasonal cointegration specifications as well as conventional cointegration specification and also for narrow monetary disequilibrium as well as for broad money disequilibrium. For each specification, all the estimated regression coefficients have the same sign and similar magnitudes. The speed of adjustment with respect to all independent variables is very low in both specifications. In each specification, the narrow monetary disequilibrium shows a short run significant effect on the demand for FER, while the broad monetary disequilibrium exerts no significant effect on FER holding in both in the short run and the long runs.

A study by Badinger (2002) uses vector error correction approach based on Johansen cointegration technique to estimate the demand for FER in case of Austria. Using quarterly data over the period 1985:1 1997:4, the study incorporates domestic monetary disequilibrium in the model. It finds that Austria's long-run FER demand is a stable function of imports, uncertainty and the opportunity cost of holding FERs with strong economies of scale. The speed of adjustment parameter is 0.38, which shows that 38 % of the discrepancy in long run equilibrium is eliminated within one quarter. It also confirm the role of the domestic monetary market disequilibrium in explaining the demand for FERs, and thus validates the monetary approach to BOP.

Rizvi *et al* (2011) analyzed the accumulation of FER in a monetary framework. They selected annual data from 2001 to 2006. The variables utilized by them are liquid FER as percent of GDP, broad money to GDP, short-term as percent of GDP added for capital accounts vulnerability, imports/GDP ratio added for current accounts vulnerability. The results they finds

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out showed that their exists positive relationship between FER and explanatory variables indicates that FER have significant impact in boosting GDP, imports, exports, stabilizing exchange rates and reduction of debt and deficits.

Emmanuel Umeora (2013) analyzed the relation between FER and macro economic stability in Nigeria. Specifically, they examine the relationship among FER accumulation, Inflation, Exchange rate and GDP by utilizing data from 1986 to 2011. The results showed that FER accumulation is important for Nigeria. The study also finds out that rise in FER leads to a rise in GDP, and FER accumulation have no impact on inflation in the selected country. Further more, FER has significant impact on exchange rate. They concluded that exchange rates volatility could be manage by holding FER.

In another study Ra (2007) examined the demand for FER in Korea by adopting ECM and simple buffer-stock model. They utilized monthly data from 1973-2005 and divided into three different periods. The first and whole data sample starting from 1973.m1 to 2005.m12. The second data set consists of pre-crisis sample period starting from 1990.m1 to 1997.m11. And the third period consists of post-crisis sample period starting from 1998.m3 to 2005.m12. The variables used in this study are yields on domestic bonds and yields on U.S bonds, imports, FER, GDP, APM and FER volatility. The study finds that demand for FER was more elastic to trade openness and adjustment costs and less elastic to post-crisis opportunity costs. However, their structural break provide different results of FER demand.

After the Asian Financial crises, the monetary authorities of the emerging markets of East Asia have sharply increased their demand for FER raising their share of the world reserves to about 40 %. Aizenman and Marion (2002) explore interpretations for the relatively high demand for FER by countries in the Far East and the relatively low demand by some other developing

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countries. The study, using a sample of 122 developing countries, shows that FER holdings over the period of 1980-1996, are the outcome of its major determinants, such as the size of international transactions, their volatility, the exchange rate arrangements, political consideration, etc. The estimated equation almost perfectly predicts FER holdings before the financial crises. The under-prediction of FERs after the crises is consistent with the claim that sovereign risk and costly tax collection to cover fiscal liabilities lead to a relatively high precautionary demand for FER. The conclusion of the paper is that these five variables i.e population, APM, GDP, variations in the BOP, APMs and exchange rate volatility account for 70% to 90% of the variation in actual FER holdings and because of the risk and high tax collection associated with high fiscal liabilities, the demand for FER in the Far East has increased.

Similarly Ramachandran (2006) examined the upsurge in FER holding for India by estimating the buffer-stock model utilizing data on weekly basis from April 2nd 1993 to December 31st 2004. Their main variables are FER volatility and treasury bill of 91 days for opportunity cost. The study concluded that FER volatility and treasury bills of 91 days are the main variables affecting the demand for FER in India. The study also find-out that precautionary measures have played significant role in determining FER in India, and it was the results of adopting floating exchanges regime in March 1993.

In another study Prabhesh *et al* (2007) applied Co-integration and VECM approach for analyzing India FER demand. They utilize quarterly data from 1983:Q1 to 2005:Q1. They used real FERs, population, real GDP per-capita, APM, ratio of real trade/GDP, current accounts deficit/GDP ratio, real capital accounts deficit/GDP ratio, short-term debt/GDP ratio, real money supply/GDP ratio, interest rate differentials, standard deviations of real exchange in the model.

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The study finds that India demand for international FERs is function of broad money/GDP ratio, imports/GDP ratio, interest rates differentials, exchange rates flexibility in the long-run. The results they finds shows that India's demand FER as precautionary approach, against current accounts uncertainty and capital accounts uncertainty.

It is argued by Dooley,*et al* (2003) argued that the reserve accumulation is the by product of the undervalued exchange rate polices adopted by the Asian economies to promote their exports and channel domestic and foreign direct investment to the export industries. They viewed Asian countries as periphery regions which follow undervalued exchange rate policies to promote exports to the central region, namely, the USA. This phenomenon can be understood as a new Bretton Woods system. These mercantilist policies resulted in persistent current account surpluses and reserve accumulation with the central bank of these economies. Relative to precautionary approach, less literature (theoretical and empirical) is available on mercantilist approach.

Aizenman and Lee (2005) estimate the significance of mercantilist motive of FER accumulation comparative to precautionary motive of FER accumulation in the Asian countries. Using data from 1980 to 2000. They take lagged of exports growth, the deviation of PPP from its trend to test mercantilist motive. The capital account deregulation and the dummies are utilize to present adjustments behind unexpected sudden stop to measure precautionary motive. They find out that investment contractions and large output are caused by financial crisis, and it was very tough for these countries to alter damage caused. Thus FER are accrued as self-insurance from costly liquidation in reaction from sudden stops. The study find that precautionary view is supported mostly. The demand for FER strongly react to liberalization of capital account. They

concluded, that the variables related with mercantilist motives are significant statistically, but insignificant economically.

A study by Sehgal and Sharma (2008) analyzed the adequacy and cost of FER along with the Determinants of FER in India. They utilized quarterly data from 1990:Q2 to 2006:Q1 for examining the behavior of precautionary motive, mercantilist motive, transactions motive and sensitive determinants namely, APM/GDP ratio, GDP, external debt/GDP ratio, portfolio investment/GDP ratio, export growth and opportunity cost in the demand for FER in India. Econometric methodology applied by them are ADF, Johansen co-integration and VECM for the determination of data. The study finds that both precautionary as well as mercantilist motives are the reason for holding FER in India. Further more, exchange rates volatility and capital flows have positive effects on FER in India. Export growth taken as proxy for mercantilist motive is also found significant.

Lisack et al (2013) analyzed the accumulation of FER by 112 developed and developing economies in period of crisis. The study addresses two main questions related to accumulation of FER. The first question is that has FER accumulation effectively protected these countries in the time of 2008-2009 financial crisis? And the second question is that what explains FER accumulation pattern, observed during the financial crisis as well as after the financial crisis? The study finds that those countries which have large amount of FER relative to short term debt abide less from financial crisis, especially if these countries are associated with low open capital accounts. Further more, they concluded that those countries that spend FER during the financial crisis restore their stocks quickly. They explain that this quickly rebuilding of stocks has slow down the accumulation pace.

Perera (2010) examined the adequacy and demand for FER in SriLanka by applying co-integration and ECM techniques. This study was twofold: first the study make FER demand model and secondly they assessed the adequacy of FER in Srilanka. The study utilized quarterly data from 1996:q1 to 2012:q2. The variables employed are FER, trade openness, imports, API, broad money, short-term foreign debt, opportunity cost measured by interest rates, and exchange rates volatility. The study finds out that FER accumulation in Srilanka is highly sensitive to import propensity, short-term foreign debt, money supply and economic openness. However, the study showed that FER accumulation looks less elastic to opportunity cost and exchange rates volatility. Further more, in assessing FER adequacy, the study found that Srilanka holds adequate FER.

Sula (2011) estimated the determinants and demand for FER by employing quantile regression for a sample of 108 underdeveloped countries. The study utilized annual data from 1980 to 2007. The variables included are FER, dummy variables for currency crisis, financial openness measured by capital controls index, trade openness, population size, and real GDP/per capita. The study adopt quantile regression to re-estimate buffer-stock model at various points of holdings FER conditional distribution. The study founds the parameters of demand function differ across countries with different level of FER holdings. The study also found that some estimates of elasticity which are insignificant in running OLS regression, are statistically significant when the study used different quantiles of FER holding distribution. Finally the study concluded that countries increase their FER holdings considerably after the crisis.

Aizenman and Riera-Crichton (2008) examined the effects of FER, capital flows and TOT shocks on REER. They selected a sample of 80 countries, both emerging and industrial countries and the data covers from 1970-2004. The results showed a significant impact of TOT

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Thailand, and Singapore. They utilized annual data from 1970 to 2005. The variables employs are FER, real GDP/capita, exports, imports, external debt and current accounts balance. They utilized an ARDL testing approach to test co-integration between FER and explanatory variables. The results they estimated showed that there exists a long-run relationship between FER holdings and explanatory variables. Further more, they concluded that current accounts surplus is the main variable of rise in FER holdings in Malaysia, Singapore and Indonesia.

Choudhry and Hassan (2008) examined FER demand under fixed or peg exchange rates and self- correcting or floating exchange rate regimes for three under developed countries namely Kenya, Philippines and Mexico by utilizing quarterly data from 1986:Q1 to 2000:Q4. The study applied ECM and co-integration techniques to analyzed the relationship between dependent and explanatory variables. The variables employ in their model are API, Variability of FER and volume of nominal imports. It was found that API, variability of FER and volume of nominal imports are the common determinants of FER in the above mention countries. Their results of co-integration showed that there exists a reliable long run relationship between FER and explanatory variables. Further more, the ECM results showed causality from independent variables to FER in the short as well as long run. However, the sub sample results indicates that the role of FER remained similar under fixed and floating regimes.

Olayinka, (2015) used multivariate modeling framework for examining the relationship between FER and growth of stock market in Nigeria by utilizing annual data from 1981 to 2011.The variables included in the model are FER, growth of stock market, interest rates. The results shows a long-run relation between FER and stock market The results they find shows that their exists a long run relationship between stock market advancement. They concluded that FER have a positive impacts on growth of stock market advancement. They also checked Granger

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shocks on exchange rate, and FER cushions this influence in emerging economies and not in industrial economies. Because financial deepness in developing economies reduce the buffer effect, further more the authors concluded that REER is more elastic to FER.

Hoshikawa (2012) examined the long-run relation between FER and exchange rate (yen/dollar) in Japan. The study focused on exchange rates regime shifts in Japan. The study applied co-integration tests, dummy variables used as instrument for analysis. The study utilized residual-based test for regimes shifts along with regression and then detect the change in exchange rates policy. The results indicates that a long-term relation exists between Japanese FER and exchange rate (yen/dollar).

Narayan and Smyth (2006) analyzed the long and short-run relation between FER, exchange rate (real) and interest rates differential in China by utilizing data from 1980-2002 on monthly basis. They econometric methodology used was co-integration bounds test. The study showed a long run relation exists among FER, exchange rate and interest rate. They also showed that exchange rate has significantly positive influence on FER. Further more, they showed that exchange rate and interest rate have no monotonic relation with FER.

In addition Ahmad and Pentecost (2009) analyzed a long run relation between FER and exchange rates in selected African countries by utilizing threshold co-integration methodology. They utilized quarterly data from 1980:q1 to 2004:q4. The results they estimated indicates a positive long run relation existed between FER and exchange rates in the sample of selected countries. Further more, they concluded that FER holdings by selected countries were higher in floating regime relative to peg or fixed exchange rates regime.

Eliza *et al* (2008) investigates the components affecting FER demand in five ASEAN (Association of South East Asian Nations) economies namely Malaysia, Indonesia, Philippines,

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Thailand, and Singapore. They utilized annual data from 1970 to 2005. The variables employs are FER, real GDP/capita, exports, imports, external debt and current accounts balance. They utilized an ARDL testing approach to test co-integration between FER and explanatory variables. The results they estimated showed that there exists a long-run relationship between FER holdings and explanatory variables. Further more, they concluded that current accounts surplus is the main variable of rise in FER holdings in Malaysia, Singapore and Indonesia.

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Causality in the model. The results of Granger Causality shows that their exists bidirectional causality between FER and interest rate.

Cady and Gonzalea-Garcia (2007) examined FER accumulation, foreign currency, and their impact on exchange rates volatility. They employed panel data from 1991:Q2-2005:Q3 on quarterly basis for 48 countries. Their results showed a significant positive relation between exchange rates volatility and other macroeconomic variables. Furthermore, for more accurate results they combined the model with policy evaluation techniques, providing information on position of foreign currency liquidation could reduce NEER volatility. They further divided sample into emerging and industrial countries and again applied the test. The results they get confirmed that increasing FER adequacy would followed by low exchange rates volatility.

Niaz *et-al* (2014) applied some econometrics analysis to identify FER determinants in Bangladesh. They utilized annual data from 1972 to 2011. The variables used are FER, exchange rate, interest rate, UPI(Unit Price index) of imports and exports, inflation rate differentials, per-capita GDP, broad money(M2), foreign aid and remittances. They estimated three models namely Model A,B and C. In model A they estimate the impact of interest rate, exchange rate, foreign aid, broad money(M2), remittances, UPI of imports and exports, per-capita GDP and inflation rate differentials on FER. In model B they eliminate inflation rate differentials and measures the impact of remaining variables on FER. In Model C they excluded inflation rate and foreign aid and measures the impact of remaining variables on FER. They applied Engle & Granger(1987) co-integration tests and some diagnostics test for better modeling. The study finds out that FER depends on interest rate, exchange rate, broad money(M2), remittances, UPI of exports and imports and per-capita GDP.

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Joan (2015) analyzed the dynamic analysis of determinants of FER in Nigeria. The study applied ECM (Error Correction Methodology) to measure the short run and long run dynamics that arise in demand for FER in Nigeria. The variables utilized in the model are, temporary disequilibrium in (BOP) proxied by balance of trade, output (GDP), external debt, growth rates of exports revenues, exchange rates, and trade openness. The study find out that in the long-runn the dependent variable and explanatory variables are co-integrated with 5 per cent significance level. In the short-run there exists negative relationship between FER and explanatory variables. This indicates that in short run, international payments imbalances and the choices to balance trade uncertainty determines the accumulation of FER in Nigeria.

Yu and Lili (2012) examined the correlation between FER and exchange rate in China by utilizing Granger causality and Johansen test of co-integration. The study utilize monthly data from 1994 to 2011. The variable included are FER, exchange rate, foreign trade total volume and GDP as scale variable. The results they get indicates a long-run equilibrium relation between FER and exchange rate of China. Further more, they concluded that any changes in FER cause fluctuation in exchange rate. They also added dummy variables to test the impact of reform in exchange rates regime. Their results suggests that reform in exchange rates regime increase exchange rate flexibility but slow down accumulation of FER.

Akdogan (2010) analyzed the movements of FER and its relation with different economic variables (namely , consumption, GDP, imports, exports, inflation and interest rates) for a sample of four developing countries namely (Argentina, Turkey, Brazil, and Korea) by utilizing annual data from 1960-2009. The study applied unrestricted VAR for structural shifts and Granger causality test. The results indicates two main points: 1) For Turkey and Argentina, interest rates differentials with US contains potentially helpful information for FER accumulation. 2) For

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Korea, net exports and consumption differentials with US contain helpful information for FER movements suggested that precautionary motive is a stronger motivation relative to portfolio adjustment for explaining FER accumulation.

Bar-Ilan and Marion (2008) examined the demand for FER in macroeconomic perspective for Asian economies. The study examined relationship between FER and macroeconomics variables namely output gap, FER, Optimal FER, exchange rate, inflation rate and discount rate. The study used Buffer-stock model inside open economy model for capturing both motives of holdings i.e the insurance or precautionary motive and export-led or mercantilist motive. The variables targets in the model by policymaker are inflation, output and FER. The study concluded that policymaker targets inflation and output levels that they desires and make use of exchange rates to get that. The targeted exchange rates also depends on FER.

Fukuda and Kon (2010) explored the long-run macroeconomic impacts of FER accumulation in a sample of 138 developing countries. The study utilized annual panel data from 1980-2004. The study included the following variables in their model i.e FER, total foreign debt outstanding, post-crisis dummies, domestic consumption, exports, GDP, and national capital investment. The study founds that a rise in FER lead to enhance economic growth and enhance investment but it will lead to decline consumption. Furthermore, the study imply that the positive effect of FER on economic growth disappears when they control the effect through investment.

Carvalho and Fry-McKibbin (2013) examined the mercantilist view of FER accumulation in Brazil. The study tests the association between FER and exchange rates volatility along with the resultant spillover effects intervention in neighboring countries. The variables utilized are exchange rates return, first difference of FER stocks and central bank intervention in Brazilian forex market. And the data selected daily from May 5, 2009 to May 29, 2012. They applied

latent factors model, using GMM estimation techniques to examine the impacts of currency intervention by central bank on the volatility of sample variables. The study finds out that FER changes used as proxy for currency intervention have positive impacts on exchange rate volatility supports the mercantilist view of FER accumulation. Lastly they concluded that currency intervention by central bank have spillover effect in other countries.

Cruz (2015) examine the mercantilist motive of holding FER for ten Latin American countries namely Bolivia, Argentina, Brazil, Dominican Republic, Colombia, Nicaragua, Peru, Uruguay, Honduras and Mexico. The study utilized annual data from 1996-2011. The study consider FER as determinant of real exchange rates. The variables they included in the model are real exchange rates, real income/per capita, TOT, interest rates (real), government expenditure, current account, workers remittances and foreign aid. The study finds no evidence of accumulating FER via tradable goods because they appreciate exchange rate. The study concluded that FER accumulation in Latin America support precautionary motive.

Similar to Aizenman and Lee (2005) Prabheesh *et al* (2009) examined the relative importance of mercantilist and precautionary approaches to demand for FER in India. The variables included in their model are FER, opportunity cost proxied by Treasury bill rates, imports, Foreign Intuitional Investments included for precautionary motive, and REER included for mercantilist motive. The results of ARDL Co-integration indicates that their exists a long-run relation between FER and explanatory variables. The results shows that all variables either related with precautionary motive or mercantilist motive are statistically significant in determining FER in India. Furthermore, they find that mercantilist motive of demand for FER is more statistically significant than precautionary motive. Finally they concluded that, both precautionary and mercantilist motives are important in explaining FER demand in India.

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2.6: Accumulation of FER: Empirical studies related to Pakistan

Coming to the literature on Pakistan, only few studies have done so far. First study on precautionary motive from Khan and Ahmed (2005) who utilized quarterly data for the period 1981-1 to 2003-2 to analyze the determinants of FER in the short run as well as long run in case of Pakistan. The variables used are FER, BOP, Inter Bank Call Rate used as a proxy for opportunity cost, APM, workers remittances, level of imports, and dummy variables also included for capturing the impact of 9/11 event and the take over of military and autonomy of SBP in the model. They also compare the role of short run monetary disequilibrium beside with the main determinants of FER holdings. Their co-integration results shows that all variables are significant at 5% significance level except remittances. They find out the existence of steady long run FER demand function. They also find out a positive effect of imports and variations in BOP on FER, and negative impact of Inter Bank Call Rate and remittances on FER in Pakistan. Their concluded that the variations in BOP and imports are the main indicators in rising FER in case of Pakistan. The speed adjustment parameter in the ECM was also insignificant. They conclude that the monetary disequilibrium driven additionally FER in the short-run, confirming the applications of monetary view to BOP in Pakistan. Their dummy variable which is used for autonomy of SBP is significant in ECM and interpret that SBP autonomy has significant positive effect on FER holdings.

The second study on mercantilist motive from Tariq, *et al* (2014) who investigates the impact of real exchange rates on FER in Pakistan with the context of mercantilist approach. They followed Ramchandran (2006) to analyzed the mercantilist motive for Pakistan. They utilized large span of data selected annually from 1973-2008. The data they used divided into three regimes i.e fixed, managed and floating exchange rates. The first regimes was selected from

1973-1981 called fixed regime while the second regimes was selected from 1982-1999 called managed regime and the third regime was selected from 2000-2008 called floating regime. The variables included in the model are FER, lagged of real exchange rates, APM for trade openness, lagged of interest rate differentials for opportunity cost , and remittances. The study undertake ECM approach and co-integration for assessing FER determinants in Pakistan. The study also imposed two dummies for regimes shifts. Overall the study finds out that their exists positive and significant relation between FER and real exchange rates. The results they find shows that FER holdings is by product of export growth strategies through exchange rates depreciation. Furthermore they find that the regime switches from fixed to floating exchange rates policies of SBP rise up the FER holdings in Pakistan.

In another study Khan (2013) examine the relation between exchange rates (real and nominal) and FER for Pakistan by utilizing co-integration analysis, VAR, Granger causality and VECM techniques. They also examined the causality between FER and exchange rates. The study utilized annual data from 1983-2009. They included NEER, REER and FER in their model. The study finds out that their exists a long-run positive relationship between FER and NEER and between FER and REER. The causality results showed that causality goes from NEER and REER towards FER indicates that both REER and NEER affect FER in Pakistan.

A study by Chaudhry *et al* (2011) empirically investigated the relation between FER and inflation in Pakistan by applying ARDL and co-integration bound testing techniques. The study used annual data from 1960-2007. The variables included are FER measured in current prices and GDPD as a proxy for inflation. The results of the study showed a negative relationship between FER and inflation rate in Pakistan indicates that any short-fall in FER has some harmful effects on goods prices.

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Chapter 3

Data Description And Econometric Methodology

3.1 Introduction

This chapter deals with the modeling of FER, data description, econometric methodology and construction of variables. Some researchers prefer to use the precautionary approach for modeling whereas other apply mercantilist approach. First we make precautionary model and then mercantilist model. After that we combine both models to make one hybrid model.

3.2 Empirical Model

3.2.1 Precautionary Model

According to this model, the financial integration of the developing countries has increased their exposure to volatile capital flows or hot money, which are subject to sudden changes specially reversals. The precautionary model considers the FER demand in a buffer stock or inventory modeling setup applied by a number of studies (see, Kelly, 1970; Johanson, 1996; Frenkel and Jovanovic, 1980; Bahmani-Oskooee, 1985; Karim and Ahmad, 2005; Aizenman *et al.*, 2007).

$$log \left(\frac{RES}{GDP} \right)_t = \alpha_0 + \alpha_1 log(IM)_t + \alpha_2 (IBCR)_t + \alpha_3 log(BOP\_U)_t + \alpha_4 log(APM)_t$$

$$+ \alpha_5 log(ER\_U)_t + \varepsilon_t \dots \dots \dots \dots (1)$$

In Equation, *RES/GDP* is dependent variable, which denotes the stock of reserves to GDP ratio(nominal), *IM, IBCR, BOP_U, APM, ER_U* denotes value of imports, inter bank call rate, variability measure of the variations in balance of payments, average propensity to import, exchange rate uncertainty. The variable ε_t represents random disturbance.

A positive relationship is expected between *RES/GDP* and *IM* imports since higher imports imply higher transactions, which leads to higher demand for reserves. The opportunity cost of holding reserves measured by inter bank call rate (IBCR) is expected to have a negative relation with reserves because a higher opportunity cost is expected to lead to a reduction in reserve holdings as alternative investments become more attractive. Some studies find the relationship between RES and Inter Bank Call Rate to be positive, and the reasons they explained is that the opportunity cost channel might be of minimum importance for developing country. The relationship between variability measure of the variations in balance of payments and reserves must be positive i.e. increased variability in the external accounts will cause an increase in the optimal level of reserves and vice versa. The APM is used as a proxy for trade openness. We are assuming that it has a positive relationship with the reserves. We utilized the APM is an intermediary for the exchange openness expecting that it has a positive relation with the FER.

Exchange rate uncertainty is defined as the risk associated with unexpected movements in the exchange rate. Economic fundamentals i.e inflation rate, interest rate, BOP are sources of exchange rate uncertainty. The relationship between exchange rate uncertainty and FER is expected to be positive. Higher exchange rate uncertainty would increased accumulation of FER because central banks need a large stock of FER to manage exchange rates. We can measure it by the difference between actual and forecasted value of monthly exchange rates.

3.2.2 Mercantilist Model According to this model, FER accumulation is the by-product of the undervalued exchange rate policies adopted by countries to promote their exports and channel domestic and foreign direct investment to the export industries. This results in persistent current account surpluses and reserve accumulation with the central banks of these economies. Best

example is China which has been following an undervalued exchange rate to maintain its export competitiveness with its trading partners, and has emerged as the top reserve holding country in the world.(see Dooley et al., 2003; Aizenman and Lee, 2007).

$$log(\frac{RES}{GDP})_t = \beta_0 + \beta_1 log(td\_REER)_t + \beta_2 log(BOT)_t + \varepsilon_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2)$$

In this equation the term td_REER denote deviation of real effective exchange rate from its trend and *BOT* is balance of trade. The variable ε_t represents random disturbance. The term deviation of real effective exchange rate from its trend is expected to be inversely related with FER because a negative td_REER indicates an undervalued real effective exchange rate of domestic to foreign currency and accordingly it would increase FER. In order to control for export growth, we used balance of trade data. We expect this sign to be positive, because a positive BOT shows that export increased and this is due to result of accumulating FER. If a country accumulate FER for mercantilist motive then value of export growth will be expected to be positive. Aizenman and Lee (2007), Dooley *et al* (2003), Prabeesh *et al* (2009) etc.

3.3.3 Hybrid Model

We combine both models to make one hybrid model.

$$log(\frac{RES}{GDP})_t = \delta_0 + \delta_1 log(IM)_t + \delta_2 IBCR_t + \delta_3 log(BOP\_U)_t + \delta_4 log(APM)_t$$
$$+ \delta_5 log(ER\_U)_t + \delta_6 log(td\_REER)_t + \delta_7 log(BOT)_t + \varepsilon_t \ldots \ldots \ldots \ldots \ldots (3)$$

All variables are in log form except IBCR.

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3.3 Data Description

In this study we will use quarterly data from 1990-1 to 2015-4. The primary source of data for this study is *International Financial Statistics*, Pakistan Bureau of Statistics, Pakistan Institute of Development Economics (Statistical Paper Series) for data on quarterly GDP, and *State Bank of Pakistan.*

3.4 Econometric Methodology

3.4.1 Augmented Dickey Fuller test

Before we perform the ARDL bound test to avoid spurious results, it is essential to check for the stationarity of the data series used. The ARDL bounds test is based on the assumption that the variables are I(0) or I(1). The objective is to ensure that the variables are not I(2) so as to avoid spurious results. In the presence of variables integrated of order two, we cannot interpret the values of F statistics provided by Pesaran *et al.* (2001). The Augmented Dickey-Fuller (ADF) test is applied to test for the existence of unit root tests. It is important because if the ordinary least squares (OLS) is apply on a non-stationary time series data, all the results will be spurious. The ADF tests show that if the estimated value is greater than the critical value i.e. $t^* >$ ADF, the null hypothesis of the unit root will not be rejected. However, if the computed value is less than the critical value i.e. $t^* <$ ADF, the null hypothesis of the unit root will be rejected and the underlying data will be stationary. For the selection of the optimum lag Akaike Information Criterion (AIC) has been used.

3.4.2 Co-Integrating Models

This study uses ARDL cointegration approach developed by Pesaran and Shin (1999) and Pesaran *et al.* (2001). It has several advantages in comparison with the standard multivariate cconintegration tests such as Johansen and Juselius(1990). The first one is that the ARDL does not need that all the variables under study must be integrated of the same order and it can be applied when the under-lying variables are integrated of order one, order zero or fractionally

integrated. The second advantage is that the ARDL test is relatively more efficient as compared to Johansen test in the case of small and finite sample data sizes. The last and third advantage is that by applying the ARDL technique we obtain unbiased estimates of the long-run model (Harris and Sollis, 2003).

The ARDL cointegration procedure involves two steps. The first step is to examine the existence of the long-run relationship between the variables in the model. If cointegration exists, the second step is to estimate the long-run and short-run coefficients using associated ARDL.

To examine the existence of the long-run relationship between the dependent variable and its determinants, an F-test procedure is followed for the joint significance of the coefficients of the lagged levels of the variables. Pesaran, *et al* (2001) propose lower and upper critical values for the F-statistic assuming all variables are I(0) for the lower bound and all variables are I(1) for the upper bound. If the computed F-statistic exceeds the upper critical value, then the null of no cointegration can be rejected irrespective of the order of integration of the variables. Conversely, if the test statistic falls below the lower critical bound, then the null of no cointegration cannot be rejected. However, if the test statistic falls between the lower and upper critical values, then the result is inconclusive.

3.4.3 Choice between Alternatives Models

In this study we have to choose between two rival models, where neither can be nested within the other i.e neither is a restricted version of other. We have two rival models called precautionary model and mercantilist model and one hybrid model as combination of both precautionary and mercantilist models. We employ J-test proposed by Davidson and MacKinnon (1981). This test is used for testing hybrid model. The non-nested tests of hypotheses arise in situations when the alternate hypothesis cannot be derived as a special case of the null

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hypothesis. This may arise either due to completely different sets of regressors in competing model specifications or different distributions of the stochastic terms.

3.4.3.1 Steps for J-test

1st step: We Estimate Model 1 here called precautionary model and obtain predicted values for Model 1.

2nd step: We Estimate Model 2 here called mercantilist model and obtain predicted values for Model 2.

3rd step: We add predicted values from Model 2 as an explanatory variable in Model 1 and then estimate again to obtain the new results. The augmented equation is as follows:

$$log\left(\frac{RES}{GDP}\right)_{t.} = \alpha_0 + \alpha_1 log(IM)_t + \alpha_2(IBCR)_t + \alpha_3 log(BOP\_u)_t + \alpha_4 log(APM)_t$$

$$+\alpha_5 log(ER\_u)_t + \beta\left(RES/GDP\right)_t^{M2} + \varepsilon_t$$

Where $\beta\left(\frac{RES}{GDP}\right)_t^{M2}$ is the predicted value from model 2.

4th step: We add predicted values from Model 1 as an explanatory variable in Model 2 and then estimate again to obtain the new results. The augmented equation is as follows:

$$log(\frac{RES}{GDP})_t = \beta_0 + \beta_1 log(td\_REER)_t + \beta_2 log(BOT)_t$$

$$+\alpha\left(\frac{RES}{GDP}\right)_t^{M1} + \varepsilon_t \dots \dots \dots \dots \dots \dots \dots \dots (2)$$

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Where $\beta \left(\dfrac{RES}{GDP} \right)_t^{M1}$ is the predicted value from model 1.

3.4.3.2.1 Test Statistics

We use t-statistics to test the following Null hypotheses one by one.

1) H_0 : $\beta = 0$

        H_1 : $\beta \neq 0$

2) H_0 : $\alpha = 0$

        H_1 : $\alpha \neq 0$

The first hypotheses tested to determine whether or not Model-2 can successfully challenged Model-1. Similarly the second hypotheses is tested to determine whether or not Model-1 is successfully challenged Model-2.

3.4.3.2 Decision Rules for J-test

1). If the predicted value of Model 2 when added in Model 1 is significant (using p-values) then we conclude that Model 2, here named as Mercantilist model, successfully challenges Model 1, here named as precautionary model.

2). If the predicted value of Model 2 when added in Model 1 is insignificant then we conclude that Model 2 is unsuccessful in challenging Model 1.

3). If the predicted value of Model 1 when added in Model 2 is significant then we conclude that Model 1 successfully challenges Model 2.

4). If the predicted value of Model 1 when added in Model 2 is insignificant then we conclude that Model 1 is unsuccessful in challenging Model 2.

We started with two model says, precautionary model equation 1 and mercantilist model equation 2. The idea is that if Model 2 is true, then the fitted values from the Model 1, when added to the first equation , should be insignificant and vice versa.

3.5 Variables Definitions and Construction

3.5.1 FER (Foreign Exchange Reserves)

FER holdings minus gold measured in Rupees. RES/GDP is ratio of FER to value of nominal GDP. Aizneman and Lee (2007).

3.5.2 BOP Uncertainty

BOP uncertainty denoted by *BOP_U* in this study, is generated by Actual value of BOP minus Forecasted (anticipated) values of BOP. Huang and Shen (1999)

3.5.3 Inter bank call rate

Different economists have used different proxies for opportunity cost of FER ranging from discount rate to government bond yield. We use IBCR as proxy for the opportunity cost.

3.5.4 Trade Openness/APM

This variable refers to the ratio of imports to GDP. Elbadawi (1990),Ford and Huang (1994). Aizenman and Marion (2002).

$$APM = IM/Y$$

Where IM and Y refer to imports and GDP respectively.

3.5.5 GDP

This study used quarterly data and data on quarterly GDP is not available in Pakistan. However, the quarterly estimates of GDP, derived from annual series by using econometric and statistical techniques are available, taken from PIDE (SPS). So we take the estimated quarterly GDP at market prices in calculating APM.

3.5.6 Imports

Imports represent the value of all goods and services received from the rest of the world. These imports needs FER. Our data consists of imports of goods and imports of services.

3.5.7 Exchange rate uncertainty

Exchange rate denoted by ER_U in this study, is calculated by monthly exchange rate minus monthly forecasted (anticipated) exchange rates.

3.5.8 REER

REER is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. An increase in REER implies that exports become more expensive and imports become cheaper; therefore, an increase indicates a loss in trade competitiveness. This exchange rate is expressed as the number of domestic currency per unit of foreign currency and accordingly a rise in the exchange rate indicates depreciation and decline indicates an appreciation of the Pakistan rupee. Aizenman and Riera-Crichton (2008), Khan (2013).

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Table I: Variables Data And Sources

Variables	Description	Source
FER	FER of Pakistan in US dollars	IFS (2016)
Imports	Imports of Goods and Services	IFS (2016)
Exports	Exports of Goods and Services	IFS (2016)
BOT	Exports divided by Imports	PBS(Pakistan Bureau of Staistics)
BOP	Current Account Credit divided by Current Account Debit	IFS (Internatioanl Financial Statistics (2016)
IBCR	Inter Bank call Rate	PBS
APM	Quarterly Imports divided by Nominal GDP	IFS(2016)
Exchange Rate	Monthly Exchange Rates	IFS (2016)
REER	Nominal Effective Exchange Rates divided by Price Deflator	IFS (2016)
GDP	Quarterly GDP at current prices	Publications of PIDE

Chapter 4

Results And Discussion

4.1 Introduction

This chapter presents and discusses the empirical results obtained for both the precautionary and mercantilist models by employing different econometric techniques. However, before estimation of the two models, the ADF test is applied for determining the existence of the unit and order of integration of all the variables involved. A data series that has mean and auto covariances depending on a time trend is said to be non-stationary.

4.2 Unit Root Tests

The ADF test results are presented in table 4.1which show that almost all the variables are non-stationary at level and showing trend. However, all the variables are stationary at first difference.

Table 4.1 ADF Test Results.

Variables	Order of integration	ADF Results	t-stat/p-value	Integration Order
logRES/GDP	Level	-1.4371	-2.8897/0.5613	I(1)
	1st difference	-8.1073	-2.8903/0.0000	
logIM	Level	-2.1905	-2.8897/0.211	I(1)
	1st difference	-9.1526	-2.8900/0.000	
logAPM	Level	-0.7224	-2.8897/0.8356	I(1)
	1st difference	-6.4212	-2.8903/0.0000	
IBCR	Level	-1.9839	-2.8909/0.2934	I(1)
	1st difference	-8.9746	-2.8909/0.0000	
logBOP_U	Level	-2.7768	-2.8900/0.0652	I(1)
	1st difference	-13.443	-2.8900/0.0000	
logBOT	Level	-2.7841	-2.8900/0.0641	I(1)
	1st difference	-16.043	-2.8900/0.0000	
logER_U	Level	-2.1253	-2.8900/0.2534	I(1)
	1st difference	-18.003	-2.8900/0.0000	
logREER	Level	-1.6304	-2.8998/0.4634	I(1)
	1st difference	-8.8497	-2.8998/0.0000	

4.3 ARDL Bound Test Results

Table 4.2 shows the ARDL bound test results for precautionary model. The results of bound test indicate that the value of F-statistics is greater than the upper bound value, even at 1% level of significance. Therefore, we reject the null hypothesis of no long run relationship. Hence the bound test gives us the evidence that their exist a long run relationship in our precautionary model. We can, therefore, analyze long run co-integration coefficients in the precautionary model.

Table 4.2: ARDL Bound Test Precautionary Model

Test Statistic	Value	k
F-statistic	4.7721	5
Critical Value Bounds		
Significance	Lower Bound (I0)	Upper Bound (I1)
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Note: Significance level 5%.

Table 4.3 shows the ARDL bound test results for mercantilist model. The results of bound test indicate that the value of F-statistics is greater than the upper bound value at 5% level of significance, Therefore, we can also reject the null hypothesis of no long run relationship. Hence the bound test gives us the evidence that their exists a long run relationship in our mercantilist model and, hence, we can move on to analyze long run co-integration coefficients of the mercantilist model.

Table 4.3: ARDL Bound Test Mercantilist Model.

Test Statistic	Value	k
F-statistic	5.3624	2
Critical Value Bounds		
Significance	Lower Bound (I0)	Upper Bound (I1)
10%	3.17	4.14
5%	3.79	4.85
1%	5.15	6.36

4.4 Short-run And Long-run Parameter Estimates of Precautionary Model

Table 4.4 shows the results of ARDL short run and long run coefficient of co-integration for precautionary model. Here the dependent variable is log of FER to GDP ratio and the explanatory variables are INTER BANK CALL RATE, log(IM),log(APM), log(BOP_U), log(ER_U). The value of Error Correction term (ECT) in Table 4.4 is negative sign and significant, which is required, this shows us the speed of adjustment towards long run equilibrium state. It indicates the speed of convergence towards long run. If this sign is positive and in significant then the there is no evidence of convergence towards long run. It also shows the long run causality running from explanatory variable to dependent variable.

Table 4.4 also shows the long run coefficients of ARDL. The estimated coefficients of the long-run relationship for precautionary model are significant for log(APM), IBCR and log(BOP_U) and insignificant for log(ER_U). As can be seen from the equation, we conclude that FER vary positively with the variations in the BOP. The positive sign of the variability measure is consistent with the intervention policy of the SBP i.e. the central bank plays an active role in the foreign exchange market. The sign of imports is also positive, which indicates positive scale elasticity in case of Pakistan. The sign of APM is also positive and significant. This is used as proxy for trade openness, as trade openness increases the demand for FER increases. However, the resulted sign of the APM is positive which is according to our expectations and consistent with the theoretical prediction of the traditional buffer-stock model. However, IBCR showed an unexpected positive sign. This positive sign of the IBCR shows that the opportunity cost channel might be of minimum importance for a developing country like Pakistan where a greater stock of FER can be used for multiple purposes i.e. stabilization of the rupee value in the foreign exchange market, imports payments, debt payments and inflation control etc. Edison

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(2003) and Aizenman and Marion (2004) mentioned that the opportunity cost of capital has little importance for most of the countries, because most of the studies found it insignificant or significant with wrong sign.

Table 4.4: Estimates of short-run and long-run coefficient of Precautionary Model

Dependent Variable: log(RES/GDP)				
Selected Model ARDL: (1,0,1,0,1,1)				
Short Run Cointegrating Form				
Variable	Coefficient	S.E	t-stat	Prob
(INTER BANK CALL RATE)	3.0308	0.8778	3.4525	0.0008
log(APM)	-3.8175	0.2511	-15.1995	0.0000
log(BOP_U)	2.8209	0.2804	10.0601	0.0000
log(ER_U)	0.3853	0.9841	0.3915	0.6963
log (IM)	0.1854	0.3886	4.674	0.0003
CointEq(-1)	-0.1721	0.0745	-2.3109	0.0230
Cointeq= log(RES/GDP) – (17.603*IBCR -19.2324* log(APM) + 16.3841* log(BOP_U) - 18.4203*log(IM)+10.5720*log(ER_U) + 15.6218)				
Long Run Coefficients				
Variable	Coefficient	S.E	t-stat	Prob..
INTER BANK CALL RATE	17.6036	10.5376	1.6705	0.0982***
log (APM)	19.2323	8.1499	-2.3598	0.0204**
log (BOP_U)	16.3841	6.8332	2.3977	0.0185**
log (ER_U)	10.5720	8.0757	1.3091	0.1937***
log(IM)	0.6998	5.0387	2.657	0.0001**
C	15.6218	24.6260	0.6343	0.5274

Note: (*), (**), and (***) are showing significance level at 1%, 5% and 10% respectively.

4.5 Short-run And Long-run Parameter Estimates of Mercantilist Model

The short run and long-run coefficients for mercantilist model are shown in table 4.5.The value of ECT in Table 4.4 is negative sign and significant, which shows the speed of adjustment towards long run equilibrium state. It shows us the speed of convergence towards long run. If this sign is positive and in significant then the there is no evidence of convergence towards long run.

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Table 4.5 also shows the long run coefficients of ARDL. The estimated coefficients of the long-run relationship for mercantilist model are statistically less significant for both log(REER) and log(BOT). The negative coefficient of the log(REER) lends support to the interpretation that countries accumulate FER to keep the exchange rate depreciated. This results supports the study of Prasad and Raju (2010), Kasman and Ayan (2013), where they find the same negative relation between FER and REER.

When countries accumulate FER, the REER decreases and the exports becomes less expensive. If the REER increases the results comes in expensive exports of that country. The value of log(REER) shows that a 10% decrease in log(REER) will result in a long run increase of 45% in RES/GDP ratio. This results supports the theory of mercantilist motive that depreciated real effective exchange rate increases FER in the long run. The country supply domestic currency to international market and demand for FER to depreciate the domestic exchange rate. Our results supports other studies like Aizneman and Lee(2007), Prabeesh et al (2009) and several other studies, where the value of exchange rate also negatively related with FER and not highly significant. The coefficient of export growth proxied by BOT is statistically significant and positive. It supports the view that countries accumulate FER to increase their export. The value of log(BOT) is 2.904 shows that a 10% increase in LBOT will lead to a 29% increase in FER. This value is also not highly significant. We concluded that mercantilist motive here is statistically significant but economically insignificant. Aizneman and Lee (2007) find that the variables associated with mercantilist motives namely export growth and depreciated real exchange rate are not highly significant, while the variables associated with precautionary motives are highly significant in sample of 128 countries. Our results are also consistent with Aizneman and Lee (2007) study.

Table 4.5: Estimates of short-run and long-run coefficient of Mercantilist Model

Dependent Variable: log(RES/GDP)				
Selected Model ARDL: (1,1,0)				
Short Run Cointegrating Form				
Variable	Coefficient	S.E	t-stat	Prob
log(REER)	3.0308	1.1083	2.7345	0.0074
log(BOT)	0.5062	0.1772	2.8556	0.0052
CointEq(-1)	-0.1721	0.0494	-3.4795	0.0008
Cointeq=log(RES/GDP) – (-4.5692*log(REER) + 2.9405*log(BOT) = 16.3841				
Long Run Coefficients				
Variable	Coefficient	S.E	t-stat	Prob..
log(REER)	-4.5691	2.0500	-2.2288	0.0281
log(BOT)	2.9404	1.3676	2.1499	0.0340
C	16.3841	9.5562	1.7144	0.0896

Note: (*), (**), and (***) are showing significance level at 1%, 5% and 10% respectively.

4.5 J-Test Results

This study used J-test proposed by Davidson and Mackinnon (1981) and the results are shown in table 4.6 and table 4.7. The steps of J-test are given in Chapter 3. In Table 4.6 we added predicted values of Model 2 i.e $log(RES/GDP)^{M2}$ in Model 1 and then estimated the model. The results show that the value of t-statistic for the regression coefficient of the variable is statistically insignificant. This shows us that mercantilist model is unsuccessfully challenges the precautionary model.

In table 4.7 we added predicted values of Model 1 $log(RES/GDP)^{M1}$ in Model 2 and then estimated the model. The results show that the value of t-statistics of the coefficient associated with this added variable is statistically highly significant. This indicates that precautionary model is successful in challenging the mercantilist model in explaining variations in accumulation of Foreign Exchange Reserves in Pakistan. Or we can say that Precautionary model is more applicable then mercantilist model in the context of Pakistan.

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We finally conclude from these results that Pakistan accumulates FER with a view of precautionary motive like other developing countries. These results supports other studies like Aizenman and Lee (2007), Prabeesh and Madhumathi (2009), where they find out that countries accumulate FER mainly for precautionary motive, and the variables associated with this motive are mostly significant.

Table 4.6 J-Test Results (Precautionary Model)

Dependent Variable: log(RES/GDP)				
Method: ARDL				
Maximum dependent lags: 1 (Automatic selection)				
Model Selection method: AIC				
Dynamic regressors (1 lag, automatic): IBCR log(APM) log(BOP_U) log(IM) log(ER_U)				
Fixed regressors: log(RES/GDP)^{M2} C				
Selected Model: ARDL(1,0,1,0,1,1)				
Variable	Coefficient	S.E	t-stat	Prob
log(RES/GDP)(-1)	0.6051	0.0801	7.5529	0.0000
IBCR	-1.0004	0.8848	-1.1316	0.2607
log(APM)	0.5336	0.2527	2.1115	0.0374
log(APM)(-1)	-0.4653	0.2168	-2.1461	0.0345
log(BOP_U)	1.2982	0.3438	3.7756	0.0003
log(ER_U)	-5.0671	0.9911	-5.1122	0.0000
lpg(ER_U)(-1)	2.7788	1.1569	2.4017	0.0183
log(RES/GDP)^{M2}	-0.1222	0.1233	-0.9910	0.3243
C	-13.4993	4.1776	-3.2313	0.0017

Table 4.7 J-Test Results (Mercantilist Model)

Dependent Variable: log(RES/GDP)				
Method: ARDL				
Maximum dependent lags: 4 (Automatic selection)				
Model Selection method: AIC				
Dynamic regressors (4 lagS, automatic): log(REER) log(BOT)				
Fixed regressors: log(RES/GDP)^{MI} C				
Selected Model: ARDL(2,1,0)				
Variable	Coefficient	S.E	t-stat	Prob
log(RES/GDP)(-1)	0.6085	0.1006	6.0478	0.0000
log(RES/GDP)(-2)	-0.1349	0.0912	-1.4792	0.1424
log(REER)	2.2398	1.0522	2.1285	0.0359
log(REER)(-1)	-2.3435	1.0679	-2.1943	0.0306
log(BOT)	0.2353	0.1752	1.3431	0.1824
log(RES/GDP)^{MI}	**0.5166**	**0.1068**	**4.8377**	**0.0000**
C	0.5062	1.6945	0.2987	0.7658

Chapter 5

Conclusion And Policy Recommendation

5.1 Conclusion

The Asian economies possessed the major part of foreign exchange reserves among the developing countries. However, this raised the question of what factors contributed to the stockpiled reserves accumulation in these countries. The literature is inconclusive. Some studies applied the buffer stock model by arguing that precautionary motives increased the stock of FER in these countries. In contrast, the others claim that the mercantilist motives triggered these FER holdings. The present paper seeks to answer this question in the context of Pakistan economy.

This study compares the importance of precautionary and mercantilist motives in the accumulation of FER by Pakistan utilizing quarterly data from 1990 to 2015. Previous studies for Pakistan analyze the role of the precautionary factors in the determination and adequacy of reserves demand and the role of mercantilist motive for FER demand. However, in this paper we examine the relative importance of both precautionary and mercantilist motive. We applied J-test proposed by Davidson and Mackinnon. The econometric estimates shows that Pakistan accumulate FER for precautionary motive. The variables associated with precautionary motives are statistically and economically important in explaining FER accumulation. In contrast, variables associated with mercantilist motives are statistically significant, but economically insignificant in accounting for the patterns of FER accumulation. These results also hold for most countries, including China as we see in the literature.

5.2 Policy Recommendations

Our study his several implications. First, hoarding of FER (mercantilist motive) is not being followed in Pakistan, which is the right approach given the BOP position in Pakistan. Second, the main driving factors for holding of FER in Pakistan is the precautionary motive, In particular the uncertainty associated with BOP and ER. Given the Past history of large scale fluctuations in ER and BOP, Pakistan his to maintain sufficient amount of FER to meet the unexpected demand. Currently the FER in Pakistan are $18bn, which is equalient to four months; imports. Although historically Pakistan have maintain less amount of FER, but is his to face severe crises because of this practice. To avoid any such situation, Pakistan could increase its FER up to the level of six months imports or even higher. To achieve this target Pakistan is to allow the nominal exchange rates to market condition, i.e to allow rupee to devalue according to PPP. This will allow Pakistan to buildup FER position and its BOP position.

References

Abdul, J. and Sheharyar, B. (2008). "The Optimal Demand For FER in Pakistan". *International Journal of Applied Econometrics and Quantitative Studies, Vol. 5, Issue. 1.*

Ahmad, A. H. and Pentecost, E. J. (2009). "Exchange Rates and International Reserves: A Threshold Cointegration Analysis" . In: *14th Annual Conference on Econometric Modelling for Africa, 8-10 July, Nigeria.*

Aizenma Joshua (2007). Comparing Hoarding Reserves in Latin America and East Asia, Mercantilism, Self Insurance or Smoothing Reer Volatility. *Quoted by Griffith – Jones S. and Ocampo Jose A. Paper Presented as SWFs workshop, London (2008).*

Aizenman, J. and Marion, N. (2003). The high Demand for International Reserves in the FAR East: What is going on? *Journal of Japanese Int. Economies 17, PP. 370–400*

Aizenman, J. and Marion, N. (2004). "International Reserve Holdings with Sovereign Risk and Costly Tax Collection. *The Economic Journal, Vol. 114, Issue, 497, PP. 569-591.*

Aizenman, J. Jinjarak, Y. and Park, D. (2011). "International Reserves and Swap Lines: Substitutes or Complements?". *International Review of Economics and Finance, Vol. 20, PP. 5-18.*

Aizenman, Joshua, & Lee, Jaewoo (2007). International reserves: Precautionary versus mercantilist views, theory and evidence. *Open Economies Review, 18(2), 191−214.*

Akinlo Olayinka, (2015). "Impact Of Foreign Exchange Reserves On Nigerian Stock Market" *International Journal of Business and Finance Research Vol. 9, No. 2, 2015, pp. 69-76.*

ARDL Modelling Approach: *International Journal of Economics and Finance Vol. 3, No. 1; February 2011.*

Bahmani-Oskooee, M. and Brown, F. (2002). "Demand for International Reserves: A Review Article". *Applied Economics, Vol.34, Issue 10, PP. 1209-1226.*

Black, S.W. (1985). "International Money and International Monetary Arrangements". *Handbook of International Economics, Vol. 2, PP. 1153-1193.*

Carvalho & Fry-McKibbin(2013). Foreign Reserve Accumulation and the Mercantilist Motive Hypothesis: A Latent Factor Approach. *Centre for Applied Macroeconomic Analysis ANU Research School of Economics. May 2013.*

Chaudhry et al (2011) Foreign Exchange Reserves and Inflation in Pakistan: Evidence from

Cheung, Yin-Wong, & Qian, Xingwang (2009). Hoarding of international reserves: Mrs Machlup's wardrobe and the Joneses. *Review of International Economics, 17 (4), 824–843.*

Chowdhury Niaz *et-al* (2014). "An econometric analysis of the determinants of foreign exchange reserves in Bangladesh". *Journal of World Economic Research 2014; 3(6): 72-82.*

Clark, P. B. (1970a). "Demand for International Reserves: A Cross-country Analysis". *Canadian Journal of Economics, Vol. III, No.4, PP. 577-94.*

Dooley, M. P., Folkerts-Landau, D. and Garber, P. (2003). "An Essay on the Revived Bretton Woods System ". *NBER Working Paper No. 9971.*

Dooley, Michael P., David Folkerts-Landau and Peter Garber. "The Revised Bretton Woods System." *International Journal of Finance and Economics* 9 (2004): 307-313.

Emmanuel Umeora Chinweobo (2013). Foreign Exchange Reserves Accumulation And Macro-Economic Stability: The Nigerian Experience: *International Journal of Business and Management Invention Volume 2 Issue 9| September. 2013| PP.150-157.*

Flood, R. and Marion, N. P. (2002) Holding international reserves in an era of high capital mobility, in Collins, S. M. and Rodrik, D. (eds.), *Brookings Trade Forum 2001*, Washington, D.C., Brookings Institution Press, pp. 1-68.

Flood, Robert and Nancy Marion. "Holding International Reserves in an Era of High Capital Mobility." IMF Working Paper No. 02/62 (2002).

Frenkel J. A. and Jovanovic B. (1981). Optimal International Reserves: A Stochastic Framework. *The Economic Journal, 91*(June).

Frenkel, Jacob A. "The Demand for International Reserves by Developed and Less-Developed Countries." *Economica* 41.161 (1974): 14-24.

Friedman, M. (1953) The Case for Flexible Exchange Rates. In *Essays in Positive Economics* 157–203. Chicago: University of Chicago Press.

Fukuda and Kon (2010). Macroeconomic Impacts of Foreign Exchange Reserve Accumulation: Theory and International Evidence: *ADBI Working Paper Series No:197.*

Heller, H.R.. "Optimal international reserves." *Economic Journal 76 (1966): 296–311.*

58

Heller, R. and Khan, M. (1978) The demand for international reserves under fixed and floating exchange rates, *IMF Staff Papers*, 25, pp.623-49.

International Monetary Fund (Various Issues) *International Financial Statistics*. Washington, D. C.: International Monetary Fund.

Kasman & Ayhan. (2008). Foreign Exchange reserves and Exchange rate in Turkey: Structural breaks, unit roots and Cointegration. *Journal of Economic Modeling*, 25: 83-92.

Kasman, A. and Ayhan, D. (2008). "Foreign Exchange Reserves and Exchange Rates in Turkey: Structural Breaks, Unit Roots and Cointegration". *Economic Modeling, Vol. 25, Issue. 1, PP. 83-92*.

Kelly, M., 1970. Demand for international reserves. *American Economic Review. 59, 655–667.*

Kemal, A. R., and M. Farooq Arby (2004) Quarterisation of Annual GDP of Pakistan. Pakistan Institute of Development Economics. (Statistical Papers Series No. 5.)

Khan Muhammad Tahir.(2013). Exchange Rate As A Determinant Of Fluctuation In Foreign Exchange Reserves: Evidence From Economy Of Pakistan. *Journal of Social Sciences and Humanities.*

Khan, K. and Ahmed, E. (2005). "The Demand for International Reserves: A Case Study of Pakistan". *The Pakistan Development Review, Vol. 44, Issue. 4, PP. 939-957.*

Lane, P. R., and Dominic Burke (2001) The Empirics of Foreign Reserves. *Open Economies Review, 18–32.*

Mishra, RK & Sharma, C 2011, 'The demand for international reserves and monetary equilibrium: new evidence from India', *Journal of Policy Modelling, vol.33, no.6, pp.901- 919.*

Moses K. Tule et al (2015). "Determination of Optimal Foreign Exchange Reserves in Nigeria" *CBN Working Paper Series CBN/WPS/01/2015/06.*

Narayan & K.smyth. (2006). The dynamic relationship between real exchange rate, real interest rate and foreign exchange reserves: empirical evidence from China, *Applied Financial Economics*, 16: 639-651.

Obstfeld, Maurice, Jay C. Shambaugh, and Alan M. Taylor. "Financial Stability, the Trilemma and International Rererves." *American Economic Journal: Macroeconomics* 2.2 (2010): 57-94.

Onoja Joan Egbe (MRS). "A Dynamic Analysis of the Determinants of International Reserves in Nigeria". *SSRG International Journal of Economics and Management Studies (SSRG-IJEMS) – volume2 issue1 January to February 2015.*

Ozyildirim, S., and Yaman, M. (2005). Optimal versus adequate international reserves: Evidence for Turkey. *Applied Economics, 37, 1557–1569.*

Pesaran, M. H., Shin, Y., and Smith, R. J. (2001). Bounds testing approaches to the analysis of long-run relationships. *Journal of Applied Econometrics, 16, 289–326.*

Prabheesh K.P. (2013). Optimum international reserves and sovereign risk: Evidence from India: *Journal of Asian Economics 28 (2013) 76–86.*

Prabheesha, K. P., Malathya, D. and Madhumathi, R. (2009). "Precautionary and mercantilist approaches to demand for international reserves: An empirical investigation in the Indian context". *Macroeconomics and Finance in Emerging Market Economies, Vol. 2, PP. 279–291.*

Ramachandran, M. (2004) The optimal level of international reserves: evidence for India, *Economic Letters,* 83, pp.365-70.

Romero Ana Maria (nd). Comparative Study: Factors that Affect Foreign Currency Reserves in China and India. *The Park Place Economist, XIII.*

Sehgal, S. and Sharma, C. (2008) A Study of Adequacy, Cost and Determinants of International Reserves in India, *International Research Journal of Finance and Economics ISSN 1450-2887 Issue 20 (2008) © Euro Journals Publishing, Inc. 2008.*

State Bank of Pakistan (Various Issues) *Annual Report.* Karachi: State Bank of Pakistan.

Sula, O. (2011). "Demand for international reserves in developing nations: A quantile regression approach". *Journal of International Money and Finance 30 (2011) 764–777.*

Tariq,M. *et al* (2014) Real Exchange Rate and FER: A Mercantilist View *Life Science Journal 2014;11(3s).*

Yu and Lu (2012). Does a correlation exist between the foreign exchange reserves and the exchange rate?: *Umeå School of Business and Economics Master thesis.*