# PRECAUTIONARY VERSUS MERCANTILIST APPROACH TO DEMAND FOR INTERNATIONAL RESERVES: AN EMPIRICAL INVESTIGATION IN INDIAN CONTEXT

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# PRECAUTIONARY VERSUS MERCANTILIST APPROACH TO DEMAND FOR INTERNATIONAL RESERVES: AN EMPIRICAL INVESTIGATION IN INDIAN CONTEXT

**Prabheesh K.P[*], Malathy D[#] and Madhumati R[$]**

## ABSTRACT

This paper empirically investigates the importance of precautionary and mercantilist approach to international reserves in Indian context using monthly data from 1993:06 to 2007:04. ARDL approach to cointegration is used to estimate the long-run relationship between reserves and its determinants. Empirical results show that reserves accumulation in India can not only considered as a precautionary savings against short-term volatile capital flows but also the result of under valued exchange rate polices followed by the central bank to make export competitive. We conclude that both the precautionary and mercantilist motives are relevant in reserve accumulation in India over the study period.

Keywords : Reserve demand; Foreign In5stitutional Investment, Cointegraton

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# 1.    INTRODUCTION

A striking phenomenon after the East Asian crisis is the huge increase in the global foreign exchange reserves from 900 billion in 1990, to 2990 billion US dollar in 2005. Despite most of the developing economies shifting from fixed to flexible exchange rate regime, which requires countries to maintain lower level of reserves to prevent any currency crisis, the share of these countries to the global reserves has also risen dramatically from 30 percent to 60 percent in the same period. Interestingly, the unprecedented rise in foreign exchange reserves with the Asian central banks, the major reserve holders, is a cause of concern among central banks for the reserve management policies.

Broadly, two alternative approaches are used to explain this unprecedented reserve accumulation in Asian economies. Firstly, the precautionary approach which considered reserve as a self-insurance against exposure to future sudden stop and reversal of capital flows. Financial integration of the developing countries has increased exposure to volatile capital flows or hot money, which are subject to sudden stop and reversal (Calvo, 1998; Edwards, 2004). The East-Asian crisis shows that the unprecedented capital flight at the time of crisis resulted in reducing the accessibility of these countries to international capital market. Similarly, the crisis also exposed the hidden vulnerabilities of East-Asian economies which forced the market to update the probability of sudden stop affecting all countries (Aizenman and Lee, 2005). Hence, the reserve accumulation with the central banks can be viewed a precautionary saving against volatile capital flows and its sudden stop.

An alternative explanation, mercantilist approach, argued that the reserve accumulation is the byproduct of the undervalued exchange rate polices of Asian economies to promote their exports. Dooley et al (2003) viewed Asian countries as periphery region which follow undervalued exchange rate policies to promote exports to central region, the US and this phenomenon led to an emergence of a new Bretton-Woods system. Therefore, they considered the reserve accumulation as a result of central banks' intervention activity in the foreign exchange market, to avoid the appreciation of domestic currency in order to keep the export competitiveness with trading partners. In

short, the precautionary approach to reserves express the concern over the sudden stop, capital flight and its volatility, whereas mercantilist approach viewed reserve accumulation as the impact of exchange rate and export policies of the country.

Empirical evidence of mercantilist argument over precautionary argument is very limited. Aizenman and Lee (2005) tested the relative importance of these approaches in the context of developing countries and found that the variable which captures the mercantilist concern was statistically significant, though; its magnitude of impact on reserves accumulation was almost zero. At the same time, the variable related to precautionary motive is found to be highly significant in explaining reserve accumulation.

The present study empirically tests the relevance of precautionary and mercantilist approach in explaining reserve accumulation in the Indian context. Though India has adopted flexible exchange rate regime after 1992, it holds more than 200 billion US dollar as international reserves as of end March 2007. This level of reserves accounts for more than 20 percent of India's Gross Domestic Product (GDP). Of this, the foreign investment is found to be the major source account for more than 50 percent of the reserve accumulation in India over the period 1991-2007 (RBI, 2007). The cumulative Foreign Institutional Investment touched 50 billion dollar by the end of March 2007(RBI, 2007). This increased flow of short-term capital in the form of Foreign Institutional Investment to the stock markets and its volatile nature can be a reason for this large reserve accumulation. Though, the greater exchange rate flexibility  mitigates the impact of shot-term capital flight, the cost of capital market crash as well as the impact of depreciation of domestic exchange rate due to capital flight are expected to be significantly large. Therefore, high reserves can be considered as a precautionary savings to mitigate the risk of shot-term capital flight.

Conversely, it is observed that the Reserve Bank of India (RBI) has been following a stable exchange rate regime with respect to US Dollar as compared to other foreign currencies (Patnaik, 2003). Evidence also suggests that the RBI has been intervening in the foreign exchange market whenever the Rupee appreciates but not when the Rupee depreciates (Ramachandran and Srinivasan, 2006). These observations provide

a case for investigating whether it is the mercantilist view that can better explain reserve accumulation in India for the period 1994- 2007.

While, a limited number of studies have empirically investigated the behavior of India's demand for international reserves, not much work has been done on testing the importance of mercantilist vis-à-vis precautionary motive. Ramachandran and Srinivasan (2006) argued that the reserve accumulation in India seems to be the result of asymmetric intervention of RBI in the foreign exchange market and that the precautionary hypothesis does not explain the upsurge of reserves. However, the study used only a small set of explanatory variables for a shorter time period. There is a dearth of studies examining the reserve accumulation process from the view of precautionary saving against the volatility of shot-term capital flows and the implication of keeping an undervalued real exchange rate of Rupee against the US dollar on the reserve accumulation. This study makes an attempt to test the importance of the two alternative views that seeks to explain reserve accumulation, by including specific variables to capture these motives such as the volatility of Foreign Institutional Investment and a measure of undervalued real exchange rate of Indian Rupee against the US Dollar.

In order to analyze the relative importance of precautionary versus mercantilist view, we use Auto Regressive Distributed Lagged Model (ARDL) approach to cointegration to estimate reserve demand function and GARCH estimation to derive the volatility measures of foreign institutional investment and exchange rate. The rest of the paper is organized as follows: section 2 deals with empirical model of reserve demand and is followed by a discussion on data and its source in section 3. The econometric methodology and empirical results are given in section 4 and section 5 presents conclusion.

## 2.    EMPIRICAL MODEL

There has been a spurt in research on demand for reserves since 1960s (Gruber, 1971). The empirical studies in Bretton-Woods period considered reserves as a function of scale transaction (transaction motive), uncertainty (precautionary motive) and opportunity cost (profit motive). However, in the post Bretton-Woods period, especially

till the 1990s, empirical studies incorporated exchange rate flexibility in the reserve demand function to study the stability of reserve demand function across exchange rate regime. Considering that the capital account venerability is the main source of financial crisis in nineties, the empirical studies in the post 1990s period incorporated variables which capture the vulnerability of capital account in reserve demand function. The present study incorporates volatility of foreign institutional investment to capture the precautionary motive of reserve holdings to volatile capital flows and the deviation of real exchange rate from its trend series to capture the mercantilist argument of undervalued exchange rate policies, along with standard explanatory variables of reserves. The empirical specification of reserve demand function is following

$$RES_t = \gamma_0 + \gamma_1 IM_t + \gamma_2 TB_t + \gamma_3 ER_t + \gamma_4 FII_t + \gamma_5 TD_t + \varepsilon_t \qquad (1)$$

Where RES, IM, TB, ER, FII and TD are international reserves, imports and treasury bill rate, exchange rate flexibility, volatility of foreign intuitional investment and the deviation of real exchange rate form its trend respectively. $\gamma_1, \gamma_2, \gamma_3, \gamma_4$ and $\gamma_5$ are the parameters to be estimated, $\gamma_0$ is the intercept, and $\varepsilon_t$ stands error term and t denotes time. All variables are expressed in logarithmic form.

We expect a positive relationship between reserves (RES) and imports (IM) since the high IM implies high transaction, which leads to high demand for reserves. The variable TB, a measure of opportunity cost, is expected to have a negative relation with RES because a higher opportunity cost is expected to lead to a reduction in reserve holdings because alternative investments become more attractive. Similarly, ER is expected to have a negative relationship with RES. Greater exchange rate flexibility would reduce the demand for reserves because central banks no longer need a large stock of reserves to manage a pegged exchange rate. In the same way, FII is expected to have a positive relationship with RES because high volatility in capital flows induces the central bank to hold high reserves as precaution. The variable TD, which captures the mercantilist argument for under valued exchange rate system, is also expected to have a positive relationship with RES. A positive TD indicates an undervalued real exchange rate of domestic to foreign currency. Therefore, a high TD would lead to high RES.

## 3.     DATA

In order to estimate the equation (1) we use monthly data from 1993:06 to 2007:04. The choice of beginning period can be attributed to the beginning period of Foreign Institution Investment in India. Most of the data series have been collected from various issues of the Reserve Bank of India publications such as Handbook of statistics on Indian Economy and monthly bulletin. In order to construct the real exchange rate of Rupee against the US dollar, the US Consumer Price Index has been drawn from the web site of US Department of Labor Bureau of Labor Statistic (www.bls.gov). The variables such as RES, IM, and FII are in crores of Rupee. The 91 days treasury bill yield rate has been taken for measuring TB. The exchange rate is expressed as the number of domestic currency per unit of foreign currency and accordingly a rise in the exchange rate indicate a depreciation and decline indicate an appreciation of India Rupee.

## 4.     METHODOLOGY AND EMPIRICAL RESULTS

To estimate equation 1, we have used the ARDL approach to cointegration developed by Pesaran, Shin and Smith (1996). First, we present the methodology used for constructing the variables such as ER, FII and TD as well as its empirical results in the following sub sections.

## 4.1     UNIVARIATE GARCH (1, 1) MODEL

In order to generate the volatility series of exchange rate and foreign institutional investment, we have applied univariate Generalized Autoregressive Heteroscedastic (GARCH) model developed by Bollerslev (1986). The main advantages of GARCH model as compared to traditional volatility estimation method such as rolling standard deviation etc are it helps to model the volatility clustering features of the data and

incorporates heteroscedasticity into the estimation procedure (Bollerslev, 1986). The GARCH (p, q) model specification can be written as

$$Y_t = \mu + \varepsilon_t$$
$$\varepsilon_{t/\Omega_{t-1}} : \ N(0, h_t) \qquad (2)$$

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon^2_{t-i} + \sum_{i=1}^{q} \beta_j h_{t-j} \qquad (3)$$
$$\omega > 0; \alpha_1, ..., \alpha_p \geq 0; \beta_1, ..., \beta_q \geq 0$$

Equation (2) is the conditional mean equation, where μ is the mean of $Y_t$. $\varepsilon_t$ is the error term conditional on the information set $\Omega_{t-1}$ and is normally distributed with zero mean and variance $h_t$. Equation (3) is the variance equation which shows that the one period ahead forecast variance, $h_t$, is based on past information and therefore it is called conditional variance. The conditional variance depends on three factors: the mean $\omega$; the news about the volatility from previous periods $\varepsilon^2_{t-i}$; and forecast variance from previous period $h_{t-j}$. The size and significance of $\alpha_i$ indicates the presence of the ARCH process or volatility clustering in the series. Similarly the size and significance of $\beta_j$ indicate the effect of GARCH. In the case of GARCH(1, 1) model, if $\alpha_i + \beta_j = 1$, then it indicates the persistence of a forecast of the conditional variance over all finite horizons and an infinite variance for the unconditional distribution of $\varepsilon_t$ (Engle and Bollaerslave, 1986). In other words, the current shock persists indefinitely conditioning the future variance. These models are called the Integrated-GARCH model or IGARCH model. Therefore, the testing for IGARCH is a test for unit roots in the conditional variance.

In order to derive the volatility of exchange rate, we follow GARCH (1, 1) model, where ht depends on only one lag of $\varepsilon^2_t$ and $h_t$. Since we found the exchange rate to be nonstationary in levels and stationary in first difference, the first difference series of exchange rate is considered for the mean equation. It is also found that the exchange rate follows an AR(1) specification by Akaike Information Criterion(AIC) and Schwarz

Criterion (SC) model selection criteria. Therefore, the mean equation is modeled with AR(1) specification. The results of GARCH (1, 1) are shown in the table 1.

The table 1 shows the presence of GARCH(1, 1) effect on exchange rate. The persistence measure, $\alpha_i + \beta_j$ is grater than one indicating a permanent shock to volatility. The Ljung- Box statistics failed to indicate serial correlation in the standardized residual as well as in standardized squared residuals at one percent level up to 10 lags. Similarly the ARCH effect could not be seen in the residuals in the model. Therefore, we select the GARCH (1, 1) to derive the volatility series of exchange rate.

**Table 1: GARCH (1, 1) Results of Exchange Rate**

$$Y_t = 0.0008 + 0.49\, Y_{t-1} + \varepsilon_t$$
$$(0.44) \quad (3.35)^*$$
$$h_t = 0.000008 + 0.86\, \varepsilon^2_{t-1} + 0.51\, h_{t-1}$$

$$(5.1)^* \quad (6.76)^* \quad (13.07)^*$$

Log $-$ Likelihood $= 521.88$, LBQ(10) $= 14.1[0.11]$, LBQ$^2$(10)
$= 4.2[0.89]$, ARCH(1) $= 4.22[.93]$, AIC $= -6.19$ SBC $= -6.09$

Note (*) indicates statistically significantly different from zero at 1percent level. p-Values are in square brackets. LBQ andLB Q$^2$ are the Ljung-Box test statistics for serial correlation in the standardized residual and squared standardized residual.

Similarly, the volatility of foreign institutional investment is also estimated through GARCH (1, 1) model. The result in the table 2 shows that the GARCH (1, 1) effect is significant in the conditional variance. The volatility persistence can be seen in this case also. The model diagnostics do not indicate serial correlation in the standardized and standardized squired residuals; and ARCH effect. Therefore, the variance of the series is used as the proxy for volatility of the FII investment.

**Table 1: GARCH (1, 1) Results of Foreign Institutional Investment**

| | | | |
|---|---|---|---|
| $Y_t =$ | 182.6 | $+0.55Y_{t-1}$ | $+\varepsilon_t$ |
| | (4.22)* | (7.27)* | |
| $h_t =$ | 16271 | $+0.38\,\varepsilon^2_{t-1}$ | $+0.67\,h_{t-1}$ |
| | (2.78)* | (3.99)* | (11.27)* |
| $Log - Likelihood = -1313$, LBQ(10) = 11.24[0.33], LB $Q^2$ (10) = 4.71[0.91], ARCH(1) = 0.20[.65], AIC = 15.88 SBC = 15.97 | | | |

Note (*) indicates statistically significantly different from zero at 1percent level. p-Values are in square brackets. LBQ andLB $Q^2$ are the Ljung-Box test statistics for serial correlation in the standardized residual and squared standardized residual.

## 4.2    HODRICK- PRESCOTT (HP) FILTER METHOD FOR TD

The deviation of exchange rate from its trend is calculated using Hodrick-Prescott (1997) or HP filter method. In literature, the variable which is used to capture the effect of undervalued exchange rate system is the deviation of Real Effective Exchange rate (REER) from its trend (Aizenman and Lee, 2006). In India, it is argued that RBI has not been targeting REER (Patnaik 2003). Therefore, REER is not considered for constructing undervalued exchange rate. Instead, we generate a real exchange rate series of Rupee versus Dollar, by considering the fact that the US as the India's major trading partner and the large foreign exchange transaction of Rupee takes place in US dollar. The real exchange rate is constructed using following formula

*Real Exchange rate of Rupee in terms of US Dollar = Nominal exchange rate * (US price level/Indian price level)*

Where, the US consumer price index (CPI) is taken for US price level, whereas the wholes sale price index (WPI) is taken as a proxy for Indian price level. Since the US CPI

is available in the base year 1980, the base year of Indian WPI (base 1993-94) has been changed to 1981-82 price level using splicing technique.

In order to derive the deviation of real exchange rate from its trend values, we use the HP filter procedure. The HP Filter is a smoothing method which is used to obtain a smooth estimate of the long-term trend component of a series. It has an advantage over simple de-trending procedure based on linear trend, that it is a time varying method and allows the trend to follow a stochastic process. Whereas, the traditional method assumes the trend series grows at constant rate. Whereas, the traditional method assumes the trend series grows at constant rate. HP computes the smoothed series $y^T$ of $y$ by minimizing the variance of $y$ around $y^T$, subject to a penalty that constrains the second difference of $y^T$. The HP filter chooses $y^T$ to minimize

$$\sum_{i=1}^{n}(y_t - y_t^T)^2 + \lambda\sum_{i=2}^{n-1}(\Delta y^T_{t+1} - \Delta y_t^T)^2 \qquad (5)$$

Where, $\lambda$ is the smoothing weight on $y^T$ growth and n is the sample size. In order to derive the series of TD, the deviation of real exchange rate from its trend, we take the deference between real exchange rate and the smoothed real exchange rate derived from HP filter.

## 4.3    ARDL APPROACH TO COINTEGRATION

To empirically analyze the log-run relationship and dynamic interactions among reserves and its' determinants, we used the Autoregressive Distributed Lagged (ARDL) approach to cointegration procedure developed by Pesarn et al (1996). This model has several advantages as compared to standard multivariate cointegration test such as Johansen and Juselius(1990). The first advantage is that this is a bound test procedure and it is simple to follow. This test can be applied irrespective of whether variables in the model are purely I(0), purely I(1) and mutually cointegrated. This avoids the pre-testing problems associated with standard cointegration test such as the classification of

variables into I(0) and I(1). Moreover, this test is relatively efficient in small and finite sample data size. In addition, this model takes sufficient number of lags to capture the data generating process in a general to specific modeling framework. The following simple model illustrates the ARDL approach

$$Y_t = \alpha X_t + \delta Z_t + \varepsilon_t \qquad (5)$$

Where $Y_t$, $X_t$ and $Z_t$ are variables in the model and $\varepsilon_t$ is stochastic error term and $\alpha$ and $\delta$ are parameters. The error correction specification of the equation (4) can be written as

$$VY_{t-1} = \alpha_0 + \lambda_1 Y_{t-1} + \lambda_2 X_{t-1} + \lambda_3 Z_{t-1} + \sum_{i=1}^{p} \beta_i VY_{t-i} + \sum_{i=1}^{p} \delta_i VX_{t-i} + \sum_{i=1}^{p} \gamma_i VZ_{t-i} + u_t \quad (6)$$

The first part of LHS of the equation (6) with parameter $\lambda$ s represents the long-run relationship and second part with $\beta$, $\delta$ and $\gamma$ represents the short-run dynamics of the model. If the null hypothesis $\lambda_1 = \lambda_2 = \lambda_3 = 0$ is rejected then there exist a long-run relationship between the dependent variable $Y_t$ and independent variables $X_t$ and $Z_t$ or there is cointegration. The ARDL approach follows a bound test approach to estimate the equation (6) to check the existence of long-run relationship. Using OLS method, an F-test for the joint significance of the null of $\lambda_1 = \lambda_2 = \lambda_3 = 0$ against $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq 0$ is used. Pesaran et al(1996) proposes a lower and upper critical values for the F-statistic assuming all variables are I(0)for lower bound and all variables are I(1) for upper bound. If the computed F-statistic exceeds the upper critical value, then the null of no co-integration can be rejected irrespective of the order of integration of the variables. Conversely, if the test statistic falls bellow the lower critical bound, then the null of no co-integration cannot be rejected. However, if the test statistic falls between the lower and upper critical values, then the result is inconclusive. In this stage, the unit root tests have to be carried out on the variables.

Once the cointegration is established, the next stage is to find the optimum lag length for each variable estimate to the equation (6). The ARDL method estimates $(p+1)^k$

number regressions, where p and k are number of lags and number of variables in the model respectively. The appropriate model can be selected using the model selection criteria such as AIC and SC. The SC will select a model with small lag length and a parsimonious model, while AIC selects a model with maximum relevant lag length. Then, the log run and short-run coefficient can be estimated and analyzed. The short-run dynamics are estimated through the error correction model, where the error correction term indicates the speed at which short-run disequilibrium is corrected to reach the log-run equilibrium.

In order to estimate the reserve demand equation, the optimum number of lags is chosen as 3. The results from bound test to check the cointegation is given in the following table.

**Table 4: Results from bound test**

| Dependent variable | F-Statistic | Probability | Conclusion |
|---|---|---|---|
| RES | 4.49 | 0.00 | Cointegration |

Table (4) shows that the calculated F-statistic is 4.49 and significant at 1 percent level. Thus the null of no cointegration is rejected and indicates there is a log-run relationship between reserves and its determinants. After the establishing of cointegration, the ARDL process estimates 363 regression equations and from which BIC criteria selected the ARDL (1,0,0,0,0) specification. The estimated long-run coefficients are given in the following table.

**Table 5: Estimated log run coefficients using ARDL approach**

| Regressor | Coefficient | t-ratio |
|-----------|-------------|---------|
| IM | 0.713 | 2.58* |
| TB | -0.155 | -3.36* |
| ER | -0.232 | -2.44** |
| FII | 0.327 | 1.81*** |
| TD | 0.317 | 1.73*** |
| C | 3.413 | 1.51 |

Note : *, ** and *** are statistically significantly different from zero at 1percent 5 and 10 percent levels respectively

Table (5) shows that all regressors of RES exhibit the expected sign and are statistically significant at 10 percent level or better. Since all variables are measured in log form, the coefficients can be interpreted as elasticity. The import elasticity is found to be 0.71, which is less than one, indicates a significant economies of scale due to holding reserves. More specifically, in order to import one unit of goods RBI has to stock 0.71 units of reserves. However, a one unit increase in opportunity cost and exchange rate flexibility decrease reserve holdings by 0.15 and 0.23 percent respectively. The less sensitive of reserve with respect to TB can be attributed to the massive accumulation reserves by the RBI without considering its opportunity cost of holding reserves.

The impact of FII on RES it is significant at 10 percent level and has the expected sign. A 1 percent increase in volatility of FII results in an increase in the reserves of about by 0.32 percent. This is the clear indication of precautionary motive of reserve accumulation against volatile capital flows.

The variable associated with mercantilist concern, TD, is statistically significant at 10 percent level and shows a positive sign. This finding indicates that a real depreciation of rupee against dollar leads to an increase in reserves. The impact coefficient of TD is found to be 0.31, which is almost equivalent to the impact of FII. This leads us to a conclusion that the mercantile argument of reserve accumulation is equally relevant as to the precautionary argument in explaining reserve accumulation in

India. Table (6) shows the error correction part of the equation (5) which shows the short-run dynamics of reserves and its determinants.

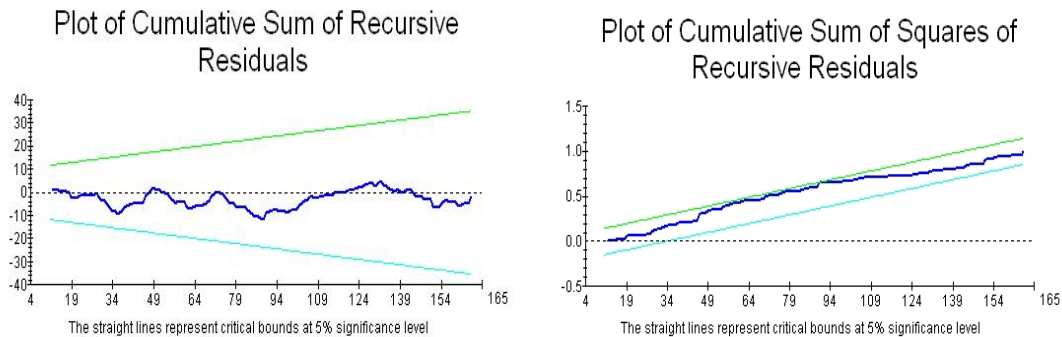**Table 6: Error Correction Representation for the ARDL model**

| Regressor | Coefficient | t-ratio |
|-----------|-------------|---------|
| ΔIM | 0.334 | 1.51 |
| ΔTB | -0.007 | -4.11* |
| ΔER | -0.0108 | -3.01* |
| ΔFII | 0.015 | 2.46** |
| ΔTD | 0.014 | 2.48** |
| C | 0.016 | 1.86*** |
| ecm | -0.046 | -3.08* |
| $R^2 = 0.23$ | | |
| Serial correlation at lag3($\chi^2$) = 0.87(0.83) | | |
| Heteroscedasticity at lag3 ($\chi^2$) = 2.69(0.44) | | |
| Functional form($\chi^2$) = 0.001(0.95) | | |

Note: *, ** and *** are statistically significantly different from zero at 1percent 5 and 10 percent levels respectively

In table (6) the error correction term (ecm) is found to be -0.04, which is significant at 1 percent level and has an expected sign. The coefficient of ecm indicate that around four percent of the deviation from equilibrium is eliminated within one month. The low ecm coupled with high reserve holdings in India seems to conform to Clark's proposition (Clark, 1970), that a country with a low speed of adjustment towards equilibrium would require a high level of reserves to finance its balance of payment. All variables in the error correction model are significant except IM and have expected sign also. It can also be seen that the variable FII and TD are significant at 5 percent level in contrast to long-run model. This may be due to the fact that the reserves in India are sensitive in short-run due to volatility of shot term capital flows as well as RBI intervention in the foreign exchange market. The model passes the diagnostic tests against serial correlation, heteroscedasticity and functional form misspecification. The

cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) plots (Figure 1) from a recursive estimation of the model also indicate stability of the coefficients over the sample period.

**Figure: 1 Plot of CUSUM and CUSUMQ for Coefficient Stability**



Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

## 5.    CONCLUSIONS

This paper has empirically investigated the importance of precautionary and mercantilist motives to the holding of international reserves in Indian context. The investigation is conducted by means of the ARDL approach to cointegration developed by Peseran et.al(1996) using monthly data from 1993 to 2007. The empirical log-run reserve demand function includes of explanatory variables such as imports, opportunity cost measure, exchange rate flexibility, Foreign Institutional Investment volatility and the deviation of real exchange rate from its trend. The volatility series of exchange rate and foreign institutional investment are derived from GARCH (1, 1) model. The deviation of real exchange rate from its trend is derived by applying HP filter method on real exchange rate of Rupee versus US Dollar.

The cointegration results indicate a log-run equilibrium relationship between reserves and its determinants. Foreign institutional investment volatility is found to have a significant effect on reserve, which through supports precautionary motive for holding reserve. The variable associated with mercantilist concern is also found to have a significant impact on reserves, which is all most equivalent to the impact of foreign

institutional investment volatility. This indicates that reserves accumulation in India is not only due to greater exposure to volatility of shot term capital flows but also due to the under valued exchange rate regime against the US Dollar. Therefore, it can be concluded that the precautionary motive as well as mercantilist motive are equally important in explaining reserve accumulation in India over the period of study.

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