The Demand for International Reserves:
A Case Study of Pakistan

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I. INTRODUCTION

Foreign exchange reserves have clear implications for exchange rate stability, financial markets, and hence, for overall economic activity. Stakeholders have different views about reserves holding. Some economists believe that foreign exchange reserves are useless and unutilised as Friedman (1953) criticised the fixed exchange rate system with the argument that it contains unutilised foreign exchange reserves. On the other hand, some economists argue that foreign exchange reserves should be there to smooth out the imbalances in balance of payments [see Kemal (2002)].

There is continuous debate about the need to hold reserves.[1] The critics are worried about the cost of holding reserves. The cost of holding reserves is the investment that nations must forego in order to accumulate reserves. In contrast, the supporters of reserves holding argue that the cost of reserves holding is small compared to the economic consequences of exchange rate variations. For instance, a depreciation in the value of the currency, caused by either financial crises or others internal or external shocks, may raise a country's costs of paying back debt denominated in foreign currency as well as its costs of imported items. Besides, it also creates high inflation expectations.

With high levels of foreign exchange reserves, monetary authorities can purchase national currency in the foreign capital markets, which helps to maintain its value. In summary, the rationale behind reserves holding includes financing external imbalances, intervening in foreign exchange markets and providing a buffer to cushion the economy against future exigencies.[2]

[1]See Aizaman and Marion (2002, 2002a).
[2]See Landell-Mills (1989).

As the proponents provide strong justification for reserves holding, it is essential to analyse further the determinants and optimal level of reserves. The question of the determination and adequacy of reserves has been widely discussed in the literature [see Heller (1966); Frenkel and Jovanovic (1981); Lane and Burke (2001); Flood and Marion (2001); Grubel (1971); Kenen and Yudin (1965); Kelly (1970); Frenkel (1974); Heller and Khan (1978); Clark (1970); Bassat and Gotlieb (1992); Claassen (1975); Courchene and Youssef (1967); Edwards (1983); Huang and Shen (1999), etc.]. The developed theory describes reserves holding as a function of variations in the balance of payments, the opportunity cost of holding reserves, the scale of the economy, trade openness, etc.

The traditional reserves demand theory is projected to have some deficiencies. [Badinger (2002)]. Firstly, it estimates the demand for international reserves in isolation from the domestic money market, thereby ignoring the implications of the monetary approach to balance of payments. Secondly, it faces the spurious regression problem because almost all studies estimate the demand for reserves using Ordinary Least Squares (OLS) method. Thirdly, most of the studies make use of the cross-sectional data, thus ignoring the institutional characteristics of individual economies.

This study attempts to overcome most of the problems existing in traditional literature on the determination of reserves. This study, making use of the Vector Error Correction Mechanism (VECM), presents evidence on this issue for the case of Pakistan which is a developing country. Exports of primary commodities, most notably cotton and textiles, are the main source of foreign exchange. Workers' remittances are also playing an important role in providing foreign exchange earnings. At the same time, foreign loans and aid also contribute in reserves accumulation.

Moreover, it is generally believed that the event of September 11 has contributed significantly in building-up such a huge amount of reserves. At the same time, the present government claims that the accumulation of reserves is resulted from the reforms started by the government in 1999 onward. The purpose of this study is to analyse the main determinants of reserves holding in Pakistan and also to see the implications of these structural shifts for the traditional reserves demand theory. Secondly, this study aims at finding the implications of monetary approach to balance of payments for reserves holding behaviour in Pakistan. Thirdly, the international accounts of Pakistan are more vulnerable to workers' remittances. The impact of remittances on reserves holding is also sought in this study. Lastly, so far no attempt has been made to work on the determination of reserves in case of Pakistan. Therefore, this study aims at contribution to the literature on international reserves in Pakistan. The rest of the study is organised as follows; Section II reviews the methodological framework and description of data; Section III gives empirical results of the study; while Section IV concludes.

II. METHODOLOGY AND DATA DESCRIPTION

II.1. Methodology

In this study we analyse the demand for international reserves in a cointegraion-error correction framework in case of Pakistan.

The Vector Error Correction (VEC) for the demand for international reserves and its determinants take the form

$$\Delta z_t = \sum_{i=1}^{p} \Gamma_i \Delta z_{t-i} + \Pi z_{t-1} + (\Psi D_t) + u_t \quad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (1)$$

where $z_t = (r, sd, mmr, apm, m, rm)$.

The terms r, sd, mmr, apm, m, and rm denote international reserves, variability measure of the variations in the balance of payments, money market rate, the average propensity to import, the level of imports and workers' remittances. The variable u_t represents random disturbance. D_t is a vector of exogenous variables and Ψ, Π, Γ_i are vectors of parameters. We follow Elbadawi (1990) in taking remittances as one of the explanatory variables of reserves. All the variables except the money market rate are in log form. The long run relationship of the following form is expected to be estimated.

$$r_t = \beta_1 + \beta_2 sd_t + \beta_3 mmr_t + \beta_4 apm_t + \beta_5 m_t + \beta_6 rm_t + u_t \quad \ldots \qquad \ldots \qquad (2)$$

where u_t= random term.

The relationship between balance of payments variability and reserves stems from the fact that reserves serve as a buffer stock whose role is to accommodate variations in external transactions. It is, therefore, expected that this relationship must be positive i.e. increased variability in the external accounts will cause an increase in the optimal level of reserves and vice versa. This study uses imports as a scale variable. Since, there is strong evidence in the literature that scale of international reserves affects reserves positively, so we expect that the sign of the elasticity of imports should be positive. The sign of the average propensity to import variable is not clear from the existing literature. On one side, the variable is taken as a proxy for the marginal propensity to import, which affects reserve negatively in the Keynesian Model.[3] While on the other hand it is used as a proxy for trade openness. This relationship should be positive as increased openness means increased vulnerability to foreign shocks, which should lead to increase in the demand for reserves.[4]

The opportunity cost of reserves, normally measured as the difference between the social rate of return on capital and the return on reserves, affects

[3]See Iyoha (1976).
[4]See Frenkel (1974).

reserves inversely. In this study, we use money market rate as the opportunity cost of reserves because of the non-availability of its true measure. The idea of using remittance in the analysis of reserves demand function is taken from the study of Elbadawi in 1990. A part of the remittances is declared and channeled through the official banking system and therefore becomes part of the supply. In addition to this part, a higher portion of the worker's remittances is undeclared and is channeled through the black market, private foreign exchange shops etc. in case of Pakistan. Nevertheless, undeclared remittances continue to be used to finance imports, travels, education abroad and other activities. In this way, the undeclared remittances also reduce pressure on the monetary authorities to accumulate reserves and therefore, we expect a significant negative effect of remittances on the demand for reserves.

In addition to the above variables, we also use a set of exogenous variables in our analysis. One of the exogenous variables is the domestic monetary disequilibrium. The justification for not using this variable in the set of endogenous variables is that the monetary approach to balance of payments assumes a short run effect of the domestic monetary disequilibrium on reserves.[5] So we are not including this variable in the cointegration equation. Instead we are looking for its short run role by incorporating it in the error correction equation as exogenous variable. The domestic monetary disequilibrium is defined as the difference between the actual money supply and the equilibrium demand for or supply of money that is

$$m - m^* = m - f(y,i) \quad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (3)$$

Where m, and m^* denote actual money supply and the estimated domestic demand for money while y and i represents GDP and interest rate respectively.

In addition to the domestic monetary disequilibrium, we also use dummies for structural shifts like the event of September 11, the military take over and the autonomy of State Bank of Pakistan. The September 11 dummy is justified on the ground that after this event, the reserves holdings of Pakistan are increasing continuously due to higher capital inflow while the reason behind the dummy for military take-over is to capture the effects of economic reforms of the present government. Seasonal dummies are also used to take care of the seasonal effects. For the autonomy of the State Bank of Pakistan, 1997 act has been taken into account. For the dummies of September 11, military take over, and the autonomy of the State Bank of Pakistan we take the value of 0 for time period before the event and 1 after the event.

Given the sufficient evidence regarding the unit-root properties of the time series, we are looking for the evidence of cointegraion between international reserves holdings and its fundamentals. The necessary condition for cointegration relationship is that the variables we are dealing with should be non-stationary. For checking the stationarity of the variables, the Augmented Dickey Fuller (ADF) has been applied. The results, given

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[5]See Badinger (2002).

in the next section, indicate that all variables are non-stationary at level. However, the test rejects the null hypothesis of unit root in case of the first difference of variables and hence, ensures that we are dealing with the integrated process of first order, I(I). So we can proceed further to test cointegration.

The test for cointegration crucially depends on the selection of the appropriate lag-length. The methodology of Sims (1980) has been used for the selection of the appropriate lag length. The results of the test suggest that the lag length of four quarters should be used.

The Johansen procedure for cointegration makes use of the two likelihood ratio (LR) tests for checking the number of cointegration vectors. On is the Trace-statistic and the other is the other is the Maximum Eigen Value-statistic. These tests are given as;

$$\lambda_{trace}(r) = -T * \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (4)$$

$$\lambda_{\max}(r, r+1) = -T * \ln(1 - \hat{\lambda}_{r+1}) \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (5)$$

where $\hat{\lambda}_i$ = the estimated values of eigenvalues

T= number of observations and r = the number of cointegrating vector.

The null hypothesis of the first test statistic (λ_{trace}) is that there are cointegrating vectors less than or equal to r while the alternative hypothesis is that there are more than r cointegrating vectors. The second test statistic (λ_{max}) tests the null hypothesis of r cointegrating vectors against the alternative of $r+1$ cointegrating vectors.

After determining the number of cointegrating vectors, we normalise the cointegrating vector with respect to the parameter of reserves, which gives us the long run estimates of the long run cointegration relationship.

For short run dynamic analysis of the demand for international reserves, we estimate the vector error correction mechanism. This estimation gives the speed of adjustment parameters or loading parameters, which tells us about the speed of adjustment of variables towards equilibrium from disequilibrium. After getting the speed of adjustment parameters, we check the stability condition of the overall system. The condition for error correction is given as

$$[\beta_{11}\ \beta_{12}\ \beta_{13}\ \beta_{14}\ \beta_{15}\ \beta_{16}] * \begin{bmatrix} \alpha_r \\ \alpha_{sd} \\ \alpha_{mmr} \\ \alpha_{apm} \\ \alpha_m \\ \alpha_{rm} \end{bmatrix} < 0$$

where β_{11}, β_{12}, β_{13}, β_{14}, β_{15}, and β_{16} denote the long run parameters of the cointegration relationship of the variables reserves, variations in the balance of payments, money market rate, average propensity to import, the level of imports and remittances respectively and the value of β_{11} is assumed to be equal to 1 for normalisation. While α_r, α_{sd}, α_{mmr}, α_{apm}, α_m, and α_{rm} denote the speed of adjustment parameters in the error correction models of reserves, variations in the balance of payments, money market rate, average propensity to import, the level of imports and remittances respectively.

If the identity 2.5 is less than zero, we conclude that the system is adjusting towards equilibrium from a disequilibrium position caused by a shock to the system and if it is positive, the conclusion is that the system does not revert to equilibrium if a shock occurs.

II.2. Data Description

The adequacy and reliability of data is the foundation of a meaningful and quality research. Committing any mistake either in the collection or in the making of data will result in erratic and misleading results. Therefore, looking to the importance of data, every possible care has been taken to ensure the reliability and consistency of data.

In the study quarterly data from 1982-1 to 2003-2 is used. The logic behind using quarterly data is that Pakistan shifted to floating exchange rate regime in 1982. Secondly, the annual data from 1982 to 2003 are insufficient for cointegration analysis. So we take the period of analysis from 1982 to 2003 on quarterly basis to avoid the rigidity of structural shift in the form of change in exchange rate regime and sample deficiency.

The primary source of data in this study is *International Financial Statistics (IFS)*, publication of International Monetary Fund (IMF). The second major source is *Statistical Bulletin*, publication of State Bank of Pakistan. Thirdly, for quarterly gross domestic product (GDP) the *Statistical Paper Series (SPS),* a publication of the Pakistan Institute of Development Economics (PIDE), has been used.

III. EMPIRICAL RESULTS

III.1. Results of the Augmented Dickey-Fuller (ADF) Test

The ADF test, which has three specifications, is applied according to the time series behaviour of the variables. We have plotted the data to check for trends in the series. Accordingly, the ADF-Test is applied by selecting specification of trend and intercept for those variables that show trends and only intercept for the other variables. In the selection of lag-length, Akaike Information Criterion (AIC) is used. The lag-length for which the AIC is the lowest is selected. Additionally, the residuals

are checked for serial correlations and normality by looking at their correlogram and applying Jarque-Bera statistic respectively.

The results of Augmented Dickey-Fuller (ADF) are given in Table 1. As can be seen from the table, the results show that all variables are non-stationary at their level and stationary in the first difference at the 5 percent level of significance. This implies that all the variables are integrated of order one or I(1). Since the variables are shown as non-stationary and also their order of integration is the same, so we can proceed to test for cointegration.

Table 1

Unit Root Tests Results

Variables	Lag Length	*t*-statistic	Variables	Lag Length	*t*-statistic
r	6	–0.998199	Δr	6	–3.600859*
sd_t	4	–1.839435	Δsd_t	4	–3.045584*
mmr	2	–2.295953	Δmmr	8	–3.324070*
apm	2	0.199299	$\Delta(apm)$	4	–5.073179*
rem	2	–0.444424	Δrem	2	–4.298454*
imp	6	–2.630006	Δimp	4	–4.929290*
i	6	–0.937179	Δi	6	–3.223115*
m	2	–2.911179	Δm	2	–10.88571*
y	4	–1.672628	Δy	4	–6.448215*
p	4	–1.922526	Δp	4	–5.951274*

Note: *Indicates significance at the 5 percent level of significance.

III.2. Estimation of the Demand for Money

Since the order of the integration of the variables is the same that is one, so we can proceed further to apply the Johansen methodology for checking the presence of cointegration among the variables.

The test is firstly, applied to the demand for money equation. In order to measure domestic monetary disequilibrium, we need the observed demand for money equation. To measure demand for money, the set of variables include real money supply, m, real Gross Domestic Product (GDP), y, and the government bond yield, i. All the variables except the government bond yield are in log form. We checked the variables for cointegration and the results of the Johansen maximum likelylihood statistics for the set of variables are given in Table 2. In the test the lag length of four quarters and seasonal dummies are used. The null hypothesis of the test is no cointegration between the real supply of money (m), Gross Domestic Product (y) and government bond yield (i). As can be seen from the table, the

Table 2

Johansen's Multivariate Cointegration Test Results

Null Hypothesis	Alternative Hypothesis		95% Critical Values	90% Critical Values
λ_{Trace} Tests		λ_{Trace} Value		
$r=0$	$r>0$	43.32398*	35.068	32.093
$r\leq 1$	$r>1$	8.767524	20.168	17.957
$r\leq 2$	$r>2$	0.115826	9.094	7.563
λ_{max} Tests		λ_{max} Value		
$r=0$	$r=1$	25.55646*	21.894	19.796
$r=1$	$r=2$	8.651698	15.752	13.781
$r=2$	$r=3$	0.115826	9.094	7.563

Notes: * Indicate the significance at 5 percent level of significance.
         VAR specification, Lag-length=4;
          Trace and Maximum-Eigen-Value Statistics without trend and intercept.

assumption of no cointegration has been rejected by both the trace and maximum eigenvalue statistics. The calculated values of both trace and maximum statistic are significant at 90 percent as well as at 95 percent.

The estimated long-run cointegrating relationship between money supply and its determinants is given below. The *t*-values are in the parenthesis and the sign '*' shows significance at 5 percent.

$$m^*=1.042881y-0.279175i \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (6)$$
$$(3.475^*)\quad (-2.150^*)$$

All the estimated parameters are significant at the 5 percent level and the signs of the coefficients are consistent with the theory that is the demand for money varies positively with income and negatively with the interest rate.

We do not go into the model of short-run, but our ultimate goal is to estimate monetary disequilibrium and to capture its effects on reserves. Following Elbadawi (1990), we compute monetary disequilibrium as follows;

$$m_{t-1}-m_t^* = m_{t-1}-1.043y + 0.279i \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (7)$$

And further, since the monetary approach to balance of payments assumes short run, so the term for monetary disequilibrium do not enter into the long run cointegrating equation of demand for reserves but instead enters into the Vector Error Correction (VEC) mechanism as exogenous variable.

III.3. Estimation of the Reserves Demand Function

The test for cointegration is further applied to another set of variables relating to the demand for reserves. The set of variables includes international reserves,

measure of the variations in the balance of payments, the money market rate, imports, average propensity to import and remittances. After elementary examination of the variables, we have found high multicollinearity between imports and average propensity to imports, so we have dropped the average propensity to imports from our analysis by following Badinger (2002).

Next the cointegration relationships among the variables, reserves (r), variations in reserves that is a proxy for the variations in the balance of payments (sd), money market rate (mmr), imports (imp), and remittances (rm) are investigated. The lag lengths of four quarters with seasonal dummies for three quarters have been used. Additionally, the dummies for structural changes such as the September 11 event ($ds11$), the autonomy of the State Bank of Pakistan ($dsbpa$), and the military take-over (dmt) are used as exogenous variables.

The results of Johansen Likelihood Ratio (LR) test for the final set of variables are given in Table 3. As can be seen from the table, the null hypothesis of no cointegration is rejected. The test refers for at most three cointegraion relationships as the calculated values of both the Trace-Statistic and Maximum-Eigen-Value-Statistic are greater than the critical values both at 95 percent as well as 90 percent. Because of the multiplicity of cointegraitng vectors, the explanation becomes difficult. However, the practitioners take first vector as the estimated long-run function. Therefore, we are taking only one cointegration relationship and normalising that relationship with respect to reserves.

Table 3

Johansen's Multivariate Cointegration Test Results

Null Hypothesis	Alternative Hypothesis		95% Critical Values	90% Critical Values
λ_{Trace} Tests		λ_{Trace} Value		
$r=0$	$r>0$	150.15*	75.328	71.472
$r\leq 1$	$r>1$	81.33*	53.347	49.925
$r\leq 2$	$r>2$	39.80*	35.068	32.093
$r\leq 3$	$r>3$	14.86	20.168	17.957
$r\leq 4$	$r>4$	1.01	9.094	7.563
λ_{max} Tests		λ_{max} Value		
$r=0$	$r=1$	68.82*	34.397	31.592
$r=1$	$r=2$	41.53*	28.167	25.611
$r=2$	$r=3$	24.91*	21.894	19.796
$r=3$	$r=4$	13.88	15.752	13.781
$r=4$	$r=5$	1.01	9.094	7.563

Notes: *Indicates significance at 5 percent level of significance.
　　　VAR specification, lag-length 4.
　　　Trace and Maximum-Eigen-Value Statistic for the specification of with-intercept in and no-trend in the cointegration equation.
　　　Ds11, dsbpa, dmt and three seasonal dummies as exogenous.

The estimated cointegration relationship is given as;

$$r^*=0.722sd-0.150rm-0.426mmr+0.699imp+3.776 \qquad … \qquad … \qquad (8)$$
$$\quad(7.81^*)\ (-1.27)\ (-5.36^*)\quad(5.03^*)\quad(4.04^*)$$

The estimated cointegration relationship shows that all the variables except remittances are significant at five percent level of significance. The terms in the parenthesis are the corresponding *t*-statistics and the sign '*' shows significance at 5 percent level. Moreover, the sign of the coefficients are according to the theoretical expectations. As can be seen from the equation, we conclude that reserves vary positively with the variations in the balance of payments. The positive sign of the variability measure is consistent with the intervention policy of the State Bank of Pakistan 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. While the relationship of reserves with remittances and the money market rate, which is a proxy for the opportunity cost of holding reserves, is negative. The elasticity of remittances shows that increase in remittances reduces the need for foreign exchange reserves. The reason of the insignificance of remittances may be the exclusion of the huge portion of remittances which is coming through the unofficial channels. The explanation of the negative sign of the money market rate is that as the interest rate rises, the cost of holding reserves rises and hence reserves decline. So at high rate of interest, the government of Pakistan prefers adjustment policies instead of reserves holding. So in case of Pakistan the trade-off between reserves holding and the speed of adjustment policies is confirmed.

III.4. Vector Error Correction Model

The short run model is also estimated for dynamic analysis. This model is estimated by employing vector error correction mechanism, assuming one cointegration relationship. In the analysis, the domestic monetary disequilibrium, dummies for the event of September 11, autonomy of the State Bank of Pakistan and military take over along with seasonal dummies are used as exogenous variables. The lag length of 4 quarters is used. The results of the vector error correction give the following speed of adjustment parameters, as given in Table 4.

The speeds of adjustment parameters, given in Table 4, indicate that the only variables that adjust to disequilibrium in the previous quarters are variations in the balance of payments and the money market rate. The rates of adjustment of variability measure and money market rate are 64.6 percent and 174 percent respectively. While the insignificant variables i.e. reserves, imports and remittances, show 7 percent, 6 percent and 11 percent adjustment to disequilibrium within the

Table 4

The Speed of Adjustment Parameters

Variables	Estimated Coefficients	*t*-values
α_r	−0.074	−0.462
α_{sd}	0.646	4.93*
α_{mmr}	−1.740	−2.05*
α_{imp}	−0.059	−0.446
α_{rm}	−0.111	−0.840

Notes: * Shows significance at 5 percent level of significance.

first quarter. However, the necessary condition of error adjustment in the overall system is that

$$[\beta_1 * \alpha_r + \beta_2 * \alpha_{sd} + \beta_3 * \alpha_{mmr} + \beta_5 * \alpha_{imp} + \beta_6 * \alpha_{rm}] < 0$$

Substituting the estimated values of the parameters, the left hand side of this inequality is computed as −1.26, which is negative as required. So, we conclude that error correction is occurring that is if a shock occurs to the system there are forces that lead the system back to equilibrium. The estimated dynamic error correction model for reserves is given as

$$\Delta r_t = -\underset{(-0.462)}{0.046} - \underset{-(0.499)}{0.074}(r_{t-1} - 0.722sd_{t-1} + 0.426mmr_{t-1} - 0.699imp_{t-1}$$

$$+0.150rm_{t-1}) \quad -\underset{(-1.72*)}{0.355}\Delta r_{t-2} - \underset{(-0.970)}{0.210}\Delta r_{t-3} + \underset{(0.948)}{0.143}\Delta sd_{t-2}$$

$$+\underset{(2.358)*}{0.315}\Delta sd_{-3} - \underset{(-1.27)}{0.409}\Delta imp_{t-4} - ....$$

$$\underset{(-1.05)}{0.227}ds11 + \underset{(1.78*)}{0.243}dsbpa - \underset{1.762**}{0.050}ec_{t-1} \quad ... \quad ... \tag{9}$$

R^2=0.42   F-statistic=1.91[6]   Q-Stat =1.26   Jarque- Bera=2.99

The value of R^2 is low; however the value of *F*-statistic is slightly significant. This implies that the overall fit is all right. So, we conclude that the implications of these variables for reserves are also significant in the short run. The insignificance of *Q*-statistic and Jarque-Bera-statistic rejects the presence of autocorrelation and non-normality factors in residuals.

In the error correction model given by Equation 5.8, we have taken only the coefficients whose *t*-statistic values are roundabout 1 or greater than 1. In the error correction model for international reserves, the speed of adjustment coefficient is not significant which means that adjustment is not taking place in the first quarter. However, its coefficient is negative which means that if actual reserves in a

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[6]The value of *F*-statistic was misprinted in the earlier version, so the correction here is being made with regret for the earlier error.

particular quarter are higher than the desired level of reserves, the actual reserves will fall in the next quarter. The coefficient of the speed of adjustment points out that only 7 percent of the deviation from disequilibrium is eliminated within the first quarter.

The only significant endogenous variables are lagged changes in reserves and lagged changes in standard variation which shows variations in the balance of payments. Changes in the lagged reserves adjust in second quarter while changes in standard deviation adjust in the third quarter.

The excess credit is significant at 10 percent level of significance and has the expected sign at lag of 1. Thus the excess credit is in compliance with the monetary approach to balance of payments in case of Pakistan. To put it differently, the excess supply of domestic component of credit leads to a reduction in reserves. The dummy variable for the autonomy of State Bank of Pakistan is significant at 10 percent level of significance. This implies that the autonomous statue given to state bank has caused an increase in the amount of reserves.

None of the other exogenous variables are significant in the error correction mechanism. The dummies for September 11 event and the military take-over have insignificant negative coefficients. While in practice, the huge build of international reserves in case of Pakistan occurred after the incidence of these structural shifts. The reasons might be that after the occurrence of these events the time period taken into account in this study is small while the time period before these events is very large.

IV. CONCLUSION

IV.1. Findings of the Study

Reserves holdings matter not only for shaping exchange rate policy, but also in the context of increased interest in the subject in the face of increasing globalisation of economies, integration of financial markets, and the financial and currency crises of the 1990s. So, issues related to the equilibrium of international reserves, its determinants and its departure from equilibrium are widely discussed in the debates of economic policy-making. In spite of its importance, no serious attempt has been made to work on the determinants of international reserves in case of Pakistan. Therefore, we have made an endeavour to determine the long run and short run determinants of Pakistan's international reserves holding and hence, contribute to the literature on reserves in case of Pakistan. We have also considered the role of monetary disequilibrium in the short run along with the other determinants in the explanation of international reserves holding.

In the context of cointegration-error correction framework, we have analysed Pakistan's reserve demand using the quarterly data over the period 1982:1-2003-2 and found that there exists a stable long run reserve demand function in case of

Pakistan. In the period of analysis, Pakistan's long run reserves policy appears to have been guided by the scale of foreign trade (imports), uncertainty (variations in the balance of payments) and the opportunity cost of holding reserves (money market rate). These three variables are considered central to the theory of optimal reserves theory. Our results are compatible with the previous work on the determinants of international reserves holdings. In other words, our results confirms that variations in the balance of payments and imports cause reserves positively while reserves vary inversely with its opportunity cost and all the relationships are significant in this study.

In addition to the above three variables, we also used remittances as one of the long run determinant of reserves holding.[7] The remittances turn out to be insignificant in the long run determination of international reserves. However, the negative coefficient of the remittances is consistent with the results of Elbadawi (1990). The inverse relationship between reserves holding and the remittances of expatriate Pakistanis working abroad is the indication of fact that remittances reduce the levels of required reserves. The reason for the insignificance of the variable may be perhaps the exclusion of a huge portion of remittances, channeled through black market, from the analysis.

Further, the analysis of short run dynamics signifies that reserve management seems to be rather inactive in terms of the speed of adjustment or in other words, the speed of adjustment parameter is insignificant in the error correction mechanism. On average, some 7 percent of the deviation from the long run equilibrium is eliminated within one quarter through adjustments in the level of reserves.

Moreover, in the short run, reserves movements are additionally driven by the domestic monetary disequilibrium, confirming the implications of monetary approach to balance of payments in case of Pakistan. However, the coefficient of domestic disequilibrium is less than one, which means that the State Bank of Pakistan does not leave it all to induced reserves flows to eliminate the imbalances in the national money market. The coefficient of domestic monetary disequilibrium is 0.5, which means that 50 percent of domestic monetary disequilibrium is eliminated by changing domestic credit while the remaining 50 percent is eliminated by the changes in reserves.

Also in the short run, reserves respond positively to the variations in the balance of payments and negatively to its own lagged changes. This implies that variations in the balance of payments play an important role both in the short run as well as in the long run. The dummy variable for the autonomy of the State Bank of Pakistan is also significant in the error correction mechanism and implies that the autonomy of the central bank has a significant positive impact on reserves holdings.

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[7]We take remittances because remittances play a significant role in the international transactions of Pakistan. Elbadawi (1990) used this variable for the first time in a case of Sudan.

IV.2. Policy Implications

For a small open economy like Pakistan a high quantity of reserves is necessary for the country's overall macroeconomic policies, for the assessment of the credit agencies of a country's credit-worthiness, to honour external debt obligations and to defend her in the event of untimely capital flights. However, there is an overall economic cost involved in reserves holding. The cost of holding reserves is the investment that nations must forego in order to accumulate reserves.

Keeping in view these arguments, a few recommendations are given with regard to the reserves holding behaviour of developing countries, in general, and for Pakistan, in particular.

- The significance of the money market rate is the indication of the significant opportunity cost of reserves holding which in other words implies that there exist a trade-off between adjustment policies and reserves holding policy in the correction of balance of payments disequilibrium. As a consequence adjustment policies for eliminating balance of payments imbalances and reserve holding policy should by conducted in coordination with each other. This coordination will help in the determination of the true level of required reserves. The choice of instrument between the two alternatives should be based on the relative cost of each. Reserves holding should be preferred in case where the marginal cost of reserves holding is smaller than the marginal cost of an adjustment policy.

- Secondly, our results confirm that variations in the balance of payments are the primary cause of reserves holding both in short run as well as in the long run. Therefore, authorities should also try to minimise the imbalances in the international account by taking other measures such as enhancing exports by ensuring quality and competitiveness, attracting foreign direct investment by providing good-looking and friendly domestic investment environment and deflation in times of serious balance of payments deficits. All these measure will go a long way in reducing the need for holding reserves.

- Thirdly, regular receipts of amounts from workers' remittances reduce the need of reserves holdings. All possible measure should be taken in this regard to channel these remittances through official banking channel. For instance, one of them is to reduce the gap between private market exchange rate and official rate of exchange.

- Finally, the results indicate that the State Bank of Pakistan remained rather inactive in reserves management in the past. Therefore, steps should be taken to restructure reserves management to enhance its performance.

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Comments

The need to have a study on the demand for international reserves for Pakistan cannot be overemphasised. Every country must have adequate reserves to meet the unforeseen variations in its balance of payments as well as fluctuations in the global foreign exchange market. However, the present study by Messrs Khan and Ahmed is deficient on numerous counts specially in the areas of theoretical foundations, research methodology and derivation of policy implications.

In the contest of theory of demand for international reserves the authors have referred to Milton Friedman (1953) in which he had highlighted the limitations of fixed exchange rate system and had advanced the case for introducing freely floating exchange rates in the world economy. He had suggested that under a freely floating regime of exchange rates, the demand for international reserves will be minimised. If the authors had conducted their research to test Militon Friedman hypothesis in the context of Pakistan economy, it would have been a useful contribution. However, no effort has been made by the authors to examine this hypothesis even though Pakistan had introduced a floating exchange rate system in 1982 which is still in vogue even to day.

A major problem with the paper stems from an excess dose of mechanics supported with limited diagnostics. The paper is replete with application of current econometric methods and tests such as Augmented Dickey Fuller (ADF) Test, Sims Test. Trace Static, Maximum Eigen Value-Statistic, Cointegration Techniques. Stationarity Tests and so on without providing adequate and acceptable justification for using these techniques and tests.

In the context of model specification for determining the demand for international reserves, the main problem with the paper is that it fails to properly differentiate factors affecting the demand for international reserves and those affecting its supply. The main equation specifying the demand for reserves includes independent variables such as variability of balance of payments, money market rate, average propensity to import, level of imports and workers remittances. The inclusion of workers remittances in this model is confusing because remittances affect the supply of international reserves. If the supply factors are to be included in the demand for reserves equation then there is equal justification for including exports, foreign aid and loans, Saudi Oil Facility and other variables of foreign exchange market which increase the supply of reserves in Pakistan.

In the paper, the quarterly data for the period 1982-1-2003-2 has been used. At the same time, the paper tries to analyse the demand for reserves for short term as well as long term. The real questions arises that when the data is on quarterly basis,

how to make a distinction between the short run and the long run. This distinction is important as different conclusions have been drawn by the authors for the two periods without offering justification for these conflicting conclusions.

While estimating the demand for international reserves for Pakistan, the authors have numerous misspecified equations. For example, the common dependent variable is the foreign exchange reserves while one of the independent variables included in the equation is "variability in the balance of payments", which has been proxied by the variability of reserves itself. In other words, there is a close correlation between the dependent variable and independent variables indicating the spurious nature of regression model used for estimating demand for international reserves for Pakistan.

One of the most striking observations relates to testing the significance of the estimated variables in the regression equations. In their estimated co-integration equation for reserves, the authors have declared remittances as a significant variable even through its t-value is just 1.27. But authors have claimed "that although the calculated value of t-statistics is lower than 2 in case of remittances but according to the rules of econometrics we may not eliminate the variable from our analysis as its t-value is greater than 1". This is an amazing conclusion as no text-book of econometrics would support the contention of the authors regarding tests of significance of the exogenous variables. It appears that the authors are laying the foundations of a new system of regression estimation and a new type of econometric theory.

Lastly, there is a clear disconnect in the paper between the main findings of the paper and the policy implications it has suggested. For example, the authors claim that State Bank of Pakistan has remained rather inactive in reserve management in the past which is an overstatement and may not be supported by actual policy stance and specific measures for reserve management adopted by State Bank of Pakistan. Concurrently, it must be kept in the mind that State Bank itself has its limitations in managing international reserves in an environment characterised by liberalisation, deregulation and greater openness of the economic system under pressures from the IMF, the World Bank, and the World Trade Organisation (WTO).

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