Real Exchange Rate and Foreign Exchange Reserves: A Mercantilist View

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Abstract: Previous studies assessed the determinants and optimality of foreign exchange reserves holdings for Pakistan in the setting of a buffer stock model. This paper extends the analysis to the interaction between the real exchange rate and foreign exchange reserves in the context of the mercantilist approach over the sample 1973-2008. Our findings show that reserves holdings in Pakistan is the by-product of the export led growth strategies of through real exchange rate depreciation. Also the floating regime switches policies of the State Bank of Pakistan boosted up the foreign exchange reserves holdings. These results are well in line with the empirical findings of many studies on other Asian countries.

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1. Introduction

The ECB[1] report in 2006 shows that during the last decades the world reserves assets increased of a great deal despite the fact that most of the countries has evolve away from the fixed exchange rate systems to the flexible exchange rate regimes (Pineau and Dorrucci, 2006). Prabheesh et al (2009) pointed out that the global reserves reached 5960 dollars in 2007 with a share of 72% by the developing countries. However, despite the substantial growth in the reserves [2] stocks of both the developed and developing countries, this accumulation has mostly been observed in the Asian economies (Ibrahim, 2011), whose reserves surpassed any benchmark level required to protect the economy against the internal and external shocks (Park and Estrada, 2009). Aizenman, et al. (2011) states that during 2008 the stock of Asia's [3] reserves surged to 3,371 billion dollars with a share of 65% in total global reserves. This large build-up of the foreign exchange reserves (FER henceforth) in these countries raised the attention of the researchers and the policy makers towards the exploration of its possible factors (Cheung and Xingwang, 2009).

However, when coming to the discussion what factors determine the FER holdings, it is still a moot question in the literature (Gandolfo, 1995; Badinger, 2004). Some researchers use the precautionary approach for its modeling whereas other prefer to apply the mercantilist approach [4] (Jo, 2011). The

[1] European Central Bank.

[2] Foreign exchange reserves are held by the monetary authorities in form of currencies, deposits, securities, monetary gold and special drawing rights (SDRs) with the International Monetary Fund etc. (Flood and Marion, 2002). Heller (1966) that the reserves currency must possess the quality of the acceptance of all times and its value must be known with certainty. Whereas, the foreign exchange reserves (FER) are the financial assets which help the countries in times of emergencies, for the correction of the balance of payments, stabilization of the currency exchange rate, financing the external debt liabilities and it signals about the financial strengthening of a country and increases the acceptability of their public and private financial instruments (Clark, 1970a; Cohen, 1979; Sarno and Taylor, 2001; Bahmani-Oskooee and Brown, 2002; Chan, 2007) and lack of it can results in vulnerabilities in the financial and economic systems of country (Grabel, 1995; ; Huang, 1995; Fischer, 2001; Kose, et al, 2006).

[3] These Asian economies are: China, Japan, India, Korea, Singapore, Hong Kong , Malaysia, Thailand, Indonesia, Philippines, Viet Nam, Kazakhstan and Pakistan etc. Terada-Hagiwara (2005) also mentioned that the IMF report(2003) shows that the reserves accumulation of these countries has become much higher than warranted.

[4] Another approach used for modeling the foreign exchange reserves is the monetary approach to the balance of payments where the disequilibrium in the money market results in the changes in the international reserves (Frenkel,

precautionary approach measures the FER demand in a buffer stock or inventory modeling setup applied by a number of recent studies (see, Kenen and Yudin, 1965; Kelly, 1970; Frenkel and Jovanovic, 1981 Johanson, 1996; Frenkel and Jovanovic, 1980; Bahmani-Oskooee, 1985; Distayat, 2001; Bird and Rajan, 2003; Aizenman et al., 2007). It is based on the argument that reserves accumulations in the Asian economies has mostly been driven by the precautionary motives. Calvo and Mendoza (1996) and Edwards et al. (2004) explained that the growing financial and economic integrations among the Asian economies increased their exposure to the external shocks, hence the policy makers in these countries following the tight adjustment policies use the foreign exchange reserves as a “war chest” against these external inequalities and capital drain etc. Although the buffer stock model is based on the important objectives of tight adjustment policies against shocks for smoothing the trade imbalances and keeping the balance between the costs and benefits of foreign exchange reserves. However, the buffer stock model is criticized by many economist on the ground that it does not account for the accumulation of reserves with such a striking rates in the present environment of the “growing capital mobility, higher exchange rate flexibility, rapid growth in financial market innovations and increasing global financial integration” (Black, 1985: Cheung and Sengupta, 2011).

In contrast, supporters of the mercantilist approach argue that FER accumulations in the Asian countries is the result of the export competitiveness[5] desires of these countries by keeping the exported goods prices low through devaluations (Dooley et al., 2003; Aizenman and Lee, 2007). Dooley, Folkerts-Landau, and Garber (2003) and Eichengreen (2004) mentioned that for modeling the FER holdings in the Asian countries the mercantilist approach is the right selection as most of these countries follow the export let growth strategies through devaluation of their currencies. Ramachandran and Srinivasan (2007) concluded that reserves upsurge in India does not explain by the precautionary measures. Aizenman, Lee, and Rhee (2007) in his study mentioned that reserves holdings is the outcome of the exchange rate and export policies of the monetary authorities in Korea. Yeyati (2008) found out that recent developments in the reserves accumulations of the developing countries is because of the mercantilist objectives of these countries for preventing export competitiveness.

All the above discussions show that it is still an open debate either to apply the precautionary or the mercantilist approach for modeling the FER. However, despite these widespread theoretical and empirical concerns about the modeling of the FER, one issue which received minimum attention is the relationship between the real exchange rate and the FER holdings. The literature provides only one[6] study of Kasman and Ayhan (2008) who applied the co integration and granger causality tests for investigating the relationship between the exchange rates (nominal and real effective) and foreign exchange reserves in Turky by using monthly data over the period 1982-1 to 2005-11. Their results show a long run relationship between both the variables. However, they mentioned that the direction of the relationship is from the foreign exchange reserves to the real effective exchange rate. Whereas, for the nominal exchange rate they stated that its granger cause the FER.

In the same way the relationship between the exchange rate systems and the FER is equally an indecisive issue in the literature. For example, Kelly (1970) during the fixed exchange rate regime the central banks keeping a large quantity of domestic and foreign currencies to keep the pegged price stable. Archibald and Richmond (1971) concluded that exchange rate systems[7] affect the FER holdings and its demand increases under the fixed regime as it works as a buffer stock for keeping exchange rates fixed. Elbadawi (1990) added that under a fixed exchange rate system, keeping a reasonable level of FER is become a matter of great concern for both the developed and developing countries. On the other hand Frenkel (1983) pointed out, although theoretically it is believed that under the floating regime the monetary authorities decrease the demand

1983; Edwards, 1984; Elbadawi, 1990; Ford and Huang, 1994; Huang and Shen, 1999; Bahmani-Oskooee and Brown, 2002).

[5] However, Burke (2009) pointed out that devaluation without full planned structural and economic reforms might put contractionnary effects on an economy.

[6] Another study is of the Ahmad and Pentecost (2009), who conducted a threshold cointegration analysis for examining the long run relationship between the exchange rate and the foreign exchange reserves for a number of African countries.

[7] Krugman (1979) and Harogh (1998) mentioned that fixing the currency value in the foreign exchange market increases the trust of the private sector on the central banks not to create inflation.

for reserves because they are no more bound to maintain the peg, however in recent years the experience of a number of countries show that that their reserves assets increased substantially even after their official announcements of keeping the flexible exchange rate system. This is also supported by the studies of Mishra and Sharma (2011), Wijnholds and Kapteyn (2001) and Sula (2011).

Similarly, when we come towards the discussion about the reserves holdings of Pakistan economy, despite that rich research works, so for only two studies modeled the foreign exchange rserves for Pakistan. One study is of the Khan and Ahmed (2005) who used quarterly data over the period 1981-I to 2003-II to investigate the short and long run determinants of the foreign exchange reserves in the framework of a cointegration framework by keeping the variation in balance of payments, money market rate, the average propensity to import, the level of imports and workers' remittances, a short run variable monetary disequilibrium and dummy variables for capturing the influence of the events of September 11, the military take over and the autonomy of the State Bank of Pakistan, 1997 act in their model. They found a positive impact of the variation in the balance of payments and the imports and negative effect of the opportunity cost and remittances on the foreign exchange reserves demand in Pakistan. Their dummy variable representing the autonomy of the State Bank of Pakistan also turned significant showed its positive relationship with the FER. However, one major drawback of their study is that despite the fact exchange related policies are of great concern specifically for the Asian economies as highlighted by a number of studies they do not considered exchange rate in their model. The second, weakness of the study is that they examined the determinants of the foreign exchange reserves both for the short and long runs period but interestingly by using the quarterly data. Another study is of the Abdul and Sheharyar (2008) who used a buffer model for the analysis of the optimal demand of foreign exchange reserves in the Pakistan by using monthly data for the period 1995-6 to 2005-6. Their main interest variables were i.e. money call rate which they used as a proxy for opportunity cost and a dummy variable for the structural shift occurred in the banking system of during 2000. However, as in this paper we do not concern with the problem of the reserves adequacy and limit our study only to the determinants of the FER holdings in Pakistan.

The paper covers this gap in the literature by examining the relationship between the RER and the FER in the framework of the mercantilist approach for Pakistan. The investigation of this interaction between the RER and the FER is important for a country like Pakistan, where the exports particularly consist on the cotton and textile goods is the main source of foreign exchange reserves earning. The second objective of this paper is to investigate the impact of the two regime switches (i.e. occurred in 1982 and 200) on the FER holdings in Pakistan for finding out whether with the movements towards the floating exchange rate regimes the country reserves assets decreases or increases.

The main finding of the paper is that real exchange rate depreciations show a positive relationship with the foreign exchange reserves holdings in Pakistan. Our results further show that the State Bank of Pakistan exchange rate systems flexibilities also contribute to this growth in the foreign exchange reserves holdings in the country.

The rest of the paper is designed as follows. Section-2 is consist on the theoretical model and discussion about the possible relationship of the explanatory variables with the dependent variable. The empirical results are given in section-3. Section-6 presents the conclusion.

2. Historical Review of real exchange rate and the foreign exchange reserves in Pakistan

Figure 1 shows the relationship between the real exchange rate and the real foreign exchange reserves for Pakistan economy during the study period, 1973-2008. The figure depicts the upward trend in both the real exchange rate and the foreign exchange reserves. Both the real exchange rate and the real foreign exchange reserves showed a decline of (-)13.70% and (-)7.13% during 1973, when the SBP delinked the rupee from the pound sterling and fixed its value with the US dollar. After that it showed an increase of (+)5.75% and (+)12.3% during 1979 and both the variables showed a further increase of (+)24.74% and (+)98.61% when the country moved from the fixed to the managed float regime in 1982. Again during 1992 both the variables show a decline of the (-)3.58% and (-)8.89%. However during 2000 with a shift towards the full floating regime both the variables showed an increase of (+)11.87% and (+)30.11%. However, during 2008 both the variable again showed a decline of (-)6.03% and (-)7.13%. These figures depicts the positive relationship the foreign exchange reserves holdings with the real exchange rate and exchange rate systems.

3. Model Formulation

The objectives of this paper are twofold. First, we analyze the role of the RER in the determination of the FER holdings in Pakistan. Second, we examine whether the FER holdings in Pakistan are related to the exchange rate systems or not. For this purpose, we construct a model based on the mercantilist approach. Our model is very close to the works of the Romero (2005) and Joe (2011). Romero (2005) conducted a comparative study for analyzing the factors of the international reserves demand in China and India by using a fixed exchange rate based sample period for the former and a floating exchange rate based sample period for the later country by using annual data for the period 1980 to 2003. He included the following variables in his model i.e. current account balance, average propensity to import, and real exchange rate. Whereas, Joe (2011) undertake a co integration and ECM approach for assessing the determinants of the international reserves hoarding for Korea accounting both for the precautionary and mercantilist factors in his model by using quarterly data over the period 1994 to 2008.

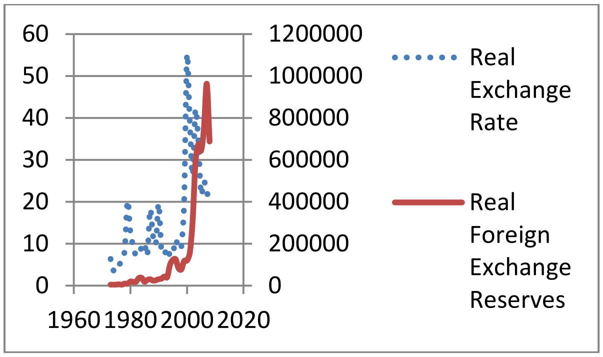

Figure 1. The relationship between the real exchange rate and the real foreign exchange reserves for Pakistan economy during the study period, 1973-2008.

Like Joe (2011) we are conducting this study for a single[8] Asian country Pakistan. However, here our particular focus is on the relationship between the RER and the FER holdings. Also we are using a large sample span of data sample covering the period from 1973 to 2008 and consist on the three regimes periods (i.e. fixed(1973-1981), managed(1982-199) and floating(200-2008)). For the achievement of our objectives, first we design the following model:

$$\mathrm{fr}^{g}{}_{\mathrm{t}} = \alpha_0 + \sum_{t=1}^{i} \alpha_{\mathrm{q}^{g}}, i\,(\mathrm{q}^{g}{}_{\mathrm{t}-i}) + \alpha_{\mathrm{rem}^{g}}(\mathrm{rem}^{g}{}_{\mathrm{t}}) + \alpha_{\mathrm{api}^{g}}(\mathrm{api}^{g}{}_{\mathrm{t}}) + \alpha_{i^{g}\mathrm{d}}(i^{g}\mathrm{d}_{\mathrm{t}-1}) + \varepsilon_{\mathrm{fr}^{g}}{}_{t} \qquad (1)$$

Whereas, ($\mathrm{D}_{\mathrm{Regm}_1} = 0$ and $\mathrm{D}_{\mathrm{Regm}_2} = 0$) $i = 1, 2, \ldots 5$

In equation (1), $\mathrm{fr}^{g}{}_{\mathrm{t}}$ stands for the foreign exchange reserves. We incorporate it in our model as dependent variable at level. Whereas, $\mathrm{q}^{g}{}_{\mathrm{t}-i}$ is the lagged real exchange rate, $\mathrm{api}^{g}{}_{\mathrm{t}}$ is the average propensity to imports which is included in the model as a proxy for the trade openness, $i^{g}\mathrm{d}_{\mathrm{t}-1}$ is the lagged differential interest rate which is used is a proxy for the opportunity cost of capital and $\mathrm{rem}^{g}{}_{\mathrm{t}}$ stands for remittances, α_0 is the intercept term and $\alpha_{\mathrm{q}^{g}}, \alpha_{\mathrm{rem}^{g}}, \alpha_{\mathrm{api}^{g}}$ and $\alpha_{i^{g}\mathrm{d}}$ are the related parameters to be estimated. Whereas, $\varepsilon_{\mathrm{fr}^{g}}{}_{t}$ is the error term. Although $\mathrm{q}^{g}{}_{\mathrm{t}}$ is our interest variable, however the historical macroeconomic conditions and previous studies[9] show that the precautionary approach cannot be weighted down as the SBP also keep the FER as insurance against unpredictable shocks to the economy. For this purpose we also incorporated other two variables i.e. $\mathrm{api}^{g}{}_{\mathrm{t}}$ and $i^{g}\mathrm{d}_{\mathrm{t}-1}$ for the role of these precautionary variables in the FER holdings in Pakistan. We have also included an additional variable $\mathrm{rem}^{g}{}_{\mathrm{t}}$ in our model. It is included in the model becasue workers' remittances is the dominant source in Pakistan helps in the management of the current account deficits and its total amount reached to 397542.78 million rupees during 2008 ((Economic Survey of Pakistan, 2008-09).

We put the symbol "g" above all the variables for showing that Hodrick-Prescott (HP from now onward) filtering method[10] has been applied for the extraction of the cyclical components form the observed time series data. We have applied the HP filter method by keeping focus on two things. First, according to the standard stationarity test [11] for

[8] Shen (199) that because of the differences in the institutional characteristics of central banks, the structures of money markets, monetary policies and exchange rate system regimes, it is difficult to generalize the study for one country for another, hence it is better to conduct a single country study for each country separately for the determination of the foreign exchange reserves demand.

[9] The detail about the previous studies conducted for Pakistan has already given in the introduction.

[10] For the decomposition of the data into the cyclical and secular components we have applied the Hodrick-Prescott filter method with weight (1600). For more detail about the HP filter method see Appendix. A.

[11] We used the Augmented Dickey Fuller test to find out that whether our data variables for checking the level stationarity of the data at 95% confidence level. The results show that all the variables except the "interest rate differential" are non-staionary at level (See Appendix. A for detail)

examining the unit root in the time series data most of our variables are non-stationary at level and showing a trend. This might made our coefficients non-reliable and lead us to spurious conclusions. Second, we removed the long run trend from the variables to enhance the ability of our model in capturing the short run fluctuations.

We have imposed two restrictions on the model i.e. $D_{Regm_1} = 0$ and $D_{Regm_2} = 0$. These restrictions show that the regime shifts have not been considered. Whereas, D_{Regm_1} and D_{Regm_2} are the two dummy variables represent the two regime shifts occurred in Pakistan during the study period. D_{Regm_1} stands for the first regime shift when the SBP moved from the fixed to the managed float exchange rate system during 1982. Whereas, the D_{Regm_2} represents the shift from the managed float to the full float excahnge rate system occured in 2000.

Similarly, to investigate the relationship between the exchange rate systems and FER holdings both the dummy variables i.e. D_{Regm_1} and D_{Regm_2} represents the two regime shifts have also been included in the model. The model is as under:

$$fr^g{}_t = \alpha_1 + \sum_{t=1}^{i} \alpha_{q^g,i}\,(q^g{}_{t-i}) + \alpha_{rem^g}(rem^g{}_t) + \alpha_{api^g}(api^g{}_t) + \alpha_{i^g d}(i^g d_{t-1}) + D_{Regm_1} + D_{Regm_1} \quad \varepsilon_{fr^g}{}_t \qquad (2)$$

$$\text{Whereas, } \left(\begin{array}{ll} 1 \text{ for } D_{Regm_1} & ,0 \text{ otherwise} \\ 0r & \\ 1 \text{ for } D_{Regm_2} & ,0 \text{ otherwise} \end{array} \right) \; i = 1, 2, \ldots.5$$

Equation (2) shows the model with the regime shifts after relaxing the restrictions $D_{Regm_1} = 0$ and $D_{Regm_2} = 0$. Whereas, D_{Regm_1} and D_{Regm_2} are the two sequential dummies. We have introduced D_{Regm_1} in the model by marking a value of “1” to the full period of the managed float period (1982 to 1999) and “0” to the rest of the period. Similarly, D_{Regm_2} takes the value of “1” for the period of full float exchange rate system (2000-2008) and “0” otherwise. We incorporated these dummy variables in our model to find out whether the exchange rate policies of the State Bank of Pakistan affect the FER holdings in Pakistan or not.

4. The relationship between the Explanatory variables and the foreign exchange reserves (FER)

It is important to understand the relationship between the dependent variable (FER) and the explanatory variables. The detail is as under:

1. $fr^g{}_t$ and $q^g{}_t$

Theoretically, the relationship between the $q^g{}_t$ and the $fr^g{}_t$ is inconclusive. The mercantilist economists support the positive influence of $q^g{}_t$ (depreciation) on the $fr^g{}_t$ holdings. Their export let growth argument is based on the idea that depreciation increases the demand for domestic exports which also increases the inflow of the $fr^g{}_t$ in a country. In contrast, a rise in $q^g{}_t$ can results in the contraction of the $fr^g{}_t$ especially in the developing countries because of their weak exports base and higher dependency on the importable inputs. It can also discourage the inflow of the $fr^g{}_t$ because of the lack of investor confidence on the domestic currency. However, we assume a positive relationship of the $q^g{}_t$ with the $fr^g{}_t$.

2. $fr^g{}_t$ and $api^g{}_t$

We used the $api^g{}_t$ is a proxy for the trade openness assuming that it has a positive relationship with the $fr^g{}_t$. However, whether the $api^g{}_t$ put positive or negative influence on $fr^g{}_t$ is still a question in the literature. On one side it is uses as a proxy for the marginal propensity to import (MPI) by assuming that it affects the $fr^g{}_t$ negatively (see, Huang, 1995; Landel-Mills, 1989. Heller (1966) explained this argument so that as uses the marginal propensity to import (m) as an openness measure and adopts a Keynesian view where the adjustment cost for an economy is equal to the inverse of its m . He concludes that greater openness, by reducing the adjustment cost, would be related to lower reserve holdings. On the other hand Frenkel and Jovanovic (1980) and Karfakis (1997) argues that $api^g{}_t$ measures an economy’s openness to external shocks, therefore it can positively affect the $fr^g{}_t$.

3. $fr^g{}_t$ and $i^g{}_{td}$

In the literature related to the foreign exchange reserves, $i^g{}_{td}$ is used as a proxy for the opportunity cost of holdings the $fr^g{}_t$ (See Bassat and Gottlieb,1992; Rodrik, 2006). Whereas, the opportunity cost is the foregoing rate of return on other productive resources alternatively of holdings the $fr^g{}_t$. Hence, it is usually expected that it has a negative relationship with the $fr^g{}_t$. Here we use the $i^g{}_{td}$

is a proxy for the opportunity cost of capital and hypothesize its negative relationship with the fr^g_t.

4. fr^g_t and rem^g_t

Remittances (rem^g_t) is an important source of the fr^g_t in Pakistan. Although Aron et al. (1997) and Ahmad et. al. (2005) found its negative relationship with the fr^g_t and justified their results on the basis of the argument that rem^g_t enables the central banks to reduce the stock of the fr^g_t. However, in this study we assumed a positive relationship between the rem^g_t and fr^g_t assuming that an increase in the remittances inflow increases the stock of the reserves in the Pakistan.

5. Results and Discussion

The estimated results are reported in table.1. First, we run some regressions for investigating the relationship between the real exchange rate and the foreign exchange reserves of Pakistan. After that we included the two dummy variables in the model represent the two regimes shifts i.e. D_{Regm_1} and D_{Regm_2} for examining whether exchange rate systems shifts have any relationship with the foreign exchange reserves holdings in Pakistan or not. The detail is given as under:

Table 1. Dependent Variable: $fer^g t$ Method :Least Squares, Newey-West HAC Standard Errors and Covariance Sample Size: 1973-2008

Adj: Sample	1973-2008	1978-2008	1978-2008	1978-2008	1978-2008	1978-2008
Independent Variables	Coeff:(S.E) (1)	Coeff:(S.E) (2)	Coeff:(S.E) (3)	Coeff:(S.E) (4)	Coeff:(S.E) (5)	Coeff:(S.E) (6)
q^g_{t-1}	--------	-1.41(1.48)	-0.41(1.37)	-0.11(1.44)	0.87(1.86)	0.89(1.88)
q^g_{t-2}	--------	-0.74(1.20)	-0.84 (1.07)	-0.07(0.90)	0.69(1.53)	0.79(1.47)
q^g_{t-3}	--------	1.49(1.16)	1.51(0.94)	2.27^{***}(0.70)	2.62^{**}(0.96)	2.74^{***}(0.87)
q^g_{t-4}	--------	2.07^{**}(0.94)	1.84^{**}(0.84)	2.86^{**}(0.93)	3.16^{**}(1.09)	3.24^{**}(1.10)
q^g_{t-5}	--------	1.26^{*}(0.61)	1.05(0.65)	1.56^{**}(0.74)	1.65^{*}(0.86)	1.70^{*}(0.87)
api^g_t	2.40^{***}(0.77)	2.86^{***}(0.72)	2.32^{***}(0.56)	2.69^{***}(0.55)	2.89^{***}(0.69)	2.92^{***}(0.65)
rem^g_t	0.54^{**}(0.18)	--------	0.56^{***}(0.14)	0.58^{***}(0.15)	0.68^{***}(0.14)	0.70^{***}(0.13)
i^g_{td-1}	-0.27(2.61)	--------	--------	3.61^{*}(2.02)	3.46^{*}(1.88)	4.02^{*}(1.93)
${}^D\mathrm{Regm}_1$	--------	--------	--------	--------	17.76^{*}(8.36)	18.32^{**}(8.13)
${}^D\mathrm{Regm}_2$	--------	--------	--------	--------	--------	7.29^{**}(2.67)
R^2	0.34	0.39	0.51	0.56	0.56	0.57
Adj R^2	0.21	0.26	0.36	0.40	0.40	0.40
DW	1.49	1.60	1.71	1.81	1.80	1.88
F-stat for $\sum q^g_{ti}$	5.73^{***}	7.44^{***}	12.91^{***}	15.86^{***}	13.70^{***}	19.88^{***}

- Asterisks "*" , "**" , "***" stands for 90%, 95%, and 99% confidence level.
- Figures in parenthesis show the SEs (Standard Errors) of the estimates.

6. Results without Regime Shifts

In table.1, columns 1, 2, 3, 4, 5 and 6 show the different versions of our computed results. First, we derived the results without accounting for the regimes switches which is showing by the two constraints i.e. $D_{\mathrm{Regm}_1} = 0$ and $D_{\mathrm{Regm}_2} = 0$. These results are given in column-1, 2, 3 and 4. The results given in column-4 show the results for our complete model where we included all the mercantilist and precautionary measures. Whereas, columns-1, 2 and 3 reports the results with different modifications. We have derived our results under the constraint of zero (0) constant. We imposed this zero (0) restriction on our model because the intercept term remained insignificant in all the regressions[12]. From the results, in column-4 we can see that q^g_t is statistically significant at lag 3, 4 and 5 but at lag 1 and 2 q^g_t remained insignificant with the unexpected negative signs However, we included it in our model to avoid the problem of any specification bias. We also run the F/Wald test for the overall significance, which confirmed that all the variables i.e. $\sum q^g_{ti}$ (i.e. q^g_{t-1}, q^g_{t-2}, q^g_{t-3}, q^g_{t-4} and q^g_{t-5}) belong to the model and we can keep it. The sign of the q^g_t is positive which is according to our expectations showing the importance of the export[13] channel in tracking the

[12] The value of the constant term is never significant in all the regressions. The reason for this is that we used only the cyclical components of the data. However, for the regression where we also included the dummies for the two regime shifts we excluded the intercept term before running the regression to avoid the problem of multicollinearty.

[13] Although in some studies i.e. lagged export alone or in addition with the exchange rate (nominal or real) has also been included as a proxy for the representation of the export led growth strategies/mercantilist approach. However, in this paper we have included only the real

$fer^g t$ holdings in Pakistan. This result is in line with the mercantilist approach that a rise in q^g_t (devaluation/depreciation) via improvement in the export competitiveness increases the $fer^g t$ inflow in a country and oppose to Wei (2010) who for Chinese economy found that the appreciation RMB against the dollar increases the demand for its exported goods, thus bring increase in the holdings of the foreign exchange reserves in the country. However, the Wei (2010) results cannot be generalized to Pakistan economy as China has a large national and international demand for its exported goods. However Pakistan is a dependent country for its imports and its exports structure is very weak like other developing countries, hence a decrease in the q^g_t (an appreciation of the rupee value together with a rise in the inflation) can reduce the inflow of the foreign currency in the country via channels of export demand, foreign capital flows etc. This result we have for the q^g_t has also supported by the Delatte and Fouquav (2009) who pointed out that in the emerging countries, the central banks value more a country's international competitiveness and the exchange rate play a key role in their export led growth strategies.

In our model, we have also incorporated two measures api^g_t and i^g_{td-1} for investigating whether, the fer^g_t is also determined by the precautionary measures in Pakistan or not. We found that both the variables api^g_t and the i^g_{td-1} showed a significant impact on the fer^g_t. However, the sign of the resulted sign of the api^g_t is positive which is according to our expectations and consistent with the theoretical prediction of the traditional buffer-stock model. However, i^g_{td-1} showed an unexpected positive[14] sign. This positive sign of the i^g_{td-1} show 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 (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. Similarly, our variable rem^g_t turned significant but with the expected positive sign. This positive sign of the rem^g_t show that as remittances is the main source of capital inflow in the country, hence an increase in it will also rise the foreign exchange reserves holdings in Pakistan. A Also they considered the relationship between the remittances and foreign exchange reserves significant although its t- value is only 1.27 etc.

We further found that the R^2 of the model is 0.56 which show that most of the variations in the fer^g_t is explained by our explanatory variables. However, we can see that the R^2 value obtained from this model is comparatively greater i.e. 0.56 > 0.51 > 0.39 > 0.34. Also the Durbin Watson statistic value is 1.81 which showed these results are reliable. For further confirmation we apply the Q-statistic, LM-statistic and CUSUM squared stability test which verified the reliability of these results (See, Appendix. A for detail).

On the other hand, we computed the results for the different versions of the model for showing the importance of the different measures in our model. We placed these results in column-1, 2 and 3 of table.1. In column-1 we kept those results where we do not account for the q^g_t. The main purpose here is to analyze the relationship of the precautionary measures with the fer^g_t in the absence of q^g_t. Here we have also included the rem^g_t as an additional variable. Here, our results are almost the same in terms of significance and magnitudes apart from i^g_{td-1}, which this time remained insignificant but with negative sign. However, the R^2 value here is only 0.34 which shows that the explanatory power of the model become weak with the exclusion of the q^g_t from the model. This result clearly show that the fer^g_t holdings in Pakistan can not be determined by only the precautionary measures. These results are further supported by the low value of the DW statistic i.e. 1.49. Similarly, the results in the other two columns i.e. 2 and 3 show that when we account for the q^g_t in our model, the explanatory power of the model increases in comparison to the column-1 results i.e. 0.51 > 0.39 > 0.34. Also, the DW values showed improvement i.e. 1.71 > 1.60 > 1.49. Another striking result we received here is that is the consistent significance and positive sign of the api^g_t in all the models. Similarly, another important result is the significance of the rem^g_t in the model. This positive significance relationship of the rem^g_t with the fer^g_t in column-3 show that the explanatory power of the model increased only when we also consider the rem^g_t in our model besides the q^g_t. The q^g_t remained insignificant at lag-1, 2 and 3 in the first two columns

exchange rate for capturing the effects of the export channel.

[14] However, Iyoha, (1976), Ben-Bassat and Gottlieb (1992) and Prabheesh et al, (2009) found negative relationship of the opportunity cost variable with the foreign exchange reserves. They also mentioned that the positive sign of the opportunity cost variable is because of the use of wrong proxy for it.

and also borderline[15] signficant at lag-5 in column-3. However, in our complete model reported in column-4, q^g_t remained insignificant at lag-1 and lag-2 only. We run the F-test for the overall significance of all the resutls which supported the inclusion of these variables in the model.

7. Results with Regime shifts

After that we computed the results following the second objective of this paper. Here, we account for the role of the two regime shifts relaxing the constraints i.e. $D_{\mathrm{Regm}_1} = 0$ and $D_{\mathrm{Regm}_2} = 0$. These results are given in columns 5 and 6 of table. 1. Our main purpose here is to find out whether the exchange rate policies of the State Bank of Pakistan are relevant to the foreign exchange reserves holdings in Pakistan or not. Column-6, shows our complete results. The results show that both the dummy variables i.e. ${}^{D}\mathrm{Regm}_1$ and ${}^{D}\mathrm{Regm}_2$ are significant but with positive signs. Although these results are opposed to the theoretical expectations and some empirical conclusions derived for the developed countries, however, these positive signs of both the ${}^{D}\mathrm{Regm}_1$ and ${}^{D}\mathrm{Regm}_2$ seems plausible specifically in the context of a developing country like Pakistan. where the fer^g_t is required for many purposes[16]. These results are also squared with the historical experience of Pakistan which can be seen in fig.1. These results show that with the shifts towards the more floating regime, the stock of fer^g_t in the country increased over time. All the other variables i.e. q^g_{t-3}, q^g_{t-4}, q^g_{t-5}, api^g_t, rem^g_t, i^g_{td-1} are still significant with the same signs and significance levels. Although i^g_{td-1} turned significant in our model however, its coefficient sign never become negative. We run the F/Wald test for the overall significance which show that all the explanatory variables can be kept in the model. With the inclusion of the dummy variables in the model the R^2 value is increased to 0. 57. The Durbin Watson statistic value also raised to 1.88 which is given in column-6 supporting that our results are reliable. We further confirmed these results with the post diagnostic results i.e. Q-statistic, LM-statistic and CUSUM squared stability test (For detail see Appendix. A).

Summing up, overall we find a significant positive relationship between the q^g_t and the fer^g_t, which shows that the benchmark mercantilist approach has applications in the historical experience of Pakistan. Similarly the significance of the other variables i.e. api^g_t and i^g_{td-1} also pointing out that fer^g_t holdings in the country are also subject to the precautionary measures. Moreover, our results about the exchange rate systems show that exchange rate systems shifts towards the more floating regime positively influence the fer^g_t holdings in Pakistan.

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 foreign exchange reserves in these countries. In contrast, the others claim that the mercantilist motives triggered these reserves holdings. The present paper seeks to answer this question in the context of Pakistan economy. Previous studies for Pakistan analyze the role of the precautionary factors in the determination and adequacy of reserves demand. However, in this paper we examine the relationship between the real exchange rate and foreign exchange reserves in the framework of the mercantilist approach. The econometric estimates show that large reserves holdings in Pakistan is the by-product of the export led growth strategies of the State Bank of Pakistan. Also the significance of the trade openness pointed out that precautionary motives also explain these reserves accumulations. Similarly, remittances also remained significant with the expected positive sign. Also contrary to the theoretical arguments that under the fixed exchange rate systems the central banks reduce the demand for the reserves, the floating regimes switches policies of the State Bank of Pakistan boost up reserves holdings in Pakistan. These findings are in equality with empirical outcomes of many studies for other Asian countries.

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[15] We kept q^g_{t-5} in column-2 as its value is slightly above 10% level of significance. However, we verfied the its inclusion in the model through the F/Wald.

[16] We have already discussed about this in the introduction.

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Appendix: A

Data Sources and Variables Definition

In this study annual data has been used for the period 1973 to 2008. The data is also divided into three sub-samples on the basis of fixed, managed and flexible exchange rate regimes followed by the country during 1973-1981, 1982-1999 and 2000-2008 respectively. However, the original periods are i.e. fixed exchange rate system from 1947 to 7th January 1982, managed from On 8th January 1982 and full float exchange rate system from 19th May 1999 onwards. However, it is modified purposively as in this study annual data has been used.

DOMESTIC VARIABLES

Variables	**Definition**	**Proxies**
1. Exchange Reserves	Real Foreign Exchange Reserves of Pakistan	q^g_t
2.Exchange Rate	Real exchange rate of Pakistan rupee vs USA dollar	q^g_t
3.Pak Inflation Rate	Average percentage change in consumer price index	π^g_{tpk}
4. US Inflation Rate	Average percentage change in consumer price index	π^g_{tus}
5. Pak Interest Rate	Annual money call rate	i^g_{tpk}
6.US Interest Rate	Annual federal reserve rate	i^g_{tus}
7.Pak remittances	Total workers' inflow of remittances in million of rupees	rem^g_{tpk}
8. Average Propensity to Imports		
8. $Regm_1$	Dummy variable for the shift towards the managed float exchange rate system of SBP occurred in 1982.	
9. $Regm_2$	Dummy variable for the shift towards the full float exchange rate system of SBP occurred in 2000.	

Data Sources: All the data are collected from, Economic Survey of Pakistan various issues, Fifty Years Statistics of State Bank of Pakistan and International Financial Statistics, IMF.

1. $i^g_t = i_t - i^*_t$ is Pakistan interest rate gap which is used as a monetary policy instrument in this study. It is computed by taking the difference between actual money call rate(i_t) and targeted money call rate(i^*_t). For de-trending Hodrick-Prescott Filter technique is used.

2. $i^g_{tus} = i_t - i^*_t$ is US interest rate gap which is used as a monetary policy instrument in this study. It is computed by taking the difference between actual money call rate(i_t) and targeted money call rate(i^*_t). For de-trending Hodrick-Prescott Filter technique is used.
3. $\pi^g_{tpk} = \pi_t - \pi^*_t$ is Pakistan inflation gap which is the difference between actual inflation rate(π_t) and targeted inflation rate(π^*_t). For de-trending Hodrick-Prescott Filter technique is used.
4. $\pi^g_{tus} = \pi_t - \pi^*_t$ is US inflation gap which is the difference between actual inflation rate(π_t) and targeted inflation rate(π^*_t) of USA. For de-trending Hodrick-Prescott Filter technique is used.
5. $q^g_t = q_t - q^*_t$ is the real exchange rate gap. It is the difference between actual(q_t) and targeted real exchange rate(q^*_t) after converting nominal exchange rate into real from. Whereas, real exchange rate is defined as the nominal exchange rate of Pakistan currency against US dollar multiplied by the ratio of the foreign to domestic price level ($RER = q(CPI^{usa} / CPI^{pak})$. For converting RER into growth terms log of it has been taken.

6. $fer^{g}_{tpk} = fer_t - fer^{*}_{t}$ is the foreign exchange reserves of Pakistan. For computation first it is converted into real form by using 1976 as base year. After that log of it has been taken. Hodrick-Prescott filter is used for de-trending and multiplied with 100.
7. $rem^{g}_{t} = rem_t - rem^{*}_{t}$ is the remittances of Pakistan. For computation first it is converted into real form by using 1976 as base year. After that log of it has been taken. Hodrick-Prescott filter is used for de-trending and multiplied with 100.
8. $Regm_1$ stands for shift towards the first regime. It takes the value of 1 for the full period of the second regime and 0 otherwise.
9. $Regm_2$ stands for shift towards the second regime. It takes the value of 1 for the full period of the third regime and 0 otherwise.
10. i^{g}_{d} is computed by taking the difference between Pakistan and US interest rates ($i^{g}_{tpk} - i^{g}_{tus}$). For de-trending Hodrick-Prescott Filter technique is used.

Stationarity Test Results

Variables	ADF test Results	Order of Integration
Log of Real Foreign Exchange Reserves	-1.44(-2.94)	I(1)
Real Exchange Rate	-2.43(-2.94)	I(1)
Log of Real Remttinces	-2.86(-2.94)	I(1)
Average Propensity to Imports	-2.52 (-2.94)	I(1)
Interset Rate Differential	-3.04** (-2.94)	I(0)

Filtering issues

The ADF test results show that all of the variables including in the model are non-stationary at level except the opportunity cost variable. This confront us with the problem that if we run the OLS test on these variables, the results will be supurious (Granger and Newbold, 1974). Hence, to avoide this problem we filtered all the serious by using the HP filtering technique.

Our filtering strategy has consequences as regards both the economic interpretation of our results and the issue of long-run relationships, i.e. cointegration. All variables entering our econometric model are expressed in gaps, i.e. in deviations with respect to their 'natural' values. In other words, we filter our raw variables so to obtain their cyclical component. This allows us to concentrate on short-run fluctuations of FER as driven by movements in possibly relevant drivers such as the RER, average propensity to imports, remittances etc.

This cyclical representation leads to interpret the oscillations in the FER gaps in a very sensible manner from an economic standpoint. For instance, a short-run upward drift of FER gap could in principle be driven by the domestic devaluation and/or an expansionary phase of the domestic business cycle, and/or the international business cycle (of course, this is only one the possible reason out of many reasons). For obtaining the cyclical components of our data we employed the HodrickePrescott filter method. The HodrickePrescott filter is the most employed filter to compute cyclical macroeconomic fluctuations. Interestingly, while being subject to possible critiques (e.g. end of sample issues). It has an advantage over the simple de-trending procedure based on the linear trend in that it is a time varying method and allows the trend to follow a stochastic process, whereas, the traditional method assumes that the trend series grows at a constant rate. The HodrickePrescott filter bring in focus the short fluctuations in the interest variables that appear to be economically very sensible (Castelnuovo, 2010). Another advantage of it on the other de-trending procedure via simple linear trend which assumes the constant rate of trend over the whole time series this procedure focused on the time varying properties of the data and allow the trend to follow a stochastic process. In contrast one can also find the long run relationship (cointegration) between the variables. However, Muller and Watson (2008) mentioned that the inferences derived on the basis of the cointegarting models is weak as it relies on the assumption of I(1) model for the common stochastic trends, which might leads to the wrong conclusions about the persistence in the data. Also because of the structural breaks such common trends might be difficult to interpret (see, i.e. Clarida et al., 2000; Lubik and Schorfheide,2004; Cogley and Sargent, 2005; Boivin and Giannoni, 2006). Finally, the somewhat agnostic statistical approach we employ naturally allows for series-specific trends, a strategy possibly overcoming small sample biases otherwise arising when subsamples displaying high volatilities such as the 'great inflation' period of the 1970s are involved in the estimation. Therefore, while considering the cointegration issue as possibly relevant from a theoretical standpoint, these 'empirically based' considerations lead us to refrain from employing ECM-type of models in this context. We leave the analysis of this complex issue to future research.

Appendix: B

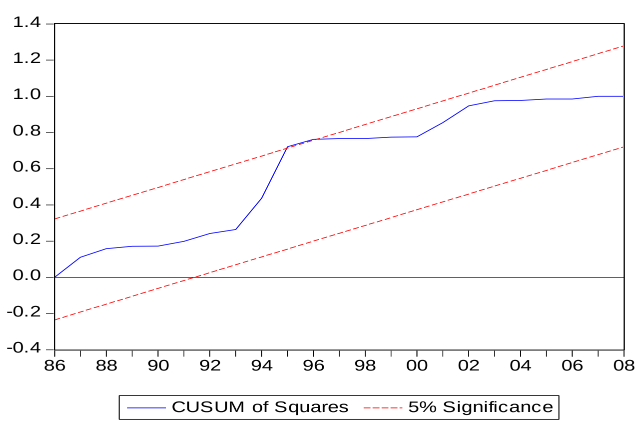
1. Regression results without Regime Shifts

<table>
<tr><td colspan="4">Regression: 3</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Corrlelogram-Q-Statistics</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Sample: 1978-2008</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Autocorrelation</td><td>Partial Correlation</td><td></td><td>AC</td><td>PAC</td><td>Q-Stat</td><td>Prob</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>. |* . |</td><td>. |* . |</td><td>1</td><td>0.086</td><td>0.086</td><td>0.2493</td><td>0.618</td></tr>
<tr><td>.**| . |</td><td>.**| . |</td><td>2</td><td>-0.232</td><td>-0.241</td><td>2.1533</td><td>0.341</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>3</td><td>-0.122</td><td>-0.082</td><td>2.6990</td><td>0.440</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>4</td><td>-0.066</td><td>-0.110</td><td>2.8632</td><td>0.581</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>5</td><td>-0.088</td><td>-0.133</td><td>3.1695</td><td>0.674</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>6</td><td>-0.017</td><td>-0.060</td><td>3.1814</td><td>0.786</td></tr>
<tr><td>. | . |</td><td>. *| . |</td><td>7</td><td>-0.029</td><td>-0.110</td><td>3.2179</td><td>0.864</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>8</td><td>-0.120</td><td>-0.187</td><td>3.8592</td><td>0.870</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>9</td><td>0.010</td><td>-0.051</td><td>3.8642</td><td>0.920</td></tr>
<tr><td>. | . |</td><td>. *| . |</td><td>10</td><td>0.040</td><td>-0.095</td><td>3.9434</td><td>0.950</td></tr>
<tr><td>. |* . |</td><td>. | . |</td><td>11</td><td>0.087</td><td>0.012</td><td>4.3294</td><td>0.959</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>12</td><td>0.035</td><td>-0.041</td><td>4.3950</td><td>0.975</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>13</td><td>-0.142</td><td>-0.198</td><td>5.5478</td><td>0.961</td></tr>
<tr><td>. |* . |</td><td>. |* . |</td><td>14</td><td>0.164</td><td>0.196</td><td>7.1586</td><td>0.928</td></tr>
<tr><td>. |* . |</td><td>. | . |</td><td>15</td><td>0.106</td><td>-0.011</td><td>7.8787</td><td>0.929</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>16</td><td>-0.117</td><td>-0.093</td><td>8.8112</td><td>0.921</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Breusch-Godfrey Serial Correlation LM Test:

Independent Variables		F-Statistic	
F-statistic	0.547523	Prob. F(5, 17)	0.7381
Obs*R-squared	4.299713	Prob. Chi.Square(5)	0.5701

CUSUM Square Test for Stability



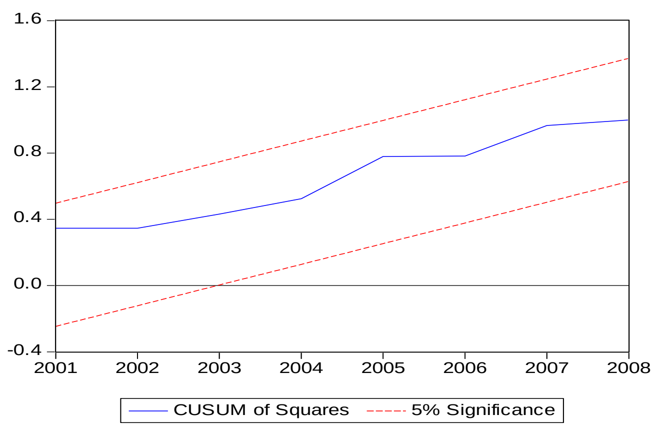
90. Regression results with Regime shifts

Regression: 5						
Corrlelogram-Q-Statistics						
Sample: 1978-2008						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.055	0.055	0.1027	0.749
.**| . |	.**| . |	2	-0.278	-0.282	2.8229	0.244
. *| . |	. *| . |	3	-0.144	-0.118	3.5764	0.311
. *| . |	. *| . |	4	-0.072	-0.151	3.7743	0.437
. | . |	. *| . |	5	-0.013	-0.090	3.7807	0.581
. | . |	. | . |	6	0.048	-0.036	3.8764	0.693
. | . |	. *| . |	7	-0.062	-0.140	4.0389	0.775
. *| . |	.**| . |	8	-0.158	-0.208	5.1523	0.741
. | . |	. | . |	9	0.032	-0.053	5.1991	0.817
. | . |	. *| . |	10	0.003	-0.174	5.1994	0.877
. | . |	. | . |	11	0.041	-0.062	5.2874	0.916
. | . |	. *| . |	12	0.024	-0.117	5.3188	0.946
. *| . |	.**| . |	13	-0.134	-0.258	6.3374	0.933
. |* . |	. |* . |	14	0.162	0.099	7.9084	0.894
. |* . |	. | . |	15	0.145	-0.040	9.2528	0.864
. | . |	. *| . |	16	-0.045	-0.069	9.3937	0.896

Breusch-Godfrey Serial Correlation LM Test:

Independent Variables		F-Statistic	
F-statistic	0.495044	Prob. F(5, 16)	0.7754
Obs*R-squared	4.134449	Prob. Chi.Square(4)	0.5710

CUSUM Square Test for Stability



12/4/2013