Online Publication Date: 10 March, 2012
Publisher: Asian Economic and Social Society

Are Real Devaluations Contractionary? an Empirical Analysis for Pakistan

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Citation: Naeem Ur Rehman Khattak, Muhammad Tariq (2012): "Are Real Devaluations Contractionary? an Empirical Analysis for Pakistan" Asian Economic and Financial Review Vol.2, No.1, pp.119-134.

Are Real Devaluations Contractionary? an Empirical Analysis for Pakistan

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Abstract

The failure of Bretton Woods system in 1970s diverted the attention of the researchers and policy makers from the orthodox wisdoms of elasticities, absorptions and Keynesian towards the new structuralist theories of contractionary depreciations. The present study has been carried out to test this contractionary hypothesis of real depreciations for Pakistan in the framework of a three version IS curve approach by using annual data over the period, 1973-2008. The main finding of the study is that real depreciation increases the output gap in Pakistan. The results also show that movement towards a more flexible exchange rate regimes also raises the output gap.

Keywords: New Structuralist theories, Open Economy IS Curve Model, Contractionary Depreciations, Output gap

Introduction

The literature provides a rich debate of individual countries (See, Branson, 1986; Ghura and Thomas, 1993; Kamin and Rogers, 2000; Berument and Pasaogullari, 2003) and cross countries (See, Lizondo and Montiel, 1978; Connolly, 1983; Ewards, 1986; Mills and Pentecost, 2001) analysis on the relationship between the real exchange rate and output level with the application of different econometric techniques[1]. However, inspite of these substantial number of studies conducted both for the developed and developing countries, the question whether real[2] exchange rate devaluations[3] put expansionary or contractionary effects on output is still not conclusive (Kamin and Klau, 1998; Afzal, 2004).

[1]For information about the application of various econometric techniques e.g. Single equation, Co integraion, VAR and Macro simulation models etc. applied for the examination of the impact of the devaluations on economic performance (See, Morely, 1992; Rogers and Wang, 1995; Hoffmaister and Vegh, 1996; Santaella and Vela, 1996; De Silva and Zhu, 2004).

[2] In this study real exchange rate has been used instead of the nominal exchange rate. It has been done so because as Ja Burke (2009) mentioned that both devaluation and inflation affect the economy in a similar way, hence for the perfect understanding of the impact of the currency devaluation, inflation must be factored into the size of depreciation. Also, the real exchange rate will be constant if the nominal devaluation results in a similar rise in prices. However, here we are concerning with the situation where nominal devaluations translate to the real devaluations. Recent studies have shown that when accompanied by appropriate macroeconomic policies, nominal devaluations definitely bring real devaluations (See, Dervis, 1979; Edwards, 1993).

[3] Both depreciation and appreciation operates in the similar way in an economy because both bring changes in the relative prices of exports and imports of a country. However, following the main objectives of the study, here the focus will only be on the impacts of devaluation/depreciation on output.

Until 1970s, the traditional[4] wisdoms i.e. elasticities (Pearce, 1961; Turnovsky, 1980), absorption (Alexander, 1952; Dornbusch, 1988; Svensson, 2000) and Keynesian (Domac, 1997) favors the expansionary hypothesis of real devaluations, were largely dominating. However, in recent years the "New Structuralist" economists (i.e. Edwards, 1989; Coock, 2004; Malender, 2009) strongly opposed the conventional[5] theories by arguing that real devaluations can bring a decline in the output level through various aggregate demand and supply side channels. Whereas, the demand side channels of the contractionary hypothesis of real devaluations suggested by the New Structuralist theorists are: the income redistribution channel, interest rate channel, investment channel, external debt channel, real balance effect channel and tax channel etc. The income redistribution channel is based on the assumption that as the marginal propensity to save (MPS) of the wage earners class is lower against the profit earner class hence devaluation will increase the prices in the export and import competing industries and reduce the real wages of the income earner group. This will raise the overall average propensity to save (APS) in an economy and result in the decrease of output (Alejandro, 1963; Cooper, 1971a). Similarly, the interest rate channel points towards the decline in the output through the decrease in consumption and investment when the devaluation swells the interest rate as a result of higher domestic prices and money supply (Van Wijnbergen, 1986). Likewise, the investment channel points to the decline in output, when the depreciation discourages the new investment in reaction of the costly imported capital goods (Buffie, 1986). In the same way, the external debt channel is based on the argument that as most of the debt of the developing countries is dominated in dollars; hence the devaluation will decrease the net wealth and aggregate expenditure of both the private and government sectors which results in the reduction of the output (Gylfason and Risager, 1984). Moreover, the real balance effect channel refers to the decrease in output as a result of the decline in the real cash balances and net wealth of the people when devaluation rise the price level because of the increase in traded goods prices (Bruno, 1979; Gylfason and Radetzki, 1991). Finally, their tax channel is based on the argument that as in developing countries the demand for imported goods is inelastic and its volume remains the same inspite of any rise in prices. This will increase the ad valorem trade taxes and redistribute the income from the private sector to the government sector. Hence all this will cause contraction in output via decrease in private consumption (Krugman and Taylor, 1978).

In contrast, the supply side channels through which real depreciation put contractionary effects on output are: the higher cost of imported inputs channel, higher wage costs channel, higher cost of working capital channel and foreign exporters as a price taker in the domestic economy channel etc. Whereas, the higher cost of imported inputs channel shows the contractionary effects of devaluation on output through the reduction in the firms demand for imported inputs (Hanson, 1983). Second, the higher wage costs channel refers to the decrease in the output level because of the curtailment in the firms supply when the workers demand for higher wages, as a result of depreciation (Gylfason and Schmid, 1983). Third, the higher cost of working capital channel is based on the argument that depreciation increases the price level and leads to the reduction of real volume of credit via higher money supply. This increase the interest rate and results in the higher cost of working

[4] The *elasticity theory* is based on the idea that real devaluation brings expansion in the output level of a country by making the trade balance surplus through the increase in the prices of imports and decrease in the prices of exports. This approach is basically based on the Marshall Lerner condition which states that if the sum of the export and import elasticities is greater than "1" in response to the change in prices, the real exchange rate depreciation will put expansionary effects on the output level of a country. Similarly, the *absorption approach* states that devaluation divert both the internal and external resources toward the domestically produce goods through the expenditure-switching (from foreign to domestic goods) and expenditure-reducing (decrease in import demand) mechanisms, consequently results in the increase in output. Whereas, the *Keynesian approach* explains that devaluation increases the output level through the aggregate demand channel assuming the economy at less than full employment level.

[5] Following the literature, in this study the words traditional, conventional and orthodox will be used interchangeably for a reference to the elasticties, absorption and Keynesian approaches.

capital and lesser production in the economy (Van Wijnbergen, 1986). Finally, the foreign exporters as price taker channel shows that as the foreign exporters face an upward sloping marginal cost curve and a horizontal marginal revenue curve so their foreign supply of goods is determined by the intersection of marginal revenue and marginal cost curves. Hence, when devaluation occurs the price receive by a foreign producer in terms of his own currency will decrease. As a result the foreign producer will reduce the output supply in the domestic economy leads to a leftward movement in the aggregate supply curve (Knetter, 1993; Kasa, 1992; Betts and Devereux, 1996).

Like the theoretical controversies, no common consensus also exists among the empirical economists about the relationship between the real depreciations and output level. The literature shows four types of empirical[6] approaches: the control group approach, the before and after approach, the macro-simulation approach and the econometric approach. Whereas, the control group approach is based on the separation of the effects of devaluations from other factors on the output (See, Donovan, 1982; Gylfason, 1987; Kamin, 1988; Khan, 1988). Similarly, the before and after approach analyzes the economic performance of a country before and after the devaluation (i.e. Alejendro, 1965 and Killick, *et al*., 1992). Likewise, the macro-simulation approach uses simulation models for examining the relationship between the exchange rate and the output (See, Roca and Priale, 1987). However, the econometric approach applied by various studies e.g. Sheehey (1986), Upadhyaya (1999) and Bahmani-Oskooee and Miteza (2006) etc. uses the econometric methods to the time series data for finding the impact of devaluations on output

All the above discussions show that the relationship between the real exchange rate and output depends on the macroeconomic policies (i.e. monetary and fiscal) of each country and cannot be generalized. These large disagreements in the literature become a source of motivation for testing this contractionary hypothesis of real devaluations for Pakistan. A study like this for a developing country[7] Pakistan can be interesting because the country has unique experiences of exchange rate systems, frequent devaluations and higher inflation periods. However, despite these abundant studies on the relationship between real exchange rate and the output, works for Pakistan are still limited. There is only one study of the Choudhary and Chaudhry (2007) who examine the impact of the nominal effective exchange rate on output and inflation for Pakistan in the framework of a VAR model by using quarterly data over the period 1975-Q1-1985-Q4. Their main findings were that devaluation declined output and increased the price level in Pakistan. The study covers this gap for Pakistan by focusing on two objectives. First, it has been examined whether real devaluations are expansionary or contractionary in Pakistan. Second, the impact of the two regime switches[8] (i.e. occurred during 1982 and 2000) on the output gap has also been investigated.

The key results of the study are that real exchange rate depreciation put expansionary[9] effects on the output gap in Pakistan a result well in line with the contractionary hypothesis of the new structuralist economists. It has also been found that the historical exchange rate systems are related to the output gap. After a brief introduction about the impacts of real depreciation on the output gap the study proceeds in the following manner. In section-2

[6] For more detail see, appendix.

[7] Khan and Aftab (1996) stated that the significance of individual countries studies cannot be ignored because case studies enables one to get proper understanding of the macroeconomic environment of a particular country.

[8] Taye (1990) mentioned that exchange rate policy can be single out one of the most important factor affect the macroeconomic aggregates in a country.

[9] In this study as the contractionary hypothesis of real devaluations has been tested for Pakistan by examining the relationship between the real exchange rate and output gap. Hence, unlike the previous studies for referring that real devaluation put contractionary effects on output the terminology that real depreciations put expansionary effects on output gap has been used with the understanding that both the terminologies have the same meaning.

the theoretical frameworks of the model used in this study are given. In section-3., the empirical results are discussed. In section-4, the study has been concluded.

Theoretical Framework of the Model

The models used in this study are derived on the basis of the standard IS curve backward looking models of Ball (1997, 1998). Ball (1997) developed a closed economy model by taking output gap is a function of the lagged real interest rate, lagged output gap and an error term. Whereas, for designing his open economy model Ball (1998) added an additional variable lagged real exchange rate to his closed economy model. Based on the Ball closed and open economy IS curve models a three version IS curve approach will be used in the present study for analyzing the contractionary hypothesis in the context of Pakistan economy. First, for constructing the closed economy model, Ball (1997) model has been calibrated and nominal interest rate and inflation rate instead of the real interest rate have been included into it. However, the nominal interest rate is used contemporaneously and inflation rate in lagged form. Moreover, lags of the output gap have also been incorporated in the model. The model is as under:

$$y^g_t = \alpha_0 + \alpha_{i^g}(i^g_t) + \sum_{t=1}^{i} \alpha_{\pi^g,j}(\pi^g_{t-i}) + \sum_{t=1}^{j} \alpha_{y^g,j}(y^g_{t-j}) + \varepsilon_{\pi^g t} \quad (1)$$

Whereas,

$(D_{Regm_1} = 0,\ D_{Regm_2} = 0\ and\ q^g_t = 0)$

i = 1 to 4. j = 1 to 3

Equation (1) shows the closed economy IS curve macroeconomic model of the study. In the model, output gap (y^g_t) is taken as a function of the interest rate gap (i^g_t), inflation gap (π^g_{t-j}) and lags of output gap (y^g_{t-j}). Whereas, $\varepsilon_{\pi^g t}$ stands for the random term. For simplicity and identification of the closed economy model, the constraints i.e. $D_{Regm_1} = 0,\ D_{Regm_2} = 0,\ q^g_t = 0$ have been placed below the model for showing that regime shifts and the real exchange rate are not included in the model. Whereas, α_{i^g}, $\alpha_{\pi^g,j}$ and $\alpha_{y^g,j}$ are the relevant parameters in the model and α_0 is the constant term. The main purpose here is to test the hypothesis that output gap (y^g_t) in Pakistan is determined only by the domestic factors. Second, for testing the contractionary hypothesis of devaluation and for showing that output gap (y^g_t) is an open economy issue in Pakistan Ball (1998) open economy IS curve model has been caliberated. Ball (1998) augmented his closed economy model with the lagged real exchange rate. However, deviating from Ball (1998) model in this study in addition to the real exchange rate some additional variables[10] i.e. trade balance and foreign exchange reserves are included in the open economy model. The model in equation form is given below:

$$y^s_t = \alpha_0 + \sum_{i=0}^{i} \alpha_{i^s,i}(i^s_t) + \sum_{i=1}^{j} \alpha_{\pi^s,j}(\pi^s_{t-j}) + \sum_{i=1}^{k} \alpha_{q^s,k}(q^s_{t-k}) + \alpha_{tb^s}(tb^s_t)$$

$$+ \sum_{i=1}^{l} \alpha_{fr^s,l}(fr^s_{t-l}) + \sum_{i=1}^{m} \alpha_{y^s,m}(y^s_{t-m}) + \varepsilon_{\pi^g t} \quad (2)$$

Whereas, $(D_{Regm_1} = 0$ and $D_{Regm_2} = 0)$

Whereas, i = 0 to 5, j =1 to 4, k = 1 to 2, l = 1 to 3, m = 1 to 3

Equation (2) shows the open economy IS curve model. In the model q^g_t stands for the real

[10] In this study, the econometric approach has been followed which according to Nunenkamp and Schweickert (1990) enable the researchers to include additional variables in their models. Here, two additional variables i.e. trade balance and foreign exchange reserves are also incorporated in the model for capturing the effects of all possible channels which results in the contraction or expansion of output in an economy. It has been done so because as mentioned by the Khan and Night (1983) in developing countries because of their weak macroeconomic performance a number of internal and external factors affect their macroeconomic performance.

exchange rate, tb^g_t for the real trade balance and the fr^g_t for the real foreign exchange reserves. Here, the constraint ($q^g_t = 0$) are relaxed for identifying that real exchange rate is present in the model. Like Ball (1998) the q^g_t is included in the model in lag form. However, it is included in the model so that an increase in it stands for the depreciation/devaluation. fr^g_t is also include in the model with lags. However, tb^g_t is included contemporaneously.

Finally, for capturing the effects of the two regime switches in the open economy IS output gap model, two dummy variables i.e. D_{Regm1} and D_{Regm2} stand for the two regime shifts occurred during the study period, 1973-2008 have also been included in the open economy model. Here, D_{Regm1} stands for the first regime shift occurred during 1982. Whereas, D_{Regm2} stands for the second regime shift occurred during 2000. Both the regime shifts are included in the in the model so that D_{Regm1} takes the value of "1" for the full period from 1982 to 1999 and "0" otherwise. Similarly, D_{Regm2} takes the value of "1" for the full period from 2000 to 2008. and "0" for the rest of the period. The following is the model:

$$y^g_t = \alpha_0 + \sum_{i=0}^{i} \alpha_{i^g,i}\,(i^g_t) + \sum_{j=1}^{j} \alpha_{\pi^g,j}\,(\pi^g_{t-j}) + \sum_{k=1}^{k} \alpha_{q^g,k}\,(q^g_{t-k}) + \alpha_{tb^g}(tb^g_t)$$

$$+ \sum_{l=1}^{i} \alpha_{fr^g,i}\,(fr^g_{t-l}) + \varepsilon_{\pi^g t} \sum_{l=1}^{l} \alpha_{y^g,i}\,(y^g_{t-l})$$

$$+ \alpha_{Regm_1}\left(D_{Regm_1}\right) + \alpha_{Regm_2}\left(D_{Regm_2}\right) + \varepsilon_{\pi^g t} \quad (3)$$

Whereas, $\begin{pmatrix} 1 \text{ for } D_{Regm_1} \text{ , 0 otherwise} \\ 0r \\ 1 \text{ for } D_{Regm_2} \text{ , 0 otherwise} \end{pmatrix}$

Whereas, i = 0 to 5, j =1 to 4, k = 1 to 2, l = 1 to 3, m = 1 to 3

Equation (3) is the open economy model with the regime shifts. Here, the constraints i.e. $D_{Regm_1} = 0$ and $D_{Regm_2} = 0$ have been relaxed for showing that both the regime shifts are considered in the open economy model. The main purpose here is to examine whether exchange rate systems affect the y^g_t in Pakistan or not.

In the above models the symbol "g" has been putted on all the variables which shows that this study is concerning only with the cyclical components of the data which are extracted from the observed series through the application of Hodrick Prescott (1981) filter method. The application of the Hodrick Prescott (HP) filter method not only limit the researchers focus on the short run fluctuations of the variables but it also avoid the problem of spurious regression, which can arise if the data is non-stationary and make the regression results non-reliable.

Empirical Strategy

It has been noted that it is difficult to explore the relationship between the real exchange rate and output gap on the priori basis; therefore it seems plausible to make an empirical evaluation of the contractionary hypothesis of real devaluations for Pakistan. For doing so, the results have been divided into three parts on the basis of all the models of the study. First, results have been computed for the closed economy model which is placed in table. 3.1. After that results for the open economy model have been derived. These results are given in table. 3.2. Finally, for examining the role of the regime shifts in the determination of output some more results are computed which are given in table. 3. A detail discussion of all the results is given as under:

Table. 3.1 show the results for the closed economy IS curve model of the study. The main purpose here is to find out whether output gap for Pakistan can be determined in a closed economy setup or not. Here, only two domestic factors i.e. interest rate (i^g_t) and (π^g_t) have been incorporated in the model. The i^g_t is included in the model by assuming that the State Bank of Pakistan uses it as a monetary policy instrument by following the Taylor rule (1993). Bernhardsen and Gerdrup (2007) mentioned that interest rate (i^g_t) is an important monetary policy instrument and it can result in the contraction or expansion of output in an economy. The results showed that i^g_t has a significant contemporaneous relationship with

the y^g_t, however with unexpected positive sign. Another, variable, included in the model is the inflation rate (π^g_t). The results showed a significant positive and lagged relationship of the π^g_t with the y^g_t. At π^g_{t-2} it showed a negative relationship with the y^g_t, but at π^g_{t-1}, π^g_{t-3} and π^g_{t-4} its sign is positive. Although at π^g_{t-1} it remained insignificant yet it has been included in the model for handling model specification problems. Overall, it has been found that π^g_t has a positive relationship with the y^g_t. This result is in line with the results of Barro (2001), Gylfason and Herbertsson (2001) and Guerrero (2006) who also concluded that inflation put contractionary effects on the output in an economy. Similarly, the lags of the dependent variable have also been included in the model to know whether y^g_t is also determined by its past values or not. The results showed that at y^g_{t-1} and y^g_{t-3} it showed a positive whereas at y^g_{t-2} it showed a negative relationship with the y^g_t. However, overall it put positive effects on the y^g_t. Although the adjusted R^2 value showed that the explanatory power of the regressors in the model is reasonable, however, the wrong sign of the i^g_t and the small value of the Durbin Watson[11] value is 1.59 which shows that there might be some missing values in the model, which are require to be considered. These results has been confirmed with the post diagnostic i.e. Q-statistic, LM statistic and CUSUM square stability tests i.e. CUSUM and CUSUM square tests.

Table. 3.2 present the results for the open economy model. Here, q^g_t with two additional variables tb^g_t and fr^g_t have been included in the model. The main purpose here is to find out whether real exchange rate (q^g_t) has a positive or negative relationship with the y^g_t. The results showed that with the inclusion of the additional variables i^g_t showed a negatively significant relationship with y^g_t which is according to the expectations. This result of the i^g_t is in contrast with the previous result given in table. 3.1. Here, i^g_t showed both a contemporaneous and lagged relationship with y^g_t. However at i^g_t, i^g_{t-3}, i^g_{t-4} it showed a significant and negative impact on y^g_t, and at i^g_{t-1}, i^g_{t-2} it showed a positive relationship with y^g_t. However, overall its overall impact on the y^g_t is negative. One possible explanation for this negative impact of i^g_t on y^g_t is that when the monetary authority following the Taylor rule increases the i^g_t, it attracts the foreign capital inflow in the country which helps in the contraction of the i^g_t through different channels i.e. growth in the domestic investment activities etc.

Similarly overall π^g_t is still having a positive relationship with the y^g_t. However, its impact in terms of quantity and significance is slightly higher than before. Similarly the interest variable q^g_t also showed a positively significant relationship with the y^g_t at q^g_{t-1} and q^g_{t-2}. This positive relationship of the q^g_t with the y^g_t justifies our hypothesis that a real depreciation put expansionary effects on the output gap. This result is also similar to the theoretical and empirical conclusions of Alejendro (1963, 1965), Branson (1986), Lizondo and Montiel (1989).

However, here the overall impact of the q^g_t on the y^g_t has also been examined without focusing on any particular channel i.e. demand or supply side. For a developing country like Pakistan this expansionary effect of the q^g_t on the y^g_t might be come from the aggregate supply channel and particularly because of the bottlenecks in the imported inputs which are using by the manufacturing sector. The main reason for this is that there are no domestic closed substitutes available for this and the country is highly dependent on imported goods. Also the country exports are mostly consist on the agricultural goods whose supply is very price inelastic specifically in the short and medium time periods. However, the overall impact of devaluation on output has been examined without focusing on any particular channel i.e. demand or supply. For a developing country like Pakistan this contractionary effect of the real depreciation on the output can be via supply channel of imported inputs using by the manufacturing sector where the range of the domestic substitutes for these goods is narrow

[11] However, this value of the Durbin Watson statistic is kept in the table with the understanding that the lags of the dependent variable are also present in the model in form of regressors which make the Durbin Watson statistic non-reliable for derivation of the conclusion about the presence of serial correlation in the data.

and the country is highly dependent on imports and having weak export structure mostly consist on the agricultural goods whose supply is very price inelastic in the short and medium run. This argument is also supported by Solimano (1986) who in his study for Chile mentioned that in developing countries the supply side resource constraints can dominantly affect the economic activities as a result of the real devaluations. Moreover, two additional variables i.e. tb^g_t and fr^g_t have also been included in the model which turned significant with the expected signs. The tb^g_t showed a negative relationship with y^g_t which shows that an improvement in the tb^g_t put contractionary effects on y^g_t. Whereas, the fr^g_t remained positively significant at fr^g_{t-1} and negatively significant at fr^g_{t-2} and $fr^g_{t-}3$. This result of the fr^g_t is also supported by the Polterovich and Popov (2003) who mentioned that an increase in the foreign exchange reserves positively affect the output level in an economy as it helps in the increase of investment and capital productivity in an economy. y^g_t is also influenced by its own lags i.e. y^g_{t-1}, y^g_{t-2}, y^g_{t-3}. However, its overall impact on y^g_t is still positive like table. 3.1. With the inclusion of the additional variables in the model, the adjusted R^2 value increased i.e. 0.70 > 0.45 showing that most of the variation in y^g_t is explained by the explanatory variables. The DW statistic value is raised to 1.84 which depicts our results are reliable. The post diagnostic tests i.e. Q-statistic, LM-test and the CUSUM stability tests also supported these results. The post diagnostic tests are given in Appendix.

Table. 3.1 Estimation results for the closed economy IS-curve model
Dependent Variable : y^g_t
Method : Least Squares
Sample Period: 1973-2008

Parameter	(Adjusted Sample:1977-2008) Estimates	Standard Error
i^g_t	1.333887***	0.249445)
π^g_{t-1}	0.159575	(0.193852)
π^g_{t-2}	-0.410692**	(0.157169)
π^g_{t-3}	0.261726*	(0.140168)
π^g_{t-4}	0.338245***	(0.064448)
y^g_{t-1}	0.269455*	(0.130396)
y^g_{t-2}	-0.278724**	(0.102516)
y^g_{t-3}	0.280000**	(0.114479)
R^2	0.59	
Adj: R^2	0.45	
DW	1.59	

- The asterisks "*" , "**" , "***" stand for 90%, 95%, and 99% confidence level.
- The best results are obtained on the basis of Q-statistic, LM test and CUSUM stability tests.
- Newy-West HAC is used for obtaining heteroskedsticity and autocorrelation consistent S.Es.
- Insignificant variables including the intercept are dropped from the model.

Two dummy variables i.e. D_{Regm_1} and D_{Regm_2} occurred during 1982 and 2000 have also been included in the open economy IS curve model to find out whether regime shifts play any role in the determination of the y^g_t or not. The results computed are placed in table. 3.4. It is found that all the variables are still

significant almost with the same magnitudes and significant levels. i^g_t turned significant contemporaneously and also at i^g_{t-1}, i^g_{t-2}, i^g_{t-3}, i^g_{t-4} and i^g_{t-5}. At i^g_t , i^g_{t-3}, i^g_{t-4}, and i^g_{t-5} it showed a negative and at i^g_{t-1} , i^g_{t-2} it showed a positive relationship with the y^g_t. However, its overall impact on y^g_t is still negative. Similarly, π^g_t turned significant at π^g_{t-1}, π^g_{t-2}, π^g_{t-3}, and π^g_{t-4} and showed an overall positive relationship with y^g_t. q^g_t is still significant at q^g_t and q^g_t and showed similar relationship with the y^g_t. The additional variables i.e. tb^g_t and fr^g_t also showed similar relationship with y^g_t. Also the overall influence of y^g_{t-1}, y^g_{t-2}, y^g_{t-3} on the y^g_t is also remained positive. Although D_{Regm_1} remained insignificant, however, D_{Regm_2} turned positively significant which shows that a shift towards the more floating regime increased the y^g_t in Pakistan. The adjusted R^2 value show that with the consideration for the regime shifts the R^2 value increased (i.e. 0.78 > 0.70 > 0.45). The DW statistic value (2.46) shows that these results are reliable, which is also checked by using the post diagnostic tests i.e. Q-statistic, LM-test and the CUSUM stability test. For details see appendix. In sum, overall the results show that a rise in the q^g_t put expansionary effects on the y^g_t, supporting our contractionary hypothesis of the real depreciations. Also it is found that y^g_t is also dependent on the historical exchange rate systems followed by the State Bank of Pakistan during the study period.

Conclusion

Are real exchange rate depreciations contractionary or expansionary? So for no agreement has been found in the empirical literature. Although the followers of the conventional theories (i.e. elasticties, absorption and Keynesian) claimed that real devaluation expands the output level. However, the recent evidences of the new structuralist empirics showed that real depreciation can results in the contraction of the output in an economy. The study has been conducted to analyze whether real depreciations put expansionary or contractionary effects on the output of Pakistan by using annual data over the period 1973-2008. For this purpose, a three version IS curve approach derived from the backward looking models of Ball (1997, 1998) has been used. The main findings of the study are that real exchange rate depreciations put expansionary effects on the output gap in Pakistan. The results also showed that movements towards a more floating exchange rate system also increased the output gap in Pakistan.

Table-3.2 Estimation Results for the Open Economy IS-curve model
Dependent Variable : y^g_t
Method : Least Squares
Sample Period: 1973-2008

Parameter	(Adjustment Sample:1978-2008) Estimates	Standard Error
i^g_t	-2.160768**	(0.555379)
i^g_{t-1}	1.327435*	(0.604548)
i^g_{t-2}	1.326249**	(0.323743)
i^g_{t-3}	-1.249717***	(0.292507)
i^g_{t-4}	-1.001293**	(0.327678)
i^g_{t-5}	0. 916754**	(0.368092)
π^g_{t-1}	0.472093	(0.376331)
π^g_{t-2}	1.020856**	(0.262219)
π^g_{t-3}	0.829516**	(0.302096)
π^g_{t-4}	-0.742159***	(0.156731)
q^g_{t-1}	0.364413*	(0.177082)
q^g_{t-2}	0.424787**	(0.122177)
tb^g_t	-3.47E-05**	(1.03E-05)
fr^g_{t-1}	0.079241***	(0.018047)
fr^g_{t-2}	-0.044001**	(0.015958)
fr^g_{t-3}	-0.124219***	(0.013413)
y^g_{t-1}	0.209367*	(0.141786)
y^g_{t-2}	0.890570***	(0.172931)
y^g_{t-3}	1.081885**	(0.311672)
R^2	0.91	
Adj: R^2	0.70	
DW	1.84	

- The asterisks "*" , "**" , "***" stand for 90%, 95%, and 99% confidence level.
- The best results are obtained on the basis of Q-statistic, LM test and CUSUM stability tests.
- Newy-West HAC is used for obtaining heteroskedsticity and autocorrelation consistent S.Es.
- Insignificant variables including the intercept are dropped from the model.
- A rise in real exchange rate stands for depreciation/devaluation

Table-3.3 Wald/F test for the Overall Significance of Regressors

Dependent Variable: y^g_t

Explanatory Variables	F-Statistic
i^g_t, i^g_{t-1}, i^g_{t-2}, i^g_{t-3}, i^g_{t-4}, i^g_{t-5}, π^g_{t-1}, π^g_{t-2}, π^g_{t-3}, π^g_{t-5}, q^g_{t-1}, q^g_{t-2}, tb^g_t, fr^g_{t-1}, fr^g_{t-2}, fr^g_{t-3}, y^g_{t-1}, y^g_{t-2}, y^g_{t-4}, y^g_{t-5}	497.7757**

Asterisks " ** " stands for 95% confidence level

For the overall significance of the model Wald test has been used. The results are given in table. 3.3. It is found that all the variables are also significant altogether in the model.

Table. 3.4 : Estimation Results for the Open Economy IS-curve model With Regime Shifts

Dependent Variable : y^g_t
Method : Least Squares
Sample Period: 1973-2008

Parameter	(Adjusted Sample:1978-2008) Estimates	Standard Error
i^g_t	-1.974180***	(0.432543)
i^g_{t-1}	1.383463**	(0.472624)
i^g_{t-2}	1.356247**	(0.364560)
i^g_{t-3}	-1.068252***	(0.182819)
i^g_{t-4}	-0.913732*	(0.458990)
i^g_{t-5}	-0.913732*	(0.458990)
π^g_{t-1}	0.451527	(0.292995)
π^g_{t-2}	1.013660**	(0.330259)
π^g_{t-3}	0.676829***	(0.141861)
π^g_{t-4}	-0.697273***	(0.110406)
q^g_{t-1}	0.268078**	(0.112831)
q^g_{t-2}	0.334657**	(0.091582)
fr^g_{t-1}	-3.27E-05**	(9.88E-06)
fr^g_{t-2}	-0.0415753*	(0.019175)
fr^g_{t-3}	-0.0118594***	(0.010014)
y^g_{t-1}	0.191383	(0.134707)
y^g_{t-2}	-0.225765*	(0.112150)
y^g_{t-3}	0.844096**	(0.228291)
D_{Regm_2}	1.692790**	(0.425135)
R^2	0.93	
Adj: R^2	0.78	
DW	2.46	

- The asterisks "*" , "**" , "***" stand for 90%, 95%, and 99% confidence level.
- The best results are obtained on the basis of Q-statistic, LM test and CUSUM stability tests.
- Newy-West HAC is used for obtaining heteroskedsticity and autocorrelation consistent S.Es.
- Insignificant variables including the intercept are dropped from the model.

Table-3.5 Wald/F test for the Overall Significance of Regressors
Dependent Variable: y^g_t

Explanatory Variables	F-Statistic
i^g_t i^g_t,i^g_{t-1} i^g_{t-2},i^g_{t-3}, i^g_{t-4},i^g_{t-5}, i^g_{t-6},π^g_{t-1}, π^g_{t-2},π^g_{t-3},π^g_{t-5}, q^g_{t-1},q^g_{t-2},tb^g_t,fr^g_{t-1},fr^g_{t-2},fr^g_{t-3},y^g_{t-1}, $^g_{t-2}$, y^g_{t-4},y^g_{t-5} , D_{Regm2}	370.9727**

Asterisks " ** " stands for 95% confidence level

Table. 3.5 shows the Wald test results computed for table. 3.4. The results show that overall all the variables are also significant in the model.

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Appendix

Empirical Approaches about the Impact of Devaluation on Output

Control Group Approach	
Author(s)	***Conclusion(s)***
Donovan (1982)	On average output decline more as experienced by the LDC in one year but less in 3 years for the 78 IMF supported devaluations
Gylfason (1987)	Devaluation impact on output is ambiguous for the IMF supported program during the period 1977-1979
Kamin (1988)	Devaluation have expansionary impact output or neutral after studying all the 107 devaluations in LDCs
Edwards (1989)	Studied the 18 devaluations in Latin America and concluded that output decline not because devaluation but because of other factors
Khan (1988)	Studied 69 LDCs devaluations over the period 1973-88 and concluded that devaluation has contractionary impact but not statistically significant
Before and After Approach	
Diaz-Alejendro (1965)	Devaluations brings reduction in output in Argentina
Cooper (1971a)	Studied 24 devaluations in LDCs over the period 1953-66 and concluded that devaluation had contractionary effect on output
Killick *et al* (1992)	Studied 266 IMF-supported programs implemented during the 1980s and concluded that in short run devaluation were neutral but in the long run output increased
Macro Simulation Approach	
Gylfason and Schmid(1983)	Devalution had expansionary effects on output in 8 out of 10 LDCs
Gylfason and Risager (1984)	Supported contractionary hypothesis for developing countries and expansionary hypothesis for developed countries
Solimano (1986)	Devaluation has contractionary impacts both in the short and medium run in Chile
Branson (1986)	Devaluation decrease output in Keynia
Econometric Approach	
Sheehey (1986)	For 16 Latin American countries found out that devaluation had contractionary impact on output
Edwards (1989)	Studied 12 devaluations in LDCs and concluded that devaluations had contractionary effects in the short run and however, in the long run it has no impact on output
Morley, 1992	Supported the contractionary hypothesis for 28 developing countries
Bahmani-Oskooee and Rhee (1997)	found out for Korean economy that real depreciations put expansionary effects in the long run
Upadyyaya (1999)	Concluded for 6 Asian countries and found out that devaluations are contractionary Pakistan and Thailand and neutral for India, Sri Lanka, Malaysia and Philippines' in the long run
De Silva and Zhu (2004)	Concluded for Sri Lankan economy that devaluation improved trade balance but results in contraction of output

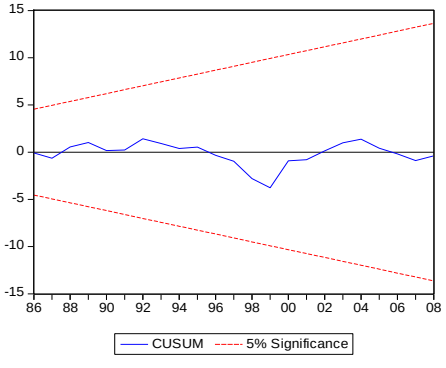
Q-Statistics Results for Table.3.2

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.047	0.047	0.0724	0.788
. |* . |	. |* . |	2	0.208	0.207	1.5616	0.458
. |** . |	. |** . |	3	0.344	0.342	5.7731	0.123
. *| . |	. *| . |	4	-0.091	-0.161	6.0790	0.193
. |* . |	. | . |	5	0.179	0.049	7.3067	0.199
. | . |	. | . |	6	0.023	-0.054	7.3272	0.292
.**| . |	.**| . |	7	-0.221	-0.224	9.3740	0.227
. |* . |	. | . |	8	0.121	0.058	10.008	0.264
. *| . |	. | . |	9	-0.142	-0.028	10.936	0.280
. *| . |	. | . |	10	-0.112	-0.023	11.541	0.317
. | . |	. | . |	11	0.011	-0.044	11.546	0.399
. *| . |	. | . |	12	-0.154	-0.004	12.818	0.382
. | . |	. | . |	13	0.034	0.059	12.884	0.457
. | . |	. *| . |	14	-0.064	-0.081	13.128	0.516
. *| . |	. *| . |	15	-0.143	-0.081	14.429	0.493
. *| . |	.**| . |	16	-0.175	-0.291	16.538	0.416

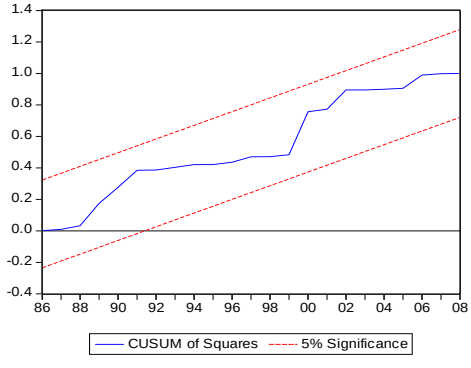
Breusch-Godfrey Serial Correlation LM Test Results for Table3.2

LM Test	Estimated Values	P-Values
F-statistic	0.599206	0.5844
Obs*R-squared	5.800250	0.0550

CUSUM Stability Test for Table3.2



CUSUM Squares Stability Test for Table.3.2



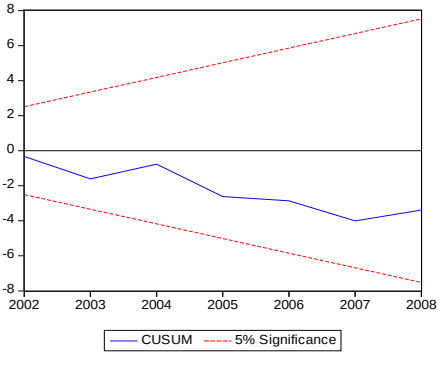
Q-Statistics Results for Table.3.3

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.**| . |	.**| . |	1	-0.238	-0.238	1.8755	0.171
. |* . |	. | . |	2	0.079	0.024	2.0917	0.351
. |**. |	. |** |	3	0.321	0.366	5.7485	0.125
**| . |	.**| . |	4	-0.374	-0.267	10.911	0.028
. | . |	.**| . |	5	-0.006	-0.252	10.913	0.053
. | . |	. *| . |	6	-0.059	-0.174	11.051	0.087
.**| . |	. *| . |	7	-0.323	-0.178	15.401	0.031
. |* . |	. | . |	8	0.107	0.013	15.898	0.044
. *| . |	. *| . |	9	-0.119	-0.067	16.550	0.056
. | . |	. | . |	10	-0.046	-0.048	16.651	0.082
. |* . |	. *| . |	11	0.129	-0.087	17.486	0.094
. *| . |	. *| . |	12	-0.086	-0.116	17.879	0.119
. |* . |	. | . |	13	0.100	-0.033	18.440	0.142
. | . |	. | . |	14	0.044	-0.046	18.557	0.183
. |* . |	. |**. |	15	0.137	0.246	19.761	0.181
. *| . |	.**| . |	16	-0.117	-0.208	20.701	0.190

Breusch-Godfrey Serial Correlation LM Test Results for Table.3.3

LM Test	Estimated Values	P-Values
F-statistic	0.902729	0.4627
Obs*R-squared	7.931807	0.0190

CUSUM Stability Test for Table.3.3



CUSUM Squares Stability Test for Table.3.3