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Is Devaluation Contractionary? Empirical Evidence for Pakistan

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Abstract:

The paper investigates the effect of real devaluation on economic growth. In the empirical model we also include other theoretically justified variables in the case of Pakistan, such as foreign remittances, money supply, and government spending. The paper implements the ADF method to test check the stationarity of the series; and the ARDL bounds testing approach to cointegration to establish a long run relationship. The findings affirm cointegration among the series. Real devaluation exerts contractionary effect on economic growth. The results from variance decomposition and impulse response-function show unidirectional causality from foreign remittances to economic growth; and bidirectional causality between money supply and foreign remittances. Furthermore, money supply Granger causes government spending; while devaluation Granger causes economic growth, albeit, weakly. The results should help in formulating a comprehensive trade policy including the use of competitive devaluation as a tool to correct balance of payments problems.

Key Words: Devaluation, Contractionary, Cointegration
JEL Classification: F31, O16, C4

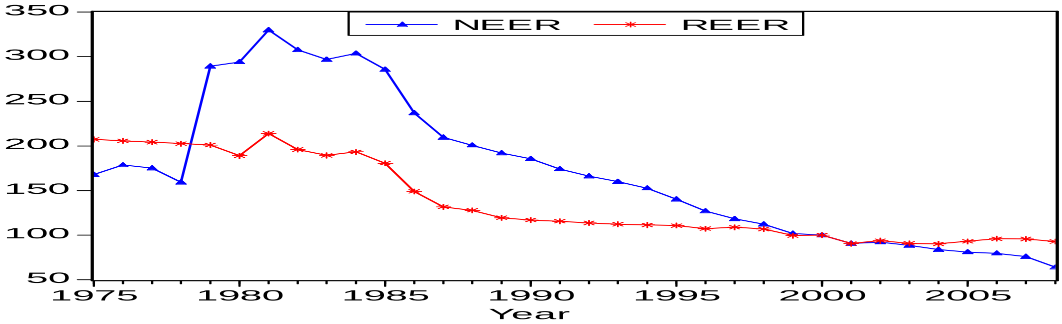
Introduction

International trade theory predicts that devaluation (depreciation of currency) improves trade balance by making exports cheaper; and imports relatively more expensive. However, the effect of currency devaluation on economic growth is uncertain. The elasticity of exports and imports with respect to devaluation captures the net effect on trade balance. If devaluation improves trade balance, it benefits the economy; but if domestic substitutes for imports are not available, devaluation could increase the domestic price of imports, and thus trigger inflation. This view is consistent with the expenditure switching mechanism theory. The impact of higher cost of imported intermediate inputs could offset the positive effects of increases in exports on output growth. Under this scenario devaluation could threaten external stability and widen trade deficit. Furthermore, the benefits of devaluation can be severely restricted if exports and imports are highly inelastic with respect to the exchange rate. Devaluation boosts exports and thereby output (due to the expansionary effect), helps build international reserves, and lowers the unemployment rate. A different line of argument is that devaluation shrinks domestic economic activity due to increased prices of intermediate inputs as well as its adverse effects on output growth. This is known as the contractionary effect.

During 1975-2005, Pakistan’s accumulated trade deficit was US$6.104 billion. The average annual inflation rate was over 9 percent. In 2009 inflation reached 11.2 percent, when the total trade deficit swelled to US$9.402 billion (Government of Pakistan (GoP), 2009). The rising oil prices in the international market took its toll on imports bill. The annual growth rate of imports was 17.77 percent while exports grew at an annual average rate of 16.4 percent during the period of 2002-2006 (GoP, 2009). Due to increased import of food items, Pakistan’s trade deficit also swelled. In 2007, the growth rate of exports was 11.4 percent against imports at 29.7 percent.

Pakistan, a nation of 160 million in the Indian subcontinent, adopted managed float exchange rate policy to improve the chronic adverse trade balance. A liberalized policy was introduced to align the local currency with the international market and pave the way to flexible exchange rate. Figure-1 plots the trends in nominal and real effective exchange rates over the study period. The local currency, the Pak-rupee (PRs), has persistently depreciated during the different regimes –fixed, floating, managed, as well as the more flexible regime. The depreciation in Pak rupee by16.3 percent in the 1st quarter of 2009 created a pressure on the foreign currency reserves. As a result, the nation saw increased political uncertainty; which created a ground for speculation in the foreign exchange market and led to capital outflows. The government of Pakistan adopted a more flexible exchange regime late in 2008 under pressure from the International Monetary Fund (IMF). This new regime slowed down the depreciation rate by 2.5 percent during Dec 2008 to Jun 2009 (GoP, 2009).

Figure-1 Movements in Real and Nominal Effective Exchange Rates



The objective of the paper is to empirically examine the long run equilibrium relation between devaluation and real output growth in Pakistan by using annual data from 1975 to 2008. The study is motivated by the lack of any serious study on Pakistan that purports to address this specific issue. The findings will help better to understand the nation's shifting exchange rate policy regimes vis-à-vis the implications for the economy. Given that the theoretical literature is inconclusive, country specific study might shed light in assessing the postulated relationship[1]. This paper highlights the obstacles Pakistan faces in reaping benefits from devaluation.

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[1]Narayan and Narayan (2007) also highlighted this point.

Dimitris (2004)[2] investigated the impact of exchange rate changes on domestic output in Pakistan. He found that devaluation slows down economic growth rate while Asif et al. (2011) found expansionary effect of devaluation. Knowledge of the impact of exchange rate on economic growth is very important in an increasingly globalized world. The recent policies of government of Pakistan for increased liberalization, particularly in the exchange rate regimes, have not been a subject of academic scrutiny. This paper fills in a gap in the literature by taking a fresh look at the impact of exchange rate on economic growth using the ARDL methodology. The approach is better suited in small samples. The paper will help government of Pakistan to make informed decision on how to apply commercial policy as a tool to promote economic growth.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 describes the sources of data and specifies the empirical strategy. Results are reported in section 4, and conclusions drawn in section 5.

2. Review of the related literature

As noted, devaluation of domestic currency can have contractionary impact on the economy by sparking a wave of anxiety about the external stability, triggering capital outflow, erosion of foreign reserves, and thus increasing the need for foreign borrowing. High import cost lowers the demand for intermediate input imports and also import of capital goods which are technologically superior. Devaluation reduces demand deposits and domestic savings [Copelman and Werner, 1996; and Kamin and Rogers, 2000]. The contractionary effect of real devaluation can cause banking crises through regional spillover effects during currency crises. These problems can be further aggravated by regional contagion through financial and trade linkages (Rajan and Shen, 2006). Frankel (2005) argues that the poor performance of the banking sector and restrictions on access to foreign lending slows down economic activity. Cooper (1971) and Lizondo and Montiel (1989) note that devaluation increases obligations of debt dominated in foreign

[2]Dimitris (2004) employed Johansen cointegration approach within a bivariate model for Pakistan and a few other Asian countries. He used data from 1968 - 99 but ignored the potential impact of structural breaks due to the civil in 1971 and the implementation of structural adjustment program in the 1990s. His results may suffer omitted variables bias.

currency and thus raises the cost of future borrowing. The contractionary effect from lowered aggregate demand can lead to wider trade deficit [Diaz-Alejandro, 1963; Cooper, 1971; and Krugman and Taylor, 1978].

Several nations have used devaluation to address balance of payments problems. However, the outcome varies by the stage of economic growth of the nation. Keynesians argue that devaluation impacts output positively, but the expansionary effect may not hold in the long run. Khan (1988) notes that the positive effects of devaluation on balance of payments are achieved at the cost of reduced growth rate. Sheehey (1986) highlights the negative effect of devaluation on the country's real output growth. Edwards (1986) argues that even though the short run impact of devaluation on output growth may be negative, in the long run the effect could be neutral. Using Mexican data, Kamin and Rogers (2000) concluded that real devaluation produces high inflation and thus slows the rate of economic growth in the short and the long run.

For the developing nations, the effect of devaluation appears to be contractionary. In the developed nations the exchange rate is market determined and thus intervention in the form of devaluation is rarely needed. Miteza (2006) analyzed the emerging economies of Czech Republic, Hungary, Poland, Slovakia and Romania. He concluded that real devaluation is contractionary in the long-run. Devaluation decreases the aggregate supply at a much faster rate relative to the increases in the aggregate demand. The supply shock caused by the rise in the cost of imported inputs feeds into the inflation (Papazoglou, 1999; Bahmani-Oskooee and Miteza, 2003). Using a three-market Keynesian model for Bangladesh, Razzaque (2003) found contractionary effect of real devaluation on domestic output.

Mejía-Reyes et al. (2010) analyzed the effect of devaluation on economic growth in six Latin American economies: Argentina, Brazil, Chile, Columbia, Venezuela and Mexico. They found that devaluation is contractionary. Bahmani-Oskooee and Kandil (2009) explore the relationship between exchange-rate fluctuations and output growth for the Middle East and North American countries. They find both contractionary and expansionary impacts of exchange rate changes on output growth. Shieh (2009)[3] found that devaluation slows down economic growth due to higher cost of imports under tight money. Findings by Kalyoncu et al., (2008)[4] however are mixed. Ratha et al., (2008)[5] reported that devaluation is contractionary. By combining data from East Asian and Latin American countries, Kim and Ying (2007)[6] showed that in the post liberalization era the effect of devaluation on economic growth is negative. Bahmani-Oskooee and Kandil (2007)[7] show that devaluation of the Iranian Rial stimulated Iranian export and had positive impact on economic growth. However, Chaudhary and Chaudhary (2007) found expansionary effects of devaluation on output.

The foregoing discussion suggests that the literature on the effect of devaluation on output growth is inconclusive (Gylfason and Schmid, 1983). To explore the relation, it may be necessary to capture country specific characteristics. For Pakistan, exports are not well diversified, nor are they competitive due to high domestic inflation and weak marketing strategies. Bahmani-Oskooee and Kutan (2008) argue that countries which depend more on imported inputs are more likely to face contractionary effects from devaluation in the short run because of higher cost of production relative to the increase in the volume of exports. This condition perhaps, is a good description of the situation in Pakistan. Some other research also lends support to the hypothesis that devaluation is contractionary [Hoffmaister and Vegh (1996) on Uraguay; Moreno (1999) on six East Asian countries; and Berument and Pasaougullari (2003) on Turkey]. The expansionary effect of devaluation is better realized in export oriented countries.

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[3]Used a modified Mundell-Fleming model to assess the impact of currency devaluation on output growth and trade balance.

[4]Examined the effect of devaluation on economic growth in the OECD countries. They found devaluation influences economic growth in 9 out of 23 economies; in six countries (Austria, Hungary, Poland, Portugal, Switzerland and Turkey), the impact of devaluation is contractionary; and in 3 of 9 countries (Finland, Germany and Sweden) devaluation raises output.

[5]Investigated the impact of currency devaluation on output growth in China using ARDL approach.

[6]Used data from East Asia and Latin America they found that devaluation affects economic growth negatively in the post liberalization era.

[7] Bahmani-Oskooee and Kandil (2007)[7] examined the relationship between exchange rate changes and output growth for the period of 1953-2003 for Iran.

Exchange rate appears to have a profound impact on the economic growth. However, political factors, weak government's commitment towards the implementation of sound economic policies also play significant role on the outcome [Bahmani-Oskooee and Kutan (2008)]. Recently, Asif et al. (2011) found bidirectional causality between devaluation and output growth although the results may be biased due to omissions of relevant variables (Lütkepohl, 1982). Ratha (2010) examine the effect of devaluation on economic growth in India. He found that currency depreciation improves trade balance, boosts exports and thus promotes economic growth. Alam (2010) did not find causal relation between devaluation of Taka and exports earnings in Bangladesh.

This is the real dilemma for Pakistan and perhaps, other emerging and developing economies that have been through political instability and turmoil over a long time. This research on Pakistan is an interesting case study by highlighting the implication of using devaluation and thus commercial policy as a tool to promote economic growth.

3. Empirical strategy and Data Sources

To explore the relationship between exchange rate changes and real output, we included theoretically justified other variables relevant to the Pakistan economy in the empirical model. Pakistan receives sizeable amount foreign remittances which plays a major role in her economic growth. Government has traditionally been an important player in the economy. Finally, monetary policy has been assuming relatively more important role over the past few decades as the monetization process continues. For the reasons just described, inclusion of these variables appears well justified (see for details, Mankiw et al. 1992; Przeworski and Limongi 1993; Barro, 1991; Barro and Lee, 1994 and, Barro and Sala-i-Martin, 1995; etc.). The empirical model is specified as:

$$\ln GDP_t = \partial_\circ + \partial_1 \ln RER_t + \partial_2 \ln RM_t + \partial_3 \ln GSR_t + \partial_4 \ln REM_t + \mu_t \qquad (1)$$

where, the variables are as defined earlier. The rate of change in GDP measures economic growth; RER_t is currency devaluation proxied by the real effective exchange rate. We expect $\partial_1 > 0$, if devaluation is economic growth augmenting, otherwise $\partial_1 < 0$. RM_t

refers to real money supply. An increase in money supply lowers interest rates, reduces borrowing cost, and promotes investment which enhances domestic output. We expect $\partial_2 > 0$. Higher the government spending, the larger is the impact on economic growth, in the absence of crowding out (Shahbaz, 2008, 2009). We expect $\partial_3 > 0$. Increased international remittance (REM_t) boosts foreign reserve; adds resources to invest in physical and human capital; and thus promotes economic growth (Shahbaz et al. 2007). We expect $\partial_4 > 0$.

Data on real government spending (GSR_t), international remittances (REM_t), real money supply (RM_t), and real GDP (GDP_t) has been collected from the Economic Survey of Pakistan (various issues). The real effective exchange rate series (RER_t) has been taken from the International Financial Statistics (IFS, 2009). All data used in the paper are annual from 1975 to 2008, each transformed into natural logarithms.

3.1 <u>ARDL Bounds Testing</u>

To explore a long run relation among the economic variables, several methods of cointegration are available for use, e.g., the residual based Engle-Granger (1987) test; Maximum Likelihood based Johansen (1991, 1992) and Johansen-Juselius (1990) tests; and the autoregressive distributed lag (ARDL) bounds testing approach to cointegration. For the first two approaches, each series must have the same order of integration. The third approach, developed by Pesaran and Pesaran (1997), Pesaran and Shin (1999), and Pesaran et al. (2000, 2001) has found wide application in contemporary literature due to its advantages over the other methods. ARDL applies irrespective of whether underlying regressors are purely *I(0)*, *I(1)* or mutually co-integrated (Pesaran and Pesaran, 1999). The approach has better small sample properties (see Haug, 2002). The method takes sufficient number of lags to capture the data generating process in a general-to-specific model framework (Laurenceson et al. 2003)[8].

[8] ARDL is also having the information about the structural break in time series data.

We employ the ARDL bounds testing approach to investigate the existence of a long run relationships between real effective exchange rate and real GDP by including few other variables. Following Pesaran et el. (2001), we write p^{th} order *VAR*(*p*) with economic growth as the dependent variable:

$$z_t = \delta_1 + \delta_2 T + \sum_{t=1}^{p} \omega_i z_{t-1} + \mu_t \quad (2)$$

where, z_t is the vector of both x_t and y_t; y_t is the dependent variable, the real GDP per capita and $z_t = [\ln RER_t, \ln RM_t, \ln GSR_t, \ln REM_t]$ is a vector matrix (z_t). The variables are as defined earlier: $\mu = [\mu_z, \mu_y]$, T is the trend, ω_i is a matrix of VAR parameters of lag *i*. Following Pesaran et al. (2001), y_t is *I(1)* although the regressors x_t can have mixed order of integration, *I(1)*/*I(0)*. The vector error correction model (VECM) is as follows:

$$\Delta z_t = \mu + at + \beta z_{t-1} + \sum_{i=1}^{p-1} \beta_i \Delta y_{t-1} + \sum_{i=0}^{p-1} \beta_i \Delta x_{t-1} + v_t \quad (3)$$

where, Δ is the first-difference operator. We partition the long run multiplier matrix χ as:

$$\chi = \begin{bmatrix} \alpha_{yy} \alpha_{yx} \\ \alpha_{xy} \alpha_{xx} \end{bmatrix}$$

The diagonal fundamentals of the matrix are unrestricted, so the selected series can be either *I(0)* or *I(1)*. If $\alpha_{yy} = 0$, then y is *I(1)*, and if $\alpha_{yy} \angle 0$, then y is *I(0)*. The VECM method is useful in testing for at most one cointegrating vector between (y_t) and the explanatory variables (x_t). We follow Pesaran et al., (2001) [Case V (unrestricted intercept and trend)] to calculate F-statistic. The unrestricted error correction model (UECM) of the devaluation-growth nexus is written as:

$$\Delta \ln GDP = \gamma_{\circ} + \gamma_T T + \gamma_{RGDP} \ln GDP_{t-1} + \gamma_{REER} \ln RER_{t-1} + \gamma_{RM2} \ln RM_{t-1} + \gamma_{GSR} \ln GSR_{t-1}$$
$$+ \sum_{i=1}^{P} \gamma_{REM} \ln REM_{t-1} + \sum_{i=1}^{p} \beta_1 \Delta \ln GDP_{t-1} + \sum_{i=0}^{p} \beta_2 \Delta \ln RER_{t-1} + \sum_{i=0}^{p} \beta_3 \Delta \ln RM_{t-1} \quad (4)$$
$$+ \sum_{i=0}^{p} \beta_4 \Delta \ln GSR_{t-1} + \sum_{i=0}^{P} \beta_5 \Delta \ln REM_{t-1} + \psi_t$$

To obtain optimal lag length for each series, the ARDL method estimates $(p+1)^k$ number of regressions, where *p* is the maximum number of lags used and *k* is the number of the variables in an equation. The Schwartz-Bayesian Criteria (SBC) and Akaike's Information Criteria (AIC) are used for model selection. In the second step, the long run relationship is estimated by using the appropriate ARDL model. Once the lag order is settled, the *Wald* (F-Statistic) statistic is used to find the long run relationship among the series. The null-hypothesis of no cointegration i.e. $H_{\circ} = \gamma_{RGDP} = \gamma_{REER} = \gamma_{RM2} = \gamma_{GSR} = \gamma_{REM} = 0$ is tested against the alternate of cointegration $H_1 \neq \gamma_{RGDP} \neq \gamma_{REER} \neq \gamma_{RM2} \neq \gamma_{GSR} \neq \gamma_{REM} \neq 0$. The null hypothesis is rejected if calculated F-statistic exceeds the upper critical bound (UCB) of the test. If the test statistic is below the LCB, H_o is not rejected. If the calculated F-statistic lies between the LCB and the UCB, the test result is inconclusive. The error correction model shows the speed of adjustment needed to restore the long run equilibrium following a shock. The diagnostic tests and sensitivity analyses are conducted to examine serial correlation, autoregressive conditional heteroscedisticity, normality of residuals, and specification problem associated with the model.

4. Results

4.1 Unit Root and Cointegration Test Results

The ADF unit root tests confirm that all the series are I(1)[9] but we implement Saikkonen and Lütkepohl test to capture possible structural breaks[10] in the series.[11]

[9]Results from the ADF tests are available from the authors upon request.
[10]The ADF and DF-GLS may be can be unreliable in the presents of structural breaks.
[11]The descriptive statistics and pair-wise correlations for the variables are presented in Appendix-1 for information of the interested reader.

Table 1: SL Unit root analysis

Unit Root Test with structural break: Constant and Time trend included					
Variables	Shift dummy is used, break date is 1992	Saikkonen and Lütkepohl (k)	Variables	Shift dummy is used, break date is 1986	Saikkonen & Lütkepohl (k)
$\ln GDP_t$	Yes	-1.8287(0)	$\ln RER_t$	Yes	-1.2693(1)
$\Delta \ln GDP_t$	Yes	-2.7865*** (0)	$\Delta \ln RER_t$	Yes	-3.5326*(0)
	Shift dummy is used, break date is 1992	Saikkonen and Lütkepohl (k)	Variables	Shift dummy and used break date is 2005	Saikkonen & Lütkepohl (k)
$\ln RM_t$	Yes	0.1551 (0)	$\ln GSR_t$	Yes	-1.0681 (2)
$\Delta \ln RM_t$	Yes	-3.1884** (1)	$\Delta \ln GSR_t$	Yes	-5.9697* (0)
	Shift dummy is used, break date is 2002			Saikkonen and Lütkepohl (k)	
$\ln REM_t$	Yes			-0.7373 (0)	
$\Delta \ln REM_t$	Yes			-4.2822*(0)	
Note: (1) ***, ** and * denotes significance at 1%, 5% and 10% level respectively. k denotes lag length. Critical values are -3.55, -3.03, and -2.76 which are based on Lanne et al. (2002) at 1%, 5%, and 10% respectively.					

Table-2 reports the Saikkonen and Lütkepohl (SL) (2002) test results in the presence of structural break by using shift dummy. All the series have unit root in levels. The series $LGDP_t$ is I(1) at the 10% level in the presence of structural break. The break occurred in 1992. The series $LRER_t$, $LREM_t$ and $LGSR_t$ are also I(1) with breaks happening in 1986, 2005 and 2002, respectively; and significant at the 1% level. The series LRM_t is stationary at the 5% level with structural break in a1992. The time of the structural break has been determined endogenously[12].

[12]The details of the method are not reported here but can be found from Lanne et al. (2003).

Table 2: Lag Length Criteria

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SBC	HQ
0	109.0126	NA	8.38e-10	-6.710490	-6.479201	-6.635095
1	275.4989	268.5263*	9.33e-14*	-15.83864*	-14.45091*	-15.38627*
2	299.3170	30.73304	1.15e-13	-15.76239	-13.21821	-14.93305

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 3: ARDL Bound Testing

Panel I: Bounds testing to cointegration		
Estimated Equation	$\ln GDP_t = f(\ln RER_t, \ln RM_t, \ln REM_t, \ln GSR_t)$	
Optimal lag structure	(1, 0, 1,1, 0)	
F-statistics	8.505**	
Significant level	Critical Values Generated by Narayan (2005)	
	Lower bounds, $I(0)$	Upper bounds, $I(1)$
1 per cent	10.365	11.295
5 per cent	7.210	8.055
10 per cent	5.950	6.680

Note: ** shows cointegration at 5 % level of significance

Based on SBC and AIC, we select the appropriate lag length of 1 (table 2). The total number of regressions estimated by the ARDL method in equation-4 is $(1+1)^5 = 32$. The F-statistics, 8.505 exceeds the UCB 8.055 (Table-3) at the 5% level. This confirms cointegration which shows a long run relationship among the series under study over the period 1975-2008 for Pakistan.

Table 4: Long Run Analysis

Dependent Variable: $\ln GDP_t$			
Variable	Coefficient	T-statistics	Prob-value
Constant	5.0418	2.2994	0.0291
$\ln RM_t$	0.1478	3.5811	0.0013
$\ln RER_t$	-0.2745	-3.0248	0.0053
$\ln REM_t$	0.0241	1.9807	0.0575
$\ln GSR_t$	0.7527	8.8798	0.0000

Table-4 reports the long run elasticities. A 1 percent increase in the growth of money supply is expected to increase domestic output by 0.1478 percent, all else same. The relationship between real devaluation and economic growth is (-0.2745) and is highly significant. This suggests that for Pakistan real devaluations are contractionary. The findings are consistent with Razzaque (2003), Dimitris (2004), Miteza (2006), Ratha et al. (2008) but contradicts those of Chaudhary and Chaudhary (2007), Alam (2010) and Asif et al. (2011). The latter reported positive effect of currency devaluation on domestic output growth. Results also lend support to the view by Bahmani-Oskooee and Kutan (2008) that political instability, high inflation, weak governance and poor implementation of economic and trade policies are responsible for the contractionary impacts of devaluation. All these factors appear to be true of Pakistan. Although nominal devaluation leads to real devaluation in Pakistan, its beneficial effect is eaten up by high inflation in the country (Wahid and Shahbaz, 2009 and Shahbaz, 2009).

A 0.2745 percent fall in expected domestic output results from a 1 percent devaluation, all else same. Thus, devaluation-based policies are unlikely to improve economic growth in Pakistan, due to the absence factors that help competitiveness[13]. A look at the history of trade in Pakistan shows that export diversification is lacking. Also, Pakistan's international market-share has not gone up following devaluation (Shahbaz et al. 2011); nor did exports rise. Improper implementation of economic policies and political instability may have been detrimental to trade balance[14] and thus to economic growth. Historically, Pakistan has had adverse trade balance which only got worse over the yeas because a major part of imports consists of crude oil, machinery equipment, electronics, raw materials and food items.

[13]Depreciation increases the exports by making exports relatively cheaper and discourages the imports by making imports relatively more expensive, thus improving trade balance.
[14]See for details (Shahbaz et al. 2011).

Table 5: Exports and Imports of Goods and Services as Share of GDP

Year	Exports as Share of GDP	Imports as Share of GDP
2001	14.6595	15.7119
2002	15.2236	15.3140
2003	16.7189	16.1255
2004	15.6669	14.6332
2005	15.6895	19.5638
2006	15.2331	23.2236
2007	14.1120	21.2202
2008	13.7898	24.5872

Table 6: Composition of Imports (in percentage)

Years	Capital Goods	Raw Material for		Consumer Goods	Total
		Capital Goods	Consumer Goods		
2000-01	25	6	55	14	100
2001-02	28	6	55	11	100
2002-03	31	6	53	10	100
2003-04	35	6	49	9	100
2004-05	36	8	46	10	100
2005-06	37	7	45	11	100
2006-07	36	7	47	10	100
2007-08	29	8	53	10	100
July-March					
2007-08	29	8	52	11	100

Source: Economic Survey of Pakistan (2008-09)

On a sectoral basis, refinery is performing below capacity. Petroleum production is less than domestic demand, which is imported. This is a drag on Pakistan's balance of payments. Devaluation exacerbated the debt liability in Pakistan. The cost of debt servicing soared which also slowed the rate of economic growth. The situation worsened as the external debt kept piling up.

Real government spending generates employment and raises income. The results show that a 1 percent increase in government spending raises output by 0.75 percent on an average, ceteris paribus. Real money supply stimulates economic activity and helps domestic output. Results show that 0.14 percent rise in economic growth is linked to 1 percent increase in money supply, on an average, all else same. The impact of foreign remittances on GDP is positive and significant. A rise in remittances adds to financial solvency and makes resources available, boosts investment and promotes economic growth. The results show that a 1 percent rise in foreign remittances is expected to raise economic growth by 0.024 percent all else same. All these results are significant.

Table-7: Short Run Analysis

Dependent Variable: $\Delta \ln GDP_t$			
Variable	**Coefficient**	**T-Statistic**	**Inst-Value**
Constant	0.0260	1.8245	0.0800
$\Delta \ln GDP_{t-1}$	0.3454	1.8129	0.0819
$\Delta \ln RER_t$	-0.0226	-0.4420	0.6622
$\Delta \ln REM_t$	-0.0121	-1.8676	0.0736
$\Delta \ln GSR_t$	0.2904	5.1307	0.0000
$\Delta \ln RM_t$	-0.0741	-2.1921	0.0379
ECM_{t-1}	-0.2842	-3.8930	0.0007
R-squared = 0.4621 Adj-R-squared = 0.3330 Akaike Criterion = -5.1169 Schwarz Criterion = -4.7963 F-Statistic = 3.5798 Prob(F-statistic) = 0.0106 Durbin-Watson = 2.3376			

Table-7 reports the short-run results. An increase in currency devaluation by 1 percent is expected to lower economic growth by 0.0226 percent, all else same, in the short run; but it is statistically insignificant. Economic growth is boosted by 0.35 percent in current period from the lagged effect of real GDP. Government spending exerts positive effect on economic growth and is statistically significant. Foreign remittances are inversely linked with economic growth. Maybe, in the short run remittance funds are invested is sectors that usually take longer time to impact economic growth. Elasticity of economic growth with respect to money supply is -0.0741. The presence of a large non-monetized sector might make monetary policy in Pakistan less effective.

The ECM_{t-1} is highly significant. This confirms a long run relationship among economic growth, currency devaluation, foreign remittances, government spending and money supply. The coefficient of lagged error term is -0.2842 implies that deviation from the long run equilibrium is corrected by over 28 percent each year.

4.2 Sensitivity Analysis and Stability Test

The diagnostic tests for serial correlation, normality of residuals, autoregressive conditional heteroscedisticity, white heteroscedisticity and model specification test suggest that the short-run model passes them well. Ramsey test suggests that the model is well specified. The cumulative sum (CUSUM) and cumulative sum of squares (CUSUMsq) tests show that the long and the short run parameters are stable.

4.3 Variance Decomposition Approach

A limitation of the Granger causality tests is that it shows the direction of the causality but not the relative strength of causality outside of selected time span (Wolde-Rufael, 2009). Nor do the tests say anything about magnitude of the feedback from one variable to the other. The variance decomposition method (VDM) helps determine the response of the dependent variable to shocks stemming from independent variables. VDM is an alternative to impulse response function (IRF). The IRF graphs are reported in Figure-4. The variance decomposition method shows the magnitude of the predicted error variance for a series that is accounted for by innovations generated from each independent variable in a system over different time-horizons.

The results presented in Table-8 suggest that economic growth is explained 22.75% by its own innovative shocks while remittances and money supply explain economic growth by 32.16% and 40.24% respectively from their shocks. The causality runs from remittances and money supply to economic growth. The response of economic growth due to innovative shocks in exchange rate depreciation is minimal. Much of devaluation is influenced by its shocks while money supply explains 17.48%. The causality from money supply to real devaluation is weak.

Table 8.A: Variance Decomposition Approach

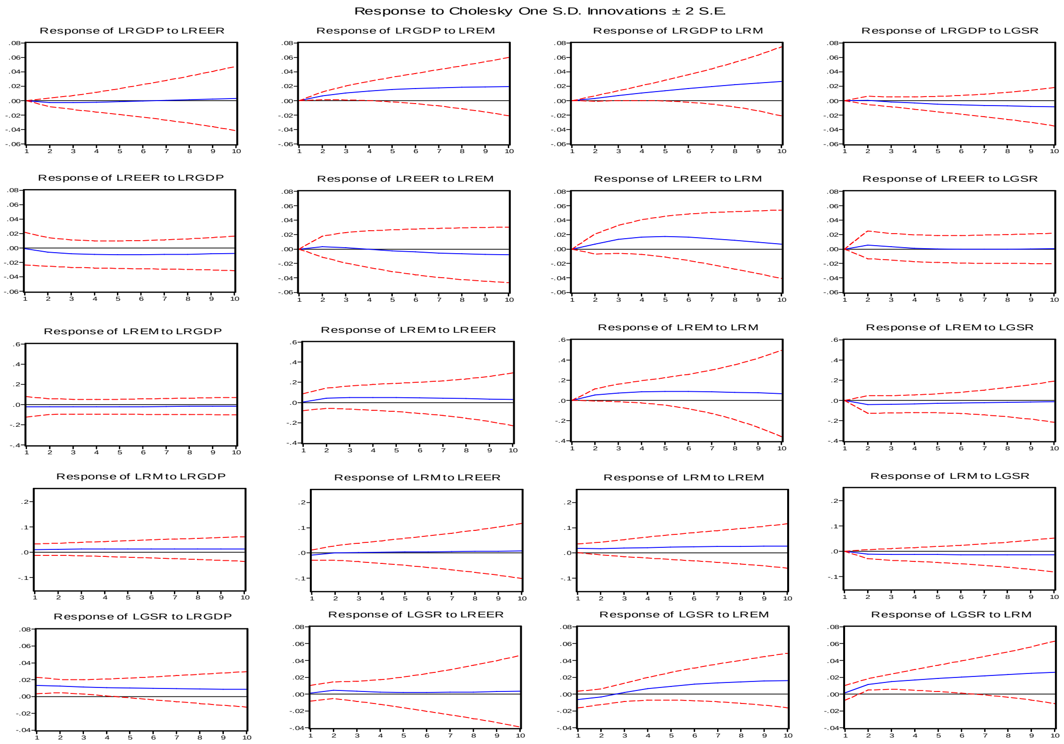
Variance Decomposition of $\ln GDP_t$					
Period	$\ln GDP_t$	$\ln RER_t$	$\ln REM_t$	$\ln RM_t$	$\ln GSR_t$
1	100.0000	0.0000	0.0000	0.0000	0.0000
2	89.5098	1.1866	7.7962	1.4960	0.0111
3	75.3941	1.4977	16.8518	5.9364	0.3198
4	61.9836	1.3159	23.8642	11.7854	1.0507
5	50.8968	1.0103	28.4252	17.7935	1.8739
6	42.1889	0.7467	31.0478	23.4051	2.6113
7	35.4350	0.5736	32.3315	28.4465	3.2131
8	30.1778	0.4899	32.7453	32.9026	3.6841
9	26.0444	0.4785	32.6158	36.8156	4.0456
10	22.7550	0.5195	32.1604	40.2442	4.3206
Variance Decomposition of $\ln RER_t$					
Period	$\ln GDP_t$	$\ln RER_t$	$\ln REM_t$	$\ln RM_t$	$\ln GSR_t$
1	0.0317	99.9682	0.0000	0.0000	0.0000
2	0.7847	97.0699	0.2677	1.1048	0.7726
3	1.8267	92.8137	0.2793	4.2735	0.8065
4	2.8887	88.0404	0.2398	8.1215	0.7093
5	3.8569	83.6677	0.2856	11.5576	0.6319
6	4.7059	80.0789	0.4684	14.1649	0.5816
7	5.4444	77.2979	0.7956	15.9146	0.5473
8	6.0880	75.1982	1.2554	16.9354	0.5228
9	6.6502	73.6130	1.8279	17.4015	0.5071
10	7.1404	72.3817	2.4906	17.4853	0.5018
Variance Decomposition of $\ln REM_t$					
Period	$\ln GDP_t$	$\ln RER_t$	$\ln REM_t$	$\ln RM_t$	$\ln GSR_t$
1	1.0425	0.0534	98.9039	0.0000	0.0000
2	1.2554	2.3316	90.5050	3.7831	2.1248
3	1.4838	4.2757	82.4798	8.5502	3.2103
4	1.6945	5.7925	75.4503	13.3504	3.7121
5	1.8724	6.9444	69.4899	17.7578	3.9353
6	2.0153	7.7990	64.5898	21.5751	4.0206
7	2.1269	8.4214	60.6593	24.7552	4.0371
8	2.2124	8.8689	57.5622	27.3355	4.0207
9	2.2774	9.1877	55.1532	29.3910	3.9905
10	2.3265	9.4134	53.2972	31.0062	3.9565

Table 8.B: Variance Decomposition Approach

Variance Decomposition of $\ln RM_t$					
Period	$\ln GDP_t$	$\ln RER_t$	$\ln REM_t$	$\ln RM_t$	$\ln GSR_t$
1	3.8308	2.8630	14.0610	79.2450	0.0000
2	4.3996	1.3636	12.2824	79.5677	2.3863
3	4.8053	0.9478	12.6347	78.1452	3.4668
4	5.0781	0.8000	13.5449	76.5650	4.0118
5	5.2386	0.7606	14.5560	75.1124	4.3323
6	5.3105	0.7774	15.5049	73.8645	4.5425
7	5.3163	0.8267	16.3323	72.8337	4.6907
8	5.2751	0.8956	17.0227	72.0061	4.8003
9	5.2019	0.9758	17.5807	71.3576	4.8837
10	5.1083	1.0620	18.0199	70.8609	4.9486
Variance Decomposition of $\ln GSR_t$					
Period	$\ln GDP_t$	$\ln RER_t$	$\ln REM_t$	$\ln RM_t$	$\ln GSR_t$
1	23.0711	0.1595	5.8157	0.3023	70.6513
2	29.7617	1.9953	4.9081	12.4374	50.8972
3	31.2050	2.2576	3.9707	24.4682	38.0983
4	29.7994	2.0196	5.0976	33.7637	29.3194
5	27.1994	1.7184	7.5134	40.3168	23.2518
6	24.3682	1.4710	10.2478	44.8491	19.0637
7	21.7301	1.2970	12.7608	48.0707	16.1412
8	19.4183	1.1895	14.8536	50.4797	14.0587
9	17.4410	1.1361	16.5026	52.3836	12.5365
10	15.7629	1.1245	17.7552	53.9627	11.3945

Innovative shocks of money supply explain foreign remittances by 31.01% implying that money supply Granger causes remittances; 53.29% of foreign remittances are influenced by its innovative shocks. Also 18.02% of money supply is affected by foreign remittances and 5.10% (4.94%) by economic growth (government spending). This implies bidirectional causality between foreign remittances and money supply but strong causality from money supply to foreign remittances. Finally, government spending is explained by 53.96%, 17.75% and 15.76% from innovative shocks of money supply, economic growth and remittances respectively. Overall, the results suggest a unidirectional causality from foreign remittances to economic growth, but feedback relation is present between money supply and remittances. Money supply Granger causes to government spending. The results are intuitive.

Figure-2 Impulse Response Function



The results of impulse response function also show that the response of economic growth from devaluation is inconclusive because real devaluation explains a smaller part of economic growth (Table-8.A). Foreign remittances and money supply stimulate economic growth and is positive till 10 time horizons. The response of real devaluation from economic growth and foreign remittances is negative from 1-10 and 5th time horizons respectively. A positive response of devaluation is found from innovative shocks in money supply. Forecast error in economic growth, foreign remittances and money supply increases government spending. The short run fluctuations in remittances around the mean might produce increased government response in the economy. The response of devaluation on government spending is inconclusive.

5. Conclusions

Despite the existence of a sizeable literature on devaluation-economic growth nexus, the results have so far been mixed. The paper implements the ARDL method to investigate the long run relationship between devaluation and economic growth in Pakistan by including money supply, government spending and foreign remittances in the empirical model. These series appear to be highly relevant for the economy.

We find cointegration among the series over the sample period (1975-2008). The finding that real that devaluation is contractionary is consistent with those of Hoffmaister and Vegh, 1996 on Uruguay; Moreno, 1999 for six East Asian countries; Kamin and Rogers, 2000 for Mexico; Berument and Pasaougullari, 2003 for Turkey; Razzaque, 2003 for Bangladesh, Dimitris, 2004 for Asian countries including Pakistan; Miteza, 2006 for Czech Republic, Hungary, Poland, Slovakia and Romania. However, our results differ from those of Bahmani-Oskooee and Kandil, 2007 for Iran; Chaudhary and Chaudhary, (2007) and Asif et al. (2011), Ratha et al. 2008 for China and Alam (2010) for Bangladesh. These later authors reported expansionary effect of devaluation on output growth. We find that government spending, money supply, and foreign remittances exert positive impact on economic growth.

In Pakistan imports dominate exports (Table-5). Devaluation made import of intermediate inputs more expensive which raised the costs went up and production. As part of comprehensive trade policy, export competitiveness should be encouraged. This can be done by improving product quality and gaining better access to foreign markets. Otherwise, devaluation is likely to hurt the economy.

Over fifty percent of total imports in Pakistan consist of raw material and consumer items (Table-6). Pakistan imports food; as such emphasis should be placed on agriculture sector. Government can help farmers by supplying improved seeds, fertilizers, machinery equipment at low cost. Efficiency must be the prime factor in distributing agricultural inputs. This will improve agricultural productivity. Such policy will reduce heavy reliance on import items such as, industrial raw materials. The use of more indigenous raw material will reduce imports, narrow down the trade gap and inflationary pressures, thus improve trade balance, and help international reserves. Resources should be directed to support research and development activities in the country. All these will lead to improved competitiveness and better market access and thus increase the share in international market for high quality exportable goods.

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1. **Appendix 1: Statistic Descriptive and Correlation Matrix**

Variables	$LGDP_t$	$LRER_t$	$LREM_t$	LRM_t	$LGSR_t$
Mean	28.6094	4.8555	1.5213	23.0177	28.5568
Median	28.7094	4.7327	1.5360	23.0405	28.6093
Maximum	29.3906	5.3657	2.3891	24.1502	29.2583
Minimum	27.7263	4.5005	0.4878	21.9304	27.7880
Std. Dev.	0.4809	0.3092	0.5176	0.6359	0.4106
Skewness	-0.2711	0.5169	-0.1962	0.0934	-0.1398
Kurtosis	2.0091	1.6538	2.2261	2.0210	1.9942
Jarque-Bera	1.7542	3.9611	1.0351	1.3658	1.4983
Probability	0.4159	0.1379	0.5959	0.5051	0.4727
$LGDP_t$	1.0000				
$LRER_t$	-0.0178	1.0000			
$LREM_t$	-0.1021	0.0249	1.0000		
LRM_t	0.1957	-0.1726	0.3490	1.0000	
$LGSR_t$	0.4803	0.0313	-0.2879	0.0457	1.0000