

7-1-2011

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Recommended Citation

Afzal, M. (2011). Impact of exchange rate depreciation on domestic output in Pakistan. *Business Review*, 6(2), 80-89. Retrieved from <https://doi.org/10.54784/1990-6587.1194>

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ARTICLE

Impact Of Exchange Rate Depreciation On Domestic Output In Pakistan

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Abstract

There is disagreement on the desirability of devaluation in the LDCs. Since the de-linking from USA dollar in January 1982, the Pakistan rupee has been losing its value vis-à-vis US dollar and other important currencies. The purpose of the paper was to see the response of domestic output to fiscal and monetary policies besides exchange rate and terms-of-trade. These policies have stable and long-run relationship with the domestic output. However, the impact of money supply and exchange rate is more robust than the other variables. Easy monetary policy has a favourable impact on domestic output. Fiscal discipline is the need of the hour because persistent and large budget deficit breeds inflation.

JEL classification, F32 E0, E6

Keywords: Depreciation, output, Cointegration, Causality, Pakistan

Introduction

Domestic output responds to a number of factors. The importance and relevance of these factors may differ from country to country and may also change overtime. An important macroeconomic policy to reduce the trade deficit is said to be devaluation. Balance of payments (BoPs) deficit may be corrected by devaluation of the domestic currency that is a reduction in the value of the domestic currency in terms of foreign currency. The reluctance to use devaluation has remained a constant bone of contention in the negotiations between the governments of some developing countries and the International Monetary Fund (IMF). Some studies have reported that devaluation would improve trade balance in LDCs and is expansionary; other studies have concluded that devaluation is contractionary and will not improve trade balance of the countries (Afzal 2004).

The major objective of devaluation is to change relative prices in a way that promotes exports and discourage imports. According to the traditional theory devaluation stimulates the domestic production of exportable and import substitutes as devaluation alters the relative prices even if the domestic prices remain the same, though these prices in the devaluing country do not remain unchanged. The success of devaluation depends on the import and export demand elasticities. Marshal-Lerner condition states that the absolute sum of sum of these elasticities exceeds unity.

Upadhyaya and Upadhyay (1999) argue that devaluation increases the price of traded goods that feeds into the general price level. Higher prices then reduce the money supply and create excess money demand. To maintain their real money balances, firms and households cut back their spending. The result is excess supply of goods, larger net exports,

and therefore, improved current account. Moreover, a reduced level of expenditures depresses the price of non-traded goods that shifts production towards higher-valued tradable and demand towards less expensive non-tradables. Within a short to intermediate run, therefore, devaluation should have a favourable effect on the external sector of the economy.

However, the real world picture is not as glowing. Economists have paid serious attention to the possibility of contractionary effects of devaluation. It has been argued that devaluation may not be much beneficial because of very low imports and exports elasticities notably in the developing countries (Gylfason and Risager 1984, Edwards 1986).

Therefore, it is very important to know how elastic the demand and supply curves of the devaluing country are. If the devaluing country's demand for imports is inelastic, for example, because of preponderance of capital goods, intermediate goods, and essential consumer goods in a country's total imports, higher import prices will not reduce imports. If the volume of imports remain the same, their value in foreign currency will remain unchanged while in domestic currency will increase in proportion to the exchange rate change. Similarly if foreign demand is also inelastic for the devaluing country's exports, lower dollar prices resulting from currency devaluation will not lead to an increase in the physical volume of imports by the foreign countries. And consequently, fewer dollars will be supplied at the higher exchange rate and the foreign exchange supply curve will be backward sloping.

Exchange rate also plays an important role not only in the balance of payments but also in resource allocation. The maintenance of an unrealistic exchange rate discourages exports and encourages imports thus imported consumption, resulting in a regular trade deficit that has serious implications for both economic growth and export promotion.

Because of high inflation, Pakistan's exports have been losing competitiveness and devaluation became inevitable resulting in massive erosion in the purchasing power of Pakistani's rupee. Compared to 1982 when Pakistan switched to managed floating exchange rate, the value of Pakistani rupee has been depreciated by more than 372% between January 1982 and June 1999 and by 520.30% in 2001-02 (Afzal and Ali 2008). Studies differ in their results on exchange rate policy (Afzal 2004).

Pakistan has experienced different exchange rate systems since 1950. Pakistan's rupee was first devalued in June 1955 by 30% and again devalued in May 1972 by 56.8% in terms of foreign currency. There have been the two major devaluations in addition to other small devaluations. According to GOP (1999-2000) the unified floating exchange was instrumental in the sharp recovery of exports during 1999-2000. And so the importance of the exchange rate policy is quit obvious.

Fiscal, Monetary, and commercial policies have significant impact on the growth of domestic output in addition to exchange rate policy. Interest rate, exchange rate, price, financial markets stability and economic growth are the basic objectives of the monetary policy that can be achieved through the management of money supply. Because of the conflict among some of these goals it is less likely to achieve all these goals simultaneously. Government purchases and taxes have an impact on the aggregate demand for goods and services thus national income and economic growth. Government does a number of functions: (1) the allocation function (2) the distribution function; and (3) the stabilization function. For performing these functions, government uses fiscal policy. The stabilization function concerns the use of budgetary policy to achieve full-employment, price stability, an adequate rate of economic growth, and BoPs equilibrium. Study of macroeconomic variables in

isolation is difficult to give reliable results.

In LDCs, government plays a predominant role and thus can influence the performance of the economy. During the past decades fiscal deficit has emerged as Pakistan's key macroeconomic problem. The rising gap between revenue and expenditure has affected almost every facet of the economy. This state of affairs was instrumental in adopting a comprehensive program of macroeconomic adjustment towards the end of 1980s. During 1990s the fiscal deficit averaged 7% of the GDP. Sound Fiscal policy fosters macroeconomic stability, which in turn, is the corner stone of private sector development and economic growth (Government of Pakistan (GOP) 2002-03, 59).

Terms of trade also play an important role in the economic growth¹. A country is benefited by favourable terms of trade (TOT) as its exports fetch more goods in exchange and its capacity to import increases. Adverse TOT implies that the real opportunity cost of a unit of import rises when its export prices decline relative to its import prices. The adverse TOT drains out the resources because to maintain old level of imports more exports are needed and unfavourable TOT are an important factor in the balance of trade deficit.

One attempting to study the response of domestic output should consider the influence of these policies on domestic output. Therefore, the purpose of the paper is to know the response of domestic output to terms of trade, exchange rate, monetary and fiscal policies? Here the objective is not to examine the relative effectiveness of monetary and fiscal policies.

The rest of the paper is designed as follows. Section 2 contains model and data sources. Unit root tests, Johansen cointegration methodology and error correction model are briefly explained in Section 3. Section 4 carries empirical results and conclusions are given in the final section.

Model and data sources

Domestic output represented by the real GDP will respond to real effective exchange rate, monetary policy, fiscal policy and the terms of trade. Since we will use cointegration analysis, we use a reduced form model. Following Edwards (1986), the reduced form of the model is:

$$\ln y_t = 0 + 1 \ln m_t + 2 \ln g_t + 3 \ln reert + 4 \ln tot \quad (1)$$

Where

\ln = natural logarithm

t = time period

y_t = the real output (GDP)

$reert$ = real effective exchange rate

mt = real money supply ($m1$) deflated by domestic price level cpi

g_t = government expenditure as percentage of the GDP(y)

$tot = uvx/uvm$

uvx = unit value of exports

uvm = unit value of imports

cpi = domestic consumer price index (2000=100)

The expected sign of the coefficients is: 10, 20, and 30 and the sign of 4 is uncertain. It may be positive or negative. Decline in tot resulting from fall in export prices may be beneficial and adverse if the fall in tot is due to increase in import prices.

The monetary and fiscal policies are supposed to have expansionary effect on the

domestic output. The reer expresses the prices abroad relative to those at home. An increase in the reer or a real depreciation means that foreign prices of goods in rupees (Pakistan's currency) have increased relative to prices of domestically produced goods. This implies that foreign goods (imports) become more expensive compared to goods at home while the domestic goods become cheaper for the foreign countries. Therefore, correct and expected sign of the coefficient of reer is positive.

Data on GDP, consumer price index, money supply, government expenditure and unit value of exports and imports were collected from Government of Pakistan (GOP) Economic Survey (various issues). The data regarding reer were collected from International Financial Statistics (IFS) yearbooks. All the variables are in natural logarithm and are in constant 2000 = 100 prices. Using annual data the period of the study is 1973 -2005.

Unit root tests, johansen cointegration methodology and error correction model

Several tests of nonstationarity called unit root tests (DF, ADF, PP, and others) have been developed in the time series econometrics literature. If the nonstationarity hypothesis is rejected then the traditional econometrics methods can be used. Otherwise the theory of cointegration may provide useful information about the relationship between the variables. The general requirement for applying the co-integration technique is to have variables of the same order of integration at hand. A time series, which is stationary after being differenced once is said to be integrated of order 1 and is, denoted I (1). A series that is stationary without differencing is said to be I (0). A series which is I (1) is said to have a unit root and a series which is I (d) has d unit roots. It is an empirical fact that many important macroeconomic variables appear to be integrated of order 1. Therefore, any adequate analysis of macroeconomic variables should examine the order of integration.

To test the data series for unit roots, Augmented Dickey-Fuller (ADF) test developed by Dickey and Fuller (1979) and non-parametric tests of Phillips _Perron (1988) were used. ADF test is based on the following regressions:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \sum_{j=1}^p \beta_j \Delta Y_{t-j} + \epsilon_t \quad (2)$$

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \epsilon_t + \sum_{j=1}^p \beta_j \Delta Y_{t-j} + \epsilon_t \quad (3)$$

Where ϵ_t is assumed to be Gaussian white noise, test statistics based on (2) and (3) are called τ_α and τ_β respectively. Z^* statistics of the Phillips _Perron (1988) are considered to have more power in finite samples than τ statistics.

Toda and Philips (1993) have shown that ignoring cointegration when it exists, can lead to serious model misspecification. Two-step procedure of Engle and Granger (1987) is a simple and popularly used test of cointegration. However, this test is appropriate for bivariate models. We use the maximum likelihood procedure of Johansen (1991, 1995), because this is based on well-established likelihood ratio principal. The advantage of the Johansen's procedure is that several cointegration relationships can be estimated and it fully captures the underlying time series properties of the data. We apply this test in two stages. In the first stage, test is performed on the multivariate model to see the cointegration of the underlying variables. In the second stage, we use this test to examine whether the variables of interest are cointegrated in the bivariate setting.

Johansen's method uses two test statistics for the number of cointegrating vectors: the trace test and maximum eigenvalue (λ -max) test. λ -trace, tests H_0 that the number of distinct cointegrating vectors is less than or equal to r against a general alternative. The

second statistic tests H_0 that the number of cointegrating vectors is r against the alternative of $r + 1$ cointegrating vectors.

Error correction model

If variables are cointegrated then based on Granger representation theorem (Engle and Granger 1987:255), an error correction model (ECM) exists which combines the long-run relationship with the short-run dynamics of the model. An error correction model of the equation 1 is as follows:

$$\begin{aligned} ? \ln y t = ? i + ? Z_{i-1} + ? ? i ? \ln y_{i-1} + ? ? i ? \ln m t_{-i} + ? ? i \ln g y t_{i-1} \\ + ? ? ? \ln t o t t_{-i} + ? ? ? i ? \ln r e e r t_{-i} + t \end{aligned} \quad (4)$$

Where Δ is the first difference operator, Z_{t-1} is the error correction term and the parameter α is the error correction coefficient that measures the response of the regressand in each period to departures from equilibrium. Since all the variables in the above equations are stationary, OLS could be used for estimation and the standard t-ratios for testing the significance of each term. F- statistic is used to test the joint significance of the lagged independent variables and the t- statistic is used to estimate the significance of the error correction term. Lagged explanatory variables represent short- run impact and the long-run impact is given by the error correction term

EMPIRICAL RESULTS

We used ADF and PP tests to determine the nonstationary status of the variables involved. The lag length of was selected on the basis of AIC (Akaike Information Criteria) and SIC (Schwarz Information Criteria) to ensure that the residuals were white noise and the optimal lag length was 1. The tests results presented in Table 1 show that we get mixed results in level form. However, the hypothesis that the first difference of the variables is non-stationary is rejected by both the tests implying that all the variables are non-stationary.

Table 1: **Unit Root Tests: Level Form and First Difference**

	ADF Level		ADF First Difference		PP Level		PP First Difference	
	τ_2	τ_2	τ_2	τ_2	Z(tb1*)	Z(tb)	Z(tb1*)	Z(tb)
lny	-1.94	-3.11	-7.72	-8.45	-1.01	-2.63	-7.53	-8.12
lntot	-2.27	-1.70	-4.85	-5.20	-2.25	-1.71	-6.73	-7.03
lngy	-2.31	-2.22	-4.96	-4.95	-2.40	-2.43	-7.20	-7.18
lnm	-0.24	-1.79	-5.06	-5.02	+0.08	-2.004	-6.01	-5.92
lnreer	-1.05	-2.05	-5.42	-5.35	-1.05	-2.08	-8.61	-8.48
lnncpi	-0.64	-3.03	-3.10	-2.95	+0.05	-2.44	-2.78	-2.65

Note: MacKinnon (1991) critical values for rejection of hypothesis of a unit root for both ADF and PP for 1%, 5% and 10% respectively are, -3.61, -2.93 and -2.60 for random walk with drift [Z (tb1*)] and -4.20, -3.53 and -3.19 for drift and linear time trend [Z (tb)].

Since the units roots have been confirmed, now we proceed to examine the variables for cointegration (Table 2 and Table 3). Since the Johansen test is based on the estimation of dynamic vector autoregression (VAR), it is necessary that a decision is made about the

number of lags. Since we are using annual data we use lag one as many researchers do. The statistical package Eviews 6 derived the results. We gather from Table 2 that the null hypothesis of no-cointegration is strongly rejected at 5% level of significance by both the -max and -trace tests in the multivariate case indicating the long-run relationship of real exchange rate, terms of trade, fiscal and monetary policies with the domestic output. We also performed a bivariate Johansen cointegration test between domestic output; and real exchange rate, terms of trade, fiscal and monetary policies to see the long-run relationship of the fore-mentioned variables with the domestic output (Table 3). The results show that both tests support the strong stable relationship between domestic output and the other variables of interest as indicated by the rejection of the hypothesis of no-cointegration at 5% level. The error correction results are reported in Table 4 below. To select an appropriate lag length, we used both AIC and likelihood ratio (LR) test. The optimal lag length was 2.

Table 2: Johansen's Test Results

Hypothesis	?-max	95%CVH	Hypothesis	?-trace	95% CV
H0: $r = 0$ H1: $r = 1$	140.22*	33.46	H0: $r = 0$ H1: $r \geq 1$	83.11 *	68.52
H0: $r \leq 1$ H1: $r = 2$	24.49	27.07	H0: $r \leq 1$ H1: $r \geq 2$	42.90	47.21
H0: $r \leq 2$ H1: $r = 3$	13.80	20.97	H0: $r \leq 2$ H1: $r \geq 3$	18.41	29.68
H0: $r \leq 3$ H1: $r = 4$	4.56	14.07	H0: $r \leq 3$ H1: $r \geq 4$	4.61	15.41
H0: $r \leq 4$ H1: $r = 5$	0.045	3.76	H0: $r \leq 4$ H1: $r \geq 5$	0.045	3.76

Note: Critical values of Table 2 and Table 3 are from Osterwald – Lenum (1992)

Table 3: Bivariate Results of Johansen Method

Hypothesis ?-max 95%CV Hypothesis ?-trace 95%CV

A. lny lnreer

H0: $r = 0$ H1: $r = 1$	29.41*	15.67	H0: $r = 0$ H1: $r > 1$	30.98*	19.96
H0: $r = 1$ H1: $r = 2$	1.57	9.24	H0: $r = 1$ H1: $r \geq 2$	1.57	9.24

B. lny lngy

H0: $r = 0$ H1: $r = 1$	30.88*	15.67	H0: $r = 0$ H1: $r \geq 1$	36.66*	19.96
H0: $r \leq 1$ H1: $r = 2$	5.76	9.24	H0: $r \leq 1$ H1: $r \geq 2$	5.76	9.24

C. $\ln y \ln m$

$H_0: r = 0$ $H_1: r = 1$	24.55*	15.67	$H_0: r = 0$ $H_1: r \geq 1$	30.49*	19.96
$H_0: r = 1$ $H_1: r = 2$	6.94	9.24	$H_0: r = 1$ $H_1: r \geq 2$	6.94	9.24

D. $\ln y \ln tot$

$H_0: r = 0$ $H_1: r = 1$	27.46*	15.67	$H_0: r = 0$ $H_1: r \geq 1$	32.50*	19.96
$H_0: r \leq 1$ $H_1: r = 2$	5.03	9.24	$H_0: r = 1$ $H_1: r \geq 2$	5.03	9.24

Table 4: Error Correction Model results

Variable	t-statistic	F-statistic
Constant	0.07 (5.56)	-
?	-0.07 (-3.24)*	-
? $\ln y$ (-1))	-0.22 (-1.33)	-
? $\ln y$ (-2))	-0.19 (-1.18)	1.78 (0.18)
? $\ln gy$ (-1))	0.04 (0.90)	-
? $\ln gy$ (-2))	0.0001 (0.003)	1.70 (0.19)
? $\ln m$ (-1))	-0.04 (-0.83)	-
? $\ln m$ (-2))	0.11 (2.32)*	3.64 (0.03)*
?		
? $\ln tot$ (-1))	0.01 (0.26)	-
? $\ln tot$ (-2))	0.01 (0.42)	2.12 (0.13)
? $\ln reer$ (-1))	0.06 (2.003)*	-
? $\ln reer$ (-2))	0.062 (2.09)*	2.83 (0.07)**
		F=2.01 (0.06)**a

Note: a = F-statistic for the joint significance of all variables except constant term and Z_{t-1} ; rest are the F statistics for the joint significance of the individual variables; * and ** show significance at 5% and 10% levels of significance.

$$\begin{aligned} R^2 &= 0.40, DW = 1.96, se = 0.02, SC(1) = 0.52(0.48) \\ HS &= 1.02(0.48); JB = 0.94(0.62), S = 0.15 \quad K = 2.22, \\ FF(1) &= 1.88(0.18) \end{aligned}$$

The error correction equation was subjected to diagnostic and specification tests. DW, se and F-value for testing the joint significance of all the variables except constant term and Z_{t-1} imply that the statistical fit of the model to the data is satisfactory. Breusch-Godfrey LM test for serial correlation (SC) is acceptable with a sample value of 0.52 and marginal significance limit (msl) = 48%. HS (White test) is the standard test for heteroscedasticity which is also acceptable in F-test version. The JB test for normality (Bera and Jarque statistic) is acceptable at 0.94 with msl = 0.62. Skewness (S) and kurtosis (K) are also reasonable. FF (1) which is Ramsey's RESET test for model specification is acceptable at 1.88 with msl = 18%. Therefore, diagnostic test statistics are satisfactory and thus support the statistical appropriateness of the ECM.

Error correction results show that the EC term Z_{t-1} has the correct negative sign and is significant. An estimate of -0.07 indicates that 7% of the preceding year disequilibrium is eliminated in the current year. The significant F-value for monetary policy and real exchange rate indicates that these have significant short-run impact on the domestic output. The significant Z_{t-1} suggests long-run relationship between domestic output and all the underlying variables. Therefore, domestic output has adequate response to monetary, and exchange rate policies. The joint significance of F-statistic at 10% indicates that the underlying variables do impact the domestic output. However, the impact of money supply and exchange rate is more robust than the other variables. Since the lagged terms for money supply and exchange rate are significant suggesting that there is causality from money supply and exchange rate to the domestic output.

Conclusions

There is disagreement on the desirability of devaluation in the LDCs. Since the delinking from USA dollar in January 1982, the Pakistan rupee has been losing its value vis-à-vis US dollar and other important currencies. Exchange rate policy is an important policy but it is not the only policy influencing the economic growth of Pakistan. Fiscal and Monetary policies are equally important, though the policies may differ in their relative importance. The purpose of this paper was to see the impact of all these policies. The paper has concluded that all these policies have their relative significance. All these policies have stable and long-run relationship with the domestic output. Using cointegration technique, it has been found that the real depreciation of Pakistan's rupee is expansionary. However, the impact of money supply and exchange rate is more robust than the other variables. Thus in analysing the behaviour and response of domestic output, the impact of monetary policy and exchange rate is given considerable attention. The analysis shows that easy monetary policy has a favourable impact on domestic output and supports the central bank report. Fiscal policy is also important and fiscal discipline is the need of the hour because persistent and large budget deficit breeds inflation. Afzal and Shah (2006) have concluded that keeping in view, low supply price elasticity, exchange rate changes are not the sufficient condition. In addition to exchange rate, other factors also matter. Maintenance of a reasonably realistic exchange rate is expected to help export promotion and will have healthy impact on income distribution and employment.

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Professionalism, this sociological analysis bring clearly, is possible for businessmen in only extremely small measure at the present time, not because of their mean-spiritedness but because of the structure of the social and cultural situation in which they have to act. Any further advance toward actual professionalism in business depends upon an alteration in that situation through an increase in the systematic and generalized knowledge available to the businessman through a specification of the ways in which he can achieve the community interest directly through the application of that knowledge. When more precise knowledge is available to him for carefully specified goals, the businessman will probably reconcile his self-interest and the community interest in a more professional way. In the meantime, professionalism remains more an ideological aspiration than a social fact.

Bernard Barber: *Sociological theory, values, and sociocultural change*