PANOECONOMICUS, 2018, Vol. 65, Issue 2, pp. 183-200
Received: 22 December 2015; Accepted: 17 October 2017.

UDC 339.743:658.5(5) "1972/2010"
https://doi.org/10.2298/PAN151222027N
Original scientific paper

Muhammad Nawaz
Corresponding author
University of Sargodha,
Department of Economics,
Sargodha,
Pakistan
mnawaz.zf@gmail.com

Ejaz Ghani
Pakistan Institute of Development Economics,
Department of Economics,
Islamabad,
Pakistan
ejaz@pide.org.pk

Currency Depreciation and Output Nexus: Evidence from Pakistan

Summary: Currency depreciation as a channel of output management has been a hot and controversial topic in both developed and developing economies. In Pakistan's case, relevant research would require study of annual data available for the period 1972 to 2010. The stationarity of variables under consideration at different orders require the application of the bounds testing approach to cointegration. The findings based on open economy IS-LM framework induce a negative effect of currency depreciation on output levels. This is consistent with the long-run estimates of the autoregressive distributive lag (ARDL) model. The short-run estimates of error-correction model (ECM) may lead to significant increment in output levels because of the depreciation of Pakistan rupee. Government spending may cause to reduce the output in the short-run, as well as, in long-run which furnishes strong support to crowding out hypothesis. The terms of trade, positive in the short-run, are negatively related to output in the long-run. However, surprise money has been insignificant in both long-run and short-run ECM. The country would need a clear long-term policy regime that inspires trust of the international community and restores the exporters' confidence.

Key words: Exchange rate, Open economy IS-LM model, Bounds-testing approach, Crowding out.

JEL: F41, F43, G28.

Most of the developing countries (DCs) are facing severe deterioration in their foreign exchange reserves, huge deficits in balance of payments, increasing burden of imports, growing shortage and rising cost of energy, and the resultant declining productivity. Increasing dependence on international donors, such as the International Monetary Fund (IMF) and the World Bank (WB), along with their tough conditions, the inability of DC-produced goods to compete in the international market; high production cost and high tariff on exports are factors that have been negatively affecting the output levels of these countries. In Pakistan, these economic problems have been exacerbated because of political instability, poor governance, frequent resort to monetary interference, and usage of fiscal discretion.

Currency depreciation has too often been used as fiscal stratagem to manage output levels by improving the current account status; however, under certain other conditions, currency depreciation may result in depreciating the production level. Theoretical work and empirical studies based on different regions/set of regions bring out the ambiguity in the currency devaluation/depreciation channel of output. Several

studies show the expansionary effect on output that is strongly supported by John M. Keynes' (1936) and Rudy Dornbusch's (1988) views, whereas other studies, such as those of Paul Krugman and Lance Taylor (1978), Yilkal W. Ayen (2014), Muhammad Shahbaz, Farid Islam, and Naveed Aamir (2016) support the contractionary effect in opposition to traditional views. These contradictory findings are the result of the usage of different methodologies, composition of countries, period under contemplation, and the structure of the model (Mustafa Acar 2000).

Because currency depreciation has been a hot issue in developing countries, especially in Pakistan's economy, which has been a victim of both political and economic crises since the country's inception when it inherited a virtually insolvent economy, with India refusing to pay her share in the divisible funds of partition. The earlier years were marred by political instability, which aggravated the economic problems of the new country. The country had to seek foreign aid to run the economy and undertake development.

Though, subsequently, the economy through the first three 5-year plan had started to look up, the 1965 war with India and later the separation of the Eastern wing caused severe distortions and weakening of the economic structure. The post recession economy had to make drastic adjustments, necessitating a heavy dose of devaluation of the currency in the early 1970s. The exchange rate suffered another big tumbling in 1982 with the introduction of a new exchange rate system under a new approach to Forex market. Since April 1982, Pakistan rupee has weakened incessantly and persistently against many currencies of the industrial world, such as the British pound, the U.S. dollar, and the Japanese yen, which is as alarming situation over the period of 1982 to 2000 (Razzaque H. Bhatti 2001). Additionally, currency depreciation since 1982 has mostly been in response to the volatility of the petroleum prices and the alarming dwindling of foreign reserves.

Pakistan has faced persistent political instability in the last three decades. A separate analysis would be needed to find the association between real exchange rate, and output levels in case of Pakistan, particularly with the bounds testing approach to autoregressive distributive lag (ARDL). This study follows the work of Mohsin S. Khan and Malcom D. Knight (1981) and its exertion developed by Sebastian Edwards (1986) along with the contribution of Krugman and Taylor (1978) in the contractionary devaluation framework for the derivation of IS-LM open economy model. The study is composed of five sections. The first section deals with the literature survey and the second section captures the analytical framework and also the derivation of IS-LM open economy model for the effect of real exchange rate on real output. The third section explains while presenting the data, variables description, and econometric techniques used for the estimation of the model. The fourth section discusses the estimated results, whereas the last one concludes the study.

1. Literature Survey

Traditional research advocates the expansionary effect of currency devaluation/depreciation on output and aggregate demand through elasticities, absorption, and the application of the Keynesian approach. These approaches are based on crisp assessment of

diverse empirical studies that scrutinize the effects of the real (nominal) exchange rate on output through different channels by using least-square analysis, macromodel simulations, panel data analysis, and vector autoregressive (VAR) scrutiny. In use of these approaches, Edwards (1986) and Dakshina De Silva and Zhen Zhu (2004) have mentioned that nominal devaluation may result in expenditure switching, high level of exports, along with the improvement in the external position and output of a country (Dornbusch 1988; Mohsen Bahmani-Oskooee, Javed Iqbal, and Saqib Ullah Khan 2016). In extending the literature, Krugman and Maurice Obstfeld (2003) have demonstrated that there is a reduction in unemployment as well.

Steven B. Kamin (1995) explains the contractionary devaluation hypothesis in the presence of black market for foreign exchange. The study develops macroeconomic model of black market for dollars and conduct numerical simulation exercise of output elasticities. The findings imply that devaluation may call for less contraction in the occurrence of black market (exchange rate) than official market (exchange rate). Talan B. Iscan (1997) considers the correlation between currency devaluation and output growth by using the sector-wise data, and empirical outcomes specify that there exists short-run contractionary effect of devaluation of non-agriculture sector and major contraction arises in case of manufacturing sector.

Kamal P. Upadhyaya (1999) scrutinizes the effect of currency devaluation on output growth for two countries, "South Asia" and "Southeast Asia". The author evaluates two approaches for exchange rate valuation and analyzes both the effect of real and nominal exchange rate on output. The empirical results indicate that real and nominal devaluations almost fail to affect output growth for the given set of countries. Moreover, the findings are also consistent with the crowding out hypothesis but find little support for rational expectation hypothesis (surprised money shock). Ilir Miteza (2006) securitizes the impact of devaluation on output for five transition economies of the European Union states by using the quarterly data set over the period of 1993 to 2000. The conclusion suggests the existence of long-run relation among the real exchange rate, real output, real money, and real wages. In addition, it also supports to the idea of contractionary devaluation hypothesis for the five transition economies.

Contrary to the conventional economic wisdom, the new structuralism school of thought stresses on the contractionary effect of devaluation on output level (Magda Kandil 2008). The contractionary devaluation problem critiqued in this literature may arise both from the demand or supply side channels (Edwards 1986; Fouopi Djiogap Constant 2012; Shahbaz, Islam, and Aamir 2016). Obonye Galebotswe and Tshimologo Andrias (2011) and Gil Kim, Lian An, and Yoonbai Kim (2015) construct the case of currency devaluation for developing as well as the developed countries and present the evidence of contractionary devaluation in favor of developing countries, whereas the reverse exists for developed countries. Peter Anker and Bahmani-Oskooee (2001) inspect the relationship between Deutsche mark (DM) and German production by adding quarterly data. The study gives an idea that the depreciation of Deutsche mark is expansionary in long-run. Bahmani-Oskooee, Chomsisengphet Souphala, and Kandil (2002) again assess the same phenomenon for selected Asian countries by

incorporating the data period 1976Q1-1999Q4. The authors make use of Johanson cointegration and conclude that short-run and long-run estimates are ambiguous for the given region. The findings propose that output is expansionary for some countries, whereas it reduces the output level for other countries.

In macroeconomic literature, various demands and supply side channels have been pointed out that can affect the output level. The demand side channels consist of real balance effect, redistribution effect, and inelastic import pricing effect, and so on (Carlos F. Diaz-Alejandro 1963; Krugman and Taylor 1978; Luca Barbone and Francisco Rivera-Batiz 1987), whereas supply side includes the cost of imported inputs and the wage-inflation channel. According to the supply side channels (economist), contractionary devaluation may increase the cost of imported inputs and reduce aggregate supply that might result in upward shift of the aggregate supply curve (Krugman and Taylor 1978; Sweder Van Wijnbergen 1986; Constant 2012). In addition to that, collective bargaining agreements and wage indexation in the presence of inflation may also result in the reduction in output supply (Pierre-Richard Agenor and Peter K. Montiel 1996; Blessing Mandizha 2014). However, the empirical literature explains that combined effect of both channels determine the net results of exchange rate fluctuations on real output and price levels (Saul J. Lizondo and Peter J. Montiel 1989; Bahmani-Oskooee and Miteza 2003).

Albert O. Hirschman (1949) explains that devaluation of currency with initial trade deficit causes loss in real income because of the high spending on import rather than export receipts. In this case, economy transfers its real income to the rest of the world, as consistent with general equilibrium framework (Richard N. Cooper 1971). In addition to that, the impact of devaluation on real income and trade balance depends on Marshall-Lerner elasticities; the low level of elasticity results in contractionary devaluation (Thorvaldur Gylfason and Micheal Schmid 1983). James E. Meade (1951) also points out the unique situation when Marshall-Lerner condition is not satisfied and currency depreciation produces a contraction.

The monetary effect of devaluation has been a significant factor in lowering output levels through the reduction in real balances (Harry G. Johnson 1972). On the fiscal side, in the presence of an *ad valorem* tax on exports, the devaluation of domestic currency generates loss of production (Krugman and Taylor 1978). In many LDCs and DCs, resorting to devaluation may be caused by the huge external debt that may compel these countries to adapt external policies as the easiest way out. This leads to the contraction of output (Gylfason and Ole Risager 1984; Van Wijnbergen 1986; Edwards 1987). Moreover, whether the effect of devaluation is contractionary or expansionary depends on its expected or unexpected usage (David Burton 1983).

2. Analytical Framework

This section provides theoretical framework, analytical model and theoretical contribution to empirical assessment. In this exercise, the work of Krugman and Taylor (1978) has been followed to assess the response of real GDP due to change in real exchange rate by using the said works' basic equations in open economy IS-LM framework.

2.1 Macroeconomic Model Specification

The model is developed consequently by the basic text book macroeconomic IS-LM open economy framework and analysis of the effect of exchange rate on real output.

To analyze the demand side of the economy, the work of Barbone and River-Batiz (1987) is also followed. GDP equation in real term in open economy is:

$$\frac{Y}{P_H} = C_W\left(Y_W/P_H\right) + C_R\left(Y_R/P_H\right) + I(r) + G + Nx\ (e), \tag{1}$$

where investment depends on real interest rate and net export depends on (real) exchange rate. Investment, government expenditure, and net exports are defined as: $I = I_0 - br$, $G = G_0$, $Nx = Nx_0 - ce$, $M^d = k(Y/P_H) - fr$, $b > 0, c > 0, k > 0$, where b, c, k, and f stand for interest elasticity of investment, exchange rate elasticity of net export, income elasticity of money demand, and interest elasticity of money demand, respectively. To solve the IS-LM open economy Mendel Fleming framework, it is assumed that monetary instrument "interest rate" is exogenous[1].

After some mathematical manipulations, LM curve and IS curve are derived, but the latter curve also consider both wage and rental income. Further, it is also assumed that incomes of both classes are the increasing function of total real income; despite that, the increment may not be the same for each class and may lead to unequal distribution of income. The mathematical form of this assumption may be written as follows:

$$\begin{aligned} \frac{Y_W}{P_H} &= f\left(\frac{Y}{P_H}\right); \\ \frac{Y_R}{P_H} &= f\left(\frac{Y}{P_H}\right). \end{aligned} \tag{2}$$

Because the basic focus of this study is to evaluate the effects of changes in real exchange rate on real income, therefore, the aggregate demand equation is derived in open economy, and the effect is examined. Substituting equations after some mathematical manipulations, the aggregate demand equation is derived as:

$$\frac{Y}{P_H} = \frac{1}{(1 - C_W - C_R) + \frac{bk}{f}}\left[I_0 + G_0 + Nx_0 - ce + \left(\frac{b}{f}\right)\frac{M}{P}\right]. \tag{3}$$

Equation (3) is the aggregate demand equation in an open economy that shows different combination of price (real money balances) and real output. Now, to analyze the effect of exchange rate on real output, the change of real GDP is taken with respect to the real exchange rate. The resulting outcome is given as:

[1] There are three endogenous and two exogenous variables that is desirable to solve the above system simultaneously.

$$\frac{d\left(Y/P_H\right)}{d(e)} = \frac{1}{(1 - C_W - C_R) + \frac{bk}{f}}[-c], \tag{4}$$

or

$$\frac{d\left(Y/P_H\right)}{d(e)} < 0. \tag{5}$$

The increase in real exchange rate leads to the reduction in real output in the long-run as indicated by Equations (4) and (5). It is evident that both terms in the denominator on the left hand side of Equation (4) are clearly positive because the sum of marginal propensities to consume of both classes must be less than one. In addition, the interest elasticity of investment (*b*), interest elasticity of money demand (*f*) income elasticity of money demand (*k*) and the coefficient of real exchange rate (*c*) are also positive. This result is also consistent with the study of Krugman and Taylor (1978).

3. Data, Variables and Econometric Methodology

3.1 Data and Variables

This subsection explains variables and sources of data used to analyze the econometric model. In developing countries, like Pakistan, currency devaluation has been the major source of boosting exports and financing balance of payments deficit. The specified framework also prompts to use the annual data set with sample period from 1972 to 2010.

This research requires different variables both for regression analysis and also for theoretical specification of the model. The data for dependent variable "real output" are taken from different issues of Pakistan Economic Survey (Government of Pakistan Ministry of Finance 2012)[2] and measured by market value of final goods and services produced domestically. One of the independent variables is the ratio of real government expenditure to real GDP, where government expenditure comprises total outlays on currently produced goods and services both at federal and provincial levels.

The study follows the formulation of Khan and Knight (1981) for the insertion of monetary policy in determining the aggregate production and widens it by incorporating the work of Edwards (1986) that promotes the rational expectation framework and use money surprise instead of money supply term. Money surprise is the fundamental variable of empirical research and has effective impact on output in developing countries (James A. Hanson 1980 and Edwards 1983). The unexpected money growth term or money surprise term [$\Delta \log M - \Delta \log M^*$] is constructed by taking the difference

[2] **Government of Pakistan Ministry of Finance.** 2012. Pakistan Economic Survey. http://www.finance.gov.pk/survey_1617.html (accessed June 07, 2012).

between the actual money growth and the estimated rate of growth for money, same as what appeared in the study of Edwards (1986).

Terms of trade is defined as ratio of export price to import price as explanatory variable with data set extracted from Handbook of Statistics on Pakistan Economy 2005 published by State Bank of Pakistan (SBP 2012)[3]. It is favorable for a country if its export price is higher than its import price or it has influential power in world market with respect to its external trade. The real exchange rate is defined as the relative price of goods of two countries. It also gives the rate at which the goods of one country are traded with another country and defined as:

$$\text{(Real exchange rate)} = \text{(Nominal exchange rate)} \times \text{(Ratio of price levels)}$$

or

$$\varepsilon = e \times (P / P^*), \tag{6}$$

where (P/P^*) is the ratio of domestic price to world price level, where domestic price (P) and the world price level (P^*) are the Consumer Price Index (CPI) of Pakistan and world power (United States of America). The data set for Equation (6) is obtained from World Development Indicators (World Bank 2012)[4].

3.2 Econometric Technique

To regress the econometric model for empirical analysis and for the buttress of IS-LM open economy model, the empirical setup of Edwards (1986) is followed, which takes the role of devaluation/revaluation and trade in assessing the real aggregate output by using exchange rate and terms of trade as an explanatory variable.

The estimated equation is as follows:

$$\log y_t = \alpha_1 + \gamma\, time + \beta_1 \log\left(GE/Y\right)_t + \beta_2 \left[\Delta \log M - \Delta \log M^*\right]_t + \beta_3 \log \tau_t + \beta_4 \log e_t + \varepsilon_t, \tag{7}$$

where y, (GE/Y), $[\Delta\log M - \Delta\log M^*]$, τ, e, stand for real output, ratio of real government expenditure to income, difference between actual and expected growth rate of nominal money known as unexpected rate of growth of money, terms of trade, and real exchange rate, respectively.

For the existence of long-run relationship among the variables, the bounds testing approach is applied to cointegration equation. For that purpose, conditional error-correction model (CECM) is developed that does not require unit root testing procedure and is applicable whether variables are I(0) or I(1) or mixture of both series. Paresh K. Narayan and Seema Narayan (2007) explain that bounds testing approach to

[3] **State Bank of Pakistan.** 2012. Handbook of Statistics on Pakistan Economy 2005. http://www.sbp.org.pk/departments/stats/PakEconomy_HandBook/ (accessed June 08, 2012).
[4] **World Bank.** 2012. World Development Indicators Data Bank. http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators (accessed June 08, 2012).

cointegration is also applicable in small sample, whereas the methods of Robert F. Engle and Clive W. J. Granger (1987) and Søren Johansen and Katarina Juselius (1990) methods are not reliable for small sample (Su Zhou 1991). The unrestricted error-correction models (UECM) based on Equation (7) can be written as:

$$\begin{aligned}\Delta ly_t = {} & \gamma\, time + \sum_{i=0}^{k} \beta_{1i}\, \Delta ly_{t-i} + \sum_{i=0}^{k} \beta_{2i}\, \Delta l\left(GE/Y\right)_{t-i} + \sum_{i=0}^{k} \beta_{3i}\, \Delta \left[\Delta lM - \Delta lM^{*}\right]_{t-i} + \sum_{i=0}^{k} \beta_{4i}\, \Delta l\tau_{t-i} \\ & + \sum_{i=0}^{k} \beta_{5i}\, \Delta le_{t-i} + \delta_1 ly_{t-1} + \delta_2\, l\left(GE/Y\right)_{t-1} + \delta_3 \left[\Delta lM - \Delta lM^{*}\right]_{t-1} + \delta_4\, l\tau_{t-1} + \delta_5\, le_{t-1} + \mu_t .\end{aligned} \tag{8}$$

The bounds testing approach is applied for the presence of long-run relationship by conducting Wald-coefficient test or joint significance test on lagged-level variables in Equation (8). To determine the existence of long-run relationship among the variables, cointegration analysis requires that calculated *F*-statistic is greater than the upper critical bounds tabulated in M. Hashem Pesaran, Yongcheol Shin, and Richard J. Smith (2001).

In the ARDL process, long-run estimates are obtained by estimating Equation (8) with OLS technique. Then, the resulting long-run values are normalized by the coefficient of the lagged dependent variables. However, short-run error-correction mechanism of ARDL model includes both short-run coefficient and error-correction term with lag value, where ECM term is the adjustment coefficient and measures the disequilibrium from the previous period or how much time it takes in the short-run to move toward its equilibrium value in the long-run due to random shocks. The error-correction term should have negative coefficient along with statistically significant size. The short-run error correction model can be written as:

$$\begin{aligned}\Delta ly_t = {} & \gamma\, time + \sum_{i=0}^{k} \beta_{1i}\, \Delta ly_{t-i} + \sum_{i=0}^{k} \beta_{2i}\, \Delta l\left(GE/Y\right)_{t-i} + \sum_{i=0}^{k} \beta_{3i} \left[\Delta lM - \Delta lM^{*}\right]_{t-i} + \sum_{i=0}^{k} \beta_{4i}\, \Delta l\tau_{t-i} \\ & + \sum_{i=0}^{k} \beta_{5i} \Delta l\, e_{t-i} + EC_{t-1} + \mu_t ,\end{aligned} \tag{9}$$

where EC_{t-1} is lagged error-correction term, and other variables and parameters are same as defined above.

4. Results and Interpretation

This section reports the empirical results and interpretations of the estimated model that apply bound testing approach to cointegration. The results of unit-root test that has been performed by applying the two famed tests of stationarity, that is, ADF and PP demand for the application of ARDL (see Table 1). After unit-root analysis, there is a need to scrutinize the response of exchange rate to output along with the combination of monetary, trade, and fiscal variables.

After estimating the ARDL model with 2 lags by following the standard lag-length selection criterion[5], the results for the presence of cointegration or long-run

[5] Akiake Information Criteria (AIC) and Schwarz-Bayesian Criteria (SBC) is used to choose the optimal lag structure where AIC select the maximum possible lag-length, while SBC select the minimum possible lag-length.

relationship among the series through bounds testing approach are mentioned in Table 2. It records the value of *F*-statistics 10.26 with the probability value 0.000 that is greater than tabulated value 4.63 (with upper bound) and 3.34 (with lower bound) which indicates the rejection of null hypothesis of no-cointegration at zero percent level of significance.

Table 1 Results of Unit-Root Test (ADF & PP Test)

Variables	Constant/constant & trend	Level (ADF)	Level (PP)	1st difference (ADF)	1st difference (PP)	Order of integration
ly	Constant	-2.47	1.49	-4.17***	-4.14**	I(1)
$l(GE/Y)$	Constant & trend	-3.57**	-3.33*	-5.53***	-5.50***	I(0)
le	Constant & trend	-4.29***	-4.36**	-6.44***	-15.10***	I(0)
$l\tau$	Constant & trend	-2.42	-2.44	-7.02***	-8.97***	I(1)
$\Delta lM - \Delta lM^*$	Constant & trend	-7.10***	-7.04***	-3.36*	-22.15***	I(0)

Notes: *, **, *** indicate the rejection of null hypothesis of unit-root at 10%, 5% and 1% level of significance, respectively. The Akaike Information Criteria is used to select the lag-length.

Source: Authors' calculations.

Table 2 Bounds Testing Approach

F-statistics (tabulated)		*F*-statistics (calculated)	Probability value
Lower bound	Upper bound		
3.34	4.63	10.26***	0.000

Notes: *** denotes the significance at 1% level of significance and rejection of null hypothesis of no cointegration.

Source: Pesaran, Shin, and Smith (2001) for bounds and authors' calculation for the *F*-statistics.

After determining the existence of long-run relationship among the series by applying the bounds testing approach, there is a need to define the long-run coefficients of ARDL estimation. The derived results that reflect the reaction of real output to the series of explanatory variables along with "real exchange rate" are reported in Table 3.

Table 3 Normalized Long-Run Estimates of ARDL Model

Regressors	Coefficients
le_{t-1}	-1.36857***
$l\tau_{t-1}$	-2.09606*
$l(GE/Y)_{t-1}$	-7.24264***
$\Delta lM - \Delta lM^*_{t-1}$	-3.65586

Notes: ***, * denote the significance level at 1% and 10% level of significance, respectively.

Source: Authors' calculations.

The theoretical justification of estimated results requires brief explanation of previous literature. On theoretical ground, currency depreciation leads to increase in net exports that may result in expansion of output (Keynes 1936; Dornbush 1988). On empirical side, some studies (Upadhyaya and Mukti P. Upadhyay 1999; Miteza 2006; Huseyin Kalyoncu et al. 2008) follow the expansionary output hypothesis that is consistent with conventional literature. The short-run results of this study are in line with that of theoretical and empirical literature. However, on the empirical side, a great deal of literature is also available that are not consistent with the theoretical literature and indicates that currency depreciation may result in reduction of output (Hakan Berument and Mehmet Pasaogullari 2003; De Silva and Zhu 2004; Kandil 2008). The long-run findings of the analysis evaluate that currency depreciation is connected with reduction in output level.

The model is estimated in double-log form with the calculating coefficient values of "real exchange rate" -1.368 that is also significant at 1% level of significance. To explain contractionary depreciation hypothesis, demand-and-supply side channels are explained in the context of Pakistan. The real balance effect that arises from demand side is not applicable in the case of Pakistan because of the unavailability of evidence based on the rigidness of prices that hinder the growth of real balances of the economy. The income redistribution effect from demand side (Diaz-Alejandro 1963; Krugman and Taylor 1978) also buttress that in a country, Pakistan in particular, working class has minimum access to the most suitable jobs and also has limited access to saving opportunities (Richard E. Caves, Jeffery A. Frankel, and Ronald W. Jones 1996). Meanwhile, wage rigidity and rise in prices because of depreciation may result in the fall of real wages that cause to shrink in aggregate demand in the long-run. Moreover, deprecation of domestic currency may lead to the redistribution of income from private to public sector *via* the imposition of *ad valorem* tariffs on both exports and imports. This overwhelming process may decrease private expenditure and increase public sector's saving that appears as a reduction in aggregate demand and may support to contractionary depreciation hypothesis in long-run (Krugman and Taylor 1978).

Most of the DCs have an excess of external debt stock and bear large amount of interest on it. In case of Pakistan, most of the external debt appears in (U.S.) dollar terms or any other strong currency, and depreciation may raise the burden on both the local residents and governments because of the loss in value of domestic currency. It may cause the deterioration of their net wealth as well as aggregate demand, and this has been the routine trend in the current political situation of Pakistan. In Pakistan, financial markets are not developed enough, and any speculative behavior may result in the loss of domestic assets or production. Fear of depreciation of domestic currency any time in the near future induces people to invest in physical assets that may increase expenditure in short-run though a contractionary effect may appear in long-run when the domestic currency is devalued. This contractionary effect will owe much to the loss suffered in assets already purchased and nonavailability of financial facilities. The combination of different effects or channels that arise from the demand side explains that currency depreciation is contractionary in long-run in case of Pakistan.

Despite the abundance of demand side channels, there are few supply side channels that may accompany contraction in output due to depreciation. Depreciation is consistent with the higher general price level and resultant loss in real wages along with rigidity in nominal wages. In the case of Pakistan, it may result in consumption losses and depressed in purchasing power. Another possibility may appear from wage indexation mechanism that saves the loss in production from workers' side. However, this process may increase cost of production through higher wages and depress output level from the producer side. Moreover, wage indexation channel has not been working properly in DCs, particularly in Pakistan (Faiz Bilquees 2006) and currency depreciation may follow its application and exert a contractionary effect on output level.

The import of raw material, intermediate or capital goods, particularly oil, and such other materials has been the common factor of weakness of both LDCs and DCs. The depreciation of domestic currency increases the cost of imports and import-based domestic manufacturers (Krugman and Taylor 1978; Edwards 1986; Van Wijnbergen 1986) and decreases the import of required input materials due to high cost, which results in low production and reduction in output supply. In Pakistan, depreciation of domestic currency manifests as a negative effect on output and employment and at the same time loss in the production level. The final channel of supply side through which contraction in output occurs is the cost of working capital. In Pakistan, financial markets are not well established and obtaining loans is troublesome. In addition, depreciation of domestic currency may squeeze the volume of available credit along with high interest cost on it (Van Wijnbergen 1986). This increases the cost of production and decreases fund availability that is associated with reduction in output level of the economy. These results are also shown by Cooper (1971), Linda Kamas (1992) and Grahman Bird and Rajan S. Ramkishen (2004).

The terms of trade is another explanatory variable that is negatively related and indicates that 1% increase in the terms of trade leads to 2.09 percentage point reduction in output level of the economy. In the case of Pakistan, the major part of the economy is dependent on imports and its import bill since 2000 and high export revenue before that may compel to consume higher income portion on both luxury imported goods and others imports. This may lead to the increase in imports, even surpassing the quantum of exports bringing about the contractionary shift of IS schedule and reduction in output level of the economy.

On the monetary side, the output level decreases with the increase in surprise events of central bank but it has been insignificant in the case of Pakistan, indicating that no surprise shock influences or disturbs the output level of the economy. For the effect of fiscal policy, "ratio of real government expenditure to real income" is incorporated that has a vital determinant of real income in developed countries as well as in developing countries but it is negatively related with the output level with the coefficient value of -7.242 that is also highly significant at 1% level of significance.

In an open economy framework, increase in government spending may cause an increase in domestic interest rate that result in the appreciation of Pakistan rupee and loss in net export as well as output. In addition, higher domestic interest rate has been unattractive to escort the higher expected profitability due to weak political situation. This downturn may scare the reduction in investment, ultimately affecting the

crowding out framework or reduction in output (Upadhyaya 1999). Despite that rationale, Pakistan's government is spending a large amount on non-development side that induces diminishing trend of output. Moreover, the government's borrowing from the central bank in developing countries is an important source to finance spending and amounts to an inflation tax but it may reduce the purchasing power of the people and result in less consumption as well as aggregate demand. Borrowing from external resources has also been on the increase typically from international agencies, such as the WB and IMF. Also, these borrowings have been made under unpleasant conditions, such as high interest rate and high inflation in the domestic economy. This has caused a contractionary shift in aggregate demand in the presence of high government spending.

Table 4 Short-Run Error-Correction (ECM) Estimates of Model

Variable	Coefficient	Standard errors	*t*-statistics	Probability
$\Delta l(GE/Y)_t$	-0.158546***	0.042701	-3.712965	0.0009
Δle_t	0.020436***	0.006214	3.288480	0.0026
$\Delta l\tau_t$	0.039618	0.028535	1.388393	0.1756
$\Delta l\tau_{t-1}$	0.119585***	0.025459	4.697622	0.0001
$\Delta lM - \Delta lM^*_{t-1}$	-0.046648	0.041151	-1.133579	0.2663
EC_{t-1}	-0.059139***	0.007997	-7.395377	0.0000
@ trend	0.017779***	0.002335	7.612502	0.0000
R^2	0.641374		AIC	-5.425911
Adjusted R^2	0.554809		SBC	-5.077605
D-W statistics	2.3010381		L-L	108.3794

Notes: *** denotes the significance level at 1% level of significance. R^2, adjusted R^2, D-W statistics, AIC, SBC, L-L stands for *R*-squared, adjusted *R*-squared, Durbin-Watson statistics, Akaike Information Criteria, Schwarz Bayesian Criteria, and log-likelihood of equation.

Source: Authors' calculations.

After the interpretation of the long-run normalized estimates of the ARDL model, we may evaluate and interpret its short-run error-correction estimates by mentioning it in Table 4. The error-correction term is -0.05 and statistically significant, showing the adjustment effect and also explain that disequilibrium in previous period is almost 5% adjusted to gain the equilibrium in the long-run. However, it also indicates that the adjustment takes place at a low level.

The overall performance of the model is good as mentioned by *R*-squared and adjusted *R*-squared. The model information criteria is mentioned by AIC and SBC that have the most high and desirable values in absolute terms, indicating that maximum information is captured by these criteria. The diagnostic and stability tests of short-run ECM also indicate that these results are stable and have no econometric problem. The

diagnostic and stability test, such as hetroskedasticity, normality, serial correlation, ARCH test and functional-form misspecification (Ramsey regression specification error test), are reported at Table 5. To conduct the normality test, Jeque-Bera statistics is reported which takes non-normal errors. The value of Ramsey test is 0.22 and also points out that the result is in favor of stability of parameters.

Table 5 Diagnostic and Stability Test of Short-Run Error-Correction of Model

Test	*F*-statistics	Probability
χ^2_{NORM}	1.668081	0.434291
χ^2_{WHITE}	0.977810	0.511539
χ^2_{RAMSEY}	0.220284	0.642458
$\chi^2_{ARCH-LM}$	0.158947	0.692621
$\chi^2_{Serial\ Corr}$	0.686506	0.511903

Notes: All stability tests reported at most left column stand for non-normal errors normality test, white hetroskedasticity test, Ramsey regression specification error test, and autoregressive conditional hetroskedasticity (ARCH test), serial correlation Lagrange Multiplier test (LM-type Breusch-Godfrey test). These statistics are distributed as Chi-square values and capture degree of freedom on first-right column.

Source: Authors' calculations.

The main explanatory variable, "real exchange rate" has an expected sign, and it is positively related to the output level in the short-run, consistent with classical or traditional theory of open economy, such as Dornbusch's open economy macroeconomics model or Keynesian open economy macroeconomics framework. Its coefficient value indicates that one percentage point increase in exchange rate or depreciation of domestic currency may lead to 0.02 percentage point increase in output level of the economy. The logical way to interpret it would be to track the traditional model or the theory of Dornbusch's or Keynes' for the open economy that persuades its expansionary impact on output (Upadhyaya, Franklin G. Mixon, and Rabindra Bhandari 2004; Narayan and Narayan 2007).

Another explanatory variable in our research framework is terms of trade which has an expected sign and is positively related to output level of the economy in short-run. The increase in terms of trade means that this variable is favorable for the country, and these results are also consistent with the studies of Mehmet Sencicek and Upadhyaya (2010) and Gonzalo Hernández (2013). On the monetary side, surprise money has a negative coefficient value (-0.04), but it is insignificant in the case of Pakistan, meaning any surprise monetary shock has no significant effect on the output level. We also include the ratio of "government expenditure to real income" that is negatively related to the output level same as in long-run. The results of this study strongly support the classic theory of output determination, in which increase in government spending results in reduction in output level through the crowding out phenomenon in case of Pakistan (Upadhyay 1999).

5. Conclusion

Exchange rate plays an important role in macroeconomic stability and economic growth. In many developing and transition economies, currency depreciation is often viewed as an instrument for generating employment, strengthening current account through enhanced exports, and improving foreign exchange reserves. However, its role in affecting economic conditions of the economy, particularly on the output or growth level is still being debated among policy maker, economist, and forecasters in the forex market. This study analyzes the issue of currency depreciation both theoretically and empirically within an open economy IS-LM framework and uses the autoregressive distributive lag (ARDL) models for empirical testing.

The results show that exchange rate or depreciation of domestic currency leads to a contraction in output both in IS-LM framework and long-run estimates of ARDL models. This may be because of the combination of both supply-side and demand-side factors. However, in a short-term perspective, currency depreciation leads to an increase in output as is case within the standard open economy macroeconomic framework as expounded by Dournbusch (1988). The sign and statistical significance of government spending in affecting the output level are in line with the above findings both in short-run and long-run, which may be because of the crowding out phenomena or excess of non-development spending in total government outlays.

The results show that the terms of trade positively affect the output level in short-run but have a negative impact in the long-run. On the monetary side, surprise money or surprise events of central bank have an insignificant role in output determination in both short-run and long-run. The findings also indicate that currency depreciation is not a viable option to boost output in the long-run. Also, government spending leads to a reduction in output due to crowding out of private spending. There is thus a need for the government to focus its attention on reducing the non-development expenditures and channel resources to enhance development spending to generate employment and growth.

References

Acar, Mustafa. 2000. "Devaluation in Developing Countries: Expansionary or Contractionary?" *Journal of Economic and Social Research*, 2(1): 59-83.

Agenor, Pierre-Richard, and Peter K. Montiel. 1996. *Development Macroeconomics*. Princeton: Princeton University Press. http://dx.doi.org/10.1080/00036840010012933

Anker, Peter, and Mohsen Bahmani-Oskooee. 2001. "On the Relationship between the Value of the Mark and German Production." *Applied Economics*, 33(12): 1525-1530. http://dx.doi.org/10.1080/00036840010012933

Ayen, Yilkal W. 2014. "The Effect of Currency Devaluation on Output: The Case of Ethiopian Economy." *Journal of Economics and International Finance*, 6(5): 103-111.

Bahmani-Oskooee, Mohsen, Chomsisengphet Souphala, and Magda Kandil. 2002. "Are Devaluations Contractionary in Asia?" *Journal of Post Keynesian Economics*, 25(1): 69-81.

Bahmani-Oskooee, Mohsen, and Ilir Miteza. 2003. "Are Devaluation Expansionary or Contractionary? A Survey Article." *Economics Issues*, 8(2): 1-28.

Bahmani-Oskooee, Mohsen, Javed Iqbal, and Saqib Ullah Khan. 2016. "Impact of Exchange Rate Volatility on the Commodity Trade between Pakistan and the US." *Economic Change and Restructuring*, 50(2): 1-27. http://dx.doi.org/10.1007/s10644-016-9187-9

Barbone, Luca, and Francisco Rivera-Batiz. 1987. "Foreign Capital and the Contractionary Impact of Currency Devaluation, with an Application to Jamaica." *Journal of Development Economics*, 26(1): 1-15. http://dx.doi.org/10.1016/0304-3878(87)90047-2

Berument, Hakan, and Mehmet Pasaogullari. 2003. "Effects of the Real Exchange Rate on Output and Inflation: Evidence from Turkey." *The Development Economics*, 41(4): 401-435. http://dx.doi.org/10.1111/j.1746-1049.2003.tb01009.x

Bhatti, Razzaque H. 2001. "Determining Pak Rupee Exchange Rates vis-à-vis Six Currencies of the Industrial World: Some Evidence Based on the Traditional Flow Model." *The Pakistan Development Review*, 40(4): 885-897.

Bilquees, Faiz. 2006. "Civil Servants' Salary Structure." Pakistan Institute of Development Economics Working Paper 2006:4.

Bird, Grahman, and Rajan S. Ramkishen. 2004. "Does Devaluation Lead to Economic Recovery or Contraction? Theory and Policy with Reference to Thailand." *Journal of International Development*, 16(2): 141-156. http://dx.doi.org/10.1002/jid.1056

Burton, David. 1983. "Devaluation, Long-Term Contracts and Rational Expectation." *Economic Review*, 23(1): 19-32. http://dx.doi.org/10.1016/0014-2921(83)90003-X

Caves, Richard E., Jeffery A. Frankel, and Ronald W. Jones. 1996. *World Trade and Payment*. 7th ed. New York: Harper Collins College Publisher.

Constant, Fouopi Djiogap. 2012. "The CFA Franc Devaluation and Output Growth in the Franc Zone." *International Journal of Financial Research*, 3(1): 40-48. http://dx.doi.org/10.5430/ijfr.v3n1p40

Cooper, Richard N. 1971. *Currency Devaluation in Developing Countries*. Princeton: Princeton University Press.

De Silva, Dakshina, and Zhen Zhu. 2004. "Sri Lanka's Experiment with Devaluation: VAR and ECM Analysis of the Exchange Rate Effects on Trade Balance and GDP." *The International Trade Journal*, 18(4): 269-301.

Diaz-Alejandro, Carlos F. 1963. "Note on the Impact of Devaluation and Redistribution Effect." *Journal of Political Economy*, 71(6): 577-580.

Dornbusch, Rudy. 1988. *Open Economy Macroeconomics.* 2nd ed. New York: Basic Books, Inc.

Edwards, Sebastian. 1983. "The Short-Run Relation between Inflation and Growth in Latin America: Comment." *American Economic Review*, 73(3): 477-482.

Edwards, Sebastian. 1986. "Are Devaluation Contractionary?" *The Review of Economic and Statistics*, 68(3): 501-508. http://dx.doi.org/10.2307/1926028

Edwards, Sebastian. 1987. "Devaluation, Aggregate Output, and Income Distribution." Unpublished.

Engle, Robert F., and Clive W. J. Granger. 1987. "Cointegration and Error Correction: Representation, Estimation, and Testing." *Econometrica*, 55(2): 251-276.

Galebotswe, Obonye, and Tshimologo Andrias. 2011. "Are Devaluations Contractionary in Small Import-Dependent Economies? Evidence from Botswana." *Botswana Journal of Economics*, 8(2): 86-98.

Gylfason, Thorvaldur, and Micheal Schmid. 1983. "Does Devaluation Cause Stagflation?" *The Canadian Journal of Economics*, 16(4): 641-654. http://dx.doi.org/10.2307/135045

Gylfason, Thorvaldur, and Ole Risager. 1984. "Does Devaluation Improve the Current Account?" *European Economic Review*, 25(1): 37-64. http://dx.doi.org/10.1016/0014-2921(84)90070-9

Hanson, James A. 1980. "The Short-Run Relation between Growth and Inflation in Latin America." *American Economic Review*, 70(5): 972-989.

Hernández, Gonzalo. 2013. "Terms of Trade and Output Fluctuations in Colombia." Economic Commission for Latin America and the Caribbean Review 110.

Hirschman, Albert O. 1949. "Devaluation and the Trade Balance: A Note." *Review of Economics and Statistics*, 31(1): 50-53. http://dx.doi.org/10.2307/1927193

Iscan, Talan B. 1997. "Devaluations and Aggregate Output Fluctuations: A Random Coefficient Regression Model for Mexico." *Applied Economics*, 29(12): 1575-1584.

Johansen, Søren, and Katarina Juselius. 1990. "Maximum Likelihood Estimation and Inference on Cointegration with Application to Demand for Money." *Oxford Bulletin of Economics and Statistics*, 52(2): 169-210. http://dx.doi.org/10.1111/j.1468-0084.1990.mp52002003.x

Johnson, Harry G. 1972. *Inflation and the Monetarist Controversy*. Amsterdam: North-Holland.

Kalyoncu, Huseyin, Artan Seyfettin, Tezekici Selman, and Ozturk IIhan. 2008. "Currency Devaluation and Output Growth: An Empirical Evidence from OECD Countries." *International Research Journal of Finance and Economics*, 14: 232-237.

Kamas, Linda. 1992. "Devaluation, National Output and the Trade Balance: Some Evidence from Colombia." *Review of World Economics*, 128(3): 425-445.

Kamin, Steven B. 1995. "Contractionary Devaluation with Black Markets for Foreign Exchange." *Journal of Policy Modeling*, 17(1): 39-57. http://dx.doi.org/10.1016/0161-8938(94)00011-4

Kandil, Magda. 2008. "The Asymmetric Effects of Exchange Rate Fluctuations on Output and Prices: Evidence from Developing Countries." *The Journal of International Trade & Economic Development*, 17(2): 257-296. http://dx.doi.org/10.1080/09638190701872772

Keynes, John M. 1936. *The General Theory of Employment, Interest and Money*. London: Palgrave Macmillan.

Khan, Mohsin S., and Malcom D. Knight. 1981. "Stabilization Programs in Developing Countries: A Formal Framework." *International Monetary Fund Economic Review*, 28(1): 1-53.

Kim, Gil, Lian An, and Yoonbai Kim. 2015. "Exchange Rate, Capital Flow and Output: Developed versus Developing Economies." *Atlantic Economic Journal*, 43(2): 195-207. http://dx.doi.org/10.1007/s11293-015-9458-2

Krugman, Paul, and Lance Taylor. 1978. "Contractionary Effects of Devaluation." *Journal of International Economics*, 8(3): 445-456. http://dx.doi.org/10.1016/0022-1996(78)90007-7

Krugman, Paul, and Maurice Obstfeld. 2003. *International Economics: Theory and Policy*. 6th ed. Boston: Addison Wesley.

Lizondo, Saul J., and Peter J. Montiel. 1989. "Contractionary Devaluation in Developing Countries: An Analytical Overview." *International Monetary Fund Economic Review*, 36(1): 182-227. http://dx.doi.org/10.2307/3867174

Mandizha, Blessing. 2014. "Inflation and Exchange Rate Depreciation: A Granger Causality Test at the Naissance of Zimbabwe's Infamous Hyperinflation." *Economics and Finance Review*, 3(9): 22-42.

Meade, James E. 1951. *The Theory of International Economic Policy. The Balance of Payment*. Oxford: Oxford University Press.

Miteza, Ilir. 2006. "Devaluation and Output in Five Transition Economies: A Panel Cointegration Approach of Poland, Hungary, Czech Republic, Slovakia and Romania, 1993-2000." *Applied Econometrics and International Development*, 6(1): 77-86.

Narayan, Paresh K., and Seema Narayan. 2007. "Is Devaluation Expansionary or Contractionary? Empirical Evidence from Fiji." *Applied Economics*, 39(20): 2589-2598. http://dx.doi.org/10.1080/00036840600707266

Pesaran, M. Hashem, Yongcheol Shin, and Richard J. Smith. 2001. "Bound Testing Approaches to the Analysis of Level Relationship." *Journal of Applied Econometrics*, 16(3): 289-326. http://dx.doi.org/10.1002/jae.616

Sencicek, Mehmet, and Kamal P. Upadhyaya. 2010. "Are Devaluation Contractionary? The Case of Turkey." *Applied Economics*, 42(9): 1077-1083. http://dx.doi.org/10.1080/00036840701721208

Shahbaz, Muhammad, Farid Islam, and Naveed Aamir. 2016. "Is Devaluation Contractionary? Empirical Evidence for Pakistan." *Economic Change and Restructuring*, 45(4): 299-316. http://dx.doi.org/10.1007/s10644-011-9119-7

Upadhyaya, Kamal P. 1999. "Currency Devaluation, Aggregate Output, and the Long Run: An Empirical Study." *Economic Letters*, 64(2): 197-202.

Upadhyaya, Kamal P., and Mukti P. Upadhyay. 1999. "Output Effects of Devaluation: Evidence from Asia." *Journal of Development Studies*, 35(6): 89-103.

Upadhyaya, Kamal P., Franklin G. Mixon, and Rabindra Bhandari. 2004. "Exchange Rate Adjustment and Output in Greece and Cyprus: Evidence from Panel Data." *Applied Financial Economics*, 14(16): 1181-1185. http://dx.doi.org/10.1080/0960310042000282058

Van Wijnbergen, Sweder. 1986. "Exchange Rate Management and Stabilization Policies in Developing Countries." *Journal of Development Economics*, 23(2): 227-247. http://dx.doi.org/10.1016/0304-3878(86)90117-3

Zhou, Su. 1991. "The Power of Cointegration Tests versus Data Frequency and Time Spans." *Southern Economic Journal*, 67(4): 906-921. http://dx.doi.org/10.2307/1061577