NUST JOURNAL OF SOCIAL SCIENCES AND HUMANITIES
Vol.2 No.2 (July-December2016) pp.141-160

In Search of Exchange Rate Undershooting in Pakistan

Wajiha Haq[1] and Iftikhar Hussain Adil[2]

Abstract:

Exchange rate behaviour does not follow very obvious and predicted pattern. Many attempts have been made to predict its behaviour as much as possible. This research re-examines the Dornbusch's model of exchange rate overshooting caused by price rigidities. Dornbusch's assumption of full employment in economy has been violated in this research which creates the possibility of exchange rate undershooting. In response to positive monetary shock, interest rate decreases and exchange rate undershoots its long run equilibrium. This research explains the dynamics of anti-intuitive exchange rate undershooting. Apart from theoretical formations of exchange rate undershooting, this research also analyses Pakistani data for exchange rate undershooting or overshooting in response to increase in money supply. Quarterly data of twenty three years for exchange rate, nominal interest rate, price, real output and money have been taken and vector autoregressive technique has been used. Evidence of exchange rate undershooting in response to positive money supply shock was found. It also gives an important insight into policy making by identifying some probable behaviour of exchange rate.

Keywords: Undershooting, Saddle Path, Price Rigidities, Monetary Shock

1. INTRODUCTION

Countries sometimes face many issues in implementation of monetary and fiscal policies whereas theoretical and policy recommend-

[1] Wajiha Haq <wajihahaq786@yahoo.com> is PhD Scholar at University of Malaysia, Kuala Lumpur, Malaysia.
[2] Iftikhar Hussain Adil <iftikhar.adil@s3h.nust.edu.pk> is Assistant Professor at School of Social Sciences and Humanities (S3H), National University of Sciences and Technology (NUST), H-12 Sector, Islamabad, Pakistan.

Author's Note: We would like to express our deep and sincere gratitude to School of Social Sciences and Humanities, NUST, Pakistan for completion of this research. We would like to especially thank Dr. Ather Maqsood Ahmed for personal guidance, which has provided a good basis and shape for current research. We would also like to thank Dr. Zafar Mahmood and Dr. Tanwer ul Islam for their critique and guidance that has improved the quality of the paper.

dations do not give expected results. Actual evidence sometimes differs from the theory suggested by monetarists and fiscal policy makers. Opening of world trade and global economies have made one country vulnerable to policies of other countries. Correspondingly the conductance of macroeconomic tools to affect the economy has not remained simple. Mundell's (1963) and Fleming (1962) models explained the conductance of monetary and fiscal policy in different exchange rate regimes. Mundell's model is still the basis of many ideas and theories of international finance but it was really back dated.

When there was a roar and excitement of introduction of flexible exchange rate in open economy macroeconomics, it was found that exchange rate is more volatile than it was to be. Dornbusch explained the phenomena with simple theory and stated price rigidity as the reason of abnormal behaviour of exchange rate overshooting towards positive monetary shocks.

There are a few ideas or rationales present in economics which are true and not very obvious. Dornbusch's explanation of exchange rate overshooting is one of such phenomena. Dornbusch (1976) advanced the theory by explaining the phenomena of significant depreciation of exchange rate when money supply is increased. The development in literature advancement is slow regarding this topic because of lack of consensus on a reliable method to measure the phenomenon and many researchers face difficulty in finding reliable data when they go into deep core of the topic. Researchers also find evidence of exchange rate undershooting in response to monetary shocks. When a persistent monetary shock is applied, given that the prices are slow to adjust, exchange rate over reacts; this phenomena is known as exchange rate overshooting. Dornbusch theory assumes that purchasing power parity is held in long run, exchange rate is determined in flexible exchange rate market and also there is perfect capital mobility considering domestic and foreign bonds as perfect substitutes. Perfect foresights of expectations are held and economy operates at full employment level [Dornbusch (1976)].When assumption of full employ-ment is replaced by more realistic assumption where real output is held variable, exchange rate overshooting phenomena does not remain simple. Prices are sticky and real output is also considered to be sluggish in response, which

causes exchange rate to either overshoot or undershoot in response to increase in money supply. Undershooting phenomena needs theoretical explanation and empirical testing. This research focuses on exploring the possibilities of exchange rate undershooting dynamics and finding possibilities of exchange rate overshooting or undershooting for data of Pakistan. This research gives insights towards behaviour of exchange rate through a different perspective by using VAR (vector autoregressive) techniques in consideration that this econometric technique can better explore the behaviour of exchange rate.

Fleming (1962) and Mundell (1963) discussed the response of exchange rate to monetary shock but they did not consider the phenomenon of price stickiness. Dornbusch (1976) did consider price stickiness while explaining the response of exchange rate to monetary shock. Mundell and Fleming did static analysis whereas dynamics were added by Rogoff and Obstfeld (1995). They took the price behaviour discussion away from price taking behaviour and introduced monopolistic competition. They also discussed special type of price stickiness that firms will not change their prices unless they get some external signal. Rogoff (1996) focused on labour market rigidities where prices are rigid due to labour contracts and due to dominance of trade union; labour market wages cannot be easily changed. However, the importance of labour market is usually ignored in empirical testing.

Whenever money supply is increased, interest rate falls. Intuition says that exchange rate should overshoot. Prices and output both are sluggish. The counter intuitive argument is that exchange rate can undershoot because of complex formation of expectations. Complex expectations are formed because of sluggish behaviour of exchange rate. When the assumption of full employment considered in Dornbusch's model is replaced by a more realistic assumption of variable output, exchange rate can either overshoot or undershoot given the condition that income elasticity of money demand should be high and it overcomes the effect of increase in money supply. One time money supply increase or money supply growth both create the possibility of exchange rate overshooting or undershooting. An increase in money supply growth results in decrease of interest rate which creates price gap between current price and long run price level. Expectations of currency

depreciation and interest rate increase are created and thus require exchange rate undershooting in order to nullify the expectations.

If the assumption of instantaneous adjustment of asset market is relaxed with its sluggish behaviour and continuous purchasing parity with long run purchasing power parity then it creates the possibility of exchange rate overshooting and undershooting. If the product of income elasticity of money demand and real exchange rate elasticity of domestic output is greater than 1 then the saddle path between real and nominal exchange rate will be negatively sloped. Hence, there will be clear undershooting of exchange rate in response to increase in money supply. Monthly data from January 2001 to December 2010 of Korea were used and found through simulations possibility of undershooting or over-shooting. It was found that adjustment towards equilibrium is delayed due to sluggish behaviour of output [Ryou (2012)].

When economy is operating at a level less than full employment but has variable output, exchange rate can overshoot and undershoot. When prices and output both adjust sluggishly in response to increase in money supply, both exchange rate overshooting and undershooting can occur. When money supply is increased, interest rate decreases as is explained by Dornbusch model; prices are expected to increase in the long run. Also people expect that the currency will appreciate. If the expectation of appreciation of currency is very strong then exchange rate undershoots in order to reduce the expectation of exchange rate appreciation and to maintain interest rate parity [Wang (2005)].

3. FEASIBILITY CHECK OF DORNBUSCH'S MODEL ASSUMPTIONSIN PAKISTAN

Monthly data of exchange rate, consumer prices, imports and exports were taken for the period of 2000-2004. It was found that purchasing power parity (PPP) is held in the long run. [Kemal and Haider (2004)].

There is evidence that PPP holds in Pakistan. Quarterly data from 1982-2005 were taken and exchange rate of Pakistan vis-à-vis United States was taken. Vector error correction model and cointegration technique was used and found that weak form PPP holds in Pakistan.

Speed of adjustment is very slow and it took almost 4-5 years for exchange to move towards its equilibrium after some exogenous shock [Khan and Qayyum (2008)]. Income elasticity of money demand in Pakistan is very high. Annual data from 1975-2009 of Pakistan were taken. Through autoregressive distributive lag (ARDL) approach, long run relationship between real income, interest rate, exchange rate and demand for money was studied. Long run income elasticity of money demand was found to be 4.16 whereas short run elasticity is 1.14 [Anwar and Asghar (2012)].

Uncovered Interest Parity (UIP) holds continuously in Pakistan. Data from 1971-2000 were taken and UIP was tested. Using cointegration, Alam and Iqbal found that UIP holds continuously in Pakistan [Alam, *et al.* (2001)]. Pakistan does not have perfect capital mobility. Data from 1976-2006 were used and ARDL approach was used for analysis. Relationship between domestic investment, real exchange rate, savings, inflation and financial development was seen and found that inadequate mobility of capital exists in the country [Shahbaz, *et al.* (2010)].

Mussa (1986) used VAR (vector autoregressive) based approach seeing variance decomposition and forecast errors. Forecast error variance decomposition has been used to check the variability of exchange rate in response to nominal and real shocks. Nominal shocks include increase in money supply and real shock includes increase in productivity [Clarida and Galí (1994); Eichenbaum and Evans (1995); and Rogers (1999)]. In order to see effect of macroeconomic shock coming from real shock, it is necessary to go deep into economy at micro level if not then at least to sectoral level to see rigidities of price and see the persistence of real exchange rate change in response to external monetary shock. Crucini and Telmer (2010), Broda and Weinstein (2008) and Bergin, Glick and Wu (2012) have used sector based real exchange rate to analyze the behaviour of exchange rate.

Crucini, Shintani and Tsuruga (2010) checked the effect of nominal shock on real exchange rate and found that increase in money supply causes a significant effect in real exchange rate and causes exchange rate overshooting whereas Kehoe and Midirigan (2007) investigated and found that real shock which is change in productivity of

labour measured by output has significant impact and causes exchange rate overshooting.

Dornbusch (1989) argued that right from Mundell to neo classicals, efforts which have been made to model exchange rate are not enough. The way dollar has moved since 1980s has become extremely unpredictable. When the efforts for making a robust model of exchange rate were being made, debates were carried on suggesting dual exchange rate for different regions whereas some suggested using tax for financial transactions or using managed floating exchange rate. However, exchange rate behaviour and models being developed and discussed in developing countries were different from that of developing countries. Purchasing power parity has always remained very misleading.

Dornbusch model of exchange rate overshooting has also been tested for different countries including China, Brazil, Russia and India. It was found that exchange rate overshooting does not occur in Brazil, India and Russia whereas in China there was some evidence of exchange rate overshooting was found. It was found that exchange rate affects real output but the model could not explain that direction [Berg (2011)]. Possibility of exchange rate undershooting was also found while using quantile regression for major currencies such as Pound, Canadian dollar, Japense Yen, Australian Dollar and Euro for their exchange rate with US dollar. Data were for period of 1999-2014 [Kuck, Maderitsch and Schweikert (2015)]. Evidences are found for exchange rate undershooting but attempts are still being to understand the phenomenon of exchange rate undershooting.

4. THEORETICAL MODEL

The following model explains the phenomena of exchange rate undershooting, which has been taken from appendix of article of Dornbusch except for equation (1) which is a simple extension of the one used in Dornbusch model [Dornbusch (1976)]. We relax the assumption of full employment proposed in Dornbusch model. This implies that a country cannot utilize its full employment. Perfect foresight of expectations has been held. Country is considered to be small where uncovered interest parity is held.

$$\dot{y} = \alpha[\mu + \delta(e + p^* - p) - \sigma(r) - (1 - \gamma)y] \quad \ldots (1)$$

$$m - p = -\beta r + \varphi y \quad \ldots (2)$$

$$\dot{p} = \pi(y - \bar{y}) \quad \ldots (3)$$

$$r = r^* + \dot{e} \quad \ldots (4)$$

where,

y = log of real output; e = log of exchange rate; p^*= log of foreign price level; p= log of domestic price level; m = log of money supply; r^* = log foreign interest rate; $\overline{y}$ = log of natural rate of output.

All parameters are positive structural parameters. Equ. (1) is goods market equilibrium condition. We introduce production lag explaining that output is sluggish and takes some time to adjust. $\dot{y}$, i.e., is rate at which output expands and it depends on real exchange rate and interest rate. μ could be any external factor such as fiscal policy, exogenous shocks, etc. α is the speed of adjustment of output.

Equ. (2) is money market equilibrium condition. Demand for real balances depend on interest rate and real income. Money market equilibrium requires money demand to be equal to money supply. m is log of nominal money, p is the log of price level, r is nominal interest rate and y is the log of real income.

Equ. (3) is Phillips curve used by Dornbusch in his model. Inflation rate increases as output moves towards its equilibrium. Phillips curve is the relationship between unemployment and wage inflation whereas Okun's law is the relationship between unemployment and difference between actual and potential output. Eq. (3) represents Phillips curve combined with Okun's law.

Equ. (4) is uncovered interest parity condition. Whenever people expect currency to depreciate, interest rate on domestic currency denominated assets exceeds foreign interest rate by amount of expected depreciation rate. $\dot{e}$ is a dynamic variable and expected rate of depreciation/ appreciation.

These equations have been taken from appendix of article of Dornbusch (1976) except for Equ. (1), which is simple extension of the one used in Dornbusch model. Rearranging Equ. (2) gives:

$$p = m + \beta r - \varphi y \quad \text{... (5)}$$

putting value of (p) from Equ. (5) in Equ. (1)

$$\dot{y} = \alpha[\mu + \delta\{e + p^* - (m + \beta r - \varphi y)\} - \sigma r - (1 - \gamma)y] \quad \text{... (6)}$$

$$\frac{\partial \dot{y}}{\partial y} = \alpha\delta\varphi - \alpha(1 - \gamma) > 0 \; onlyif \delta\varphi > 1 \; and \; 1 < \gamma > 0$$

Setting ($\dot{y}$) locus equal to zero, we find,

$$\frac{\partial e}{\partial y} = \frac{[(1 - \gamma) - \delta\varphi]}{\delta} < 0 \; onlyif \delta\varphi > 1$$

i.e., output locus will be negatively sloped.

$$\frac{\partial \dot{y}}{\partial m} = -\alpha\delta < 0$$

Any money supply shock will shift output locus towards left. Rearranging Equ. (2) gives

$$r = \frac{1}{\beta}(p - m + \varphi y) \quad \text{... (7)}$$

rearranging Equ. (4) gives

$$\dot{e} = r - r^* \quad \text{... (8)}$$

putting value of (r) from Equ. (7) in Equ. (8)

$$\dot{e} = \tfrac{1}{\beta}[p - m + \varphi y] - r^* \quad \text{... (9)}$$

setting ($\dot{e}$) locus equal to zero, we find,

$$\frac{\partial \dot{e}}{\partial y} = \frac{1}{\beta}\varphi > 0$$

any observation towards right of exchange rate locus means that exchange rate will increase and vice versa.

$$\frac{\partial \dot{e}}{\partial m} = -\frac{1}{\beta} < 0$$

Money supply shock will shift exchange rate locus towards left as given in Figure 1.

When observation is on the right side of exchange rate locus, output will increase and vice versa. If observation is on the right side of output locus, exchange rate will increase and vice versa.

Figure 1. Saddle Path of Exchange Rate and Output

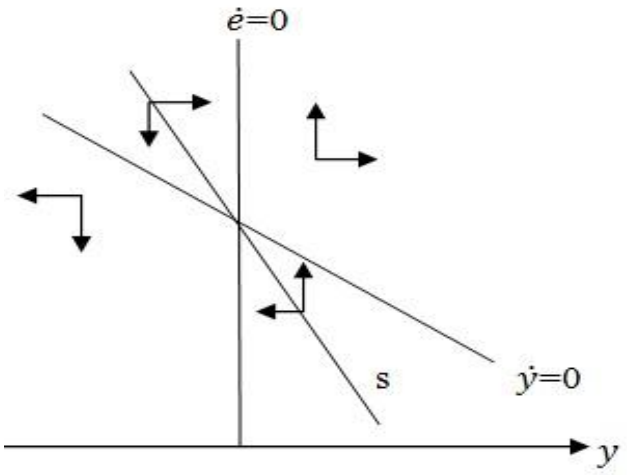
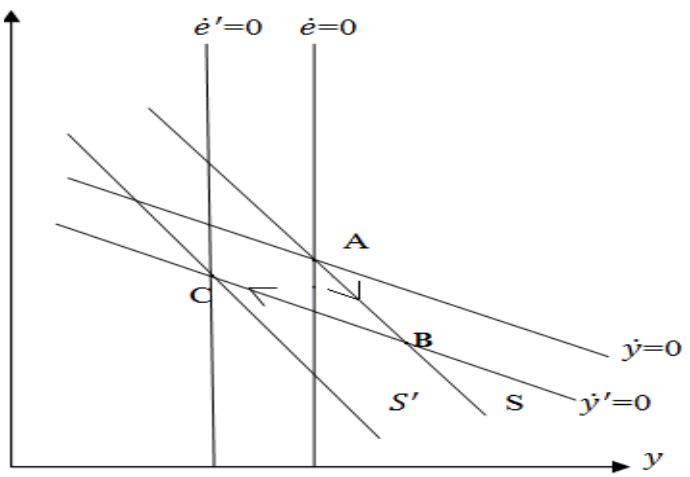


Figure 2. Exchange Rate Undershooting



Increase in money supply shifts both locus and saddle path to left. Exchange rate moves from point A to B and eventually reaches C. When money supply is increased output increases but the growth is constant at that time due to its sluggish behaviour. Exchange rate appreciates in that period. Output and its growth decreases when exchange rate depreciates.

Dynamics of exchange rate undershooting show an immediate decrease in interest rate when money supply increases as is clear from figure 2. Cost of production decreases and negative gap between price and its long run level is created. Country becomes competitive and also at given interest rate, lower prices increase real money balances and require higher level of output to maintain equilibrium in money market. Output and aggregate demand increases. Considering income elasticity of money demand to be high, money demand increases. Money demand becomes greater than money supply and exchange rate appreciates. Appreciation of currency creates expectations of currency depreciation so interest starts increasing towards r* in order to maintain uncovered interest parity. Increase in interest rate increases cost of production and prices. Gap between prices and their long run equilibrium starts shrinking. In effect, aggregate demand and output decreases. It raises current account deficit and currency ultimately depreciates towards its long run level.

5. DATA AND METHODOLOGY

5.1. Data

Secondary data have been taken for analysis. Exchange rate overshooting/undershooting has been tested for Pakistan's data for which quarterly data have been collected. Data of different variables namely money supply, interest rate, exchange rate, real output and prices for Pakistan have been collected for almost 28 years starting from first quarter of 1982 to second quarter of 2010. Total number of observations is 114. Source of data for aggregate variables is International Financial Statistics. Quarterly gross domestic product at constant factor cost (2005) has been taken from SBP working series Hanif (2013).

These data have been used for calculation of impulse response. The reason for selecting data from 1982 onwards due to the fact that Pakistan's exchange rate was pegged. After that it was managed floating. Dornbusch's phenomenon also gives reliable results on managed floating exchange rate regime [Obstfeld and Rogoff (1995)].

5.2. Methodology

In order to see the behaviour of exchange rate in response to money supply, this study used vector autoregression (VAR) technique. VAR has been used to study the impulse response of prices, interest rate and exchange rate. By using VAR, we tried to analyze the effects of unit shock in money supply on nominal exchange rate, prices, real output and nominal interest rate. In this analysis, we have assumed that interest parity holds in the long run and home country is small which takes interest rate and prices of imports as given. Domestic and foreign bonds are also considered as perfect substitutes and interest rate of domestic country and foreign country remains same.

Order of integration of four variables, money supply, prices, exchange rate and nominal interest rate is checked.
where,

p = log of prices measured by general consumer price index with base of 2005,
m = log of money supply (M2),
r = nominal interest rate,
s = log of exchange rate which is rupees per dollar,
y = log of Gross Domestic Product at constant factor cost (2005).

After checking order of integration, partial autocorrelation function was drawn in order to determine the number of lags to be used during estimation. After estimation impulse response was seen.

6. RESULTS

First we check that whether variables are stationary or not and for that we do unit root testing. Time series data have been used for analysis where usage of stationary series is very important. So we have used Dickey Fuller test to check the order integration of series.

In order to apply VAR, we first check the order of integration of four variables namely exchange rate, money supply, prices and nominal interest rate. All variables are I(1) except for nominal interest rate and real output as shown in Table 1. Engle and Granger (1987) consider same order of integration for variables that are cointegrated. However,

Asteriou and Hall (2007) say that cointegrating relationship might exist in variables with I(0) and I(1).

Our main focus is to calculate impulse response function. For calculation of impulse response, cointegration needs not to be tested. We have checked partial autocorrelation function in order to determine number of lags to be introduced in estimation of multiple equation models. PACF of all variables show that their first lag is significant for all variables except for real output whose first, second, fourth and fifth lags are significant. Nominal interest rate also has first and fourth lags to be significant. All variables are taken in log form except for nominal interest which is in percentage. Due to this reason nominal interest has more lags significant than money supply, exchange rate and prices. Quarterly domestic output has quarterly fluctuations so it has more lags significant than any other variable.

Table 1. Unit Root Testing

Variable	Calculated values		Critical values at 5%	Order of integration
	At level	At difference		
M	-1.535	-4.506	-3.45	I(1)
R	-3.041	--	--	I(0)
P	-1.796	-3.873	-3.45	I(1)
S	-1.919	-4.946	-3.45	I(1)
Y	-5.955	--	--	I(0)

*-3.45 is the critical value with drift and trend *-2.89 is the critical value with drift only.

Nominal interest rate is in percentage whereas all other variables are in logarithm form. That is why we find long bars in PACF of nominal interest rate as compared to money, nominal exchange rate and prices.

Figures 3, 4, 5, 6 and 7 present partial autocorrelation function for money supply, nominal interest rate, prices, exchange rate and real output respectively. Impulse response was determined by giving unit shock to money supply. Basic VAR has been used for estimating impulse response where first lag of all variables has been taken. Order of cointegration suggests that Vector Error Correction Model (VECM) should be used which consider variables stationary at their first and other

levels. In order to avoid inefficiency of estimates, we have used VECM and found that both VAR and VECM give the same results. If variables are cointegrated in the long run then VECM (cointegrated VAR) and basic VAR gives the same results and we have also counter checked it by applying both techniques and found the same results.

Figure 3. PACF of money supply

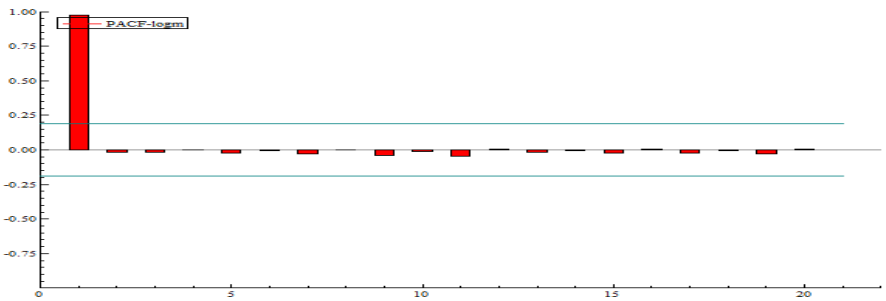


Figure 4. PACF of Nominal Interest Rate

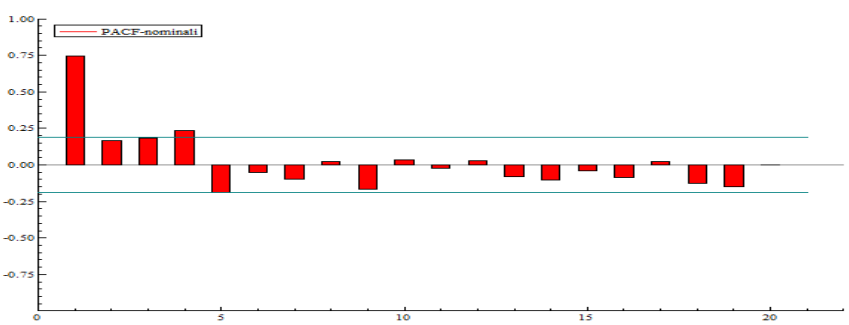


Figure 5. PACF of Prices

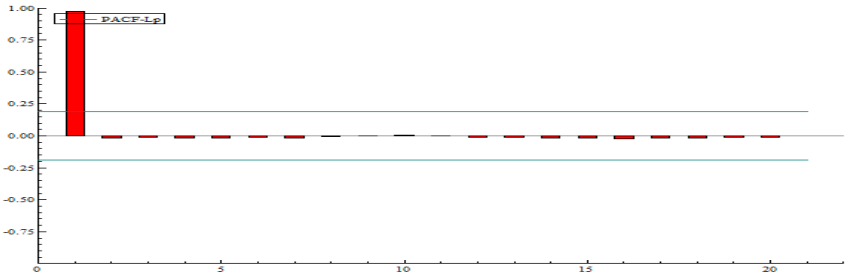


Figure 6. PACF of Exchange Rate

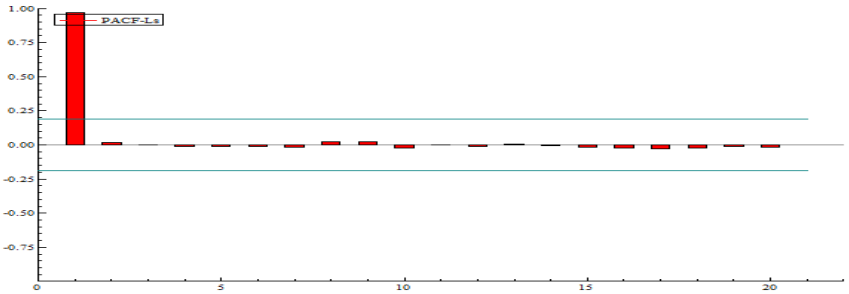


Figure 7. PACF of Real Output

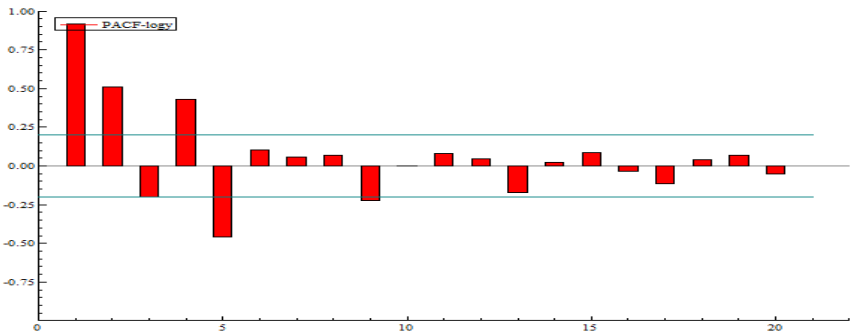
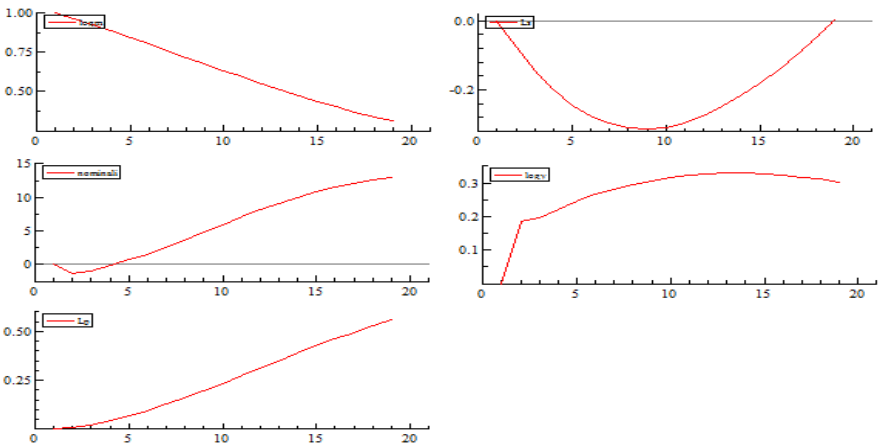


Figure 8. Impulse Response of Money Shock



VAR result shows that money supply shock causes exchange rate to first appreciate and depreciate towards its long run. Prices increase over a period of time as given in figure 8. Output increases and then declines. Interest rate first decreases and then increases. When money supply is increased, prices do not replicate money path. Interest rate drops as a result. Unit shock of money supply decreases interest rate right away whereas prices are sticky and output is sluggish. Cost of production increases and negative gap is created between current price and long run price level. This negative gap increases competitiveness of country. Also at given interest rate, lower prices increase money balances and requires simultaneous higher level of output to maintain equilibrium in money market. So output increases and creates positive increase in money demand and aggregate demand. Appreciation of currency creates expectation of depreciation as ever variable is self-reversing. These expectations cause interest rate to increase in order to maintain uncovered interest parity. Increase in interest rate cause prices and cost of production to increase and hence output declines. Aggregate demand also decreases and it raises current account deficit and currency ultimately depreciates towards its long run level.

7. CONCLUSION

Dornbusch model of exchange rate overshooting has many discrepancies but still it has given important insights about exchange rate behaviour. Dornbusch assumed economy to be operating at full employment. When this assumption is relaxed, it creates possibility of exchange rate undershooting. Real output is sluggish in economy and prices are sticky. Positive money supply shock decreases interest rate immediately. Prices are sticky and increase over period of time. Negative price gap causes output to increase and hence money demand increases. Currency appreciates in effect. Shock to any variables implies that it will come back to its equilibrium. So currency appreciation creates expectations of depreciation of currency. These expectations require interest rate to increase in order to maintain interest rate parity. In effect output decreases, current account deficit increases and eventually currency appreciates. Hence, undershooting of exchange rate can be the possibility when money supply is increased and interest rate decreases. Pakistan's quarterly exchange rate shows potential of exchange rate undershooting in response to positive monetary shock. These results have been taken through VAR analysis. Also the dynamics of exchange rate undershooting have also been analyzed through phase diagram which show that money supply increase causes output to react but its growth remains constant when currency appreciates. Output growth declines when currency appreciates. This model uses the condition that product of income elasticity of real exchange rate and income elasticity of output should be greater than one. It can be concluded from this research that any monetary shock can lead to enormous changes in prices and output and adjustment of variables towards their equilibrium can take long periods.

8. POLICY RECOMMENDATIONS

Identification of possibility of undershooting suggests abnormal reaction to exchange rate and large periods of adjustment. Government's policies should be designed in a way that apart from conductance of monetary policy, they also decrease period of adjustment.

If money supply increases and exchange rate appreciates, its biggest cost will be worsening of current accounts. Exports will decrease as it will become expensive. Imports will decrease and current account deficit will increase which is not good for economy. Current account deficit decreases output and increases unemployment. Benefit of exchange rate appreciation is decrease in foreign debt. While increasing money supply, government has to measure costs and benefits. If the government's aim is to decrease foreign debt whereas it can bear the costs of increasing current account deficit then increase in money supply and causing exchange rate to undershoot will be a wise decision. Whereas if the cost of current account deficit outweighs all its benefit then increasing money supply will not be a wise decision.

REFERENCES

Ahmed, M. (1992) Exchange Rate Policy: An Econometric Investigation. *The Pakistan Development Review*, 31:1, 49-74.

Ahmed, Z. I. (2015) The Efficiency of Exchange Rate Market: A Case Study on Pakistan. *International Journal of Economics, Finance and Management Sciences*, 3:2, 125-137.

Alam, S., M. S. Butt, and A. Iqbal (2001) The Long Run Relationship between Real Exchange Rate and Real Interest Rate in Asian Countries: An Application of Panel Cointegration. *The Pakistan Development Review*, 40: 4, 577–602.

Anwar, S., and N. Asghar (2012) Is Demand for Money Stable in Pakistan? *Pakistan Economic and Social Review*, 50: 1, 1-22.

Berg, M. V. (2011) Shocks Measured With Dornbusch Overshooting Model: *An Exchange Rate Determination for Brazil, Russia, India and China.* Available at : http://hdl.handle.net/2105/9961

Bergin, P. R., R. Glick, and J. L.Wu (2013) The Micro-Macro Disconnect of Purchasing Power Parity. The *Review of Economics and Statistics*, 95:3, 798-812.

Bilson, J.F.O. (1978) Rational Expectations and Exchange Rate. *The Economics of Exchange Rates Readings*, Addison-Wesley p. 75-96.

Bokhari, J. (2004) The Volatility in Financial Markets. Dawn-Business, 17 Aug, Islamabad.

Broda, C., and D. E. Weinstein (2008) Understanding International Price Differences Using Barcode Data. *NBER Working Papers, 14017*.

Calvo, G. A. (1983) Staggered Prices in a Utility-Maximizing Framework. *Journal of Monetary Economics, 12*, 383-398.

Clarida, R., and J. Galí (1994) Sources of Real Exchange-Rate Fluctuations. How Important are Nominal Shocks? *Carnegie-Rochester Conference Series on Public Policy*, 41:1, 1-56.

Current FAQs: Board of Governors of Federal Reserve System. (2013, 12-13) Retrieved on March 3, 2014, from Board of Governors of Federal Reserve System: http://www.federalreserve.gov/faqs/money_12849.html.

Dimitrios, A. and S. Hall (2007) Applied Econometrics: A Modern Approach. Revised edition, *China: Palgrave Macmillan*.

Dornbusch, R. (1989) Real Exchange Rate and Macroeconmics: A selective survey. *The Scandavian Journal of Economics*, 91: 2, 401-432.

Dornbusch, R. (1976) Expectations and Exchange Rate Dynamics. *Journal of Political Economy*, 84: 6, 1161-1176.

Dornbusch, R., S. Fischer, and R. Startz (2004) Macroeconomics. McGraw-Hill, NewYork.

Eichenbaum, M., and C. Evans (1995) Some Empirical Evidence on the Effects of Monetary Policy Shocks On Exchange Rates. *Quarterly Journal of Economics, 110*, 975- 1010.

Engle, R. F., and Granger, C. W. (1987) Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica: journal of the Econometric Society*, 55: 2, 251-276.

Fleming, J. M. (1962) Domestic Financial Policies Under Fixed and Under Floating Exchange Rates. *International Monetary Fund Staff Papers, 9*, 369-379.

Frenkel, J.A. (1976) A Monetary Approach to Exchange Rate: Doctrinal Aspects and Empirical Evidence. *Scandinavian Journal of Economics*, 78, 169-91.

Frenkel, J.A. (1986) International Capital Mobility and Crowding-Out in the U.S. Economy: Imperfect Integration of Financial Markets or of Goods Markets? *In How Open Is the U.S. Economy?*eds R Hafer. Lexington Books, Lexington, 33-67.

Hanif, M.N., and J. Iqbal (March, 2013) Quarterisation of National Income Accounts of Pakistan. *SBP Working Paper Series*.

Kehoe, P. J., and V. Midrigan (2007) Sticky Prices and Sectoral Real Exchange Rates. *Federal Reserve Bank of Minneapolis Working Papers*, 656.

Kemal, M. A., and R. M. Haider (2004) Exchange Rate Behaviour after Recent Float: The Experience of Pakistan. *The Pakistan Development Review, 1,829-852.*

Khan, M. A., and M. Qayyum (2008) Long and Short Run Dynamics of Exchange Rate in Pakistan: Evidence from Unrestricted Purchasing Power Parity. *The Lahore Journal of Economics*, 29-56.

Kuck, K., R. Maderitsch, and K. Schweikert (2015) Asymmetric Over- And Undershooting of Major Exchange Rates: Evidence from Quantile Regressions. *Economics Letters*, 126, 114-118. doi:10.1016/j.econlet.2014.11.028

Lothian, J. R. and M. P. Taylor (2006) Real Exchange Rates over the Past Two Centuries: How Important is the Harrod-Balassa-Samuelson Effect? *The Warwick Economics Research Paper Series (TWERPS), 768*, University of Warwick, Department of Economics.

Mahmood, T., H. u. Rehman, and S. A. Rauf (1995-2008) Evaluation of Macroeconomic Policies of Pakistan. *Journal of Political Studies*, 17, 57-75.

Mundell, R. A. (1963) Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates. *Canadian Journal of Economics and Political Science, 29*, 475-485.

Mussa, M. (1976) The Exchange Rate, the Balance of Payments and Monetary and Fiscal Policy under Regime of Controlled Floating. *Scandinavian Journal of Economics.* 78, 229-48.

Mussa, M. (1986) Nominal Exchange Rate Regimes and The Behaviour of Real Exchange Rates: Evidence and Implications. *Carnegie-Rochester Conference Series on Public Policy, 25,* 117-213.

Obstfeld, M., and K. Rogoff (1995) Exchange Rate Dynamics Redux. *Journal of Political Economy, 103,* 624-660.

Rogers, J. H. (1999) Monetary Shocks and Real Exchange Rates. *Journal of International Economics,* 49:2, 269-288.

Rogoff, K. (2002) Dornbusch's Overshooting Model After Twenty-Five Years: International Monetary Fund's. *Palgrave Macmillan Journals,* 1-34.

Rogoff, K. (1996) The Purchasing Power Parity Puzzle. *Journal of Economic Literature, 34,* 647- 668.

Ryou, H. (December 3, 2012) Exchange Rate Dynamics under Financial Market Frictions. *Korea: ESSEC Business School.*

Shahbaz, M., N. Ahmad and A.N.M. Walid (2010) Savings-Investment Correlation and Capital Outflow: The Case Of Pakistan. *Transit Studies Review,* 17, 80-97.

Stockman, A. C. (1980) A Theory of Exchange Rate Determination. *Journal of Political Economy,* 88:4, 673-698.

Wang, C. Y. (2005) Exchange Rate Overshooting in Taiwan. *Review of Quantitative Finance and Accounting,* 55-71.

Wang, C.Y. (2005) The Flexible Price Monetary Model in the Economics of Foreign Exchange and Global Finance. *Springer B erlin Heidelberg* 131-147.