

An Empirical Study On Exchange Rate Pass-Through In Pakistan: A New Evidence

Khurram Shahzad*, Atif Ali Jaffri**

ABSTRACT

This paper has produced a new evidence on exchange rate pass-through and pass-through of global energy prices on monthly inflation in Pakistan for the period 2007M6 to 2018M6. The study has used consistent monthly data of CPI inflation (MOM) with new base year 2007-08, which is distinction from previous empirical literature for Pakistan. The empirical results showed that exchange rate, output gap, global energy inflation and lagged inflation affect positively and significantly monthly inflation in Pakistan. Short run and long run exchange rate pass-through was found 0.16 and 0.42, respectively. It means that due to 1 percentage point increase in depreciation of rupee against US dollar, monthly inflation in current period increases by 0.16 percentage point and 0.42 percentage point in the long run. We have applied all necessary diagnostic tests to confirm the existence of no heteroscedasticity, no autocorrelation, stability of model and normality of estimated residuals. The study concluded that exchange rate-passthrough in short run and long run is significant and high in case of Pakistan. Therefore, exchange rate stability is important for controlling inflation in Pakistan.

KEY WORDS: Pass-through, Inflation, Foreign Supply Shock

Introduction

Exchange Rate Pass-through (ERPT) and pass-through of global energy prices to domestic inflation is a topic of large interest for both the policy makers and academia. High ERPT is considered a factor responsible for monetary policy ineffectiveness due to inability of central bank in managing aggregate demand pressure arising from rise in foreign demand. Similarly, high pass-through of global energy prices raises input costs and overall inflation in the country.

The direct channel of ERPT runs via the price of imports, through the external sector. The change in the import prices affects the producer and consumer prices in the country. However, indirect channel affects the competitiveness of the exports by making the domestic goods cheaper in foreign currency for foreigners, increases the demand of goods and ultimately increases home consumer prices. Theoretically, depreciation of local currency against US dollar enhances the volume of exports and aggregate demand of the country resulting increase in domestic price level.

This paper is based on PhD Dissertation entitled “ An Empirical Study on Disaggregated Exchange Rate Passthrough, Trade Disconnect and Second Round Effect of Imported Inflation in Pakistan” by Khurram Shahzad, PhD Scholar, Department of Economics, University of Gujrat.

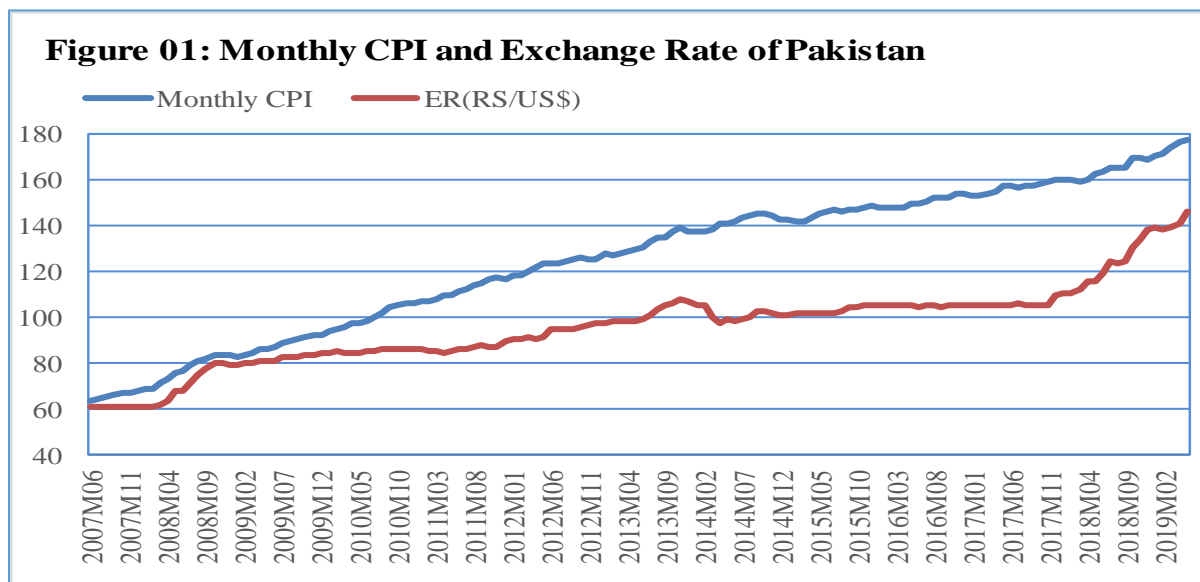
* PhD Scholar, Department of Economics, University of Gujrat, Gujrat. Pakistan

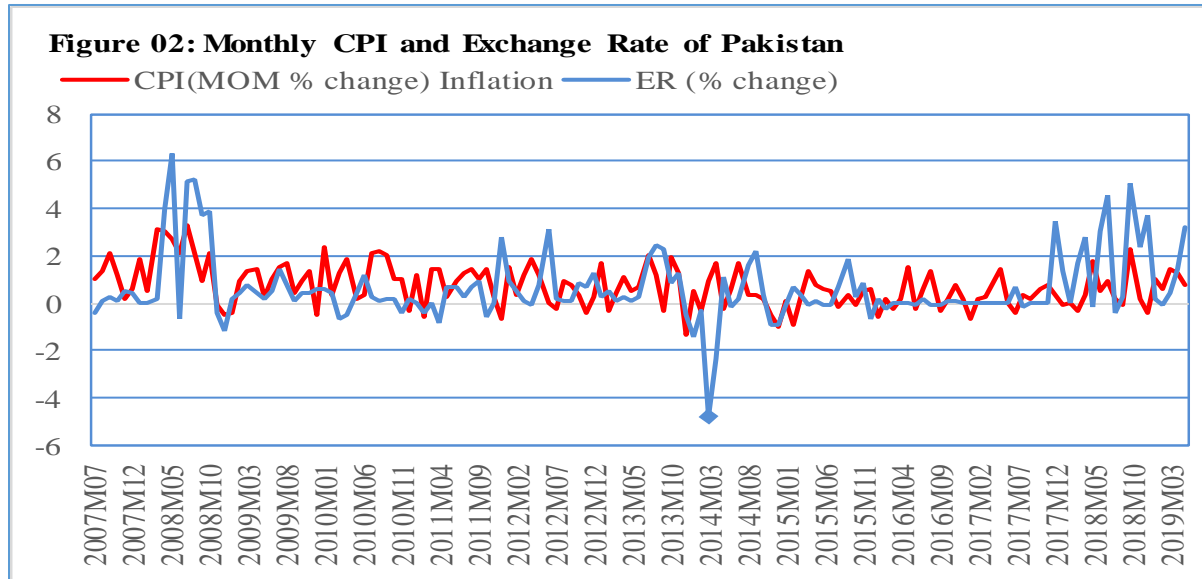
**Associate Professor, Department of Economics, University of Gujrat, Gujrat. Pakistan

Pak Rupee continuously depreciated against US dollar by 74.5% from July 2007 to November 2017 whereas Pak rupee has depreciated against US dollar by 49% from

November 2017 to June 2019 (See, Figure 1&2). During 2018 Pak rupee depreciated by 34% against US dollar causing enormous inflationary pressure raising inflation to 7.2 percent in Jul-May2019 as compared to 3.81 percent in the corresponding period of last financial year. State Bank of Pakistan (SBP) had already recorded its concerns in Monetary Policy Statement (MPS, March 2018) stating that strengthening of global commodity prices and depreciation of rupee will put pressure on inflation of Pakistan. In response, SBP continuously increased the discount rate approaching to 12.25% in May, 2019 which is the highest rate observed in last 8 years. Figure 02 shows that depreciation of Pak rupee passes through in domestic inflation as spikes in depreciation are accompanied with spikes CPI inflation.

In case of Pakistan, most of the studies provided evidence for pass-through using data of 1990's and 2000's and concluded that pass-through is very low [e.g., Siddiqui & Akhtar, 1999; Choudhri & Khan, 2002; Hanif, Iqbal, & Khan., 2017]. This study will revisit empirical evidence on the subject by using consistent data on CPI with new Base Year (2007-08) and estimating the short run and long run ERPT. The remaining part of the paper includes sections on literature review, methodology and data, results and finding and conclusion.





Literature Review

The recent empirical literature has showed large variation in the ERPT to domestic consumer prices in the past few decades. Swallow, Bertrand, Magud & Velencia. (2016) used the data of 62 emerging and developed economies from 2000-15 and revisited the pass through of exchange rate in consumer prices. The study concluded that pass through of exchange rate reduced in those countries where monetary management improved and increased where monetary management weakened. Ha, Stocker & Yilmazkuday. (2019) used the time series quarterly data set of 55 countries for the period 2007-18 to find the ERPT by using Structural Vector Autoregressive (SVAR) model. The study concluded that in most of the countries the ERPT was due to domestic shocks and in less flexible exchange rate regimes the ERPT was higher than average. While the global shocks affected less proportion of exchange rate movement. The study also concluded that in most of the countries there was downward trend of ERPT in inflation. Usman & Musa (2018) studied the ERPT in inflation in Nigeria by using Auto Regressive Distributed Lag (ARDL) Model. The study used annual time series data from 1960 to 2015 and found that there is long run and short run relationship between exchange rate and consumer price index. Kim & Lin (2018) used the monthly data of USA for the period of 1973 to 2017 and revisited the estimation of ERPT to CPI in USA. The study used the vector auto regressive (VAR) model on the macroeconomic data and found that the ERPT in USA has increased over the period of time. Chuah, Chong & Tan. (2015) used time series quarterly data for the period of 1992 to 2013 and used backward looking Philips curve to analyze the pass through of global commodity prices into headline inflation in Malaysia. The study found that Second Round Effect of ERPT existed in Malaysia, which increased prices in Malaysia.

A few studies on ERPT in Pakistan have confirmed low passthrough by incorporating various determinants of inflation. Hanif et al. (2017) argued that the global commodity inflation affected the domestic inflation. However, the linkages are different under different regimes of interest. The study also found that there was bivariate causality between global commodity inflation and domestic inflation in Pakistan. Jaffri, Mirza & Bashir. (2014) found that global food inflation,

energy price indices and industrial inputs affected the overall inflation in Pakistan positively and significantly in the long run. The same results of pass through of world oil prices to domestic inflation of Pakistan are confirmed by Asghar & Tanveer (2015). However, the results showed that the causality between world oil prices and inflation, world oil price and exchange rate, domestic inflation and exchange rate was unidirectional. Hanif (2012) found that monetary policy had been more effective on nonfood inflation than food inflation in Pakistan and the major cause of inflation in Pakistan was growth in money supply. The study suggested that the food inflation can only be controlled by better supply of food items. However, the food inflation was affected by the global food inflation in Pakistan. Finally, the study found that food inflation was more persistent than headline and core inflation in Pakistan.

Methodology and Data

The study follows Gelos & Ustyugova (2017) to estimate the ERPT and impact of global energy prices on domestic inflation in Pakistan.

$$INF_t = \alpha + \sum_{i=1}^n \delta_i INF_{t-i} + \sum_{i=0}^n \phi_i YGAP_{t-i} + \sum_{i=0}^n \theta_i DLGEPI_{t-i} + \sum_{i=0}^n v_i DLER_{t-i} + \varepsilon_t \quad (1)$$

Where

INF Month on Month CPI Inflation in Pakistan

YGAP Difference of natural log of manufacturing index and its HP trend

DLGEPI Difference of natural log of foreign energy price index

DLER Difference of natural log of Exchange Rate of Pak Rupee and US dollar

The long run ERPT (PT_{ER}) and long run global energy prices pass-through (PT_{GEPI}) are calculated as follows

$$PT_{GEPI} = \frac{\sum_{i=0}^n \theta_i}{1 - \sum_{i=1}^n \delta_i} \quad (2)$$

And

$$PT_{ER} = \frac{\sum_{i=0}^n v_i}{1 - \sum_{i=1}^n \delta_i} \quad (3)$$

It is expected that all explanatory variable will positively affect the domestic inflation. The study has used the monthly data for the period from 2007M07 to 2018M06 for the empirical investigation. This study has used data on inflation by using CPI with base year 2007-08. Inflation has been calculated Month on Month basis. The data of global energy price index (GEPI), Manufacturing index for output (YG) were obtained from International Financial Statistics (IFS), IMF. The data of Exchange Rate was collected from World Development Indicator (WDI), World Bank and data of domestic inflation was collected from Monthly Statistical Bulletin, State Bank of Pakistan.

Results and Findings

All the variables in the model were stationery at level as shown in table 1. Therefore, the study has used the ordinary least square (OLS) method to obtain the results. Table 2 shows that all the variables have correct signs and most of the variables are statistically significant. Short run ERPT (the coefficient of DLER) was 0.16 whereas long run ERPT was estimated 0.42. It means that due to 1 percentage point increase in depreciation of rupee against US dollar, monthly inflation in current period increases by 0.16 percentage point and 0.42 percentage point in the long run

TABLE 1: Stationarity Tests (ADF)

Series	With Intercept	With Intercept and Trend	Level of Integration
INF	-8.58(0) ^{***}	-10.09(0) ^{***}	I(0)
YGAP	-3.78(0) ^{**}	-3.79(0) ^{**}	I(0)
DLGEPI	-7.32(0) ^{***}	-7.29(0) ^{***}	I(0)
DLER	-7.15(0) ^{***}	-7.21(0) ^{***}	I(0)

^{***}, ^{**}, ^{*} indicate stationarity at 1%, 5% and 10% level of significance, respectively

TABLE 2: Estimation Results (OLS)

Dependent Variable: INF

Variables	Coefficients	t-values	Probability
C	0.002782	2.61 [*]	0.0103
INF(-1)	0.140297	1.44	0.1530
INF(-2)	0.021742	0.23	0.8171
INF(-3)	0.277284	2.91 ^{***}	0.0045
YGAP(-1)	0.049862	2.83 ^{***}	0.0057
YGAP(-2)	-0.021639	-1.09	0.2752
YGAP(-3)	0.049964	2.58 [*]	0.0115
YGAP(-4)	-0.021221	-1.13	0.2602
YGAP(-5)	-0.013727	-0.73	0.4634
YGAP(-6)	0.013196	0.75	0.4541
YGAP(-7)	0.035488	1.92 ^{**}	0.0571
YGAP(-8)	-0.006217	-0.34	0.7309
YGAP(-9)	-0.000931	-0.04	0.9619
YGAP(-10)	0.016688	0.89	0.3749
YGAP(-11)	-0.030840	-1.78 [*]	0.0773
DLER	0.167453	2.73 ^{***}	0.0075
DLER(-1)	-0.060467	-0.88	0.3775

DLER(-2)	0.021647	0.32	0.7440
DLER(-3)	0.011202	0.16	0.8741
DLER(-4)	-0.098778	-1.47	0.1452
DLER(-5)	0.020589	0.31	0.7536
DLER(-6)	-0.001078	-0.02	0.9871
DLER(-7)	0.132273	2.18**	0.0317
DLGEPI	0.007410	0.75	0.4557
DLGEPI(-1)	0.021005	2.11**	0.0375

***, **, * indicate significance of coefficients at 1%, 5% and 10% level of significance, respectively

TABLE 3: Diagnostic Tests

R ²	0.50	Adjusted R ²	0.37
F-stat	4.00	Prob.	0.0000
Breusch-Godfrey Serial Correlation LM Test			
F-stat	2.25	Prob. F(2,95)	0.1114
Chi-Square	5.51	Prob. Chi-Square(2)	0.0636
Breusch-Pagan-Godfrey Test of Heteroskedasticity			
F-stat	0.83	Prob.	0.6854
Chi-Square	20.88	Prob.	0.6458
Jarque-Bera Test of Normality			
Jarque-Bera Stat	1.1038	Prob.	0.5758
Ramsey RESET Test			
t-stat	0.56	Prob.	0.5737
F-statistic	0.32	Probability	0.5737

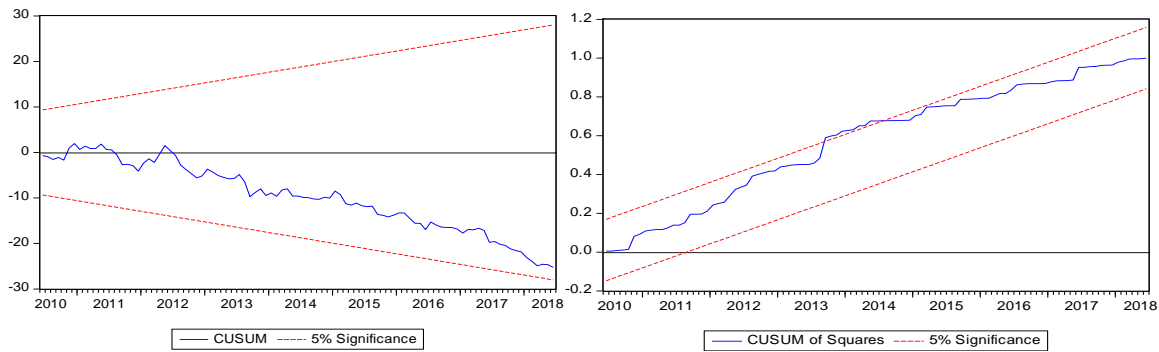
FIGURE 03: CUSUM and CUSUMSQ Tests for OLS Model

Table 03 shows R-squared is 0.50 and F-statistic is significant thus confirming overall significance of the model. The model was selected based on general to specific methodology of selection of lags of explanatory and dependent variable taking maximum lags 12 since we have monthly data. The diagnostic tests performed on results showed evidence of no heteroscedasticity and serial correlation and model was not misspecified. The stability of the parameters was tested using CUSUM & CUSUMSQ tests as shown in Figure 03.

Conclusion

The study has produced a new evidence on pass through of exchange rate and global energy prices on domestic inflation in Pakistan for the period 2007M6 to 2018M6. All variables in the model were stationery at level, so we applied OLS technique to estimate the short run and long run ERPT.

The estimated results showed that exchange rate change, output gap and global energy inflation have positive and significant effect on domestic inflation in Pakistan. In the short run, 1 percentage point increase in depreciation of rupee against US dollar caused the monthly inflation to increase by 0.16 percentage point and 0.42 percentage point in the long run. The study concluded that ERPT in short run and long run is significant and high in case of Pakistan.

The policy implication is that recent rupee depreciation against US dollar will raise inflation in Pakistan and to avoid inflationary pressure rupee stability is important. Rupee stability can be achieved through controlling current account deficit and building foreign exchange reserves in Pakistan.

References

Ahmed, E., & Ali, s. A. (1999). Exchange Rate and Inflation Dynamics. *The Pakistan Development Review*, 38(3), 235-251.

Ahn, J., Park, C. G., & Park, C. (2016). Pass-Through of Imported Input Prices to Domestic Producer Prices: Evidence from Sector-Level Data. *IMF working paper WP/16/23*.

Asghar, N., & Naveed, T. A. (2015). Pass-Through of world oil prices to inflation: A time series analysis of Pakistan. *Pakistan Economic and Social Review*, 53(2), 269-284.

Campa, J. M., & Goldberg, L. S. (2005). Exchange Rate Pass-Through into Import Prices. *Review of Economics and Statistics*, 4(87), 679-90.

Choudhri, E. U., & Khan, M. S. (2002). The Exchange rate and consumer prices in Pakistan: Is Rupee Devaluation Inflationary? *The Pakistan Development Review*, 41(2), 107-120.

Chuah, K. P., Chong, E., & Tan, J. T. (2015). Global Commodity Prices and Inflation Dynamics in Malaysia. *Bank Negara Malaysia Working Papers*. WP5/2015.

Frankel, J., D. Parsley, and S.-J. Wei (2012): Is Slow Pass-through Around the World A New Import for Developing Countries?, *Open Economies Review*, 23(2), 213-251.

Feenstra, R. C., Gagnon, E. J., & Knetter, M. M. (1996). Market Share and Exchange Rate Pass-Through in World Automobile Trade. *Journal of International Economics*, 2(40), 187-207.

Gelos, G., & Ustyugova, Y. (2017). Inflation responses to commodity price shocks- how and why do countries differ? *Journal of International Money and Finance*.

Goldberg, L., & Campa, J. (2010). The Sensitivity of the CPI to Exchange Rates: Distribution Margins, Imported Inputs, and Trade Exposure. *The Review of Economics and Statistics*, 2(92), 392-407.

Goldberg, P. K., & Hellerstein, R. (2008). A structural Approach to Explaining Incomplete Exchange rate pass through and pricing to market. *Journal of Economic Literature*.

Goldberg, P., & Knetter, M. (1997). Goods prices and exchange rates: What have we learned? *Journal of Economic Literature*(35), 1243-1292.

Hanif, M. N. (2012). A Note on food inflation in Pakistan. *Pakistan Economic and Social Review*, 50(2), 183-206.

Hanif, M. N., Iqbal, J., & Khan, I. N. (2017). Global Commodity Prices and Inflation in a small open economy. *State Bank of Pakistan working paper*.

- Ha, J., Stocker, M. M., & Yilmazkuday, H. (2019). Inflation and Exchange Rate Pass-Through. World Bank Group, Macroeconomic, Trade and Investment Global Practice, Police Research working paper 8780.
- He, B., Zhu, H., Chen, D., & Shi, Y. (2015). On Pass-through of RMB Exchange Rate to Prices of Different Industries. *Information Technology and Quantitative Management (ITQM 2015) (Elsevier)*.
- Hellerstein, R. (2008). Who bears the cost of a change in the exchange rate? Pass-through accounting for the case of beer. *Journal of International Economics, Elsevier, 76(1)*, 14-32.
- Helmy, O., Fayed M., & Hussien, K. (2018). Exchange rate pass-through to inflation in Egypt: a structural VAR approach. *Review of Economic & Political Science*, 2356-9980
- Ibrahim, M. H., & Said, R. (2011). Disaggregated Consumer Prices and Oil Prices Pass-Through: Evidence from Malaysia. *PROSIDING PERKEM VI, JILID* , 285-295.
- IMF. (2011). *World Economic Outlook*. International Monetary Fund September 2011.
- Jaffri, A. A. (2010). Exchange Rate Pass-through to Consumer Prices in Pakistan: Does Misalignment Matter? *The Pakistan Development Review, 1(49)*, 19-35.
- Jaffri, A. A., Mirza, F. M., & Bashir, S. (2014). Is Pass through of global food inflation to food inflation in pakistan symmetric? *Pakistan Economic and Social Review, 52(1)*, 35-43.
- Jalil, M., & Zea, E. T. (2011). Pass through of international food prices to domestic Inflation during and after the great recession; evidence from a set of latin American Economies. *Desarrollo Y Sociedad*, 135-179.
- Kemal, M. (n.d.). The impact of commodity price on inflation. *Turkiye Bankasi, Economic*.
- Klenow, P. J., & Malin, B. A. (2011). Microeconomic Evidence on Price-Setting. (1, Ed.) *Friedman and M Woodford (ed.), Handbook of Monetary Economics, 3*, 231-284.
- Kim, H & Lin, Y. (2018). Exchange Rate Pass-Through to Consumer Price and The Role of Energy Prices. MPRA paper No.89345
- Liu, Y. H., & Chen X. L. (2017). The imported price, inflation and exchange rate pass-through in China. *Cogent Economic & Finance, 5*:1279814.
- Menon, J. (1995). Exchange Rate Pass-Through. *Journal of Economic Surveys, Wiley Blackwell, 9(2)*, 197-231.

Menon, J. (1997). Exchange Rate Pass Through. *Center of Policy Studies and The IMPACT Project*.

Ozmen, U, M. & Topaloglu, M. (2017) Disaggregated Evidence for Exchange Rate and Import Price Pass-Through in the Light of Identification Issues, Aggregation Bias and Heterogeneity,. SBRT Working paper No 17/08 (State Bank of Republic of Turkey)

Rhee, c., & Lee, H. (2013). Commodity Price Movement and Monetary Policy in Asia. *BIS Papers, Bank for International Settlements, number 70*.

Sawallow, C. Y., Bertrand, G., Magud, E. N., and Valencia, F. (2016). International Monetary Fund (IMF) working paper No. wp/16/240.

Siddiqui, Rehana and Naeem Akhtar (1999) The Impact of Changes in Exchange Rate on Prices: A Case Study of Pakistan. *The Pakistan Development Review* 38:4, 1059–66.

Takhtamanova, Y. F. (2010): Understanding changes in exchange rate pass-through, *Journal of Macroeconomics*, 32(4), 1118–1130.

Usman, O., Musa, M, S. (2018). Revisiting Exchange Rate Pass-Through to Consumer Price Inflation in Nigeria: A Cointegrated Vector Autoregressive Approach. *Academic Journal of Economic Studies* 4:1, 60-67.