



## IMPACT OF REAL EFFECTIVE EXCHANGE RATE ON INFLATION IN PAKISTAN

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### ABSTRACT

*The determination of inflation is widely debated all over the world. The macroeconomic variables namely: money supply, income velocity of circulation, real effective exchange rate and real income of the economy are the main affect of inflation. The objective of the study was to investigate the impact of real effective exchange rate on inflation in Pakistan. The time series data of real GDP, nominal GDP, real effective exchange rate, prices and money supply for the period of 1973 to 2007 was used in the study. It was concluded that the real effective exchange rate has impact upon inflation in Pakistan. The correlation matrix of the explanatory variables was calculated to establish the relationship among real effective exchange rate and with other variables. A positive and strong relationship between the real effective exchange rate and inflation was found.*

**Key Words:** Inflation, Real effective exchange rate and correlation matrix

**JEL Classification:** E31, E52 and F31

### INTRODUCTION

Inflation is one of the most researched topics in economic literature because it has serious inferences for growth and income distribution. The determinants of inflation were also widely debated all over the world. The role of money in an economy was of a major concern particularly in determining the prices. Some economists were of the view that growth in money supply leads to inflation if money demand was stable and money supply was considered an important instrument for controlling inflation. The effects of Real Effective Exchange Rate (REER) on inflation were

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also investigated in some research studies and it was found that REER affected the rate of inflation in several countries.

Inflation is a persistent increase in the level of consumer prices or a constant decline in the purchasing power of money, caused by an increase in available currency and credit beyond the quantity of available goods and services. Inflation harmfully influences the overall development, the financial sector growth and the poor part of the population. There was clear agreement that even modest level of inflation damage real growth (Cecchetti, 2000). Inflation reduced the real income and encouraged insecurity. The price constancy was the major objective of monetary policy of central banks due to adverse shocks of inflation and the central banks were dedicated to the low inflation. Hence the central banks implemented inflation as the center of attention of monetary policy, targeting inflation explicitly or implicitly as and when essential (Qayyum, 2006).

Money-inflation relationship was not immediate under normal conditions and so one should not expect all outcomes of currently implemented monetary policy actions to happen in the same current period (Aikaeli, 2007). Monetary policy of a country was basically designed by keeping in view the factors which are responsible for increasing the inflation rate. Inflation in the long run is always and everywhere a monetary phenomenon (Friedman, 1963). The central bank and the fiscal authorities are accountable to attain price constancy if inflation is a monetary phenomenon (Khan and Schimmelpfenning, 2006).

High economic growth about six per cent was observed in Pakistan during 2004-06 with high prices. The headline inflation stayed more than eight per cent during this period. The average Consumer Price Index (CPI) was 9.3 per cent in 2004-2005 and about 8 per cent in 2005-06. Annual inflation stayed above 11 per cent during the 11 years of the past 32 years in Pakistan. Average real per capita income growth was 2.8 per cent during the periods of inflation less than 11 percent. This growth was observed 1.5 per cent during the periods of high inflation. Inflation might be terrible for Pakistan's economy in case it stayed above the threshold level of about six per cent. It might be dangerous when it crosses the double digit level. Inflation remained under five per cent during the first four years of the new millennium and then rapidly reached to 9.3 per cent in 2004-05 and established to eight per cent in 2005-06. The growth in wheat prices and exchange rate was low in some years and high in others. On the other hand, it looks like that inflationary pressure was formed at an alarming level by extreme money flows towards public and private sector, in company with the import price hike and wheat price grow in 2003-04 and 2004-05 (Khan *et al*, 2007).

There were great structural changes and uncertainty during 1970s and the role of inflation expectations was relatively apparent. A comparatively low average inflation (7.2 per cent) was observed during the decade of 1980s. The main factors at the back of this growth in consumer prices were private sector borrowing, exchange rate depreciation and adaptive expectations. The conventional liberalization policies accepted a drive in 1990s. Average inflation rate rose to 9.6 per

cent. Inflation was very low during 2001-04. Wheat support price was not moved up during 2001-03. CPI raised again in 2004-05 when inflation attained a level of 9.3 percent. It went down a little to eight per cent in 2005-06 (Ahmad *et al*, 2007).

The Real Effective Exchange Rate (REER) is the weighted average of a country's currency relative to an index or basket of other main currencies adjusted to analyze the consequences of inflation. The relative trade balances were given due importance in determining the weights for comparing the currency of one country with each other country within the index. An individual country's currency value relative to the other major currencies in the index was determined by using this exchange rate, as adjusted for the effects of inflation (Investopedia, 2007). The REER was an indicator of trade competitiveness and captured the behaviour of Pak-rupee against a basket of currencies (GOP 2006). Nominal exchange rate, tariffs, trade subsidies, domestic and world market prices were included in real effective exchange rate. The change in country's competitive position relative to its trading partners was reflected by REER (Ahmad, 2000). Bonato (2007) looked at the determinants of inflation in Iran in both short run and long run. The approach focused on the relationship between nominal variables and inflation instead of using the traditional estimates of the demand function for real money balances. A long-term relationship was observed between the price level and money, its rate of return, exchange rate and real output. Khan & Ali (2011) were the view that there were many determinants of the prices. They explained that the prices of real estate in Quetta city, Pakistan were based upon urbanization, refugees' influx, monetary, lack of investment alternatives and inflow of foreign remittances.

The objective of the study was to determine the impact of real effective exchange rate on inflation in Pakistan.

## DATA AND METHODOLOGY

Time series data were used in estimating the long run relationship of inflation and real effective exchange rate along with other macroeconomic variables in Pakistan. The included variables in the study were the growth rate of prices, output growth rate, the growth rate of real effective exchange rate, money supply growth rate and growth rate of the velocity of money in the economy. The data about these time series from the year 1973 through the year 2007 was taken from the Federal Bureau of Statistics, Islamabad and State Bank of Pakistan, Karachi. The velocity of money was calculated with the help of the identity of quantity theory as the ratio of nominal GDP and money supply. Augmented Dickey Fuller (ADF) unit root test was used to determine the order of integration of the variables used in the analysis. For the purpose of testing of order of integration of individual time series, the standard Augmented Dickey and Fuller (1981) method was used. The reported statistics in this study was, however, confined to the ADF (AD) approach including intercept, with trend and without trend. AD and ADF up to level three were calculated to know the real situation (Dickey and Pantula, 1987). Informal test like auto correlation function and partial

correlation function were also performed but not reported. The results of ADF at level were reported in the Table 1.

**Table-1.** Unit Root tests using Augmented Dickey-Fuller Method

Variables	Without trend	With trend
Gv	-5.23	-5.15
Gm	-3.16	-3.23
Gq	-2.96	-2.79
Gp	-4.80	-4.42
Greer	-3.97	-3.61
LnGm	-3.12	-3.12
LnGq	-3.02	-2.89
LnGp	-3.06	-2.89

- Critical value for the augmented Dickey-Fuller statistic with intercept and without trend was -2.96 (p = 0.05 per cent)
- Critical value for the augmented Dickey-Fuller statistic with intercept and trend was -3.56 (p = 0.05 per cent)

All the variables used in the model were found integrated of the same order i.e. I (0) on the basis of with and without trend. It means that all the time series used in the analysis were stationary. The variables were transformed into log form at the stage of model specification in order to smooth out the data. The ordinary least square (OLS) method was used to estimate the required coefficients. Following equation was specifies to know the effects of real effective exchange rate on inflation in Pakistan:

$$\text{LnG}_p = \alpha_0 + \alpha_1 \text{LnG}_m + \alpha_2 \text{LnG}_q + \alpha_3 \text{G}_v + \alpha_4 \text{LnG}_m(-1) + \alpha_5 \text{LnG}_p(-1) + \alpha_6 \text{LnG}_{\text{reer}} + u \quad (1)$$

Where:

LnGp = Natural log of price growth,

LnGm = Natural log of money supply growth,

LnGq = Natural log of real income growth,

Gv = Velocity growth

LnG<sub>m</sub>(-1) = Natural log of money supply growth with one year lag,

LnG<sub>p</sub>(-1) = Natural log of price growth with one year lag,

LnG<sub>reer</sub> = Natural log of growth rate of real effective exchange rate, and

U = error term

## RESULTS AND DISCUSSION

The long run relationship between the variables was determined with ordinary least square (OLS) method and reported in Table 2. The coefficient of lagged money growth was estimated 0.58 and was highly significant at 0.01 percent probability level.

**Table-2.** Regression Results relating Log of Inflation with Independent Variables including REER in Pakistan

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.083**	0.603	-1.769	0.084
LnGm	0.203	0.223	0.912	0.370
LnGq	-0.069	0.121	-0.565	0.577
Gv	0.033***	0.012	2.806	0.009
Greer	0.010	0.008	1.211	0.237
LnGm(-1)	0.583***	0.140	4.155	0.000
LnGp(-1)	0.552***	0.098	5.649	0.000
R <sup>2</sup>		0.79		
Adjusted R <sup>2</sup>		0.75		
Durbin-Watson		1.89		

\*\* Indicated that the coefficient was significantly different from zero at 0.05 probability level.

\*\*\* Indicated that the coefficient was significantly different from zero at 0.01 probability level.

Ln indicated that variables were in the logarithmic form.

It meant that a one percent increase in the growth rate of money supply in this year will increase price level by 42 per cent in the next year. It showed that monetary growth affected inflation with a lag of around one year. The growth rate of money supply of the same year was also positively related with the inflation rate in the country. The coefficient of money growth was estimated 0.20 and was insignificant. It meant that a one percent increase in the growth rate of money supply in this year have no normal effect on price level in the same year.

The growth rate of prices was found negatively related with the growth rate of real GDP in country. The estimated coefficient of this variable was -0.07 and was found insignificant. It showed that there was not any effect of growth rate of GDP on inflation rate. The inflation rate of current year was found positively related with the one year lagged inflation of the country. The estimated coefficient of lagged inflation rate was 0.55 and was found highly significant at 0.01 percent probability level. It meant that a one percent increase in inflation rate in a year will increase prices in the next year. The growth rate of prices was found positively related with the income velocity of circulation in Pakistan. The estimated coefficient was 0.03 and was highly significant at 0.009 probability level. It showed that a one unit increase in the income velocity of circulation will affect prices positively by 3 per cent.

The growth rate of real effective exchange rate was found positively related with the inflation rate in Pakistan. The estimated coefficient was 0.01 and was insignificant in case of model specification in logarithmic form. However, the estimated coefficient was 0.135 and was significant in case of model specification without logarithmic form. The result was provided in table 3. It was concluded that the real effective exchange rate has impacted upon inflation in Pakistan.

**Table-3.** Ordinary Least Square Results considering Growth Rates including REER as independent variable

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.354	3.030	-0.777	0.444
Gm	0.101	0.191	0.532	0.599
Gq	0.098	0.324	0.303	0.764
Gv	0.393	0.144	2.726	0.011
Greer	0.135	0.094	1.425	0.165
Gm(-1)	0.327	0.118	2.754	0.010
Gp(-1)	0.471	0.122	3.853	0.001
R <sup>2</sup>		0.73		
Adjusted R <sup>2</sup>		0.67		
Durbin-Watson		1.60		

The correlation matrix of the explanatory variables included in the specified model was also calculated to determine the correlation of real effective exchange rate with other variables. The Estimated Correlation Matrix of Variables was reported in Table 4.

**Table-4.** Estimated Correlation Matrix of Variables

	LnGm	LnGp	LnGq	Gv	Greer
LnGm	1.000	-.011	.228	-.713	-.117
LnGp	-.011	1.000	.0385	.416	.603*
LnGq	.228	.038	1.000	.0203	-.014
Gv	-.713	.416*	.0203	1.000	.468*
Greer	-.117	.603*	-.014	.468*	1.000
LnGm(-1)	.297	.405*	.236	-.106	.176
LnGp(-1)	.140	.667*	-.071	.089	.367

It was obvious from Table 4 that there was a very strong and positive correlation between the real effective exchange rate and rate of inflation and also between real effective exchange rate and velocity growth. It meant that the real effective exchange rate of a year had very profound effects on the inflation and velocity growth of the same year.

## CONCLUSION AND POLICY IMPLICATION

The impact of real effective exchange rate (REER) was tested in this research study using the data for the real GDP, nominal GDP, Real Effective Exchange Rate, Prices and Money supply. The time series data from 1973 to 2007 was used from Federal Bureau of Statistics, Islamabad and State bank of Pakistan, Karachi. For this purpose, velocity of money was calculated with help of real and

nominal GDP. The growth rates of all the variables were also estimated. The stationary property of the data series was determined with the help of ADF test. The required econometric model was specified in the logarithmic form. The relationship between inflation and real effective exchange rate in Pakistan was determined by the ordinary least square (OLS) method. The estimated coefficient between inflation and real effective exchange rate was 0.01 and was not significant. It was concluded that the inflation in Pakistan was not effected by the real effective exchange rate. The correlation matrix of the explanatory variables included in the specified model was also calculated to know the correlation of real effective exchange rate with other variables. A positive and strong correlation between the real effective exchange rate and rate of inflation and also between real effective exchange rate and velocity growth was found. It explained that the real effective exchange rate of a year had very profound effects on the inflation and velocity growth of the same year in Pakistan.

The important policy implication of the study was that inflation in Pakistan might be controlled through the tight monetary policy and with a control over the real effective exchange rate. The exchange rate is over valued and government must consider devaluation of the rupee. The State Bank also controls government borrowing from the banks. Otherwise, the central bank of Pakistan opt formal inflation targeting as a new approach to monetary policy to abstain from fixed and floating exchange rates dilemma. A bill advocating on formal inflation targeting in the USA has been proposed because the price stability is formally designated as the main objective of monetary policy, which clearly signals the monetary stance and the criteria for assessing central bank performance. Under this approach the transparency of monetary policy and flow of information from the central bank to the public and government are increased (Svensson, 1999 and Berg, 1999).

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