

# EXCHANGE RATE PASS – THROUGH TO DOMESTIC PRICES: EVIDENCE FROM PAKISTAN

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## ABSTRACT

*Exchange Rate Pass – Through is the phenomena that explains to what extent the movements in exchange rate affect macroeconomic variables of any economy. This paper analyses the movements of exchange rate that has affected on wholesale price index, consumer price index, large scale manufacturing, fuel and lightening and the growth of money supply. The data from June 2005 to June 2011 is analyzed by using the econometric framework. In this study, the econometric model, recursive VAR, suggested by McCarthy (2000), is applied in order to measure the movements of exchange rate pass – through to domestic prices by using the impulse response function and variance decomposition.*

*In this study, the results of the impulse response have shown that impact of exchange rate pass through is high on wholesale price index. While the results of the impulse response have shown that the impact of exchange rate pass through is much lower for Consumer Price Index. The result of the variance decomposition has shown that the variance decomposition is indicating that for the CPI variance decomposition is as much as the 5.48 percent. For the WPI the variance decomposition is as much as 10.15 percent and the other variations are explained by the other independent variables.*

## KEYWORDS

Exchange Rate Pass – Through, Domestic Prices, Consumer Price Index  
Wholesale Price Index

## 1. INTRODUCTION

### 1.1. Background

In this 21st century, every individual firm or any economy has to survive in dynamic environment by considering all the changes within the economy. Due to United States Dollar (USD) appreciation, the Pakistani Rupee (PKR) is depreciating and Pakistan is facing heavy economic losses at the same time. This is how; globalization trend in the whole world keeps on changing and having different implications like on macroeconomic factors like CPI (Consumer Price index), GDP (Gross Domestic Product), GNP (Gross National Product), WPI (Wholesale Price index), fuel prices, growth in MS (Money Supply) and others. Globalization is the continuous process of growth among states that is determined by the openness of trade, foreign

direct investments, capital and cash flows along with technological and structural changes. This view has been supported in the work of Torres (2001). The security issues and tourist attacks in Pakistan have negatively impacted the economy of Pakistan. Pakistan's economy is moving at slow pace because of its adverse moment of macroeconomic variables.

Arby et al. (2012) found the factors that any economy is directly or indirectly dependent upon the economic development. These factors are represented in the gross domestic product of the economy by giving collective effect. The factors in the way of economic development may include the regular misfortunes, political mismanagement, self – injecting business cycles, rate of capital formation and global macroeconomic inclinations. The growth in the

real GDP is a commonly used yardstick to measure the pace of economic activities. It is often desirable for macroeconomic policy purposes to assess whether exchange rate is just transient or permanent. In knowing the shocks of the increase or decrease of overall real GDP growth, it is important to know the level of ERPT in fact combines in itself four streams of economic motions: business cycles, long – run movements and short – run seasonal variations in economic activities and economic jolts.

Goldberg and Knetter (1997) defines that the ERPT can be explained as a change in export and import countries about one percent of change in the domestic prices. The PLR has too much depreciated in the year 2009 against USD that was a big task for the policy maker of monetary policy.

#### *1.1.1. Exchange Rate Pass Through and Its Impacts*

Rincon (2000) did the research on ERPT for the first time in economy like Colombia. This study gives some insight not only on the long term but also the short term impact of ERPT on the domestic prices. Historical studies on the ERPT shows the high volatility of nominal and real rate of exchange because of local pricing of economy. The results were the hypothesis of pass – through coefficient for US import prices of Japan.

McCarthy (2000) discussed in his study about the consumer prices index and the producer price index for the industrial countries by discussing the influence of rate of exchange on the prices of import.

Shah and Hyder (2004) explained the ERPT shocks on domestic rates by two channels, direct and indirect channels. Exchange rate shocks can be felt on the prices of goods domestically by the change of prices of import specially the finished goods and the inputs in incident of direct channel. The quantity of imports always causes the currency to appreciate or depreciate. Today organizations are keen to know the fluctuations of output that leads to input. The reason behind that is the pressure from central bank to maintain the aggregate demand and hence it will result in stability in the economy. In this paper, the impact

of exchange rate pass – through to domestic prices acts as the key indicator for a stable economy and proper monetary arrangement in every sector. Behind the reduced pass-through, the factors are related to important actions to curb inflation or flow of monetary arrangement that hold an impact on the increase/ decrease of exchange on domestic prices.

It is examined the monetary and inflation experiences of a sample of industrial countries since the early 1970s, and some empirical support for this hypothesis, although the data are inconclusive for the most direct test we implement. Several previous studies have identified a reduction in exchange rate pass-through across various countries. For example, Cunningham and

Taylor (2000) discussed the cases of Sweden and the United Kingdom in 1992-93 and Brazil in 1999. Goldfajn and Werlang (2000) examined episodes of large depreciations in seven emerging markets and five industrial countries in the 1990s. In all cases, Goldfajn and Werlang find that pass-through was less than would have been predicted by their empirical model using data for the 1980s and 1990s.

Both Taylor (2000) and the Bank of Canada have conjectured that changes in pass through behavior may be due to changes in the orientation of monetary policy. The low-inflation environment itself is changing price-setting behavior. When inflation is low, and the central bank's commitment to keeping it low is highly credible, firms are less inclined to quickly pass higher costs on to consumers in the form of higher prices. However, past studies show that the theoretical mechanism behind this linkage has not been rigorously derived. Here the study presents a simple theoretical model that incorporates the link between policy behavior and pass-through.

The model's hypothesis on data from eleven countries between 1971 and 2000 was taken.

The study considers five countries with a history of moderately high inflation rate that adopted explicit and relatively low inflation targets as objectives for monetary policy in the early 1990s.



## 1.2. Research Problem

The exchange rate surpass is a significant issue in the economy like Pakistan because of unpredictable monetary arrangements.

- a. The expensive dollar (USD) affecting Pakistan's economy.
- b. Increase in exchange rate is affecting the producer price index, consumer price index, inflation and other macroeconomic factors.

## 1.3. Objectives of the Study

The study would have following objectives based on issues described above as research problem.

The research on above pointed out areas will have following objectives:

- To analyze the impact of ERPT (Exchange Rate Pass - Through) on CPI (Consumer Price Index).
- To identify the power of ERPT (Exchange Rate Pass - Through) on WPI (Wholesale Price Index).
- To find out the impact of ERPT on LSM (Large Scale Manufacturing).
- To know the effect of ERPT on FLLGHT (Fuel and Lightening).
- To find out the impact of ERPT on growth in MS (Money Supply).

## 1.4. Scope of Research

The scope of the study is crucial for the officials transacting in exchange rate and its long term and short term influence on the domestic prices in the economy like Pakistan. Ministry of Finance and Statistics and Warehouse department of State Bank of Pakistan will be accessed to collect data in relevance to research questions. In this study, around 9 years (2005 – 2013) data has been collected to understand and analyze the investment and feasibility aspects on the economic development of Pakistan. This study will be undertaken in the city of Karachi and in order to know the facts and figures on this study, the relevant people will be contacted personally and via email. As this study is undertaken for academic purposes but this study is opening the new doors to explore. This study is being

undertaken for academic purposes but would also help to open new avenues for exploitation.

## 2. LITERATURE REVIEW OF THE STUDY

### 2.1 Introduction

According to literature survey on ERPT, the majority of researchers have given insights on impact of ERPT on macroeconomic wellness of the states. These studies are done focusing on the macroeconomic aggregates of demand and supply.

Kim (1991) initiated by applying VAR framework in this type of study. The majority of the studies undertaken under this umbrella applies Vector Auto Regressive framework in order to scrutinize the ERPT (Exchange Rate Pass – Through).

Menon (1995a) was considered as the most comprehensive study on exchange rate pass through in its time, on industrialized economies, he presents a central idea of 43 empirical studies. Most of his studies were done in the United States. Exchange rate pass-through is certainly incomplete according to majority of these studies. In this study, for different countries the level of exchange rate pass through varies because of the two factors that the economies based individually on the openness of the market and the size. Menon (1995a), in addition to that, the study illustrates that the ERPT (Exchange Rate Pass – Through) is stable over time for long run.

This study on ERPT (Exchange Rate Pass – Through) is done in the economy like Pakistan by considering the macroeconomic factors. While for different countries the results would be different, methodologies will be changed and variables selection could vary for different time periods. Specifically, the issue is of aggregate price that has huge effect on the result of the particular study. It is found in some studies that ERPT (Exchange Rate Pass – Through) is asymmetric, means during appreciation and depreciation in ERPT it is different. Menon (1995a) applied an OLS (Ordinary Least Square) approximation technique ignoring the stationary in data, but later it was revised. Kim (1998) in United States examined the ERPT by

applying multivariate co-integration test. The survey links the price change of producer price index (PPI) to difference in effective exchange rate, supply of money and income at aggregate level. Producer prices are specifically being contributed by the exchange rate.

## 2.2 Exchange Rate Pass Through and VAR

Ahmad and Ali (1999) took the data from 2nd quarter of 1982 to 4th quarter of 1996 and investigated the relationship of exchange rate (nominal) and price level of domestic concern along with other macroeconomic variables in the context of Pakistan. Different types of shocks were observed in this study in order to adjust the speed and pattern of variables. In this paper, for estimation of model, co-integration test is applied. As for the findings of the study suggested; that one percent rise in import prices leads to outcome of 0.15 percent raise in consumer price index (CPI). Keeping in view the exchange rate is appreciated or depreciated in the appropriate situation. Siddiqui & Akhtar (1999) from 1972 to 98 identified the shocks of transformation in real and monetary variables on the prices of domestic concern. This study examines the long – run relationship and causality factor between the exchange rates and price level of domestic concern. According to the findings of this study, no significant unidirectional or bidirectional impact and casual relationship was found between the transformation of domestic prices and exchange rates (ER). McCarthy (2000) explained ERPT on the cumulative degree for a number of industrialized nations present all – inclusive training of exchange rate pass – through. In the study by applying vector auto regression model, data of CPI (Consumer Price Index), import prices and PPI (Producer Price Index) from 1976 to 1998 was taken. The modest result was found in ERPT to consumer prices in different countries of the world. McCarthy reported that there is positive association of ERPT with the openness of the country, change in exchange rate and with the resolution while negative correlation with unpredictability of exchange rate.

Goldfajn and Werlang (2000) studied ERPT onto consumers' rates in 71 states by applying the panel estimation method on data from 1980

to 1998. The economies involved are developed and emerging. The study showed that with respect to time, consumer prices are increased due to pass – through and reach at peak following 12 months in emerging markets hence the gradation of pass through initiated to be more developed. A study given by (Rincon, 2000) is the study ever done in Colombia on ERPT. Johansen Co – Integration framework is used for estimation of pass – through effect. The monthly data from year 1980 to 1998 was taken and resulted in incomplete ERPT. The results of this study are based on elasticity's of the long run for the prices of import and export these are eighty four percent and the sixty one percent for change in the rate of exchange while the impact over CPI of ERPT in long run basis is 48%. The research study by (Feinberg, 2000) applies OLS regression technique on industry level data through out for Colombia, Korea and Morocco. According to this study, the results shown that the ERPT is indicated as incomplete in the study. The annual data of 25 industries over eight years was taken from 1980 – 87. The research shows an effect on the long run basis of the real effective rate of exchange on PPI to be fifty one percent. On the other hand, the price and exchange rates are used for comparing the results. Therefore, to draw certain conclusions of long term relationship, further two econometrics models are applied focusing on Vector Autoregressive models. Firstly, an unlimited VAR model in stroke with McCarthy (2000), secondly multivariate co – integration in stroke with Kim (1998).

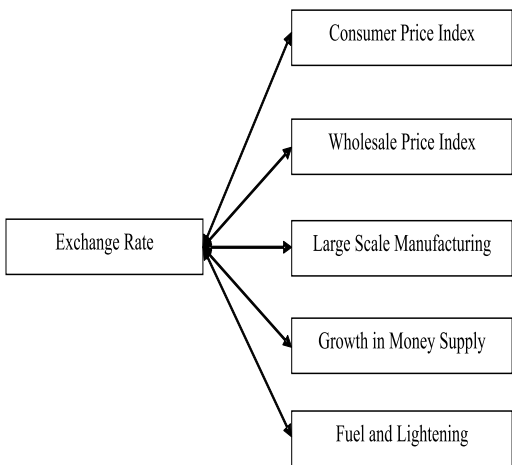
Rowland (2004) studied that the change in producer and consumer prices leads to change of eighty percent in exchange rate. According to this study, ERPT to prices by producer considered, there are certain limitations when the ERPT to CPI is considered. In proposing the monetary policy change to shocks in the rate of the exchange, the result from this study helps the policymakers. Devereux and Engel, (2002) completed a task considering the equilibrium idea of the exchange rate by assuming the study of Krugman (1989) that changes in the rate of exchange does not matter for the economy but the exchange rate volatility is extreme. It was found that to get enough exchange rate shocks, in this study, there is always combination of

domestic currency and variance of international price setting and goods supply and expectations that partialities the decision in global economic arcades.

Choudhri and Hakura (2002) explained the exchange rate pass – through with new open macroeconomic frameworks with different series of rates by investigating the performance of ERPT. The result shows that the best fit model includes variety of strings from different literatures and they are producer and local currencies pricing close prices, sticky wages and distribution cost.

**2.3 Theoretical Framework**

Shah and Hyder (2004) used a recursive VAR model by McCarthy (2000) in their study by taking the data on the monthly basis that is from January 1988 to September 2003. The key results from their study observed that, there is moderate effect on domestic prices due to exchange rate fluctuations and domestic price inflation is caused mainly in WPI and CPI baskets which are administered by the price control authorities of government.



Secondly, in WPI the ERPT is explained more than CPI because of higher market share in WPI basket relative to CPI basket. Thirdly, the ERPT effect is more expressed in first quarter according to the WPI and CPI coefficients. The fourth finding in July 2000 shows that ERPT to CPI due to free floating PKR to USD parity have further fragility hence the structural changes in the economy. Another finding was that in WPI

basket, the ERPT fluctuations are the most durable like within the pass – through of manufacturers and fuel and lightening. At the same time, pass – through offers a big autonomy for setting an independent monetary policy by considering increased targeting system.

McCarthy (2000) has discussed the ERPT on basis of exterior factors that include the impact of import prices and exchange rates to domestic inflation. In this study an economic framework of VAR model is used which incorporates a price chain. The research study by (Feinberg, 2000) applies OLS regression technique on industry level data through out for Colombia, Korea and Morroco. According to this study, the results showed that the ERPT is indicated as incomplete in the study. The results are described as pass through to consumer prices for countries found as modest, this consumer prices are considered to be the principal concern in monetary policy. In many counties, during the late 1990s there was a disinflationary effect excluding the United States. In this paper on the behavior of variables in the economy explained largely the movements of US exchange rate to import prices, as these fluctuations contribute low to the US disinflation. While the unexpected behavior occurs in oil prices and their behavior that resulted in finding the major contributors and they are oil prices, CPI and PPI. The significance of investigating exchange rate relationships is more oriented towards a system despite of a single equation according to this study. Price & Nasim (1999) did the study in Pakistan in order to identify the main determinants of inflation. Growth in money and foreign prices were declared as key indicators of CPI in under developed country like Pakistan. The price estimation equation expressed the weighted average price of all the goods and services within the economy. The result showed that in the first year one percent raise in prices of foreign goods lead to 0.14 percent rise in consumer price index while in the second year the raise was 0.35 and the impact for long run was determined as increase of 0.32 percent. Ca’ Zorzi et al. (2007) started to work by proceeding ERPT on domestic prices provides empirical evidence of movements on the rates. In this study, vector autoregressive model was applied on the data

from emerging markets of number of countries and control group of industrialized countries. Along the pricing chain, the result shows the decline in ERPT. After analysis, the outcome is that in emerging economies, the exchange rate pass – through is significantly higher than the economies that are highly developed.

Takhtamanova (2008) for measuring the ERPT gives theoretical framework, according to empirical results, ERPT as compared to 1980s, the results of ERPT was low in commencement of 1990s. The author measured the ERPT by applying the economic curve by Philip in capitalist economy and that is different from command economy this is due to the impact of real rate of exchange (RER) over the rate of inflation. Therefore, the movement in the inflation in an open economy is caused due to the rate of exchange of real shocks. According to the author's framework in this study, four factors (1) The degree of real ERPT to the individual firm's prices, (2) The rates of fraction of basket of consumer price index due to import (3) The portion or fraction of the firms in the economy by flexible prices, (4) The officials concerned with the monetary phenomenon and their credibility. Gopinath et al. (2007) focused on the disaggregated demand and supply and the authors have used the original data which results in the large gap among normal goods prices in dollar amount from 25% against non – dollar amount with 95%. The data in this study was on currency and prices for US imports with respect to conditional change on the prices over time. Pyne et al. (2011) during reforms, the ERPT to prices of import in some sectors in India were investigated. For this, imports of chemicals, transport, machinery, metal manufactures, equipments and food processing sectors were analyzed that contribute to about 70% of India's total. An economic framework was used for estimation purpose and it was on simultaneous equation imperfect model. After compilation of data from different sources, panel data regression techniques were used as the econometric method. As ERPT moves up and down in India, therefore its outcome is incomplete ERPT to the prices of import as well. The data in this study was on currency and prices for US imports with respect to conditional change on the prices over

time. Hasan, Pasha, Rasheed & Husain (1995) explored the key participants involved in the inflation of whole sale price index in Pakistan. In the equation of aggregated price level, raw material, food items and tradable were included. The indices of these components were further divided into sub indices in order to predict the exogenous variables in WPI inflation. The result showed that increase in outside prices, executed prices and wheat prices are main indicators for calculating the inflation in Pakistan.

### 3. RESEARCH METHODOLOGY

#### 3.1 Research Design

The research philosophy of this study is positivist, the research approach is deductive, the research choice is mono – method (quantitative), cross – sectional and based on time series data, In order to measure the constructs in the study, Vector Auto Regression model is employed and existing measures present in the literature are used.

#### 3.2 Procedure

Vector Auto Regression (VAR) Model is used by applying different test. Firstly, in order to have unit cycle free unit root test is applied. For unit root Augmented Dickey Fuller (ADF) test is applied in order to bring for random walk behavior among variables. Secondly, variance decomposition and impulse response function are operated to know the sensitivity and shocks in percentage. Thirdly, for underlying assumptions, residuals normality test is done.

#### 3.3 Research Data

Time series data from 2005 to 2013 is taken and the variables are exchange rate, consumer price index, and wholesale price index, large scale manufacturing the growth in money supply and fuel and lightening.

#### 3.4 Variables

In this study, the variables are Exchange Rate (ER), Consumer Price Index (CPI), Wholesale Price Index (WPI), Large Scale Manufacturing (LSM), Fuel and Lightening (FL) and Growth in Money Supply (MS).



### 3.5 Hypothesis of the Study

H1 = There is impact of exchange rate pass-through on consumer price index (CPI)

H2 = There is impact of exchange rate pass-through on wholesale price index (WPI)

H3 = There is impact of exchange rate pass-through on large scale manufacturing (LSM)

H4 = There is impact of exchange rate pass-through on fuel & lightening (FLLGHT)

H5 = There is impact of exchange rate pass-through on growth in money supply (MS)

## 4. DATA ANALYSIS AND FINDINGS

In this study, the monthly data from June 2005 to June 2011 and hence 73 observations are taken in total. The source of data of all variables is the Statistics and Warehouse Department of State Bank of Pakistan. In this study, VAR (Vector Autoregressive) model is used and optimal lag length of the VAR model is taken. The Augmented Dicky Fuller (ADF) unit root test is used to determine the stationary of the variables, as there should be random walk behavior. This test suggests that variables (CPI, WPI, FLLGHT and ER) in logarithm have I (1) order of integration and two variables (LSM and MS) have I (2) order of integration. The results of the ADF are presented in Table (1). The VAR is estimated in first and second difference with 6

lags as lag length based on likelihood ratio test.

### 4.1 Unit Root Test

Augmented Dickey-Fuller T-statistic is used to differentiate the time series data to make the data stationary. The two hypotheses are under taken for making the data stationary.

H0: All the variables have no unit root.

H $\alpha$ : All the variables have unit root.

The CPI series is not stationary at levels so there is unit root. In the first difference now the series is completely stationary and hence there is no unit root, as we can see at 1%,5% and 10% levels so the null hypothesis is rejected that there is unit root.

**Table: (1): Unit Root Test (Stationary Test)**

Factor	Log Differences	t-Statistics	Probability	Remarks	ADF Test
CPI	At levels	2.105103 -3.524233 -2.902358 -2.588587	0.9999	Series is stationary at first difference	I(1)
	First Difference	-4.043690 -3.527045 -2.903566 -2.589227	0.0021		
Exchange Rate	At levels	-0.671494 -3.527045 -2.903566 -2.589227	0.8466	Series is stationary at first difference	I(1)
	First Difference	-3.349684 -3.527045 -2.903566 -2.589227	0.0163		

Fuel & Lighting	At levels	0.425183 -3.524233 -2.902358 -2.588587	0.9828	Series is stationary at first difference	I(1)
	First Difference	-8.864997 -3.525618 -2.902953 -2.588902	0.0000		
Large Scale Manufacturing	At levels	-2.210248 -3.544063 -2.910860 -2.593090	0.2049	Series is stationary at second difference	I(2)
	First Difference	-2.177845 -3.544063 -2.910860 -2.593090	0.3639		
	Second Difference	-6.330267 -3.548208 -2.912631 -2.594027	0.0000		
Money Supply	At levels	-2.177845 -3.544063 -2.910860 -2.593090	0.9989	Series is stationary at second difference	I(2)

**Source:** Author's Estimation using Eviews 5.1.

The exchange rate series is stationary in the levels stage but still it is not showing the clear pattern. In the first difference now the series is completely stationary and hence there is no unit root, as it can be seen at 1%,5% and 10% levels so the null hypothesis is rejected that there is unit root. The FLLGHT (Fuel and Lighting) series is stationary in the levels stage but still it is not showing the clear pattern. In the first difference now the series is completely stationary and hence there is no unit root, as its shown at 1%,5% and 10% levels so the null hypothesis is rejected that there is unit root. The LSM (Large Scale Manufacturing) series at levels is not stationary so there is the presence of unit root. At first difference there is still unit root. At second difference the series is stationary and there is no more unit root and the presence of autocorrelation. Hence as at 1%, 5% and 10% levels the series in second difference is falling in

critical region, so the null hypotheses is rejected that there is unit root. The MS (Money Supply) series at levels is not stationary so there is the presence of unit root. At first difference there is still unit root. At second difference the series is stationary and there is no more unit root and the presence of autocorrelation. Hence as at 1%, 5% and 10% levels the series in second difference is falling in critical region, so the null hypotheses is rejected that there is unit root. The WPI (Wholesale Price Index) series is stationary in the levels stage but still it is not showing the clear pattern. In the first difference now the series is completely stationary and hence there is no unit root, as it can be seen at 1%,5% and 10% levels so the null hypothesis is rejected that there is unit root. The table (1) reveals that variables (CPI, ER, FLLGHT and WPI) have become stationary at first difference and variables (LSM and MS) have become stationary at second difference, on

the basis of this, the null hypothesis of non-stationary is rejected and it is safe to conclude that the variables are stationary. This implies that the above mentioned (CPI, ER, FLLGHT and WPI) variables are integrated of order one, i.e. 1(1) and (LSM and MS) variables are integrated of order two, i.e. 2(2).

#### 4.2 Wald Test

In table (2) Wald test of CPI is showing the significant results probability and the chi-square test for Exchange Rate to Consumer Price Index and Wholesale Price Index to Consumer Price Index. Michael et al. (2002) explicated that the changes in exchange rates have no significance

on the economy as the relative goods are not mainly affected by this. The shocks due to exchange rate changes are limited at the domestic prices by the home distributors and the pricing of the local currency. In the table (2) Wald test for Exchange rate is showing the significant results of probability and the chi-square test for consumer price index to exchange rate, Fuel & Lighting to Exchange Rate, Large Scale Manufacturing to Exchange Rate, and the money supply to exchange rate. According to Mario et al. (2005) the pass through affect on consumer goods products related to automotive industry and capital goods is not much persistent, because non-oil products have more effect.

**Table: (2) Wald Test Results**

Dependent variable: CPILOG				Dependent variable: ERLOG			
Excluded	Chi-sq	Df	Prob.	Excluded	Chi-sq	Df	Prob.
ERLOG	14.25973	6	0.0269	CPILOG	5.711978	6	0.4562
FLLGHTLOG	4.365076	6	0.6274	FLLGHTLOG	8.323890	6	0.2153
LSMLOG	4.081706	6	0.6656	LSMLOG	13.34625	6	0.0379
MSLOG	1.050314	6	0.9836	MSLOG	6.010764	6	0.4220
WPILOG	13.90983	6	0.0307	WPILOG	3.394207	6	0.7580
All	52.31082	30	0.0070	All	41.11449	30	0.0850
Dependent variable: FLLGHTLOG				Dependent variable: LSMLOG			
Excluded	Chi-sq	Df	Prob.	Excluded	Chi-sq	Df	Prob.
CPILOG	8.331857	6	0.2148	CPILOG	13.51199	6	0.0356
ERLOG	23.37665	6	0.0007	ERLOG	22.68516	6	0.0009
LSMLOG	6.467038	6	0.3730	FLLGHTLOG	15.56986	6	0.0163
MSLOG	12.17754	6	0.0581	MSLOG	10.63512	6	0.1003
WPILOG	19.84932	6	0.0029	WPILOG	15.96597	6	0.0139
All	64.58807	30	0.0002	All	104.9434	30	0.0000
Dependent variable: MSLOG				Dependent variable: WPILOG			
Excluded	Chi-sq	Df	Prob.	Excluded	Chi-sq	Df	Prob.
CPILOG	3.081699	6	0.7985	CPILOG	29.80099	6	0.0000
ERLOG	6.896444	6	0.3305	ERLOG	20.79040	6	0.0020
FLLGHTLOG	3.807196	6	0.7027	FLLGHTLOG	14.32820	6	0.0262
LSMLOG	3.754583	6	0.7098	LSMLOG	13.06274	6	0.0421
WPILOG	12.01594	6	0.0616	MSLOG	19.00344	6	0.0042
All	73.33015	30	0.0000	All	66.75734	30	0.0001

**Source:** Author's Estimation using Eviews 5.1

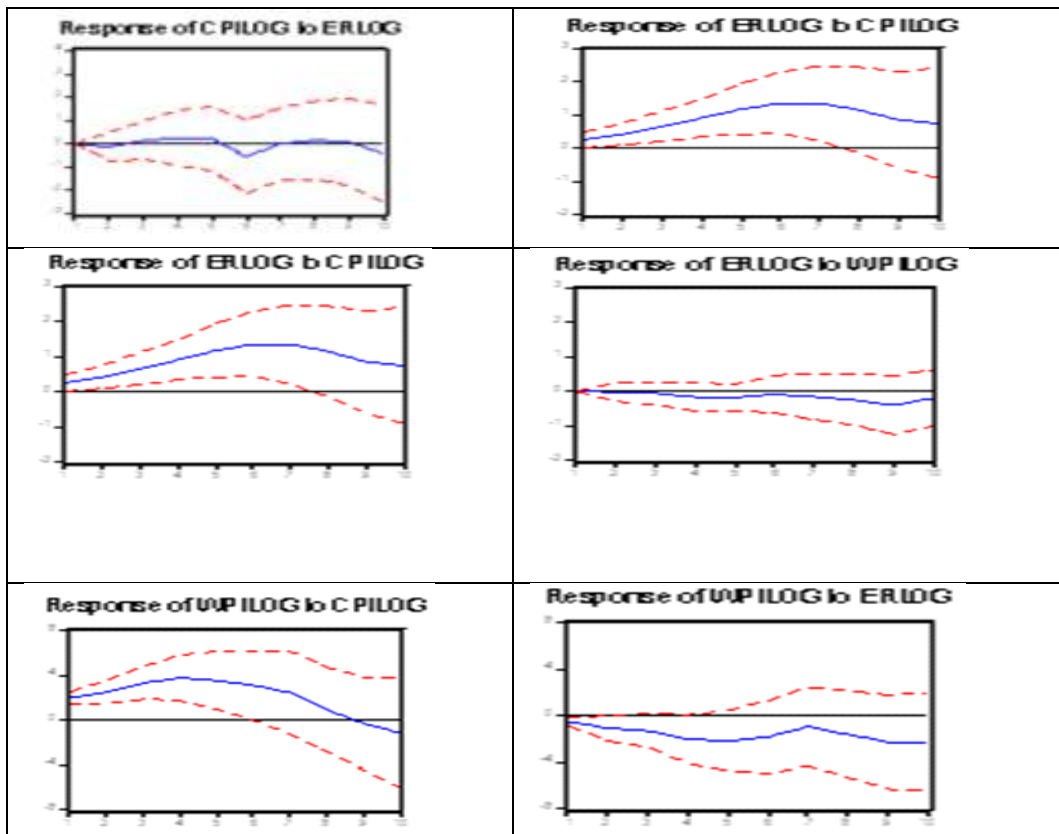
In the table (2) Wald test for fuel and lightening is showing the significant results of probability and the chi-square test for exchange rate to fuel and lightening, money supply to fuel and lightening, and the whole sale price index to Fuel & Lighting. The table (2) for Wald test for money supply is showing the insignificant results of probability and the chi-square test for all the independent variables to the dependent variable Money Supply. The table (2) for Wald test for whole sale price index is showing the significant result for probability test and the chi-square test for all independent variables to dependent Wholesale Price Index.

**4.3 Impulse Response Function**

Brooks (2008) elaborates the sensitivity of the dependent variables on other variables. For every variable, there is separate equation which

defines the unit shock. Impulse response function affects the VAR system over time period. The impulse response results are indicating that the exchange rate pass through on the WPI is much influential. The study proposed by the Hyder et al. (2005) explained that the exchange rate pass through fluctuation has medium effect on the prices domestically in any country, they have further concluded that it is more dominant on the whole sale price index as compared to the consumer price index, As seen in fig: (1). The exchange rate pass through is much lower in CPI or the domestic prices as compared to the WPI. McCarthy (2000) the results of the impulse response indicated that in most of the countries the exchange rate pass-through is not influential on the inflation domestically, however the prices of import have significant impact.

**Fig: (1) Impulse Response Function**



**Source:** Author’s Estimation using E-views 5.1.



The impulse response curve for the CPI is rising for initial five months than there is fall. The WPI is increasing till the period eight then there is downward shock thereafter. According to McCarthy (2000) the consumer price index has lower effect of exchange rate fluctuations as compared to producer price index. Brooks (2008) states that variance decompositions depict slightly different from other methods being used in Vector Autoregressive Model. In this phenomenon, the proportion of shock of dependent variable is measured by taking all variables. A shock of dependent variable is felt not only on an individual variable but the shock will also be transmitted to all the variables in the VAR system.

#### 4.4 Variance Decomposition

The table: (3) for the variance decomposition is indicating that for the CPI variance decomposition is as much as the 5.48 percent, for the WPI the variance decomposition is as much as 10.15 percent and the other variation are explained by the other independent variables. The variance decomposition for CPI is showing the highest variation at period ten about 1.52 percent. McCarthy (2000) explained the results of the variance decomposition that the prices of import and the exchange rates shocks to the fluctuations in consumer prices is not much influential and can be considered as modest.

**Table: (3) Variance Decomposition**

Period	S.E.	Variance Decomposition of CPILOG:					
		CPILOG	ERLOG	FLLGHTLOG	LSMLOG	MSLOG	WPILOG
1	1.705707	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.468466	96.03835	1.268882	0.084387	0.212356	0.047635	2.348392
3	3.039639	92.42769	1.785498	0.173116	0.286435	0.493417	4.833841
4	3.502571	90.90229	1.767541	0.489512	0.230513	0.899696	5.710448
5	3.901932	90.52537	1.493539	1.146326	0.189138	1.347279	5.298346
6	4.262352	89.95715	1.254732	2.126989	0.173929	1.977061	4.510140
7	4.595564	88.56721	1.159411	3.279637	0.161525	2.923632	3.908584
8	4.907424	86.32951	1.200291	4.445817	0.145581	4.239973	3.638827
9	5.202385	83.48889	1.333733	5.525087	0.129818	5.878589	3.643879
10	5.484537	80.33282	1.520005	6.479415	0.117046	7.724657	3.826056

Period	S.E.	Variance Decomposition of ERLOG:					
		CPILOG	ERLOG	FLLGHTLOG	LSMLOG	MSLOG	WPILOG
1	0.849755	8.327896	91.67210	0.000000	0.000000	0.000000	0.000000
2	1.337810	13.38233	81.41742	0.148265	1.766145	0.397368	2.888474
3	1.800554	16.76897	75.25671	0.792482	1.118075	0.247420	5.816344
4	2.217780	19.50445	70.12590	2.281315	0.744045	0.197118	7.147170
5	2.584940	22.25081	65.32627	4.565343	0.584227	0.201368	7.071984
6	2.903634	24.40925	61.19557	7.296062	0.548139	0.194077	6.356906
7	3.178228	25.86144	57.67256	10.23088	0.559886	0.162749	5.512478
8	3.415198	26.58621	54.71691	13.16373	0.575837	0.165651	4.791662
9	3.621740	26.71844	52.20572	15.95680	0.584463	0.262486	4.272098
10	3.804642	26.42420	50.02657	18.53188	0.585366	0.482741	3.949239

Period	S.E.	Variance Decomposition of WPILOG:					
		CPILOG	ERLOG	FLLGHTLOG	LSMLOG	MSLOG	WPILOG
1	2.765705	45.37232	0.002812	1.389336	0.415074	4.353941	48.46651
2	4.452009	40.48690	0.051903	1.523834	0.694952	5.422504	51.81991
3	5.693340	43.57218	1.692430	1.493079	1.136297	5.867079	46.23894
4	6.647066	47.67837	5.564731	1.269475	1.529531	5.782048	38.17585
5	7.420881	49.90111	11.08862	1.090462	1.602595	5.072046	31.24516
6	8.076411	49.69877	17.17818	0.995943	1.462249	4.285915	26.37894
7	8.655292	47.71938	22.92287	1.009224	1.278990	3.929788	23.13974
8	9.186275	44.87376	27.81463	1.150807	1.146147	4.136999	20.87766
9	9.682422	41.87279	31.71939	1.410615	1.074808	4.757304	19.16509
10	10.14667	39.11715	34.74057	1.745605	1.043185	5.567057	17.78644

Source: Author's Estimation using E-views 5.1.

For CPI to FLLGHT, the variation are at most at the period ten about 6.48 percent, for money supply it is 5.87 and WPI is 5.71 percent in period four. Variance decomposition is highest in period five for CPI at highest 49.90 percent. In CPI to MS the variation is at highest at period three of 5.87 percent; other variations are explained by the other dependent variables.

For ER to CPI, the variations are at most at the period nine about 26.71 percent. For ER to FLLGHT, it is 18.53 and MS is 0.4827 percent in period ten. Variance decomposition, for ER to WPI is 7.147 in period four and to LSM; it is 1.766 in period two.

The study proposed by the Hyder et al. (2005) explained that the exchange rate pass through fluctuation has medium effect on the prices domestically in any country; they have further concluded that on the whole sale price index is more dominant as compared to the consumer price index. Hyder et al. (2005) have further explained that the change of cost of production has influence on prices in domestic by the exchange rate pass through. McCarthy (2000) explained the change in exchange rates has no significance on the economy as the relative goods are not mainly affected by this. The shocks due to exchange rate changes are limited on the prices domestically by the home distributors and the pricing of the local currency. McCarthy (2000) the consumer price index has lower effect of exchange rate fluctuations as compared to producer price index.

#### 4.5. Findings

Following are the key findings that have been explored through the data analysis by applying the Vector Auto Regressive Model.

- The Augmented Dicky Fuller Test has been carried out to check the random walk behavior and the level of stationary. All the variables have become the unit cycle free at first difference. But the variables Money Supply (MS) and Large Scale Manufacturing (LSM) are unit cycle free at second difference.
- The results of the impulse response have shown that the impact of exchange rate pass through is much lower for Consumer Price

Index. It means Hypothesis 1 ( $H_0$  is rejected and  $H_a$  is accepted, which states that there is impact (high or low) of exchange rate pass – through on consumer price index).

- The results of the impulse response have shown that impact of exchange rate pass through is high on producer price index. It means Hypothesis 2 ( $H_0$  is rejected and  $H_a$  is accepted, which states that there is impact of exchange rate pass – through on producer price index).
- The results of the impulse response have shown that the impact of exchange rate pass through is much low for Large Scale Manufacturing. It means Hypothesis 3 ( $H_0$  is rejected and  $H_a$  is accepted, which states that there is impact (high or low) of exchange rate pass – through on Large Scale Manufacturing).
- The results of the impulse response have shown that the impact of exchange rate pass through is relatively high for Fuel and Lightening. It means Hypothesis 4 ( $H_0$  is rejected and  $H_a$  is accepted, which states that there is impact (high or low) of exchange rate pass – through on fuel and lightening).
- The results of the impulse response have shown that the impact of exchange rate pass through is relatively high for Money Supply. It means Hypothesis 5 ( $H_0$  is rejected and  $H_a$  is accepted, which states that there is impact (high or low) of exchange rate pass – through on Money Supply).
- The result of the variance decomposition has shown that the variance decomposition is indicating that for the CPI variance decomposition is as much as the 5.48 percent.
- For Wholesale Price Index, the variance decomposition is as much as 10.15 percent and the other variations are explained by the other independent variables.
- The result of the variance decomposition has shown that the variance decomposition is indicating that for the Exchange Rate variance decomposition is as much as the 3.804.

- For Fuel and Lightening, the variance decomposition is as much as 7.44 percent and the other variations are explained by the other independent variables.
- For Large Scale Manufacturing, the variance decomposition is as much as the 8.89 percent and the other variations are explained by the other independent variables.
- The result of the variance decomposition has shown that the variance decomposition is indicating that for the Money Supply variance decomposition is as much as the 171.8409.

## 5. CONCLUSIONS, RECOMMENDATIONS AND FUTURE RESEARCH DIRECTIONS

The study is based on Recursive Vector Autoregressive (VAR) model by Sims (1980) for the univariate autoregressive models used as suggested by McCarthy (2000) on monthly data from June 2005 to June 2011. The table (1) reveals that variables (CPI, ER, FLLGHT and PPI) have become stationary at first difference and variables (LSM and MS) have become stationary at second difference, on the basis of this, the null hypothesis of non-stationary is rejected and it is safe to conclude that the variables are stationary. This implies that the above mentioned (CPI, ER, FLLGHT and WPI) variables are integrated of order one, i.e. 1(1) and (LSM and MS) variables are integrated of order two, i.e. 1(2).

The findings of this paper suggest that Wald test for whole sale price index is showing the significant result for probability test and the chi-square test for all independent variables to dependent Wholesale Price Index. There is a moderate effect of Consumer Price Index of Exchange rate variations in terms of variance decomposition and there are other independent variables that have at most effect on exchange rate pass through. The whole sale price index has at most effect of exchange rate pass through. The impulse response results are indicating that the exchange rate pass through on the WPI is much

influential as seen in fig: (1). ERPT (Exchange Rate Pass – Through) is much lower in CPI or the domestic prices as compare to the WPI. The impulse response curve for the CPI is rising for initial five months than there is fall.

The WPI is increasing till the period eight then there is downward shock thereafter the table (3) for the variance decomposition is indicating that for the CPI variance decomposition is as much as the 5.48 percent, for the WPI the variance decomposition is as much as 10.15 percent and the other variation are explained by the other independent variables. The variance decomposition for CPI is showing the highest variation at period ten about 1.52 percent. For CPI to Fuel and Lightening the variation are at most at the period ten about 6.48 percent, for money supply it is 5.87 and WPI is 5.71 percent in period four. Variance decomposition is highest in period five for CPI is at most highest 49.90 percent. In WPI to exchange the variation is at highest at period three of 5.87 percent, other variations are explained by the other dependent variables.

### 5.1 Future Research Directions

In this study, more macroeconomic variables can be added like inflation, import prices, discount rate etc., because these variables have direct impact on the monetary policy implications. Other econometrics methodologies and techniques can be applied like to see the impact of long term association of ERPT (Exchange Rate Pass – Through) on these macroeconomic variables used under study. That is Johansen Integration test and the regression analysis by applying Ordinary Least Square (OLS) technique. The study can also apply different test like multicollinearity. Test for heteroscedasticity and multivariate analysis techniques like dummy variables, chow test, logit and probit models can also be applied. McCarthy (2000) the ERPT (Exchange Rate Pass – Through) to consumer prices aggregately that is the main point of concern in monetary policy is not significant on many of the countries, further it is indicated that the policies do have significant effect on consumer goods inflation.

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