



RESEARCH ARTICLE

NEXUS BETWEEN OIL PRICE, EXCHANGE RATE, FISCAL DEFICIT, FINANCIAL DEVELOPMENT AND INFLATION: EVIDENCE FROM INDIA

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ABSTRACT

The economies of developing countries are more affected by high inflation rate which disrupts the consumption, investment and production activities as well as their economic growth and in turn brings macroeconomic instability. This study investigates the impact of oil price, exchange rate, gross fiscal deficit and financial development on the inflation rate in India. The multiple regression model has been employed to analyse the secondary data (1980 to 2020) collected from the web portal of the World Bank and Reserve Bank of India. The result shows that the impact of the exchange rate fluctuation is considerably more realised in this study when compared to other independent factors. So import reduction and maintaining adequate foreign exchange reserves can bring stability in the exchange rate in India. Moreover, policymakers may concentrate on minimising crude oil consumption and promoting the use of renewable energy to protect the domestic economy from changes in oil price fluctuation in the global market. In addition to these suitable monetary as well as fiscal policies are inevitable to reduce the inflationary pressure in Indian economy.

KEYWORDS

Inflation, Exchange Rate, Oil Price, Fiscal Deficit and Financial Development

JEL Code: F31, E31, E51, E62

1. INTRODUCTION

Promoting economic growth and maintaining low inflation are two primary goals of macroeconomic policies. However price stability is a key factor which determines the growth rate in an economy. Inflation is one of the crucial economic indicators which reflects the status of an economy. During inflation, there is sustained and persistent increase in general price level which leads to fall in purchasing capacity of money. It reflects the economic performance of a country and brings changes in economic environment of a country (Barro, 2013; Lucas, 2001; Tobin, 1995; Tu and Lee, 2019). For the 62-year period from 1950-51 to 2012-13, the average annual inflation rate calculated by the Wholesale Price Index (WPI) was nearly 6.7 percent. Prior to the global economic meltdown, from 2000-01 to 2007-08, yearly inflation averaged nearly 5.2 percent. However, inflation increased close to 10 per cent in 2010-11 and 2011-12 before the falling trend in 2012-13 (Mohanty and John, 2015). Economic growth of a country is negatively influenced by inflation at all levels, and significant advantages may be realised by emphasizing appropriate monetary policy for reducing the volatility in price fluctuations (Singh and Kalirajan, 2003).

Inflation is recognised as both global as well as domestic issues which is associated with supply and demand side. Rate of inflation is affected by the frequent changes in drivers of inflation. Inflation disturbs key segments of economic activities like consumption, production, distribution and investment behaviour in developing economies. In this light, this paper attempts to identify the major factors which contributes inflation and in turn influences the growth of the economy particularly in case of India.

2. REVIEW OF LITERATURE

There is a significant relationship between fiscal deficits and inflation in high-inflation countries. In the emerging or developing countries, the fiscal aspect of inflation receives significant attention in macroeconomic theory. In most of the developing countries, the fiscal authorities finance their deficit budget by issuing currency through central bank and raising internal debt or external debt (internal or external borrowing). Therefore this method of deficit financing leads to inflation in the economy. On the other hand it is well acknowledged that developing economies have inefficient tax collection, political instability, and limited external financing options (Alesina and Drazen, 1991; Calvo and Vegh, 1999; Cukierman et al., 1992). However, inflation is primarily a fiscal issue which is influenced by people's expectations about fiscal policy and the budget deficit (Sims, 1994). There is a causal relationship between budget deficit and inflation in Nigeria (Oladipo and Akinbobola, 2011). The study concludes that the fiscal deficit and inflation have a positive association in developing countries. Moreover inflation is mainly caused by the fiscal deficit and as well, it is referenced in India, the fiscal deficit has always been rather high (Khundrakpam and Pattanaik, 2010). There is a proof that budget deficits and inflation go hand in hand in Italy, in Iran and in Turkish economy (Tekin-Koru and Erdal, 2003; Fratianni and Spinelli, 2001; Mehdi and Reza, 2011). So far as Bulgaria, Romania, and Russian economies are concerned, fiscal deficit is a weak driver of inflation (Komulainen and Pirttila, 2002).

Furthermore, oil prices, foreign exchange rates and domestic credit to the private sector may all drive inflation in emerging nations such as India. Crude oil is a necessary raw material for worldwide industry, and fluctuations in its price have a significant influence on economic activity

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(Baumeister and Hamilton, 2019; Kilian, 2009; Wen, Gong, and Cai, 2016). Moreover, oil price has asymmetric impact on inflation in both long and short run (Raheem et al, 2020 and Chou and Lin, 2013). But it is argued that fluctuations in oil prices have a minor influence on inflation (Chen, 2009). On the contrary, in the cases of the USA and Thailand, there is no correlation between the price of oil and core inflation (Evans and Fisher, 2011; Jiranyakul, 2015; Chen and Wen, 2011).

The exchange rate policy is also important for analyzing the mechanism of inflation in developing countries (Mishkin, 2008). Moreover exchange rate pass through inflation is stronger in case of unstable monetary policy (Mishkin, 2007; and Taylor, 2000). Because Asian economies have an unstable monetary policy, exchange rate swings put pressure on the price level (Ishaq and Mohsin, 2015). Fluctuations in the exchange rate frequently have an impact on import pricing. There are two phases of transmission of exchange rate to price rise. Changes in the exchange rate affect import prices in the first stage, but import prices are transferred to wholesale and consumer prices in the second stage (Yanamandra, 2015). Volatility in the behaviour of the exchange rate and its detrimental effect on decisions about investments might result in a decrease of output, which can lead to an increase in price levels (Dixit, 1989 and Krugman, 1986). Supporting these argument, (Bleaney and Francisco, 2007) discovered a significant positive correlation between the real exchange rate and inflation rate.

3. OBJECTIVE

- This study looks at the connection between India's inflation, oil price, exchange rate, gross fiscal deficit, and financial development.

4. SOURCES OF DATA AND METHODOLOGY

The secondary data from 1980 to 2020 have been collected from the web portal of World Bank and Reserve Bank of India (RBI). The variables studied are gross fiscal deficit (GFD) and exchange rate (ER), financial development (FD) and oil price (OP) as independent variables where as inflation rate are the dependent variable. We have taken domestic credit

to private sector (DCPS) and wholesale price index (WPI) as proxy measures of financial development (FD) and inflation rate respectively. In order to study the relationship among the variables, logarithmic form of each variable is taken for analysis. First all the variables are examined to check the stationary. Augmented Dickey Fuller (ADF) test and Phillip Perron (PP) unit root test are used to check the stationary properties of the variables (Dickey & Fuller, 1979; Phillips & Perron, 1988). Multiple linear regression equation is employed to examine the impact of independent variables on dependent variable.

Here Multiple Regression Model is written as;

$$Y = C + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon_t$$

Where Y = Wholesale Price Index (WPI)

X_1 = Domestic Credit to Private Sector (DCPS) as a measure of financial development

X_2 = Exchange Rate (ER)

X_3 = Gross Fiscal Deficit (GFD)

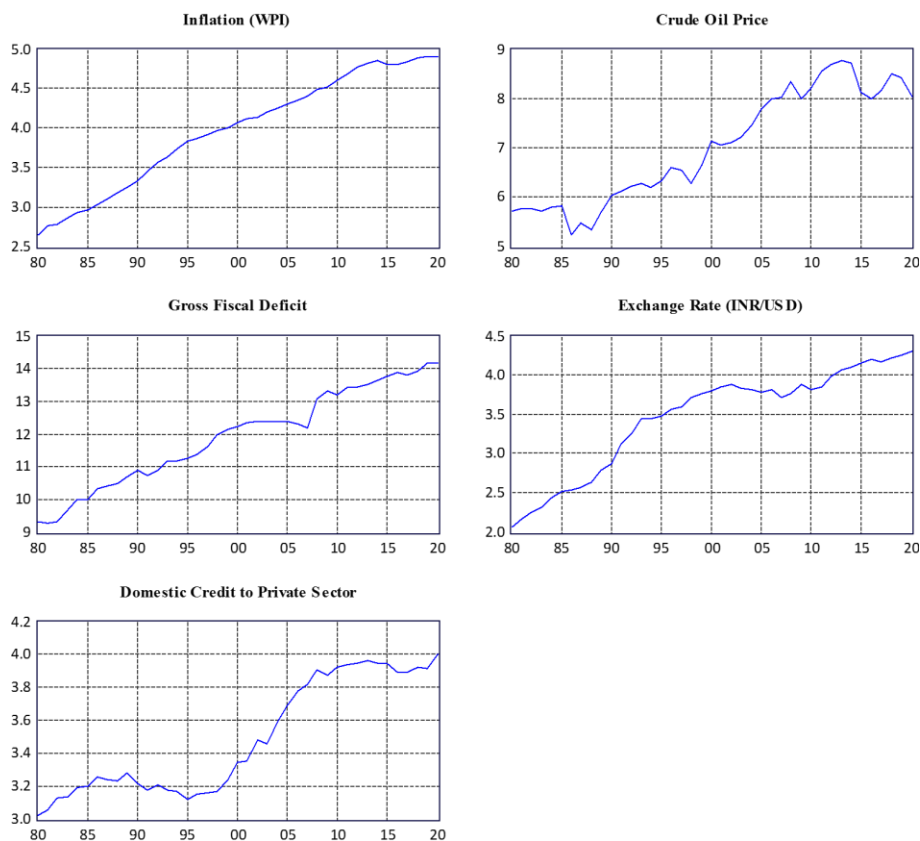
X_4 = Oil Price (OP)

C = Intercept

$\beta_1, \beta_2, \beta_3$ and β_4 are coefficients

5. RESULTS AND DISCUSSION

The inflation rate as per whole sale price index (WPI) has an increasing trend from 1980 to 2020 (figure 1). Furthermore, gross fiscal deficit, financial development (Domestic Credit to Private Sector), exchange rate, and oil price, have been expanding at the same time. It indicates that raising all of the independent variables could lead to an increase in inflation.



Source: Author's estimations

Figure 1: Trend of inflation, financial development, gross fiscal deficit, exchange rate and oil price (1980 to 2020) in India.

The degree of association between variables is summarised through the Pearson correlation coefficients in table 1. The results of Karl Pearson's correlation (table 1) describes that the dependent variable WPI (wholesale price index) has a significant positive association with independent variables oil price, gross fiscal deficit, exchange rate, and

domestic credit to private sector. It also demonstrates that wholesale price index has the lowest degree of relation with domestic credit to private sector as compared to other variables, while gross fiscal deficit has the strongest correlation.

Table 1: Correlation Matrix

Correlation Probability	<i>LnWPI</i>	<i>LnOP</i>	<i>LnGFD</i>	<i>LnER</i>	<i>LnFD</i>
<i>LnWPI</i>	1.00000 ---				
<i>LnOP</i>	0.946 (0.000)	1.00000 ---			
<i>LnGFD</i>	0.988 (0.000)	0.926 (0.000)	1.00000 ---		
<i>LnER</i>	0.970 (0.000)	0.864 (0.000)	0.953 (0.000)	1.00000 ---	
<i>LnFD</i>	0.889 (0.000)	0.940 (0.000)	0.898 (0.000)	0.765 (0.000)	1.00000 ---

Source: Author's estimations.

The unit root results (table 2) represents that the variables under this study are stationary with first difference I (1), and at level I(0) which describes that variables are stationary at mixed order. We have used

multiple regression analysis technique of the Ordinary Least Square (OLS) technique (Gujarati and Porter, 2012) to examine the relationship among dependent and independent variables.

Table 2: Unit Root Test Result

Test	ADF		PP	
	Level- I (0)	1 st Diff.- I (1)	Level- I (0)	1 st Diff.- I (1)
<i>WPI</i>	0.399 (0.980)	-3.491** (0.013)	-1.102 (0.996)	-3.439** 0.015
<i>GFD</i>	-3.024** (0.041)	---	-2.520 (0.118)	-5.505* (0.000)
<i>ER</i>	0.317 (0.976)	-5.261* (0.000)	0.172 (0.967)	-5.295* (0.000)
<i>FD</i>	-0.127 (0.939)	-1.747*** (0.076)	-0.074 (0.945)	-5.463* (0.000)
<i>OP</i>	-1.467 (0.539)	-5.332* (0.000)	-1.526 (0.510)	-5.216* (0.000)

Note: *, ** and *** represent the significance at 1%, 5% and 10%, respectively.

Source: Author's estimations

Table 3: Multiple Regression Analysis

Dependent Variable: WPI Method: Least Square			
Variables	Coefficient	t-Statistics	Prob.
<i>C</i>	-1.001	-9.065	0.000
<i>FD</i>	0.252	2.366	0.024**
<i>ER</i>	0.503	8.074	0.000*
<i>GFD</i>	0.126	3.392	0.002**
<i>OP</i>	0.122	4.371	0.000**
<i>R-squared</i>	0.997		
<i>Adjusted R- squared</i>	0.996		
<i>F-statistics</i>	34.518		
<i>Prob(F-statistics)</i>	0.000		
<i>Durbin-Wals on stat</i>	1.128		

Note: *, ** and *** represent the significance at 1%, 5% and 10%, respectively.

Source: Author's estimations

The equation of model is stated that

$$ER = -1.001 + 0.252FD + 0.503ER + 0.126GFD + 0.122OP + \epsilon_t$$

Constant value = -1.001 depicts that if all variables are ceteris paribus, then the value of exchange rate in India is -1.001. Regression coefficient $\beta_1 = 0.252$ refers to an increase of domestic credit to private sector by 1 percent leads to rise of inflation by 0.252 percent. The value of the elasticity of inflation to financial development is $E = 0.252 < 1$ indicates the increase in inflation rate is inelastic to financial development. Regression

coefficient $\beta_2 = 0.503$, describes that 1 percent change in exchange rate promotes inflation rate by 0.503 percent. The elasticity value of exchange rate is $E = 0.503 < 1$, also indicates exchange rate elasticity of inflation is inelastic. Regression coefficient $\beta_3 = 0.126$ describes that gross fiscal deficit increases by 1 percent, raises rate of inflation by 0.126 percent. The fiscal deficit elasticity of inflation is $E = 0.126 < 1$, indicating that the increase in fiscal deficit is inelastic. Moreover Regression coefficient $\beta_4 = 0.122$ refers to an increase in oil price by 1 percent can change the inflation rate in India by 0.122 percent. The oil price elasticity of inflation is also $0.122 < 1$. In the above estimation, the value of *Durbin-Wals on stat* is 1.128 which shows the existence of serial correlation problem.

Based on Table 3 it can be stated that F Prob. value = 0.00000 = 0.05 which means simultaneously significant effect. This shows that financial development (domestic credit to private sector), Rupee/USD exchange rate, gross fiscal deficit and oil price have a significant effect on the inflation rate (wholesale price index) in India. In-case of domestic credit to private sector, P-value = 0.024 < 0.05, so it can be inferred that it has a significant and positive effect rate of inflation. The exchange rate has a significant and positive effect on inflation rate as P-value = 0.0000 < 0.05. A partial test of gross fiscal deficit, P-value = 0.002 < 0.05, so it can be concluded that there is also significant and positive effect on rate of inflation in India. For Oil price, P-value = 0.000 < 0.05, which describes there is a significant and positive effect on price rise or inflation rate. The value of Adjusted R-squared = 0.996, it means that all the concerned independent variables have a very strong effect of 99.6 percent on the movement of inflation rate in India.

Stability Test

It is observed that the plots of cumulative sum of square (CUSUMSQ) test lies within the critical bands of five percent level of confidence interval. So there is lack of instability in the coefficient as in estimated multiple regression model. From figure 2, it is examined that coefficients over the period of study examined in the model are reliable and stable.

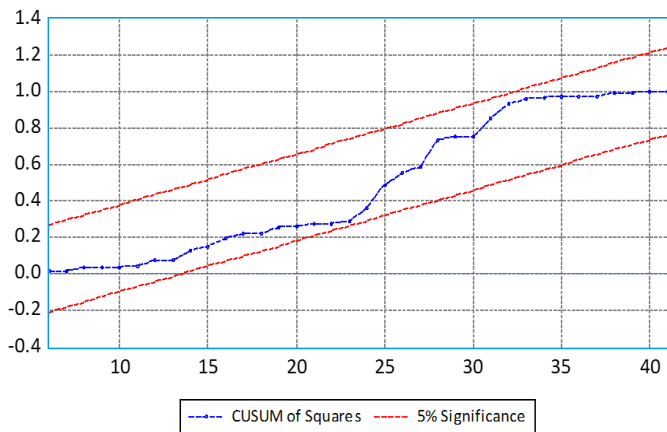


Figure 2: CUSUM of squares

Diagnostic Test Result

From the residual diagnostic test result (table 4) we found that multiple regression model is a fit model for the data considered in this study. There is no heteroskedasticity, the residuals are normally distributed and also stationary. So it satisfies most of the assumption of OLS and provides adequate description of the data therefore it can be accepted as a suitable regression model for the data. On the other there is existence of serial correlation problem in the estimated equation at five percent level of confidence.

Table 4: Diagnostic Test Result		
Diagnostic test		Prob.
Breusch- Godfrey Serial correlation LM Test	Obs* R-squared	0.013
Heteroscedasticity Test: Breusch-Pagan- Godfrey test	Obs* R-squared	0.108
Test of Normality	Jarque-Bera statistics	0.892
Q statistics	All Prob. Values	More than 0.01

Source: Authors Own Compilation

6. CONCLUSION

The paper tries to examine the factors that may have contributed to inflation in India during last four decades from 1980 to 2020 using a multiple regression analysis by analysing the important determinants of inflation such as oil prices, gross fiscal deficit, exchange rate and financial development in India. The paper documents that inflation in India is complex in nature and it is influenced by the factors which change frequently. The exchange rate is one of the key determinants which governs inflation during the study period. With rise in exchange rate or depreciation in the value of domestic currency rupee the import becomes costlier for India and it contributes to price rise. It can be inferred that there is exchange rate pass-through into Indian import prices indicating the effect of rising prices. Crude oil is an important raw material for most of production activities, and its price changes have an important impact on cost of production. Near about 80 percent of crude oil requirement is fulfilled through import in India. So, rising oil prices leads to increase the production costs as well as the prices of related goods and in turn causes inflation. On the other hand, increase in oil price may cause a recalculation of nominal wages and causes inflation. There is positive impact of financial development (domestic credit to private sector) on inflation in India within a sample period of 1980-2020. The coefficients for inflation are more when financial development is larger for the lower income countries like India. However fiscal deficit remained high since many decades in India which plays a major role in generating inflationary pressure in the country.

The outcome demonstrates that, in contrast to other independent factors, the impact of exchange rate volatility is significantly more realised in this study. Therefore, reducing imports and keeping sufficient foreign exchange reserves can stabilise India's exchange rate. To further safeguard the domestic economy against changes in oil price fluctuation in the international market, policymakers may focus on reducing crude oil consumption and encouraging the use of renewable energy. In addition to this, an effective fiscal and monetary policy are required to lower the inflationary pressure on the Indian economy.

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