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Inflation in Pakistan: Money or Oil Prices

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ABSTRACT

The study attempted to investigate the determinants of inflation in case of Pakistan and to check the validity of monetarist stance that inflation is always and everywhere a monetary phenomenon by investigating the impact of oil prices, M2 and GDP on prices. The descriptive analysis shows there is strong correlation between money supply and prices and also between GDP and prices while the correlation between oil prices and CPI is (0.60) less as compare to other variables. The important finding of the paper is that oil prices have short run impact on inflation whereas money supply is the long run determinant of inflation in case of Pakistan.

1. INTRODUCTION

Inflation, after the recession, is amongst the worst enemy for the policymakers. It affects exchange rate, balance of payments, asset prices etc. Moreover it creates money illusion, and distorts price mechanism. Volatile or unanticipated inflation creates problems for the investors due to change in the returns, wage determination and interest rate.

Due to harshness of its nature, inflation is always present in the policy debate, especially finding determinants of inflation. Inflation could be a demand side phenomenon as well as supply side phenomenon and few researchers called it a structuralist issue. Demand side phenomenon implies inflation is a monetary phenomenon, while supply side phenomenon implies inflation occurs when cost of production increases, i.e., due to change in aggregate supply. On the other hand structuralist view implies that due to presence of various bottlenecks aggregate demand—aggregate supply is inapplicable. These bottlenecks include inelastic supply of agricultural products, Government budget constraints, and shortage of foreign exchange to meet import demand [for more details see Bilquees (1988)].

It is, nevertheless, almost unanimously decided by different studies that money supply, sole, is the most significant determinant of inflation in Pakistan. For instance Qayyum (2006) concluded that money supply contributes 90 percent to the explanatory power which means that the monetary factor is responsible of inflation in case of Pakistan.

It is indeed a question of concern that how much time is required money supply to affect inflation. Kemal (2006) shows that money supply impacts inflation after a lag of 9 month in case of Pakistan. This implies that impact of any shock on inflation in the course of one month or one quarter may not be very visible which is the main reason for the general belief that it’s not money and some other factor which causes inflation in the economy.

Few others indicators such as structural issues, fiscal deficit, wheat support prices and oil prices are in the limelight for explaining inflation. Khan and Schimmelpfennig (2006) finds money supply contributes in the long-run variation while wheat support prices contribute to short run variation in prices. On the other hand, Bilquees (1988) finds structural issues are as important as money supply in explaining inflation.

Oil is the main commodity in the consumer basket as well as core part of the production. Thus increase in oil prices indirectly affect inflation as well through increase in the cost of production. Therefore, cost of production and cost of services change according to change in oil prices. Though increase in oil prices have quick impact while prices do not go down vice versa. This paper discusses that contribution of increase in oil prices and role of money supply in explaining the inflation.

From the above discussion, it is justifiable to say that money in the long run and others are important indicators in the short run to explain inflation. Contrary to demand side, impact of international oil prices through cost of production is considered to be supply side determinants of inflation. It is expected that oil price increase contributes to domestic inflation in the short run but in the long run adjustment in money supply will mitigate the impact of increase in oil prices. Therefore, objective of the paper is to check that whether impact of oil on inflation is temporary and in the long run money is the core determinants of inflation.

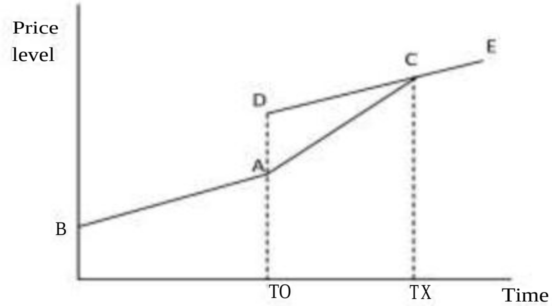
The study is divided into 6 chapters. After the introduction Section 2 provides the background of study—the literature review and the types and history of inflation throughout the world. Section 3 consists of data and its descriptive analysis used in the study and models for inflation opted in various studies. Section 4 provides the econometric approaches in our study while Section 5 interprets the results of econometric estimation. Section 6 draws conclusions of our study.

2. INFLATION: WHAT? WHY? HOW?

Much of the work in economics forecasting based on leading indicators usually developing indicators such as inflation [Clements and Hendry (1998)].The unremitting increase in prices of food and non-food items is called inflation. It is not the one or two time increase in price level or the relative price change but the continuous rise is actually inflation. The one time increase in prices and the random shock does not change the rate of prices and hence not considered as inflation. This fallacy can be seen further by considering the following case of economy which suffered from shock.

The diagram shows the trend from A to B of the prices over time by the slope of the line. At time to the economy surpasses through the shock (any supply shock) and due to this shock the prices rose from B to C changing it trend as the economy does not adjust instantaneously but after sometime it adjust itself moving to the line D to E which is parallel to line AB means the prices came back to the original trend. As the prices rose due to shock but adjusted after sometime not changing the rate of prices this change is not regarded as inflation, it is just a one-time price change [Batten (1981)].

Fig. 1. Effect of External Shock on Prices



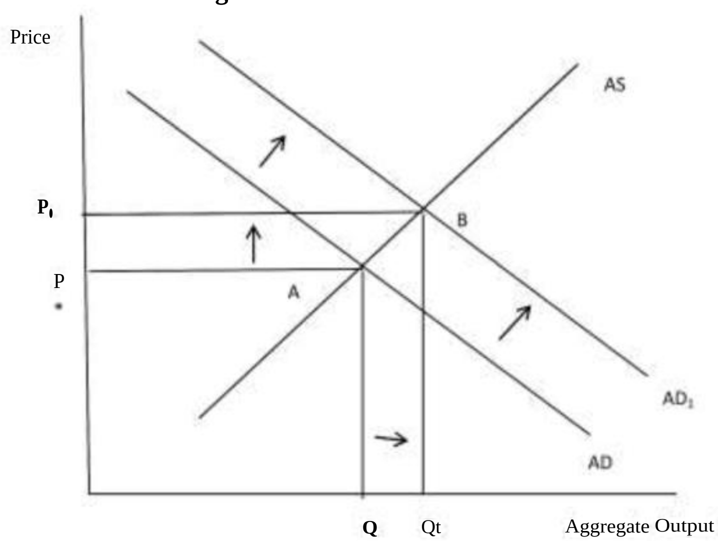
2.1. Causes of Inflation

Inflation has different costs depending on the fact that whether it is anticipated or unanticipated. The former concerns with the fluctuating prices that the market cannot controls, menu cost and relative prices changes while the latter changes the interest rate as interest rate is equal to the real interest rate and the expected inflation. There are two ultimate causes of inflation; **the demand pull inflation** and the **cost push inflation**.

Demand Pull Inflation

Demand pull inflation is when the economy's aggregate demand increases or the economy's growth becomes too fast exceeding the long run rate of growth. This is due to increase any of the factors C+I+G+NX.

Fig. 2. Demand Pull Inflation

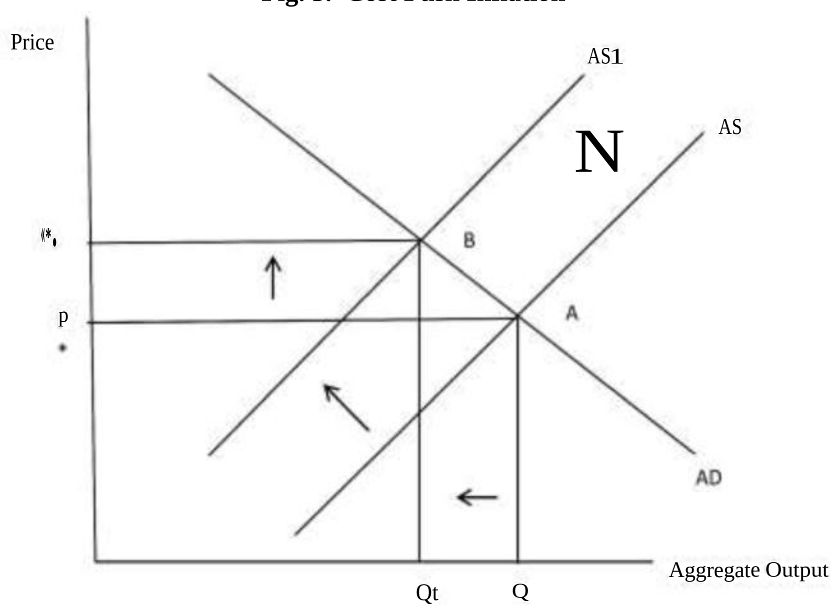


The long run rate of growth is determine by productivity and is the average sustainable rate of growth. Increase in aggregate demand makes the firm response in pushing the prices upward. U.K experienced the demand pull inflation in 1980s due to increase in house prices. The government cut the tax rate thus increasing the consumer spending and increasing demand. The firms could not meet the rising demands of consumer and responded in high prices. The economy of UK was growing 5 percent a year and this inflation rate deflated in 90's when the economy went into recession. In the working paper of IMF, the study shows that money in circulation- the demand pull impact is responsible for the inflation in the long run whereas as the cost push inflation by the spill over effect of world food prices is for the short run only [Peña and Monfort (2008)]. During the post 1970's world inflation crises, when Pakistan was also suffering from international and domestic economic crises, study showed that in addition to monetary factors demand pull factors are also responsible for the hike in inflation in Pakistan [Ahmad, Ahmed, and Summer (1996)].

Cost Push Inflation

Cost push inflation occurs when any of the factors leading to increase in cost causing the aggregate supply to increase. This is due to several reasons i.e., due to bargaining of labour unions for high wages, the cost of firm's production increases which results in high prices leading to cost push inflation.

Fig. 3. Cost Push Inflation



Rising wages also allow the aggregate demand to rise as the high disposable income leads to the high spending of consumers. Another reason of cost push inflation is when the raw material used in production becomes expensive and when the import prices of products increases due to devaluation of imported goods means the local currency is needed more for purchase of the same amount of imported goods. Increase in government taxes causes the goods become expensive. Printing of money causes inflation to rise because the available money determines the purchasing power of consumers. This printing of money crowds out the private sector from the banking system, which results in growth reduction and high inflation.

Blaming the businesses and labour is the central belief of cost push argument. The businesses raise prices in order to get high profits stemming their monopoly power. They think that high cost of production is the stimulus of high prices. This argument is a fallacy. Some periods during business have high sales than others. In time when sales are high, they lower the prices rather than high capturing the high demand. In order to beat the high demand, the firms offer high prices to supplier thus leading to high prices in the whole industry. In this regard businessmen have to announce the high prices to their customer. Labour also stems their monopoly power by demanding the high wages. The firms accepting their demand increase the wages and in order to offset this increase, they increase their prices. Once this occurs, labour feels their real purchasing power has been lost and once again they demand for high wages leading to phenomenon called wage spiral. Increasing prices makes all the economy's producers to increase their prices in an effort to increase their real power and resultantly the public feels that everyone is responsible for inflation. Economist regards the cost push factor- the ultimate reason of inflation really a myth [Batten (1981)]. The reason is that the monopolist faces the downward demand curve hence in order to raise the price; the monopolist must have to lower down its production and hence less profits leaving no incentive to produce further. Encountering this price increase, the individuals want to hold more money balances but if money supply remains constant the individuals offset this increase by lessoning the demand of goods until the prices come back to its original position. The point which is left by the supporters of this argument is that money supply remained same throughout the phenomenon. So this argument does not imply inflation is the necessarily the cost push phenomenon.

Structuralist View of Inflation

Streeten (1962); Baumol (1967); Olivera (1964) and Maynard and Rijckeghem (1976) supported a "structural" approach of inflation. Structuralise school of thought believes the that in addition to money supply and budget deficit supply side bottleneck are also responsible for inflation. They believe that inflation cannot be curtailed only by monetary and fiscal reforms as the supply side bottleneck, import and export bottlenecks also have an important role in reducing the inflation. Several studies in case of Pakistan incorporated structural variables in addition to monetary variables such as [Ahmad, Ahmed, and Summer (1996); Naqvi and Khan (1989)]. These studies show that demand pull inflation, import prices and growth of money supply shows a significant impact on the hike of inflation of Pakistan during 1970's and additional services sector was responsible for the inflationary hike in 1980's but import prices did not have any role any this period.

Inflation is a regressive tax phenomenon which adversely affects the poor. The poor people hold cash in their pocket whereas the rich holds assets in their portfolio. As inflation erodes the cash value that is why the poor group is more exposed to it. Furthermore the high and persistent inflation leads to the deterioration of economic growth and development of financial sector. Optimal resource allocation is inhibited as the role of relative price change is deteriorated by the high inflation. A number of empirical studies show that there is non-linear relationship between inflation and growth. Inflation has either no impact or a positive impact on growth at low levels but has adverse impact on growth as it exceeds the threshold level. In a panel of 140 countries, estimated threshold level of inflation is 1–3 percent for industrial countries and 7–11 percent in developing countries [Khan and Senhadji (2001)]. In case of Pakistan, threshold level is estimated 4-6 percent [Hussain (2005)] whereas the optimum rate of inflation is 3 percent and to avoid the detrimental impact on growth, the policy makers should try to keep inflation below 6 percent [Khan (2005)]. In Pakistan, short run growth is affected by beyond the 9 percent rate of inflation [Mubarik (2005)] whereas another study shows that 4-6 percent is the threshold level in Pakistan and beyond which it is harmful for growth [Hussain (2005)].

Inflation reduces the real return in the long-run lessoning the frictions between investors and savers as financial institutions are intermediaries. This intermediation becomes costly as a result of inflation. Thus inflation inhibits the financial development. Beyond the threshold level of inflation, financial development also harmed as that of growth. This economy's enemy also reduces the competitiveness of country in the world as the appreciation of the currency resulting the increase in exchange rate which has an adverse impact on country's export.

When the world was suffering from economic crises in 1970s, Pakistan also suffered from high inflation of 15 percent annually due to the oil prices hike and the nationalisation in the country. The inflation became more severe as the result of catastrophic flood ruined the agriculture sector. The inflation of Pakistan slows down in 1980s relative to the rest of the world as the commodity producing sector flourished, public expenditures lowered and nationalisation reversed. The country's money stock was less than the rest of the world. The uncertainty increased as the inflation again rose up in the 1990s due to gulf war. The main factors behind this increase were the increase in procurement prices of wheat [Hassan, *et al*. (1995)], exchange rate depreciation, government and private sector borrowing, and adaptive expectations. In 2000s the inflation remained low level and shoot up again in 2006-08 due to increase in private sector borrowing and the hike in import prices. The reasons of inflation in case of Pakistan became inconclusive that weather the monetarist, budget deficit or the structural factors are responsible. Several studies showed that budget deficit has no role in inducing the inflation and government can finance its development by borrowing [Khan and Gill (2010)]. Some studies showed that supply side factors are responsible for the inflation in Pakistan [Bilquees (1988)].

In September 1994, Pakistan's president ask Pakistan institute of development economics to sort out the reasons and remedies of inflation in Pakistan [Naqvi (1994)]. The institute responded that inflation expectations, food prices and raw material prices and the growth in money supply that affect the inflation with some lag (ibid).

2.2. Models of Inflation

Most of the studies, while examining the determinants of inflation have opted the **'Quantity theory of money'** given by the classical American economist Irving Fisher. It explains that how money affects the economy in the long run. It explains that quantity of money is the only determinant of the price level in the economy assuming that velocity and output remaining same in the long run but changes in the short run. In the short run, unexpected increase in money supply has beneficial effect on the growth of output. In the long run the individuals offset this increase by increasing the factor prices. Based on fisher equation, this theory states as

$$\text{Money} * \text{velocity} = \text{Price} * \text{income}$$
$$MV=PY$$

Where velocity is the income velocity of money which tells us how many times a dollar is spent to buy total number of goods and services. Taking velocity constant Fisher argues that velocity depend upon the institutions and technological factors of the economy which slowly changes, so velocity does not change in the short run. Moreover, taking output as constant in the short run implies to the argument that classical economist believes that wages and prices are completely flexible and the output of the economy always remain at its full employment level. Keynes believed that the aggregate demand and purchasing power of individuals determines the amount of money [Maynard (1936)]. So the individuals want to hold more amounts in order to keep their real money balance constant. He accepted quantity theory of money in the long run but his view was quite different in the short run as he argued that velocity is not constant but variable in the short run and the amount of money does not only drive prices.

Before John Maynard Keynes, the Cambridge school of thought (including Keynes) argued on quantity theory of money by focusing on money demand instead of money supply. They believed that all the money quantity does not always used for transaction but individuals save fraction of money for speculative purposes. That fraction is represented by k in equation.

$$MV=PY$$

$$M=k.PY$$

Where, $k=1/V$ and M is money demand.

Milton Friedman [Friedman and Schwartz (1970)] constructed on the work of different economist and concluded that people usually hold real rather than nominal money balances. Inflation erodes this real value and the economic agents compensate this real decline in value by holding more money. This real balance is the function of inflation expectation, permanent income and relative expected return on stocks and bonds on money. In Freidman theory velocity can be predicted and is no longer constant. In view of him, the problem of inflation is the money supply rule and stated that:' inflation is always the everywhere a monetary phenomenon'. He argued that inflation would disappear if the Federal Reserve were required to increase the money supply at the same time as increase in real GNP.

Another study proposed by Phillips (1958) to model the inflation which says that there exist a trade-off between price inflation and unemployment in the short run and medium run in the economy. However, later it was strongly criticised by the Friedman (1968) and Phelps (1968).

Various studies done on the data of different countries shows variety of behaviour regarding movements in inflation and its causes. Hassan, *et al*. (1995), Khan and Qasim (1996) and Sherani (2005) argued that in Pakistan wheat support prices are also responsible for inflation and its causes. [Khan and Schimmelpfennig (2006), examines that if inflation is caused by wheat support prices in addition to money supply and exchange rate in the hybrid model of structuralise monetary model. Wheat support price is the minimum guaranteed price set by the ministry of food and agriculture before the time of harvest in September. Actual procurement prices paid by the government can exceed the wheat support prices according to the market condition. Ibid came to result that in the long run monetary factors are responsible for inflation while wheat support prices shows short run effects. The paper worked on the usual quantity theory of money, the monetarist perspective. Agents hold money for transaction purposes, as a store of value, and for speculative purposes. Based the monthly data from the period January 1998 to June 2005, checking the short dynamics first and the long run relationship using the estimation as a vector error correction model (VECM) in log-levels to find that weather the variables shows the long run co-integration behaviour. Prices and money supply have long run relationship. The result shows that co-efficient of private sector credit-the money supply significantly equal to 0.205 whereas that of wheat is 0.004 which is much less than that of money supply. The t-statistics suggest that the wheat support price is not part of the long-run relationship (0.120). The results show that the variables that explain inflation growth are broad money growth and money supply growth with lag of 12 months. This means that monetary condition affect inflation with a lag of 1 year in Pakistan. The paper concludes that only money shows the long run effect and the wheat support prices does not have any impact in the long run but have in the short run.

Qayyum (2006) also analysis the movements of inflation using the quantity theory of money (QTM). The theory assumes that real income changes in the long run and velocity is constant, so the inflation is determined by the growth in money. While some economist writes that 'velocity is constant' is an extreme proposition and must be rejected [Friedman and Schwartz (1992)]. Another said that velocity and income grows slowly and is independent of the behaviour of money supply and prices [Laidler (1997)]. However study shows that in case of Pakistan income velocity is not constant and deviates from potential level of income growth [Qayyum (2005)]. The paper converted the theory of money equation into the growth variables, adding the error term to the model so that to capture any other relationship of inflation with other variables. The main determinants of real income growth are labour, capital and technological change. These deterministic factors of growth are unrelated to demand for money. Therefore, real income growth is unrelated to quantity of money supply and price level. However, prices have proportional relation between money supply relative to real income [Dwyer and Hafer (1999)]. The graph in study showed that velocity of money has inverted U trend in case of Pakistan. The decrease in the trend indicating a varying velocity can be explained by the changing structure of financial sector as well as the extensive reforms in the economy. The result showed that money supply contributes 90 percent to the explanatory power which means that money supply—the monetary factor is responsible of inflation in case of Pakistan.

Kemal (2006) using the QTM as base model found that inflation results by the increase in money supply. However the changed money supply does not affect the prices immediately, but after sometime, with the lag of 9 months which is also proved in [Naqvi and Khan (1989) and Ahmed (2005)]. The paper uses the co-integration and concluded that in the long run, inflation is a monetary phenomenon. Moreover, inflation does not adjust itself to equilibrium as a result of exogenous shock.

Different school of thoughts considered different factors that determine inflation. Structuralists believe that inflation is the result of rigid structures of economy whereas monetarist believes that it is only the monetarist phenomenon. Other factors only influence the prices in the short run but not in the long run.

Unanticipated increase in money supply can influence output gains in the short run but this would anticipate the individuals about the increase in inflation in the long run which results in disinvestment, price escalation, and surge in uncertainty, and distortions in balance of payments in the international trade.

All over the world, central banks changed their previous policy procedures and shifted to the announced 1990's policy that targets inflation-the P-star model [Hallman, *et al*. (1991)]. The P-star model has more predictive power and information. Different views are there regarding the role of P-star model. Some economist argues that P-star model is better than other models [Hallman (1998, 1991); Christano (1989)]. Some views that the study on OECD countries showed no impressive result [Hoeller (1991)] while another study shows such results for the smaller countries that these countries tend to import inflation and report improvement when adjusted by these factors. In Pakistan, study on the P-star model was done by [Bilquees and Qayyum (2005)]. The model is based on long run quantity theory of money and puts together long run determinants of price level and also the short run changes in current inflation.

$$\pi_{t+h} = \alpha_0 + \alpha_1 \pi_t^* + \sum_{i=1t}^{n} \beta_i \pi_{t-i} + \varepsilon_{t+h}$$

The real output fluctuates around potential real output Y* and income velocity of money has equilibrium level V*. The model postulates that difference between the actual and long run equilibrium price level acts as a good predictor of inflation. If this difference is positive it implies that inflation will fall in future until it reaches the equilibrium level and vice versa. However the price gap does not have information about the dynamics of adjustment of prices. The paper uses the ECM approach for the adjustment process and Hodrick-Prescort filter approach to estimate equilibrium output and velocity which basically used the long run systematic moving average to de-trend the particular series. One of the important assumption is that velocity of money is stationary and the long-run measure of velocity can be obtained by taking average [Hallman, *et al*. (1989, 1991)] but the results negates the assumption. Checking the long-run relationship, co-integration they used Granger approach and for the forecasting performance of preferred leading indicator of inflation, M2 is used by central bank. The forecasting performance is evaluation by Root mean square error and relative RMSF to a simple univariate autoregressive model. The results of the study show quite clearly that compared to simple autoregressive model and M2 growth augmented model, the P-star model can be used to obtain leading indicator in Pakistan because it has information about future rate of inflation.

Beside the focus only on monetary factors [Bilquees (1988)] worked on the monetary and the stucturalist factors in the perspective of Pakistan. The study used the Harberger approach for the monetarist side after [Harberger (1963)] which is the extension of quantity theory of money. The Harberger model combines the rates of inflation to the growth of money and that of real income measured by income balances and the addition cost of holding cash. Earlier the cost of holding cash is measured by the rate of interest rate but in LDCs the interest rate is low than the rate of inflation. The rate of expected cost would be better measure by the devaluation of money so the Harberger approach uses the expected cost of holding cash, the difference between the last year's inflation and the present year rate of inflation. In the model of price expectation, the model is defined as the price depends upon the lag money supply as well as the present money supply, the real income balances and the inflation expectations. The reason of incorporating lag money supply is that money supply does not affect instantaneously. The structuralism's basic idea is that level of aggregate demand does not explain the inflationary hike in the LDCs. However, the supply and demand division in different sectors of economy is the basic reason of inflation in the economies of LDCs. The cause of inflation is due to inelastic food side, inelastic trade bottlenecks and inelastic tax revenues due to structural deficiencies in an economy. In the LDCs the tax revenue instability is directly related positively to the budget deficits. The results of the model shows that in case of Pakistan , money supply, real income and the inflationary expectation show the 65 percent of the variation. The coefficient of money supply and real income are insignificant and the size of coefficient of real income also decreases drastically but the lagged money supply is significant at 2.5 percent level of significance. The insignificant negative sign of real income balances shows that the supply side bottlenecks also lead to higher rate of inflation. The inflation expectation shows the significant behaviour at 0.1 percent. The inflation expectation has a strong impact on the inflation shows that in addition to monetary factors there are some other factors that influence inflation. Using the structuralise model, the result shows that expectations of prices, the import prices and the trends in the commodity producing sector are the most significant variables. The relative food price index shows the incorrect sign in the presence of lagged import prices and remains insignificant. The credit to the government sector variable shows a positive sign but remains insignificant. The inclusion of the lagged import prices increases the explanatory power of the model. Overall the result shows that the sluggish growth in output has been overcome by increased imports which have been aided through the increased in the flow of foreign exchange in the form of payments from workers overseas. These shortages in commodity producing sector and high import have substantial impact on the rate of inflation and lower output cause expectations of inflation to rise.

It has been argued that there are several reasons of inflation relating to supply and demand. However, energy prices volatilities are the major issue throughout the history [Hamilton (2008)]. Among the huge demand of energy and oil, the supply is limited to an extent of few countries. The study of inflation in Pakistan considers energy prices [Haider and Jawad (2013)]. The emerging economy Pakistan has a high demand of energy more than that of US. Energy inflation in Pakistan is no more different than the rest of the world. The demand of energy is inelastic and through cost push and demand pull it directly affects the core inflation. The paper used the oil prices, money supply, exchange rate, energy import gap ratio (EIMPR), Government tax revenue as a ratio of value added to manufacturing sector and adaptive expectation are used to determine the energy inflation. Checking the stationary variables and the long run relationship the paper used the approach of OLS, GLS and GMM and concluded that the expectations shows almost 60 percent of the model's explanatory power. The result are same as that of theoretical approach showing that exchange rate, broad money, government tax revenue as a ratio of value added to manufacturing sector and adaptive expectation are significant. Oil prices have an indirect effect on the energy country's inflation and are significant at lag of one year. After oil prices exchange rate has very important role in the inflation of Pakistan. It has the pass through effect through money devaluation. The expectation coefficient shows that increase in prices cause the inflation to rise as the people consider expectations regarding portfolio allocation.

In Pakistan, it is generally debated that fiscal imbalances might have played a main role in explaining price variation. [Asif and Agha (2006)]. The paper investigates the long run relationship between fiscal imbalance and inflation in case of Pakistan. There is always pressure on the central bank to finance the country's fiscal deficit the fiscal dominance usually complicate the conduct of monetary policy mostly a discretionary policy. Furthermore, there should be rule based policy. The non- stationary behaviour of all variables shows that they have trend over time. The paper used the VAR model and the cointegration analysis shows that the long run relationship exist among inflation, fiscal deficit, and total bank borrowing by the government, while the Real GDP and exchange rate have been taken as exogenous.

Azam and Rashid (2014) analyse the causes of inflation in case of Pakistan. They argued that factors of inflation in Pakistan are monetary as well as supply constraints. Pakistan is the agrarian economy and the slow growth of agricultural sector needs to be considered because it impacts the price variation. During 1972–1980, the prices increased at an annual rate of 13.31 per cent. A secular hike in the cost of production, high inflation expectations and constant exchange rate depreciation, economic instability due to bad performance of civilian government are the causes of inflation in Pakistan. In period 2001-05, inflation declined at 4.94 per cent despite of the increase in money supply to 16.26 per cent. According to the Government of Pakistan, low monetisation of budget deficit, increase in output, decrease taxes and exchange rate appreciation were the factors that pressured the inflation to its low level [Pakistan (2006)]. During the period 2006-2011, the inflation again rose due to food prices instability. (Ibid) used the quantity theory of money and converting it in the differential form explaining the relationship of variables with prices.

$dP/P = dM/M + dV/V – dY/Y$

The paper used the lagged money supply variable. The reason of incorporating lag money supply is that money supply does not affect instantaneously [Bilquees (1988)]. Using the regression analysis, the results show that money supply is statistically insignificant and there is no one to one relation between the money supply and the prices implying that there could be other factors for inflation in Pakistan. However, the structural factors such as the wheat support prices, import prices, oil prices are statistically significant and the hypothesis is rejected that inflation in Pakistan is monetary phenomenon. This argument implies cost increase pushes up prices which is alternative hypothesis.

Mohsin and Ishaq (2015) have worked on fiscal deficits that lead to inflation. The study uses the GMM approach on panel data of eleven countries for checking the impact of deficit on prices. Their result shows that independent central bank (that has no political pressure) can stabilise prices. If central banks are under political pressure, the only way that government finds to finance deficit is seinorage. Whenever deficits are financed, it results in high inflation. Moreover institutions have very marked role on the inflation caused by budget deficit financing. The weakened institutions induce the inflation as a result of deficits.

3. DATA AND MODEL

For the determination of inflation factors in case of Pakistan we use the quarterly data set of all the series from 1980Q1 to 2013Q4. Reason of using data from 1980 is non-availability of quarterly data on oil prices before 1980. Data on oil prices is obtained from (Quandl), while data on money supply and CPI (prices) is obtained from International Financial Statistics, and data on quarterly GDP is obtained from Hanif, Javed, and Malik (2013).

Following Khan and Schimmelpfennig (2006), Qayyum (2006) and Kemal (2006) this study used widely accepted quantity theory of money model. In simple Mathematical form it can be written as;

$$MV = PY \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \qquad (1)$$

Where,

M= money supply
V= velocity of money
P=prices
Y=output

The fisher equation says that money multiplied by velocity-the circulation of money in economy is equal to the total expenditure in terms of volume of monetary transaction multiplied by the price. Where velocity is the income velocity of money which tells us how many times a dollar is spent to buy total number of goods and services. Taking velocity constant Fisher argues that velocity depend upon the institutions and technological factors of the economy which slowly changes, so velocity does not change in the short run. Moreover, taking output as constant in the short run implies to the argument that classical economist believes that wages and prices are completely flexible and the output of the economy always remain at its full employment level.

Following assumption given by the Classical economists, Monetarists believe that quantity of money is the only determinant of the price level in the economy assuming that velocity and output remaining same in the long run but changes in the short run. In the short run, unexpected increase in money supply has beneficial effect on the growth of output. In the long run the individuals offset this increase by increasing the factor prices.

Following the lines, we estimated our model by including oil prices as a supply side variable in the main model (1). Formally, above equation (1) can be written as in natural log form, where velocity is considered to be constant;

$$\log(P_t) = \alpha_0 + \alpha_1 \log(M_t) + \alpha_2 \log(Y_t) + u_t \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

After inclusion of oil prices the (2) become

$$\log(P_t) = \alpha_0 + \alpha_1 \log(M_t) + \alpha_2 \log(Y_t) + \alpha_3 \log(OP_t) + u_t \quad \ldots \quad (3)$$

Where OP represents oil prices in dollars, u is the random error terms of the regression, subscript t represents time period and α_s are the parameters of each variable.

3.1. Data Descriptive Analysis

Data is divided into three periods. The first period is from 1980-1987 before the structural adjustment program. The second is from 1988-2001Q1 when Pakistan entered into the globally announced ‘Structural adjustment program’ introduced by IMF. Moreover, liberalisation, privatisation and other reforms was also introduced in this period. The third period of data is from 2001Q2-2013.

Growth of money supply was highest during 1980-87 and lowest in the structural adjustment program and stabilisation program. Though low growth of money supply did not seem to effect inflation compared to 1980-87 but due to lower growth in money supply effect GDP badly. Another reason for lower inflation in the 1980-81 was lesser openness and huge foreign aid which was then paid during the 1988-1999 and onwards. Variation in money supply has reduced during the last one decade which is also shown in the graph as well. Higher variation in money supply keeps variation in price changes at lower end. This also implies that money supply is a good tool to control inflation and keep inflation stable.

Movements in oil prices show quite different average and compound growth rates during the three periods. This implies that oil prices are more volatile than money supply and prices which is also shown by the value of coefficient of variation.

Correlation table shows that there is high correlation between M2 and CPI as well GDP and CPI. Similarly there is high correlation between M2 and GDP. Moreover, low correlation is observed in oil prices with all the three variables. This may imply that oil prices in the long run may not impact either of the variables. The economy is adaptable to these external shocks in the long run, though there are good chances that in the short run these shocks may impact all the three variables differently.

These results imply that in the long run money may positive impact prices but not the oil prices. The higher variation in money supply to control inflation seems to be effective for stable inflation.

Table 1

Descriptive Statistics

	1980-87			1988-2001Q1			2001Q2-2013		
Variables	AG	CG	CV	AG	CG	CV	AG	CG	CV
M2	7.25	5.02	2.97	3.74	3.35	2.3	3.67	3.52	0.81
CPI	1.69	1.57	0.97	2.23	2.22	0.54	2.19	2.15	0.71
Oil Prices	-1.45	-2.66	-9.48	3.26	1.26	7.9	4.18	2.53	3.92

AG = Average Growth, CG, Compound Growth Rate, CV=Coefficient of Variation.

Table 2

Correlation Table

	CPI	M2	OP	Y
CPI	1.00			
M2	0.99	1.00		
OP	0.60	0.58	1.00	
Y	0.97	0.98	0.55	1.00

4. ESTIMATION PROCEDURE

Our objective of the paper is to see the impact of money and oil prices on inflation in the long run and short run. Therefore, cointegration methodology is used to estimate the model. The first step during the application of cointegration is to check stationarity of the variables. There are several estimation procedures to check the stationarity which are discussed below.

4.1. Unit Root Test

The series is said to be stationary or have no unit-root if it satisfies the following three conditions:

- Mean value is time independent.

  $E(Y_t) = \mu$

- Variance is constant over time.

  $Var(Y_t) = E(Y_t - \mu)^2 = \sigma^2$

- Co-variance between the variable current term and its lag term is constant over time.
  Stationary variable has constant trend overtime.

  $Covar = \gamma_i = E(Y-\mu)(Y_{t-i} - \mu)$

Non-stationarity, a common property in many macroeconomic and financial time series, means that a variable has a unit root and has no clear tendency to return to a constant value or a linear trend. Therefore, it is one of the essential step of time series analysis.

Dickey-Fuller Test

Dicky and Fuller set an approach to check non-stationarity or unit root formally. Consider the following AR(1) model:

$$Y_t = \phi Y_{t-1} + \varepsilon_t$$

Checking the null hypothesis that $\phi=1$ and alternative hypothesis is $\phi<1$. $\phi=1$ implies that series is stationary and $\phi<1$ implies that non stationary. Simplifying the equation:

$$Y_t - Y_{t-1} = \phi Y_{t-1} - Y_{t-1} + \varepsilon_t$$
$$\Delta Y_t = Y_{t-1}(\phi-1) + \varepsilon_t$$
$$\Phi-1 = \gamma$$
$$\Delta Y_t = \gamma Y_{t-1} + \varepsilon_t$$

With new equation, now the hypothesis changed to:

H_0: $\gamma=0$
H^a: $\gamma<1$

We know that $\phi=1$ implies the series is stationary. Therefore, $\gamma = \phi-1=0$ implies the series is stationary. Similarly, $\phi<1$, implies series is non-stationary, therefore, $\gamma = (\phi-1)<0$, implies that series is non-stationary.

If the Dickey-Fuller (DF) calculated statistic is smaller than the critical value at 5 percent level of significance then null hypothesis would be accepted concluding that variable is stationary and vice versa.

$$\Delta Y_t = \gamma Y_{t-1} + \varepsilon_t$$
$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \varepsilon_t$$
$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \varepsilon_t$$

The first equation is pure random walk equation. Additional deterministic terms are added to these equations, the first equation included α_0 is the drift term or intercept whereas the second equation added drift as well as linear trend. The goal of this approach is to estimate any one of these equation by OLS. Methodology remains same using any of the equation while the standard errors are insensitive to the addition of trend or drift term. However, critical values are sensitive to sample size.

The Augmented Dickey-Fuller Test

As we are working with time series data so this data is exposed more to problem of correlation, Dickey and fuller extended their model to remove the problem of serial correlation including extra lags of dependent variable.

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{p} \beta \Delta Y_{t-1} + \varepsilon_t$$
$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta \Delta Y_{t-1} + \varepsilon_t$$
$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta \Delta Y_{t-1} + \varepsilon_t$$

Addition of trend term and drift term in the equation is the difference among these three augmented dickey-fuller equations. Including few lags would mitigate the problem of serial correlation. However, including too many lags lessens the strength of test to reject the null hypothesis as the degree of freedom decreases as a result of increased parameters, thus this test is sensitive to no. of lags.

Phillips-Peron Test

While ADF test works on higher lags to deal with serial correlation, PP test, the test of regression is the non- parametric corrections of AR (1) process (outside the regression framework) and it is differed from ADF as it is robust to hetroskadasticity and serial correlation in errors. Moreover, we do not have to specify the lag length for regression.

$$Y_t = \alpha_0 + \gamma Y_{t-1} + \varepsilon_t$$

However this test is reform of ADF test with the least restrictive nature of error process. The test is similar to that of ADF but differed in the way that in ADF we lose the no. of observation by adding the lag terms in the process.

KPSS

Kwiatkowski, Phillips, Schmidt and Shin (1992) gave the test for the unit root testing when the series of y_t is AR(0) as compared to the ADF and PP test which tests the unit root at the series where y is AR(1).

$$y_t = \beta` D_t + \mu_t + u_t$$
$$\mu_t = \mu_{t-1} + \varepsilon t$$
And the $\varepsilon_t \sim WN(0, \sigma^2 \varepsilon)$

Where 'D' is the deterministic component that contains trend or constant or both and μ_t is the pure random walk with variance $\sigma^2 \varepsilon$. The null hypothesis for test implies that μ_t is constant by

H_0: $\sigma^2 \varepsilon = 0$
H^a: $\sigma^2 \varepsilon > 0$

The KPSS uses langrange multiplier (LM) and is given by:

$$KPSS = (T^{-2} \sum_{t=0}^{T} \hat{S}^2_t) / \lambda^2$$
$$\hat{S}^2 = \sum_{j=i}^{t} \mu\hat{}j$$

KPSS converges to a function of standard Brownian motion that depends on the form of the deterministic terms D_t but not their coefficient values β. For instance, D_t =1, then

$$KPSS \xrightarrow{d} \int_0^1 V_1(r)dr$$

$V_1(r)$ =W(r)-rW (1) and W(r) is a standard Brownian motion for r [0,1]. If D_t = (1, t) `then

$$KPSS \xrightarrow{d} \int_0^1 V_2(r)dr$$

Where

$$V_2(r) = W(r) + r\,(2- 3r)\, W(1) + 6r\,(r^2- 1)\int_0^1 W(s)ds$$

The stationary test is a one-sided right-tailed test so that one rejects the null of stationarity at the 100·α percent level if the KPSS test statistic is greater than the 100· (1α) percent quintile from the suitable asymptotic distribution.

4.2. Co-integration

Cointegration among the variables exist if all the variables are non-stationary nonetheless integrated of same order. Therefore, as a first step we need to determine the order of integration of all the variables. If all the variables are integrated of the same order then we can say that there may exist cointegrating relationship. Second necessary condition is to get linear combination of the variables (residual) integrated of lower order than the order of variables. Engle Granger and Johansen are the two popular approaches used to estimate cointegrating relations when all the variables are cointegrated of same order.

Engle–Granger is a two-step procedure. After successfully checking the stationarity of the data, first step involves estimating the co-integration equation by OLS and obtain regression residual. After that we check the stationarity of residual. If it is integrated of lesser order than the variables then we apply second step which is known as error correction mechanism by regressing change in variable on several lags of independent and dependent variables and lag value of residual. If coefficient of residual come out to be significant then we say that the long run relation among the variables is not spurious.

There are few drawbacks in the Engle–Granger approach such as it takes one variables as independent variables, it can allows just one cointegrating relationship and it is a two-step procedure. Contrary to this Johansen approach covers all the three criticism on the Engle–Granger approach.

In this approach no variable is set exclusively as the dependent variable, the cointegrating equation and error correction mechanism is a one step procedure, and there can be more than one cointegrating vector. This procedure relies on the relationship between the rank of the matrix and its characteristic roots. In general terms the cointegrating equation can be represented as,

$$\Delta y_t = \Pi y_{t-1} + \Gamma \Delta y_{t-1} + \varepsilon_t$$

where Π is the long run cointegrating matrix and it contains equilibrium (error) correction terms and Γ shows the coefficient of VAR.

The existence of co-integrating relationship depends on the rank of the matrix Π. If rank of Π is equal Π is a null matrix implying that there is no linear combination. If the rank of a matrix Π is full rank matrix then both rows are linearly independent and variables are stationary and cannot co-integrate [Enders (1995)]. Since we have three variables, for the cointegrating relationship the rank should be equal to one or two if there are two cointegrating relationships. In both cases, the rows in the matrix Π are linearly dependent to each other and the rows are multiple of each other. This shows that there exists a linear combination, which is integrated of the order less than the order of integration of original variables.

Lag length test using likelihood ratio test can be performed as recommended by Sims (1980).

$$(T\text{-}c)\ (\log|\textstyle\sum_1| - \log|\textstyle\sum_4|)$$

Where,

T = no. of observations
c= no. of parameters in unrestricted model.

Following the χ^2 distribution one can estimate with degree of freedom equal to the no. of restriction or one can select the lag- length with AIC and SBC.

Determine the rank of π by estimating the model. For this test the hypothesis that variables are not co-integrated which means the rank π=0. We have two options testing the null hypothesis r= 0 implying that there is no co-integration against the alternative there are co-integrating relationships that means r>0, and calculate the trace statistics

$$\lambda(0) = -T[\ln(1-\lambda_1) + \ln(1-\lambda_2) + \ln(1-\lambda_3)]$$

if this value exceeds the critical value then reject the null hypothesis. Another way, compute the trace value λ (1) at H_o: r ≤1 and Ha is there are two to three co-integrating relationships.

$$\lambda(1) = -T[\ln(1-\lambda_2) + \ln(1-\lambda_3)]$$

Analyse the co-integration vector and speed of adjustment co-efficient. Carefully select the model with no. of parameters or constant that entails the no. of restriction and results are exposed to them.

5. EMPIRICAL ESTIMATION AND RESULTS

We applied three test discussed above, i.e., ADF, PP and KPSS to check the stationarity of the variables. The results of stationarity show that all the variables are non-stationary at level and integrated of same order, i.e., stationary at first difference. This proves the sufficient condition of the cointegrating relationship among the variables.

Table 3

Unit Root Tests

	ADF	Lags	PP	KPSS
CPI	0.42	1	0.90	1.44*
ΔCPI	-3.21*	3	-7.84*	0.18
Money Supply	-0.05	1	-0.89	1.45*
ΔMoney Supply	-13.55*	1	-14.85*	0.05
GDP	-1.54	1	-1.06	1.38*
ΔGDP	-4.00*	4	-64.87*	0.04
Oil Prices	-0.39	1	-0.72	0.86*
ΔOil Prices	-11.00*	1	-12.08*	0.32

Note: * implies significant at one percent level of significance.

This approach has two further tests i.e., trace test and maximum Eigen-value tests. Both trace test and eigenvalue test are based on pure unit root assumption, which is fulfilled in our case. The objective of the test is to verify if the variables have a common stochastic drift. Although both the tests are very similar to Lütkepohl, Saikkonen, and Tre (2001) but most of the Monte-Carlo studies prefer eigenvalue test over trace test due to robustness with non-normality [Maddala and Kim (1998)].

Eight lags are used VAR, which is selected using the minimum AIC. Trace test reported in Table 6 shows that there exists two cointegrating vectors at five percent level of significance. While Maximum Eigenvalues reported in Table 7 implies that there exists only one cointegrating relationship among the variables. As discussed above, eigenvalue test is better than trace test thus we accept one cointegrating relationship among the variables and the following analysis is done.

Table 4

Trace Test

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value 0.05	Prob.**
None *	0.21	53.35	40.17	0.001
At most 1 *	0.13	25.12	24.27	0.039
At most 2	0.06	8.529	12.32	0.198
At most 3	0.01	0.74	4.13	0.446

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level.
*denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) p-values.

Table 5

Eigenvalues Test

Hypothesised No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value 0.05	Prob.**
None *	0.21	28.23	24.16	0.01
At most 1	0.13	16.59	17.80	0.08
At most 2	0.06	7.79	11.22	0.19
At most 3	0.01	0.74	4.13	0.45

Results of Normalised Cointegrating Vectors

The money supply has positive relation with CPI showing that the increase in money supply causes an increase in prices in the long run. The co-efficient of M2 is 0.54 and its t-value is 22.69, which is higher than the t-critical value. Therefore, it is conformity of significant association between money supply and prices. Magnitude of the coefficient implies that in the long run one percent increase in money supply leads to 0.54 percent change in prices. However, the effect of money supply on prices is half if we compare it with Kemal (2006) in which oil prices is not included in the explanatory variables.

The long-run association of GDP with prices is negative. Magnitude of the coefficient is 0.24, which implies that one percent increase in GDP in the long run leads to quarter percent decline in prices. Moreover, t-value is 10.52 which higher than the critical t-value at five percent level of significance therefore it is also statistically significant.

Association between oil prices and prices is positive. The coefficient of oil prices is 0.04, which is quite low, implies that one percent increase in world oil prices leads to 0.04 percent increase in domestic prices. Value of t-statistics of oil prices is 1.20, which is less than the critical value of t-statistic at 5 percent level of significance. Therefore oil prices do not have statistically significant impact on prices in the long run.

Table 6

Normalised Cointegrating Vectors

Cointegrating Eq:	CointEq1
LCPI(-1)	1.00
LM2(-1)	-0.54*
	(0.02)
	[-22.69]
LGDP(-1)	0.24*
	(0.02)
	[10.52]
LOP(-1)	-0.04
	(0.03)
	[-1.20]

Standard errors in ( ) & t-statistics in [ ].
* indicates significant at one percent level of significance.

Results of Error Correction

Results of vector error correction given are reported in Table 7. It shows short run adjustment in all four variables. Coefficient of error correction implies that adjustment in prices in the short run is not statistically significant, which enforce the hypothesis of sticky price in the short run. Since Pakistan is a small economy who cannot effect world terms of trade significantly thus short run adjustment in oil prices is also statistically not significant at 5 percent level of significance. Adjustment in money supply and GDP is significant in the short run. However, the speed of adjustment in money supply is more than speed of adjustment in GDP, which is accordingly to the expectations. The coefficient of M2 is 0.29, which implies that money supply adjusts 29 percent in one quarter.

Results of Vector Autoregressive

Results of vector autoregressive are reported in Table 9. CPI is significantly affected by its own lags. However, although, M2 and GDP has significant association with prices in the long run but lags has statistically insignificant association in explaining prices. This is contrary to the Kemal (2006) results that money supply affect inflation after 9 months lag. This implies that money supply and inflation behaviour is changed in the last ten years and need to revisit. On the other hand, oil prices which is insignificantly associated in the long run, has positive effect on prices in the short run. Nonetheless, coefficient of first quarter is 0.014, which implies that 10 percent increase in international oil prices, say from $50 to $55 leads to increase in domestic prices by 0.14 percent.

Table 7

Vector Error Correction Mechanism

Error Correction:	D(LCPI)	D(LM2)	D(LGDP)	D(LOP)
CointEq1	-0.01	0.30	-0.06	0.51
	(0.01370)	(0.11088)	(0.02774)	(0.26935)
	[-0.68144]	[2.68214]	[-2.20314]	[1.91351]
D(LCPI(-1))	0.63	-1.30	-0.06	0.08
	(0.10171)	(0.82315)	(0.20594)	(1.99959)
	[6.22344]	[-1.57116]	[-0.27589]	[0.04134]
D(LCPI(-2))	-0.27	0.72	0.02	-2.85
	(0.12158)	(0.98389)	(0.24615)	(2.39004)
	[-2.21100]	[0.73519]	[0.06635]	[-1.19343]
D(LCPI(-3))	0.32	-1.70	-0.14	2.28
	(0.11944)	(0.96663)	(0.24184)	(2.34813)
	[2.71293]	[-1.75848]	[-0.59451]	[0.97245]
D(LCPI(-4))	-0.16	2.66	0.26	-3.66
	(0.11523)	(0.93251)	(0.23330)	(2.26523)
	[-1.37397]	[2.84929]	[1.14254]	[-1.61611]
D(LCPI(-5))	0.20	-0.60	0.19	2.71
	(0.11917)	(0.96441)	(0.24128)	(2.34273)
	[1.63992]	[-0.62296]	[0.80680]	[1.15808]
D(LCPI(-6))	-0.20	0.89	0.02	-1.31
	(0.11654)	(0.94312)	(0.23595)	(2.29101)
	[-1.71934]	[0.94308]	[0.07857]	[-0.57198]
D(LCPI(-7))	0.26	-2.69	0.14	0.56
	(0.11412)	(0.92354)	(0.23105)	(2.24345)
	[2.24786]	[-2.90816]	[0.62508]	[0.25015]
D(LCPI(-8))	0.09	1.86	-0.07	0.45
	(0.10377)	(0.83980)	(0.21010)	(2.04004)
	[0.86923]	[2.21091]	[-0.35729]	[0.22179]
D(LM2(-1))	-0.01	-0.22	-0.01	0.22
	(0.01236)	(0.10002)	(0.02502)	(0.24297)
	[-0.66727]	[-2.18091]	[-0.42186]	[0.92457]
D(LM2(-2))	-0.007	0.07	0.01	0.02
	(0.01182)	(0.09564)	(0.02393)	(0.23232)
	[-0.60218]	[0.74659]	[0.19102]	[0.10165]
D(LM2(-3))	0.01	0.05	-0.03	-0.05
	(0.01177)	(0.09522)	(0.02382)	(0.23130)
	[0.98884]	[0.52054]	[-1.48567]	[-0.19736]
D(LM2(-4))	-0.01	0.23	-0.01	-0.07
	(0.01119)	(0.09057)	(0.02266)	(0.22002)
	[-0.36642]	[2.56629]	[-0.24251]	[-0.33081]
D(LM2(-5))	0.01	0.33	-0.03	0.07
	(0.01106)	(0.08953)	(0.02240)	(0.21748)
	[1.24467]	[3.67067]	[-1.34005]	[0.34175]
D(LM2(-6))	-0.01	0.11	-0.01	-0.02
	(0.01126)	(0.09113)	(0.02280)	(0.22138)
	[-0.35777]	[1.25697]	[-0.67710]	[-0.10686]
D(LM2(-7))	-0.01	-0.001	0.01	0.09
	(0.01083)	(0.08768)	(0.02194)	(0.21300)
	[-0.69364]	[-0.00679]	[0.37036]	[0.41064]
D(LM2(-8))	0.0003	0.05	0.01	0.11
	(0.01007)	(0.08147)	(0.02038)	(0.19791)
	[0.03634]	[0.61255]	[0.42113]	[0.58398]
D(LGDP(-1))	-0.004	-0.07	-0.62	1.19
	(0.05380)	(0.43540)	(0.10893)	(1.05766)
	[-0.08064]	[-0.15957]	[-5.65576]	[1.12395]

Continued—

Table 7—(*Continued*)

D(LGDP(-2))	0.04	0.95	-0.28	0.55
	(0.06320)	(0.51144)	(0.12795)	(1.24239)
	[0.66802]	[1.86369]	[-2.15765]	[0.44168]
D(LGDP(-3))	-0.02	0.84	-0.16	1.48
	(0.06516)	(0.52731)	(0.13192)	(1.28094)
	[-0.33631]	[1.59596]	[-1.23416]	[1.15403]
D(LGDP(-4))	-0.07	1.58	0.51	2.55
	(0.06549)	(0.52997)	(0.13259)	(1.28740)
	[-1.03018]	[2.98791]	[3.84869]	[1.98506]
D(LGDP(-5))	0.002	1.81	0.23	1.69
	(0.06840)	(0.55351)	(0.13848)	(1.34458)
	[0.02990]	[3.27336]	[1.68337]	[1.25555]
D(LGDP(-6))	0.007	0.73	-0.11	2.61
	(0.06857)	(0.55491)	(0.13883)	(1.34797)
	[0.09850]	[1.30761]	[-0.76943]	[1.93746]
D(LGDP(-7))	0.05	0.80	-0.23	1.57
	(0.06695)	(0.54179)	(0.13555)	(1.31610)
	[0.76831]	[1.48166]	[-1.72039]	[1.19647]
D(LGDP(-8))	0.06	0.13	0.08	0.13
	(0.05793)	(0.46881)	(0.11729)	(1.13882)
	[1.11852]	[0.28663]	[0.65183]	[0.11348]
D(LOP(-1))	0.01	-0.04	0.008	0.02
	(0.00552)	(0.04468)	(0.01118)	(0.10855)
	[2.54560]	[-0.85254]	[0.68343]	[0.20470]
D(LOP(-2))	0.001	-0.003	-0.01	-0.36
	(0.00572)	(0.04627)	(0.01158)	(0.11240)
	[0.14717]	[-0.05674]	[-1.24657]	[-3.17570]
D(LOP(-3))	0.01	-0.06	0.01	-0.01
	(0.00594)	(0.04804)	(0.01202)	(0.11670)
	[1.60285]	[-1.23952]	[1.04695]	[-0.11507]
D(LOP(-4))	-0.001	0.01	0.008	-0.15
	(0.00600)	(0.04859)	(0.01216)	(0.11804)
	[-0.12169]	[0.35084]	[0.64216]	[-1.30786]
D(LOP(-5))	0.003	-0.07	0.01	-0.19
	(0.00579)	(0.04687)	(0.01173)	(0.11385)
	[0.54118]	[-1.43560]	[0.72617]	[-1.64590]
D(LOP(-6))	0.008	-0.06	0.006	-0.02
	(0.00598)	(0.04843)	(0.01212)	(0.11764)
	[1.33316]	[-1.29820]	[0.50695]	[-0.22021]
`D(LOP(-7))	0.001	-0.01	0.001	0.007
	(0.00560)	(0.04530)	(0.01133)	(0.11004)
	[0.29926]	[-0.28249]	[0.11524]	[0.06602]
D(LOP(-8))	-0.0007	-0.01	-0.007	-0.10
	(0.00534)	(0.04320)	(0.01081)	(0.10494)
	[-0.12787]	[-0.29179]	[-0.62881]	[-0.92691]
R-squared	0.63	0.53	0.98	0.30
Adj. R-squared	0.50	0.36	0.98	0.04
Sum sq. resids	0.008	0.53	0.03	3.13
S.E. equation	0.010	0.08	0.02	0.19
F-statistic	4.72	3.14	171.63	1.17
Log likelihood	405.88	154.97	321.23	48.46
Akaike AIC	-6.21	-2.03	-4.80	-0.26
Schwarz SC	-5.45	-1.27	-4.04	0.51
Mean dependent	0.02	0.03	0.01	0.01
S.D. dependent	0.014	0.10	0.13	0.20

Standard errors in ( ) & t-statistics in [ ].

The immediate impact of oil prices is mainly due to the sub-components of CPI contains oil products. One interpretation of impact of oil prices on CPI is that the hike in oil prices causes the aggregate demand to increase. Due to increase in international oil prices import bill would increase leading to the deficit in current account balance creating the dire need of foreign exchange (forex) reserves in forex market. This leads to decline in money supply in domestic economy when central bank injects the money in foreign exchange market to prevent exchange rate depreciation. Thus, the insignificant impact of oil prices on domestic prices in the long run is lessened by change in money supply.

6. SUMMARY AND CONCLUSIONS

Our study analyse the determinants of inflation in Pakistan using prices as a function of oil prices, money supply and GDP. The model is based on quantity theory of money. Using quarterly data from period 1980Q2-2013Q4, the descriptive analysis shows there is strong correlation between money supply and prices and also between GDP and prices, while the correlation between oil prices and prices is low as compared to other variables.

The stationarity tests (ADF, PP, &KPSS) show that all variables are non-stationary at level and stationary at first difference. The test of Johansen cointegration approach shows that there is long-run relationship between the variables and there is one cointegrating vectors using 8 lags of all the variables in VAR.

It is concluded that In the long run money is the only determinants of inflation. Change in oil prices effect mildly in the short run to prices but it does not affect continuous increase in prices. In other words it is a onetime effect which does not persists for longer period.

Since oil prices have significant impact on the prices in the short-run. Thus it implies that changes in money supply in response to change in the demand for foreign exchange due to change in international oil prices mitigate the impact of oil prices on domestic prices in the long run.

Therefore, it is concluded that inflation is a monetary phenomenon and supply side shocks are mitigated by money supply in the long run, therefore the pass through effect of supply side shock to inflation remains for a short span.

APPENDIX

Fig. 4. Trend of M2

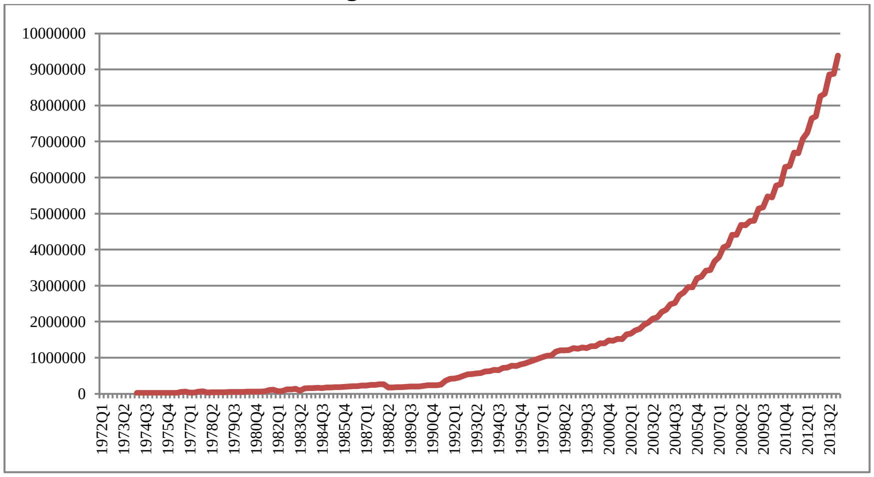


Fig. 5. Trend of M2 Growth Rate

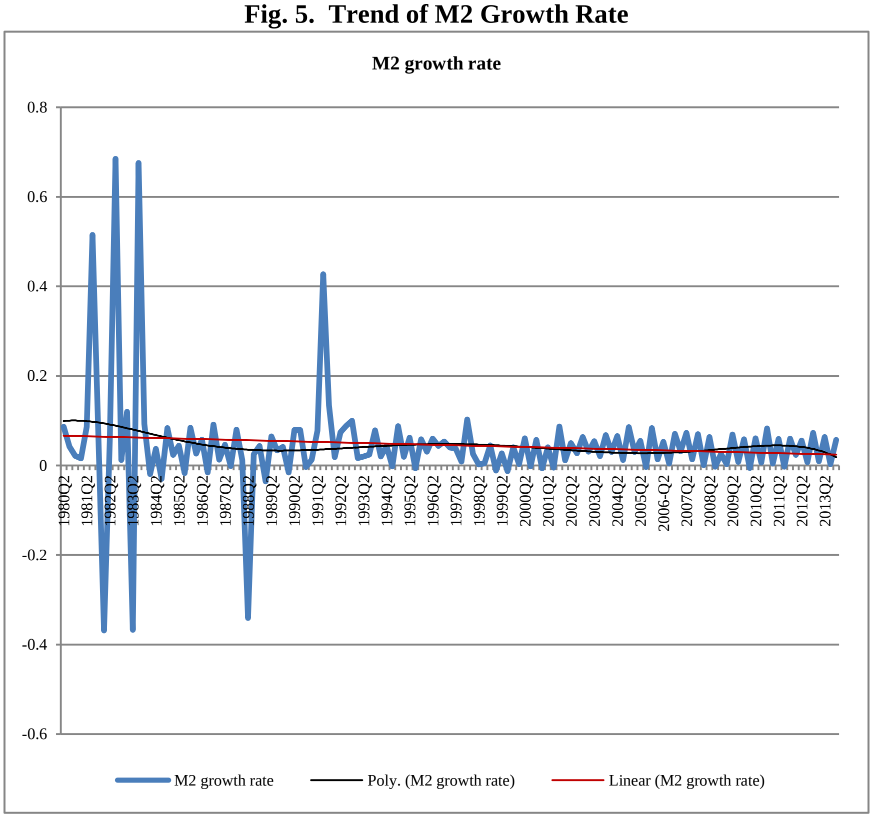


Fig. 6. Trend of Oil Prices

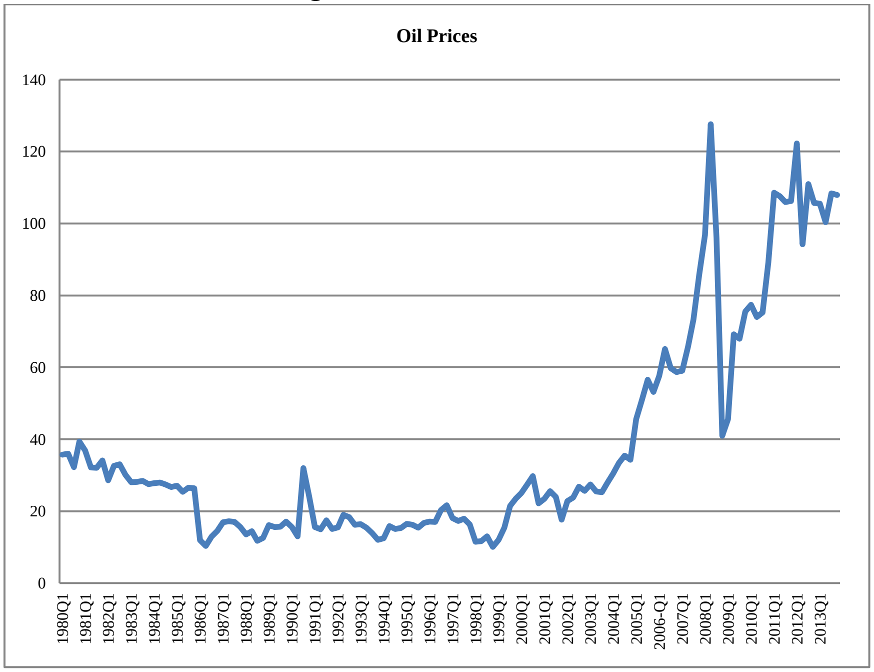


Fig. 7. Trend of Growth of Oil Prices

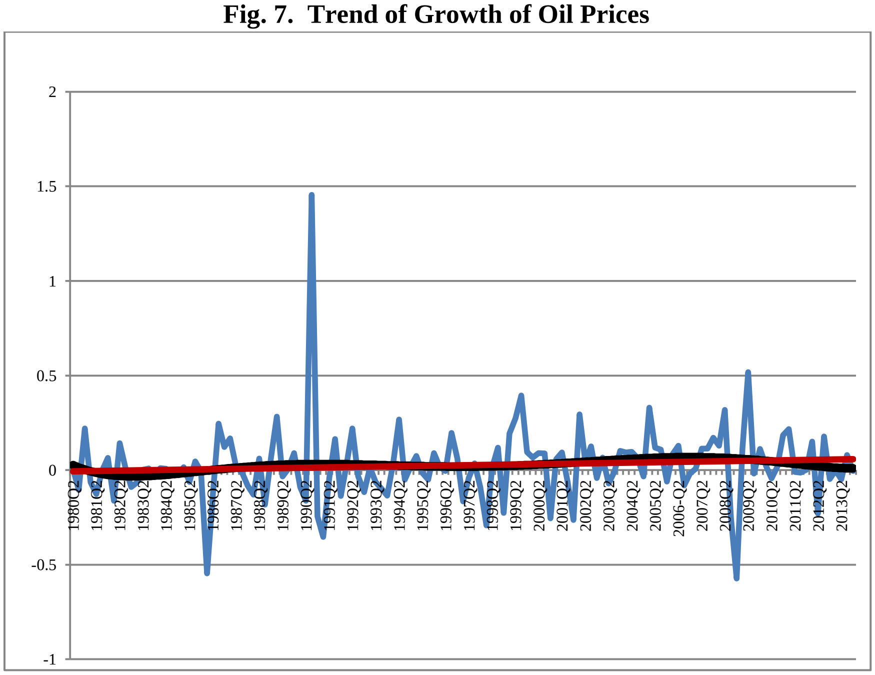


Fig. 8. Trend of CPI

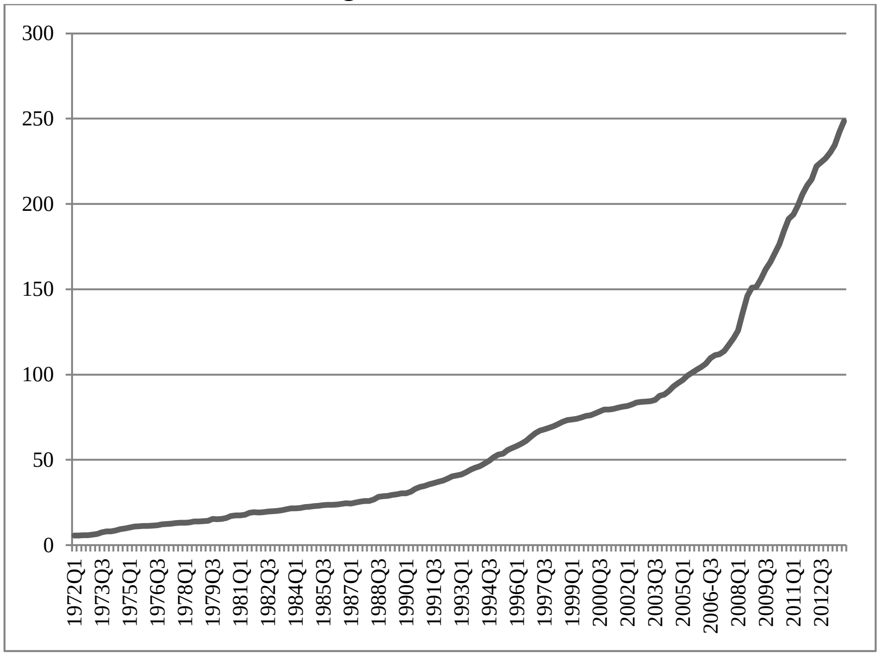


Fig. 9. Trend of CPI Growth

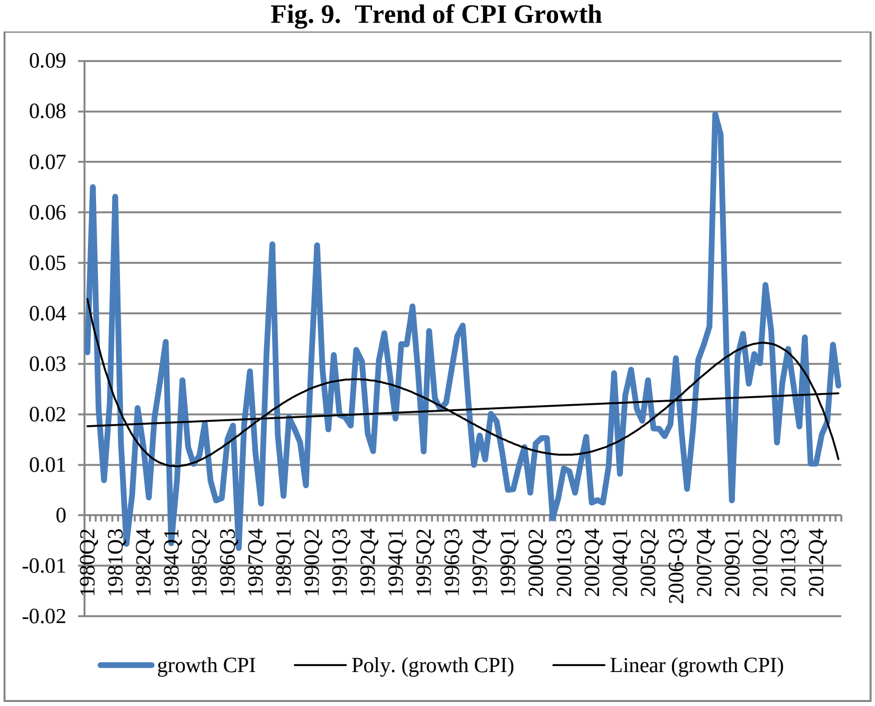


Fig. 10. Trend of GDP

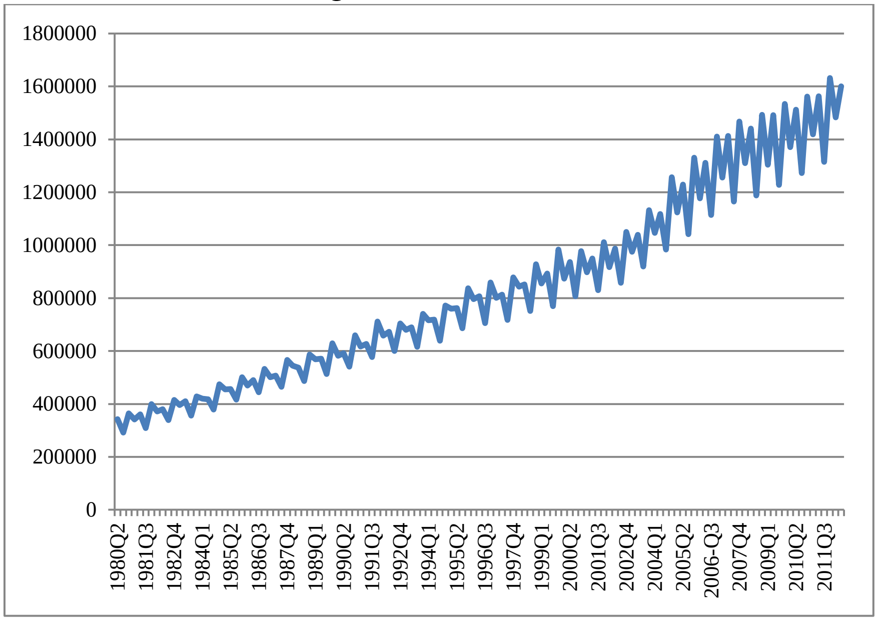
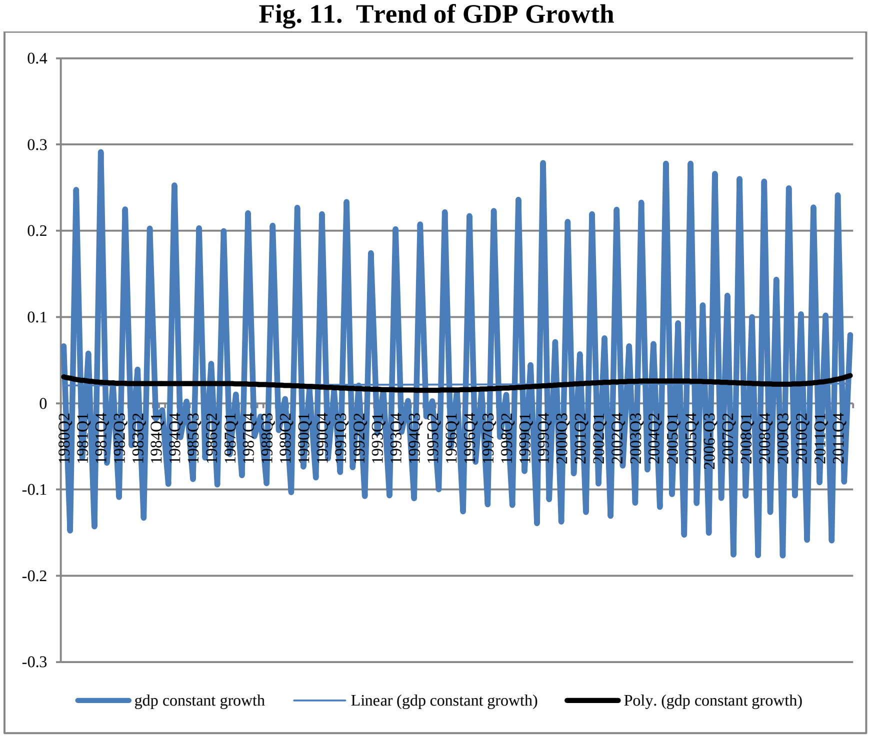


Fig. 11. Trend of GDP Growth



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