International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2016, 6(4), 727-737.

The Impact of Oil Price Changes on Inflation in Pakistan

Afia Malik[♯,*]

Pakistan Institute of Development Economics, Islamabad, Pakistan. *Email: afia@pide.org.pk

ABSTRACT

Oil prices have fluctuated enormously in recent years. Strong volatility in oil prices has serious implications for Pakistan's economy given its substantial dependence on imported fuels. Energy prices have a crucial role behind inflation rates in Pakistan and it is proved in this study. We estimate the effects of oil price changes on inflation for Pakistan using an augmented Phillips curve framework. Our results suggest a strong oil price-inflation relationship, especially when oil prices are rising continuously over the past 1 year.

Keywords: Oil Prices, Inflation, Pakistan
JEL Classifications: E31, Q43

♯ Afia Malik is a Senior Research Economist at the Pakistan Institute of Development Economics (PIDE), Islamabad. The author alone is responsible for any error or omission in the paper.

1. INTRODUCTION

Since 1970s movement in oil prices has created difficulties for policymakers and business leaders. In particular, price swings in the last 10 years or so have been quite dramatic. International oil prices fluctuated around US$ 20 per barrel in the 1990s before rising. Especially since 2004-2005, oil prices experienced a sharp upward trend to reach an all-time high of close to US$ 150 per barrel at one point in mid - 2007-2008[1], later decreased to US$ 30 per barrel by the end of 2007-2008. After that decline oil prices swelled again (with minor plunges in between) and averaged around US$ 104 per barrel in 2012-2013. Yet in the last quarter of 2014, there has been a deep fall in the price of oil close to US$ 57 per barrel, which even dropped to US$ 47 per barrel in the beginning of 2015[2] (Figure 1).

Generally, there is a consensus amid macroeconomists that oil price shock reduces economic activity and increases inflation simultaneously (Malik, 2010). As remarked by Lescaroux and Mignon (2008) various transmission channels exist through which oil prices may influence economic activity and inflation. For instance, increase in the price of crude oil is passed on to the price of petroleum products and, from the consumer perspective (households, industry and government) the energy bill grows, while from the production perspective, companies have to deal with an increase in unit costs.

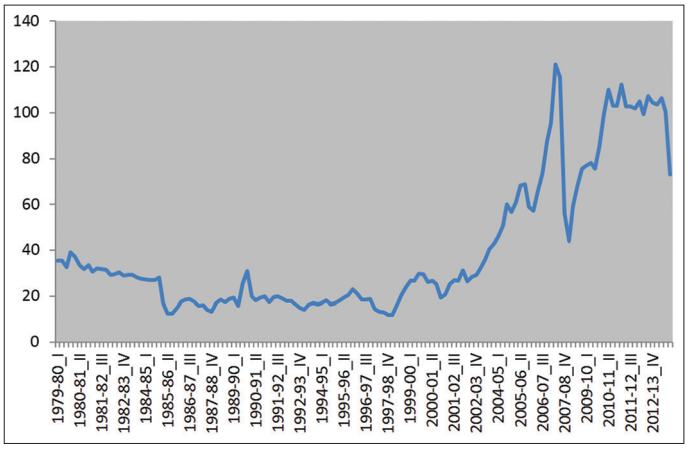
In other words, crude oil prices have a direct effect on the prices of energy-related items, such as household fuels, motor fuels, and electricity. Likewise, increase in oil prices instigates productivity decline which is passed on to real wages and employment, core inflation, profits and investment, as well as stock market capitalisation. Moreover, the transmission of energy prices is influenced by the real adjustments in the economy in the short and medium to long run, as well as structural determinants of the pass-through to consumer prices. The combination of these factors and the policy response of central banks eventually explain the transmission of energy price fluctuations to overall inflation.

Theoretically, extent to which rising oil prices is passed on to higher core inflation through higher production costs depends, among other things, on how much they enter in the overall inflation expectations of those who set prices and wages. Higher the

1 Strong growth of the world economy since 2004 with China and India as major players, have shaped up this extraordinary demand for oil. With rising demand and supply side rigidities created huge pressure on oil prices (for details see State Bank of Pakistan (2008).

2 Oil prices reached their lowest level for about six years. This fall is largely associated with sluggish global demand and new shale oil discoveries in North America and reluctance on the part of oil exporting countries to reduce their supplies in the international market (State Bank of Pakistan, 2015).

Figure 1: Crude oil price ($ per barrel)



Source: International financial statistics database

inflation expectations over the longer term, there are more chances of passing on the increasing energy and wage costs to consumer prices. That is, rising oil prices may lead to continuous increase in core inflation. However, once oil prices ease, the inflationary pressures disintegrates (Cavallo, 2008).

Volatility in oil prices has important implications for Pakistan's economy given its substantial dependence on imported fuels. Oil is the second largest source of energy consumed (30%) after natural gas (44%). Energy prices have a crucial role to play behind inflation rates in Pakistan. There exists a strong correlation between international crude oil prices and consumer price index (CPI) (around 0.87%). Since 2004-2005, headline inflation is continuously going upwards. Reasons generally cited for this continuous increase are mainly increase in global oil prices and import bill of food group. It is also contended that the impact on inflation would have been even worse, had the government not offered subsidies on oil products and food commodities (Pesnani, et al., 2008).

Petroleum products account for approximately 50% of modern energy consumption in Pakistan. Share of motor spirit (petrol) and high speed diesel (HSD) is more than 50% in the petroleum product group. The demand of petroleum products in the country is about 21 million tons out of which hardly 19% is met through local resources while the balance is met through imports. Among the fuels used in thermal power plants, oil is the most expensive and heavily used (details in Section 3). Indeed oil is so inextricably interlinked with our modern lives that large price fluctuations which we are witnessing since 1970s cannot be taken for granted.

Therefore, to investigate the impact of international oil price fluctuations on Pakistan' economy is warranted. The objective of this paper is to analyse the impact of oil price fluctuations on inflation in Pakistan using quarterly data from 1979 to 1980 Q1 to 2013-2014 Q3. In order to account for the possible asymmetry in oil price data, paper will use different transformations of oil price data. The plan of the paper is as follows: Section 2 gives an overview of literature. Section 3 deliberates on the importance of oil prices in Pakistan's energy market. Section 4 discusses data and methodology. In Section 5 results are analysed. Section 6 concludes the discussion.

2. LITERATURE REVIEW

Oil price fluctuations have remained a well-researched topic for its assumed role in the macroeconomic performance in the country. Specially, after the oil shocks of 1973-1974 and 1979-1980, this variable is considered vital for macroeconomic stability (Jalles, 2009). Bruno and Sachs (1982) study is supposedly the first one to have examined the effects of oil prices of the 1970s on output and inflation in a theoretical framework. Later, Hamilton (in 1983, 1996, 2003, and 2008) established a vital role for oil price increase in most of US recessions. Similarly, Tatom (1998), Mork (1989), Mork, et al. (1994), Kahn and Hampton (1990), Huntington (1998) all have substantiated through their empirical investigations the effect of oil price shocks on output and inflation. Lescaroux and Mignon (2008) also investigated the links between oil prices and various macroeconomic variables including CPI for a large set of countries, including both oil importing and oil exporting countries and highlight the existence of relationships between oil prices and macroeconomic variables.

Few studies have examined predominantly the reaction of consumer prices and inflation to oil price movements (for instance, Gisser and Goodwin, 1986; Fuhrer, 1995; Gordon, 1997; Guo and Kliesen, 2005; Hooker, 2002; Stuber, 2001; Barsky and Kilian, 2004; LeBlanc and Chinn, 2004; Kinnefors and Wribe, 2006; and O'Brien and Weymes, 2010). According to Fuhrer (1995), Gordon (1997) and Hooker (2002) oil price increase represents an inflationary shock which can be accompanied by second round effects, through the price-wage loop. Barsky and Kilian (2004) show that oil price increases generate high inflation, whereas LeBlanc and Chinn (2004) confirm only a moderate impact of oil prices on inflation in United States, Europe and Japan. Kinnefors and Wribe (2006) also find some connection between the price of crude oil and inflation for Sweden. Likewise, O'Brien and Weymes (2010) also confirm the role of energy prices behind inflation in Irish economy.

There is another strand of literature that highlights the significance of sample stability. Empirical literature has shown an asymmetric relationship between oil price shocks and economic recession. That is, an increase in oil price led to a decline in gross domestic product (GDP) while the decrease in oil price does not encourage the economic activity. Evidence of asymmetries in the link between oil prices and economic activity has been established in some papers (for instance, Hooker, 1996; Mork, 1989; Mork, et al., 1994; Sadorsky, 1999; Lee, et al., 1995; Federer, 1996; Balke et al., 2002; Huang, et al., 2005; and Jbir and Zouari-Ghorbel, 2008).

Hooker (1996) for instance, challenges Hamilton's findings on the ground, that sample stability is important. Oil prices are endogenous, and that linear and symmetric specifications misrepresent the form of the oil price interaction. According to Hooker (1996) oil prices does Granger cause a variety of US macroeconomic indicators in the data up to 1973; and not in the data after wards?

In general, the evidence confirms that economic activity responds asymmetrically to oil price shocks. The basis for their argument is

the oil price declines of the mid - 1980s during which the world price of oil halved and the linear relationship between oil prices and economic growth appeared to break down. At large, rising oil prices tend to retard aggregate economic activity by more than falling oil prices stimulate it. The implication of this literature is indirect transmission mechanisms are crucial through which oil price shocks have macroeconomic impacts.

Cuñado and Gracia (2004) have also empirically proven asymmetries in the oil prices and macroeconomic variables (consumer prices and economic activity) for some of the Asian countries. Similarly, Huang and Yang[3] examines the relationship between real oil price changes and inflation rates in the framework of Mork's (1989) asymmetrical model. Their findings support long run asymmetric responses of inflation rates to real oil price increases and decreases. They explained that the immediate response of inflation to real oil price changes are mainly larger than that of lagged periods, and the cumulative impact of real oil price increase is in general larger than the cumulative impact of real oil price decrease.

Stuber (2001) argues that the first round effects on the total CPI of large changes in the price of crude oil have diminished since the early 1980s (relative to 1970s) because of declining oil intensity. Likewise, Jalles (2009) while studying the effects of changes in oil prices for the French economy find a significant effect of oil price variations on inflation. However, the magnitude of this effect becomes smaller in their sub-sample after 1985.

In general, with respect to the role of oil price changes in the economy, studies show that there is a nonlinear relationship between oil prices and economic variables. Majority of studies are now including a separate negative and positive oil price change variables as an alternative specification.

Major portion of research carried out so far is in the context of developed economies. Research concerning the impact of oil price volatility in the context of developing countries is limited; especially when we look at research studying the relationship between oil price volatility and inflation. For Pakistan, no serious attempt has been made so far to empirically examine the effect of oil prices on inflation. To my knowledge this is the first study empirically testing the direct impact of asymmetries in oil prices on inflation in Pakistan.

By and large empirical studies on the subject under consideration have suggested the impact of oil price increase on inflation. However, the intensity of this impact depends on country's energy intensity and import dependency. These issues are discussed in the coming section.

3. IMPORTANCE OF OIL IN PAKISTAN'S ENERGY MARKET

The association of high energy prices and inflation depends on how important energy is in the economy. That is, the manner in which international oil price changes propagate through an economy depends partly on the structure of the economy's energy markets. Factors that determine the vulnerability of the Pakistan's economy to large energy price changes in international markets include energy mix and oil intensity, energy dependency, and the overall energy intensity of consumption.

With oil being the second largest source of energy used along with almost a constant rate of its production Pakistan is heavily dependent on oil imports from Middle East exporters (Saudi Arab playing the lead role). Almost 82% of the demand for petroleum products in the country is met through imports. Pakistan spent almost 20% of its export earnings on oil imports in 1994-1995 which increased to almost 61% in 2012-2013. Pakistan's energy dependency ratio (that is energy imported as a proportion of energy demanded)[4] stands at 33% in 2012-2013. In the presence of limited foreign exchange reserves, this energy dependency is quite high. Likewise, the share of net oil imports in GDP[5] has increased substantially from −3.13 in 1990-1991 to −6.22 in 2012-2013. With such a high ratio, unless country is running in surplus, or has extremely large foreign exchange reserves, high oil price leads to severe macroeconomic adjustments. Therefore, the international oil price fluctuations have a direct bearing on the macro-economy of the country.

Moreover, decrease in energy intensity is considered as the most promising route for reducing vulnerability to oil shocks (Bacon and Kojima, 2006). There are number of factors affecting energy intensity including climate, level of development, as well as whether it produces and refines oil. Its decline can be achieved via moving away from energy intensive industries; changing household consumption patterns away from activities which require large amounts of energy (e.g. using less personal transport and more reliance on mass transportation); and involvement in those production activities that are more energy efficient. For Pakistan energy intensity is almost constant since 1971 (Figure 2) indicating no improvement in efficiency. In comparison, other countries like for instance China, in spite of increase in energy consumption has been successful in bringing down its energy intensity by about 70% since 1978, when the country started its economic reform programmes.

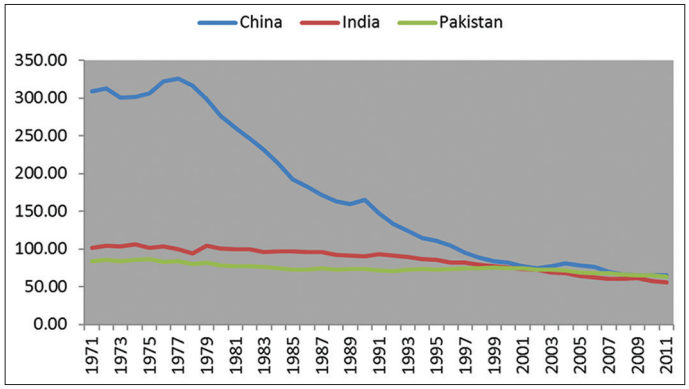
As mentioned earlier, oil is the second main source of energy in the energy landscape in Pakistan in terms of consumption demand. In Pakistan, oil and gas together dominate our energy sector, with a share of 30% and 44% respectively; followed by electricity, coal and liquefied petroleum gas with a share of 16%, 9% and 1% respectively. However, consumption of oil products has declined in the last few years, as an outcome of fuel switching (Figure 3). When oil prices started rising globally Pakistan shifts its reliance from oil to gas via (heavy reliance of thermal power plants on gas for electricity generation and mushroom growth of compressed natural gas fitted cars). This shift towards gas along with inefficient pricing over the last couple of years has put enormous burden on the available natural gas resources and now they are depleting at

3 Cited from http://econ.ccu.edu.tw/academic/master_paper/091019seminar.pdf.

4 Oil accounts for 80 % in total energy imports followed by 18 % of coal imports, and 1 % each of electricity and Liquefied Petroleum Gas (LPG).

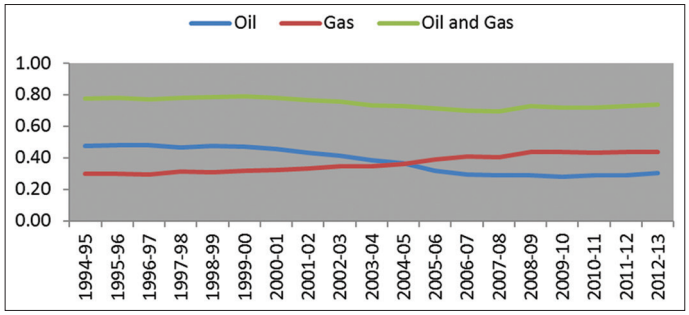
5 An index of the relative importance of the oil price increase to the economy in terms of the potential adjustments needed to offset it.

Figure 2: Energy intensity



Source: World development indicators database

Figure 3: Share of oil and gas in total energy consumption



Source: Pakistan energy yearbook (various years)

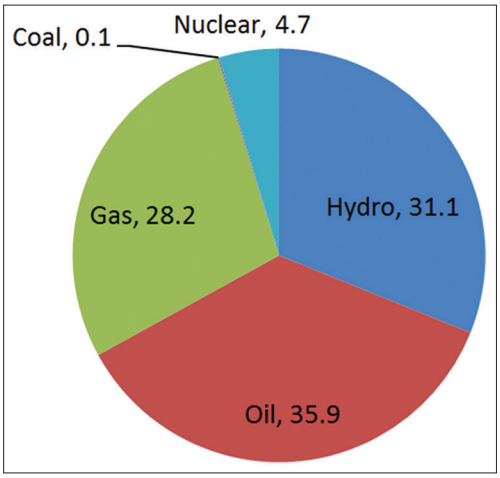
a very fast speed. Although Pakistan has huge potential of natural gas resources but has failed to exploit it.

This high oil and gas dependency is also reflected in the high oil and gas inputs used in electricity generation (Figure 4). Among the fuels used in thermal power plants, oil is the most heavily used. As oil prices goes up cost of generating one unit at thermal plant also goes up. For instance in 2014, cost of generating one unit at thermal plant has increased manifold i.e. Rupees 18/KWh when produced using furnace oil and Rupees 24/KWh when produced using diesel, while the average sale price of electricity in Pakistan is about Rupees 9/KWH. In the fuel mix, furnace oil is the most heavily used fuel in Pakistan and mostly in the power sector.

To date, government of Pakistan has given subsidy to utilities for not passing on the impact of high fuel prices to customers. However, since the budget deficit has now gone beyond sustainable limits, the government is now moving away from subsidy (under pressure from International Monetary Fund) and utilities are now being asked to pass on the impact of fuel prices to customers. Recently, National Electric Power Regulatory Authority has approved an increase in electricity price up to 60% for distribution companies. Since electricity is one of the major components of manufacturing cost, this will increase the CPI further.

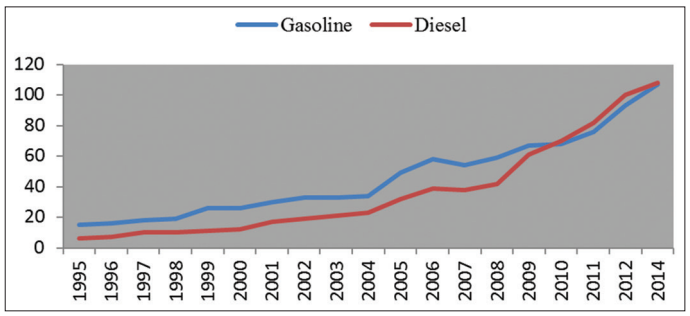
The price of oil was $10 per barrel in 1995 which increased to $110 per barrels in May 2014 showing an increase of almost hundred times as compared to its price in 1995. This has led to an increase in petroleum prices domestically (Figure 5). In 2012-2013, almost 52% of total oil consumption is in the transport sector (where

Figure 4: Total electricity generation 2012-2013



Source: Pakistan energy yearbooks 2013

Figure 5: Petroleum prices (rupees per liter)



Source: Key indicators for asia and pacific, asian development bank, 2013, 2014

gasoline and HSD together accounts for 95% of total transport share). When prices of petroleum products goes up not only transport costs add burden to consumer basket but increase in prices of other products through indirect transmission channels also supplement in the rise of CPI.

3.1. Inflation and Oil Price

In Pakistan the general price level CPI is persistently rising since its inception. The prices remained volatile during the decade of 1990's ranging from 5.7% to 13% mainly because of declining economic growth, expansionary prices, output setbacks, higher taxes and a depreciation of Pakistani Rupee. The inflation rate started declining from 1998 onward due to improved supply position of goods and strict budgetary measures. The inflation rate was 5.7% in 1998-1999. It was brought down to 3.6% in 1999-2000 and further to 3.1% in 2002-2003. The inflation rate has averaged 3.9% during 2003-2004.

It is often argued that price of oil and inflation is linked in a "cause and effect framework." As oil prices move up or down, inflation follows in the same direction[6]. For the oil importing countries, the scale with which they are normally hurt, depends on the specific structure of their economies. For Pakistan, in the 1990s, there seems to be a weaker link between oil price and inflation rate.

6 Huang, Bwo-Nung and Yang, Chin-Wei, "The Changing Effects of Oil Price Changes", accessed at http://econ.ccu.edu.tw/academic/master_paper/091019seminar.pdf.

That is, despite slow-down in oil prices, inflation rate remained high (because of the above mentioned factors). However, in the 2000s, especially after 2004, oil price-inflation relationship does seem to exist for Pakistan (Figure 6).

In other words, despite government's reluctance in full passing on of oil price increase (prior to 2010), high oil prices has become an important factor (along with food prices) contributing to high inflation in Pakistan since 2004-2005. In 2005-2006 and 2006-2007 average inflation was near 8%. However, regardless of monetary tightening (high interest rates) by the State Bank of Pakistan, average inflation jumped to 13.7% in 2010-2011. The supply constraints not only kept inflation high, but also hurt growth.

In fact, in the last few years the growth in monetary assets has outstripped the rise in nominal GDP. The easy monetary policy adopted to kick start the stagnant economy has led to the rise in general price level. Due to lack of resources for economic development, the government has been resorting to deficit financing (bank borrowing, creation of new currency) over the years. The excessive growth in money supply compared to increase in output has resulted in inflation. However, in 2012-2013, inflation averaged 7.4%, down from 11% a year earlier. Even though oil prices were high but ease in food prices played an important role in bringing inflation rate in single digit.

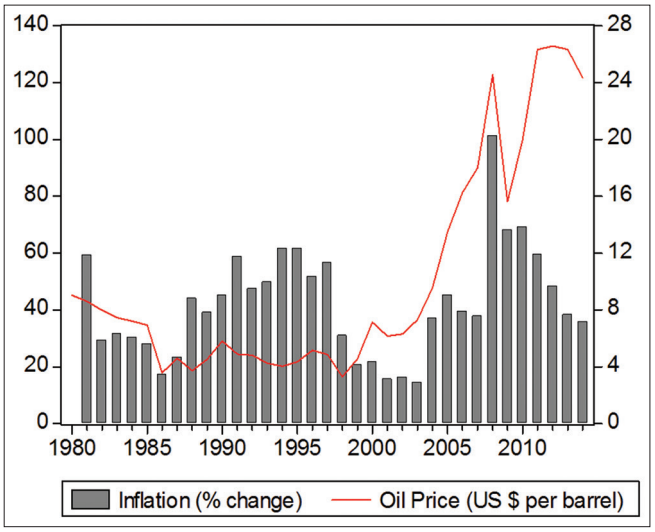
The focus in this study is limited to oil price and inflation relationship. Therefore, influence of food prices on inflation in Pakistan is not involved in the analysis.

4. METHODOLOGY

Following LeBlanc and Chinn (2004) we estimate the impact of oil price changes on inflation for Pakistan using an augmented Philips curve framework. The Philips curve is a useful method to show the effect of oil prices on inflation. Crude oil prices are included in the Phillips curve. In addition, we also include interest rates as a measure of monetary policy[7]. To take into account other possible policy channels we have also included real effective exchange rate as well as fiscal deficit[8] as exogenous variables in selected models. Past inflation is also included in the model because of the link between actual inflation and expected inflation. GDP growth is also used as proxy for economic slack[9].

With the rise in oil prices inflation rate is expected to rise, Central Bank (that is the State Bank of Pakistan) is expected to raise interest rate to counter inflationary pressures. Further, government deficit is expected to increase with the increase in oil prices because of the government's reluctance to fully pass on the increase to consumers. Similarly, when oil prices are going down government

Figure 6: Oil price and inflation



Source: International financial database

is not very keen to bring down the domestic prices of petroleum products immediately. It is because fuel taxes have important revenue implications for Pakistan[10].

The impact of deficit spending is expected to be positive on inflation as government resorts to monetisation of fiscal deficit which increase as a result of increase in oil prices[11]. Similarly, inflation expectations are going to influence positively actual inflation.

The underlying model for estimation can be written in a general form as:

$$\pi_t = \beta_0 + \beta_1 \pi_{t-1} + \beta_2 Op_t + \beta_3 I_t + \beta_4 FD_t + \beta_5 REER_t + \beta_6 Gr_t + \varepsilon_t \quad (1)$$

Where,
π_t = Inflation rate at time t,
π_{t-1} = Inflation rate at time t-1 (expected inflation),
Op_t = Crude oil prices at time t,
I_t = Interest rate at time t,
FD_t = Fiscal deficit scaled by GDP at time t,
$REER_t$ = Real effective exchange rate at time t,
Gr_t = GDP growth at time t,
ε_t = Error term
β_0 to β_6 are parameters.

The apparent asymmetric response of economic activity to oil price shocks in many economies has led researchers to explore different specifications for the oil price variable (e.g. Hamilton, 1996; Mork, 1989; Mork, et al., 1994, and Hooker, 1996)[12].

7 Lagged value of the percentage change in money supply is also tried to measure monetary policy. Lagged value is taken because money supply does not affect inflation immediately. But the variable does not performed significantly in the model.

8 Due to lack of resources for economic development Government often resorted to deficit financing (bank borrowing, creation of new currency) thus creating inflationary pressures.

9 Economic slack is an unobserved variable and its measurement is subject to considerable uncertainty especially in real time. Given data limitations GDP growth is used here for estimation purposes.

10 Fuel taxation is the simple way to earn revenue given relatively price inelastic and income elastic consumption of petroleum products (Bacon and Kojima 2006). Petroleum taxes are the largest source of indirect revenues in Pakistan. Petroleum product prices are higher than the import parity price because of these taxes. The share of petroleum taxes in indirect taxes in 2012-13 is almost 25%.

11 With more money in the economy inflation rate goes up.

12 Later on many researchers have used these specifications in their empirical analysis.

Four such specifications are also used in this paper just to check whether asymmetries in oil prices have any effect on inflation in Pakistan. The first variable used is net oil price increase past four quarters (NOPI4) defined as the price increase if any relative to movements over past four quarters (Hamilton, 1996). This variable will capture only the increase relative to past four quarters otherwise zero, thus, placing less emphasis on price changes that have occurred during periods of high volatility.

Following the empirical literature, we define next three variables as:

1. ΔOp_t = Quarterly changes of real oil prices, that is, the conventional first difference transformation of oil price variables (in logs), that is,
   $\Delta Op_t = \ln Op_t - \ln Op_{t-1}$, where Op_t is the real oil price in period t. Following Mork (1989) and Mork et al. (1994) we distinguish between the increases and decreases of oil price. That is,
2. ΔOp_t^+ = Real oil price increases, that is,
   $\Delta Op_t^+ = \max(0, \Delta Op_t)$
3. ΔOp_t^- = Real oil price decreases, that is,
   $\Delta Op_t^- = \min(0, \Delta Op_t)$.

Precisely, this is done by defining two variables for oil price changes, where either one equals the real price change when the latter is positive or negative, respectively, and zero otherwise. In other words, we separate oil price changes into negative and positive changes in a believe (in the light of existing evidence) that oil price increases may have a significant positive effect on inflation even though this may or may not happen for oil price decreases. Moreover, even the extent to which rising oil prices convert into higher overall inflation through higher energy costs depends on their continuance. If they continue to rise, there are more chances for them to translate into sustained increases in the overall price level, that is, overall inflation rate.

Following Hamilton (1996) we have used the world price of crude oil in US$ deflated by CPI in US as a proxy for real oil prices. Some of the empirical studies analysing the impact of oil price shocks have used world oil price converted into respective country's currency by means of market exchange rate (e.g. Mork, et al., 1994; Abeysinghe, 2001). The main difference between the two oil prices is oil price in domestic currency takes into account the difference in the oil price that country faces due to its exchange rate fluctuations or its general price levels. Some of the studies have used both variables in order to differentiate whether each oil price shock reflects the world oil price evolution or could be due to other factors such as exchange rate fluctuations or national price index variations (e.g. Cuñado and Gracia, 2005; Kumar, 2005; and Malik, 2010). Cuñado and Gracia (2005) show examples for some Asian countries, where the US$ world price of oil had a trend of increasing prices during the early 1980s, but the real price of oil expressed in the local currency showed a downward trend during the same period of time. This is possible due to the behaviour of local currency's exchange rate towards the US$. Malik (2010) also show similar trend for Pakistan. Cuñado and Gracia (2005) also emphasise that the relationship between oil price and inflation are more significant when oil price variable is denominated in local currency. The focus in our study is on inflation therefore we will also try oil price variable defined in local currency, that is, in Pakistani Rupees.

For Inflation rate we have selected growth rate of the CPI, and the expected inflation is the lagged inflation rate. For GDP growth quarterly series of GDP is generated using the methodology adopted by Kemal and Arby (2004) then its growth rates are generated. Quarterly series for revenue and expenditure is generated using the Lisman and Sandee methodology. Then government deficit spending is derived from them and scaled by GDP. The REER is a trade weighted exchange rate adjusted for relative prices. The interest rate is represented by the Pakistan State Bank interest rate. Data for all variables is collected from International Financial Statistics database and World Development Indicators database. All variables are used in log form except for variables with negative values. The sample selected for the current analysis ranges from 1979 to 1980 Q1 to 2013-2014 Q3.

5. EMPIRICAL RESULTS

First, we check for stationary in each variable. Second, we analyse whether a long run relation exists between the series testing for multivariate cointegration between inflation, oil prices, and other right hand side variables in equation (1). Third, we test for asymmetries in the oil price changes and inflation relationships.

5.1. Results of the Unit Root Tests

To check stationary of the variables, we refer to the Augmented Dickey-Fuller (ADF) test and Phillips and Perron (PP) tests. These tests are based on three following models: (i) Without intercept, (ii) with an intercept and (iii) with an intercept and trend. As a first step of the empirical analysis, unit-root tests have been carried out for all of the variables: Oil prices, inflation, interest rate, GDP growth, REER and deficit GDP ratio. Table 1 shows the results.

According to the ADF test oil price variable and deficit GDP ratio have unit roots in level form without intercept, with intercept and with intercept and trend; rest of the variables have no unit root in level form. However, in the first difference all variables are stationary. More or less same results hold in case of PP test. Due to space limitation, we report only ADF test results here. This leads us to examine the cointegration between variables.

5.2. Results of Long Run Cointegration

Johansen Maximum Likelihood method is used to test for long run cointegration. According to the Johnson Maximum Likelihood test allowing for a linear deterministic trend in data with intercept and no trend or with intercept and trend, the null hypothesis of one cointegrating relationship between inflation and the right hand sight variables (in equation [1]) cannot be rejected at the 5% level, because the estimated statistic (is greater than the critical value in both the cases). Thus, suggesting a stable long run relationship between inflation and all the explanatory variables. Equation (1) is then estimated using Newey-West method to correct for autocorrelation and heteroscedasticity (Heij, et al., 2004). First difference of the variable is not used to avoid the potential loss of valuable information and obscure outcomes (Hsing, 2007).

Results are reported in Table 2. The variable of most importance to us real oil price in US$ is positive and significant in (1) and (2) estimated for the whole sample. In the first estimated model, column (1) of Table 2 both real effective exchange rate and deficit spending are insignificant therefore omitted in (2).

To answer our question about the influence of oil price on inflation, this model highlights a positive and significant relationship between inflation rate and international crude oil prices in US $ for Pakistan. Oil price coefficient (0.454) in column (2) of Table 2 shows that the influence of oil price on inflation is by a large degree (more than the price of any other raw material or other items in the CPI basket. It is because oil is not only consumed in the transport sector in Pakistan but it is also a major source of fuel used in electricity production. The association between inflation and oil prices is more or less the same in both equations, and also in support of existing research on the subject. However, coefficient value may be different from other studies. It is because of the difference in energy import dependency, oil intensity and energy intensity as discussed in Section 3.

Rest of the control variables in our equation, like interest rate and expected inflation are as expected. Tightening of monetary policy by the State Bank of Pakistan via increase in interest rates has a negative and significant influence on inflationary pressures in Pakistan. Similarly, expected inflation plays an important role in Pakistan. GDP growth is positive and highly significant implying higher inflation is caused by strong economic growth. That is, if an economy is growing too fast, which could lead to shortages because people are demanding products and services faster than they can be supplied, we would expect to see a higher inflation rate. Moves may then be made to slow GDP. Central Bank (i.e. State Bank for Pakistan) may increase interest rates to restrict borrowing. This would also help to control inflation because the effect would be less demand for goods and services. Another explanation is high growth rates of GDP leads to more employment. Thus, unemployment drops but this may cause labour shortages. This fall in unemployment puts upward pressure on wages which leads to higher inflation.

Results as reported in (1) and (2) indicates a strong relationship between oil price and inflation but when we look at Figure 6 this relationship seems to be weaker from 1986 to 1998. Therefore, following Hamilton's (1983) methodology, also followed by Jalles (2009) we performed the chow breakpoint test on equation (1), first we tested for a breakpoint on 1984-1985, (when there was a

Table 1: Unit root test ADF

Variables	Level			First difference		
	Without intercept	With intercept	With intercept and trend	Without intercept	With intercept	With intercept and trend
ADF test						
Inflation	−0.912	−4.347***	−4.469***	−8.204***	−8.172***	−8.134***
Oil price	−0.214	−1.425	−1.995	−10.050***	−10.013***	−10.197***
Interest Rate	−0.6304	−3.224**	−3.238*	−11.622***	−11.579***	−11.533***
REER	−2.085**	−2.009	−0.524	−8.185***	−8.265***	−8.462***
GDP growth	−1.043	−3.080**	−4.397***	−237.629***	−236.80***	−235.888***
Deficit GDP ratio	−0.332	−1.849	−3.081	−4.687***	−4.666***	−4.652***

*>10% critical value, **>5% critical value, ***>1% critical value, thus rejecting null hypothesis of having a unit root. ADF: Augmented dickey fuller

Table 2: Results of estimated equations

Dependent Variable: Percentage change in CPI, that is, inflation rate	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.546 (0.381)	0.531 (0.598)	7.576 (2.509)**	−2.835 (−2.497)**	−0.749 (−0.439)	7.275 (1.078)	−8.866 (−2.754)**
Oil price	0.566 (1.573)*	0.454 (1.880)*	0.042 (0.052)	1.267 (3.867)**	0.392 (1.591)*	0.058 (0.067)	1.390 (3.186)**
GDP growth	0.0189 (2.204)**	0.019 (2.847)**	−0.0002 (−0.0241)	0.027 (2.799)**	0.019 (2.889)	−0.0002 (-0.022)	0.028 (2.928)**
Expected Inflation	0.475 (5.215)**	0.483 (5.052)**	0.261 (2.673)**	0.513 (4.671)**	0.495 (5.243)	0.261 (2.681)**	0.522 (5.045)**
Interest rate	−0.162 (−2.859)**	−0.169 (−3.030)**	−0.181 (−2.337)**	−0.155 (−2.592)**	−0.168 (−2.243)**	−0.181 (−2.424)**	−0.142 (−2.410)**
REER	−0.004 (−0.999)		−0.027 (−2.541)**			−0.027 (−2.418)**	
Deficit	−0.939 (−0.106)		23.553 (3.267)**			23.545 (3.269)**	
Adjusted R^2	0.32	0.32	0.36	0.58	0.32	0.36	0.58

Results in column (1) and (2) are for the whole sample (1979-80Q1 to 2013-14Q3) and oil price variable is real oil price in US$; Column (3) is for sub-sample (1985-86Q1 to 1997-98 Q4) and column (4) is for sub-sample (1998-99 Q1 to 2013-14 Q3 and real oil price is in US $ in both cases. From (5) to (7) real oil price is in Pakistani Rupees. Value in parentheses is the t-statistics, **Significant at 5% or 1% critical level; *Significant at 10% critical level. CPI: Consumer price index, REER: Real effective exchange rate

clear collapse of oil prices)[13]. The chow breakpoint test provides evidence for the existence of a structural break in this point at the 1% significance level. Second, we estimate equation for the sample 1985-1986 Q1 to 2013-2014 Q3 and tested for the second breakpoint in 1997-1998 (when oil prices show a rising trend). Again, chow breakpoint test provides evidence for the existence of a structural break in this point at the 1% significance level. Both points can be verified in Figure 6.

Given this we re-estimated equation (1) for two sub-samples, 1985-1986 Q1 to 1997-1998 Q4 and 1998-1999 Q1 to 2013-2014 Q3. Results are reported in column (3) and column (4) of Table 2 respectively.

For the first sub-sample our regression results also confirms a weaker and insignificant association between oil price variable and inflation in Pakistan. In the literature it is argued that after the mid - 1980s, due to the nominal price decreases beginning in 1981 and wide swings, following the market collapse in 1985, the relationship between oil prices and macro-economy disrupted (Cuñado and Gracia, 2005).

However, in this sub-sample except for GDP growth rest of the variables are significant. Unlike the results for the whole sample, real effective exchange rate and deficit spending[14] have a strong and significant role to play for inflation in Pakistan unlike the previous cases when whole sample is selected. Negative coefficient of REER imply that if Pakistani Rupees depreciates against US dollars, its adverse impact on import prices is outweighed by the positive benefits on exports, thus having a negative impact on inflation (prior to 1998-1999).

For the second sub-sample, 1998-1999 Q1 to 2013-2014 Q3 results as reported in column (4), oil price has a strong influence on inflation unlike the previous sub-sample. Here, real effective exchange rate and deficit spending are omitted because they become insignificant and their omission does not make any difference in the overall significance of the model. Rest of the variables, GDP growth, expected inflation and interest rate are as expected, similar to when whole sample is selected (as reported in column [1] and column [2]).

The influence of oil price variable is much stronger and significant in the period 1998-1999 Q1 to 2013-2014 Q3 as compared to its behaviour in the sub-sample (1985-1986 Q1 to 1997-1998 Q4) because of the sharp increase in oil prices after 2004.

Next, we estimate equation (1) using real oil price measured in Pakistani Rupees, results are reported in column (5) of Table 2. Results are exactly similar to column (2) when oil prices are in US$. Similarly, for the sub-samples, 1985-1986 Q1 to 1997-1998 Q4 and 1998-1999 Q1 to 2013-2014 Q3 results are reported in column (6) and (7) respectively. Results are exactly similar to when oil prices are in US $. For the whole sample and second sub-sample, insignificant variables are omitted, as it has no effect on other results.

5.3. Asymmetry in Oil Price Variable

In this sub-section we investigate asymmetry in terms of the relationship between different oil price specifications and inflation. Results are reported in Table 3. Column (1) is for the whole sample and column (2) and column (3) are for two sub-samples 1985-1986 Q1 to 1997-1998 Q4 and 1998-1999 Q1 to 2013-2014 Q3 respectively. Similar pattern of samples is kept in the remaining columns with different oil price specifications.

First we define oil price as NOPI4 allowing for asymmetric effects of oil price increases, and find a positive association between NOPI4 and inflation in all the three samples i.e. as reported in column (1) to (3). This implies that the conversion of rising oil prices into higher inflation through higher energy costs depend on their continuity. That is, if they continue to rise, there are more chances for them to translate into sustained increases in the overall price level, that is, overall inflation rate in Pakistan.

Second we define oil price as ΔOp_t, i.e., quarterly changes of real oil prices. Results as reported in column (4) to (6) for the three samples indicates that real oil price change matters to inflation only after 1997-1998. It may be because of the sharp increase in oil price in this period. In the other two cases coefficient of real oil price change become insignificant.

Finally, following Mork (1989) and Mork et al. (1994) we enter in the same equation real oil price increases (ΔOp_t^+) and decreases (ΔOp_t^-) as separate variables determining inflation rates (results are reported in column [7] to [9] in Table 3). Contrary to the existing evidence, results for Pakistan confirm a positive effect of oil price decrease but only in the second sub-sample (1998-1999 Q1 to 2013-2014 Q3). For oil price increase, coefficient is insignificant regardless of which sample is selected. One possible explanation for this result could be: When oil prices started rising in 2000s, in order to protect consumers from the impact of high prices government capped domestic sale prices of petroleum products on many occasions via making adjustments in petroleum development levy to absorb the impact of increase in international price, thus loss to government revenue. In addition, the government introduced a price differential claim to reimburse oil companies for the subsidy to consumers (Malik, 2010). But at the same time, results are in contradiction with the existing evidence, so it is difficult to conclude robustly for this oil price specification for Pakistan.

Briefly, for Pakistan oil price variable NOPI4 performs better as compared with other oil price specifications[15]. It is significant irrespective of which sample is selected. It means small oil price fluctuations does not matter much for inflation in Pakistan but only when they continue to rise it does matter. Rest of the variables, irrespective of which oil specification is used, performed in the same manner as reported in Table 2 with respect to inflation in all cases.

13 Due to Saudi Arabia and studies have pointed mid-1980s as break- point in the way economic agents react to oil prices (cited from Jalles, 2009).

14 Pakistan had experienced high fiscal deficit in this period.

15 For France, NOPI4 also performs better as compared to other specifications (Jalles, 2009).

Table 3: Results of estimated equations

Dependent variable: Percentage change in CPI, that is, inflation rate	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	1.953	7.537	−3.834	2.126	7.713	−2.378	2.199	8.185	−1.198
	(3.102)**	(4.384)**	(−1.659)	(3.299)**	(3.735)**	(−1.027)	(3.310)**	(4.007)**	(−0.518)
NOPI4	0.091	0.134	0.088						
	(1.816)*	(1.812)*	(1.619)*						
Oil price change				0.638	−0.056	2.948			
				(0.696)	(−0.049)	(1.976)**			
Real oil price increase							0.045	1.333	0.233
							(0.045)	(0.517)	(0.264)
Real oil Price Decrease							0.829	−1.089	4.197
							(0.854)	(−0.953)	(3.002)**
GDP growth	0.018	−0.0004	0.029	0.019	−0.0003	0.033	0.0198	0.0002	0.036
	(2.892)**	(−0.042)	(3.263)**	(2.772)	(−0.026)	(2.945)**	(2.776)**	(0.020)	(2.896)**
Expected Inflation	0.482	0.219	0.692	0.523	0.263	0.831	0.525	0.248	0.843
	(5.027)**	(2.009)**	(6.657)**	(4.535)**	(2.641)**	(5.622)**	(4.490)**	(2.479)	(5.609)**
Interest rate	−0.155	−0.167	−0.163	−0.156	−0.183)	−0.127	−0.157	−0.184	−0.115
	(−3.087)**	(−2.462)**	(−2.799)**	(2.772)**	(−2.427)**	(−2.425)**	(−2.814)**	(2.479)**	(−2.183)**
REER	−0.00001	−0.027	0.055	−0.001	−0.027	0.036	−0.002	−0.032	0.025
	(−0.005)	(−2.464)**	(2.287)**	(−0.447)	(−2.099)**	(1.427)	(−0.512)	(−2.412)**	(0.986)
Deficit		22.982			23.607			23.859	
		(3.257)**			(3.249)**			(3.252)**	
Adjusted R^2	0.32	0.38	0.50	0.29	0.36	0.53	0.29	0.35	0.52

Results in column (1), (2) and (3) are for the whole sample (1979-80Q1 to 2013-14Q3), and two sub-samples (1985-86 Q1 to 1997-98Q4) and (1998-99 Q1 to 2013-14 Q3) respectively. Similar pattern of samples is followed in the rest of estimated models with different oil specifications. Value in parentheses is the t-statistics; **Significant at 5% or 1%critical level, *Significant at 10%critical level. CPI: Consumer price index, REER: Real effective exchange rate

6. CONCLUSION

This paper analyses oil price-inflation relationship for Pakistan over the period 1979-1980 Q1 to 2013-2014 Q3. The association of oil prices and inflation depend on how important oil is in the economy. Oil is the second main source in the energy landscape of Pakistan in terms of consumption demand. With almost a constant rate of its production Pakistan is heavily dependent on oil imports. With almost constant energy intensity for the last four decades and energy dependency of around 33%, strong volatility in international crude oil prices have serious implications for inflation rates in Pakistan.

Using an augmented Phillips curve framework we estimate the effects of oil prices on inflation rates in Pakistan. We supplement the traditional Phillips curve approach by taking into account the growing body of empirical evidence suggesting that oil prices may have asymmetric effects on inflation and that structural instabilities may exist in those relationships. We allow for breakpoint testing for structural changes. As a consequence of these testing we estimated models for the whole sample a well as for two sub-samples, 1985-1986 Q1 to 1997-1998 Q4 and 1998-1999 Q1 to 2013-2014 Q3. Results highlight a strong oil prices-inflation relationship after 1997-1998.

Second, we chose to carry out estimation with alternative specifications of oil prices to allow for asymmetries in oil prices. Our results suggest a strong oil price-inflation relationship. Secondly, our results indicate the importance of only one oil price specifications, that is, NOPI4. It is the continuity in rising oil prices that has a significant role in setting inflationary trends in Pakistan even after taking care of structural instabilities. Although oil price decrease (ΔOp_t^-) is found to be statistically significant after 1997-1998, but in this period oil price increase (ΔOp_t^+) is insignificant. It is the period when oil prices have increased substantially. The other two oil price specifications are statistically significant in this period. So it is difficult to reach a robust conclusion for this oil price specification.

Pakistan like almost all other oil importing countries in the world is quite vulnerable to oil price volatility. But the evidence for the developed countries is slightly different. In developed countries recent oil price increases have weaker effect on inflation as compared to 1980s. In these countries, besides reduction in oil intensity, central bank fights harder to keep the inflation rates in check. Further, the competition in product markets has slowed down the extent to which oil prices and wage effects can be passed on to consumers (Leblanc and Chinn, 2004; Kinnefors and Wribe, 2006; and Jalles, 2009).

Therefore, for Pakistan, an apt macroeconomic response to higher oil prices is required. The role of macroeconomic policies should help in making adjustments to demand and supply and to protect against inflationary pressures. For net oil importers in the developing world, the government cannot completely eliminate the adverse impact of oil price shocks but suitable policy response can minimise it (Asian Development Bank, 2005).

Given foreign exchange implications of oil importation, oil prices demand strict measures to promote efficiency in the usage of oil products on priority basis. Efficiency in the use of energy is the cost-effective response to high energy prices. Efficiency in the use of energy can produce considerable improvements in supply in Pakistan, thus reducing reliance on imports. Energy intensity

in Pakistan is more than double to that of the world average and more than five times to that of Japan and the UK. Furthermore, for each dollar of GDP Pakistan consume 15% more energy than India and 25% more than the Philippines. The energy saving potential of Pakistan is estimated to be around 11.16 MTOE (Malik, 2012).

In Pakistan, liquid fluids are primarily used in the transport sector and power sector. There is a need to improve efficiency in the use of petroleum products in these sectors. In addition, transport policy can play an important role in influencing future oil dependency and energy efficiency. Decisions about investments in road and rail infrastructure, urban transportation systems, vehicle taxation, etc., all may have an influence on demand for and dependence on oil.

Further, we have plenty of untapped hydropower and coal resources. But they are facing political, administrative, security and financial issues. There completion can enhance cheap energy capacity and reduce reliance of power sector on oil in Pakistan. Undoubtedly, Pakistan should continue the strategy (of fuel switching from oil to gas) but at the same time exploration of new oil and gas resources cannot be ignored[16]. Similarly, cross-border natural gas pipeline development cannot be ruled out.

Energy security concerns as well as the objective to have clean and affordable energy for all in Pakistan demands reduction in the use of fossil fuels either through better conservation strategies or through dependence on non-fossil fuels. In Pakistan, despite having a significant potential of renewable energy, least importance is given to these environment friendly sources of energy in our growth strategies. Undoubtedly, we have plans and policies in place but lacked in the capacity to take appropriate decisions and timely implementation of those decisions. The renewable sector demands substantial private investments to materialise the potential of renewables for supplying a clean and modern energy.

REFERENCES

Abeysinghe, T. (2001), Estimation of direct and indirect impact of oil price on growth. Economic Letters, 73(2), 147-153.

Asian Development Bank. (2005), The Challenge of High Oil Prices. Asian Development Outlook Update. Manila: Asian Development Bank. Available from:http://www.adb.org/sites/default/files/publication/27712/adu2005part3.pdf.

Bacon, R., Kojima, M. (2006), Coping with High Oil Prices. ESMAP Report 323/06. Washington, DC: The International Bank of Reconstruction and Development/The World Bank.

Balke, N.S., Brown, S.P.A., Yücel, M.K. (2002), Oil price shocks and the U.S. economy: Where does the asymmetry originates? The Energy Journal, International Association for Energy Economics, 23(3), 27-52.

Barsky, R.B., Kilian, L. (2004), Oil and the macroeconomy since the 1970s. Journal of Economic Perspectives, 18(4), 115-134.

Bruno, M., Sachs, J. (1982), Input Price Shocks and the Slowdown in Economic Growth: The Case of UK Manufacturing. NBER Working Paper Series, Working Paper No. 851.

Cavallo, M. (2008), Oil Prices and Inflation. FRBSF Economic Letter, No. 2008-31, October, 03, 2008. San Francisco: Federal Reserve Bank.

Cuñado, J.F, Perez de Gracia (2005), Oil prices, economic activity and inflation: Evidence for some Asian countries. The Quarterly Review of Economics and Finance, 45(1), 65-83.

Federer, J.P. (1996), Oil price volatility and macroeconomy. Journal of Macroeconomics, 18(1), 1-26.

Fuhrer, J.C. (1995), The Phillips Curve is Alive and Well. Boston: New England Economic Review of the Federal Reserve Bank. p41-56.

Gisser, M., Goodwin, T.H. (1986), Crude oil and the macroeconomy: Tests of some popular notions. Journal of Money, Credit and Banking, 18(1), 95-103.

Gordon, R.J. (1997), The time-varying NAIRU and its implications for economic policy. Journal of Economic Perspectives, 11(1), 11-32.

Guo, H., Kliesen, K.L. (2005), Oil price volatility and US macroeconomic activity. Federal Reserve Bank of St. Louis Review, 86(6), 669-683.

Hamilton, J.D. (1983), Oil and the macroeconomy since world war II. Journal of Political Economy, 91(2), 228-248.

Hamilton, J.D. (1996), This is what happened to oil price-macroeconomy relationship. Journal of Monetary Economics, 38(2), 215-220.

Hamilton, J.D. (2003), What is an oil shock? Journal of Econometrics, 113(2), 363-398.

Hamilton, J.D. (2008), Understanding Crude oil Prices. NBER Working Paper Series, Working Paper No. 14492.

Heij, C., Boer, P., Franses, P.H., Kloek, T., Dijk, H.K. (2004), Econometric Methods with Application in Business and Economics. Oxford: Oxford University Press. p360.

Hooker, M. (2002), Are oil shocks inflationary? Asymmetric and nonlinear specifications versus change in regime. Journal of Money, Credit and Banking, 34, 540-561.

Hooker, M.A. (1996), What happened to the oil price-macroeconomy relationship? Journal of Monetary Economics, 38(2), 195-213.

Hsing, Y. (2007), Impacts of higher crude oil prices and changing macroeconomic conditions on output growth in Germany. International Research Journal of Finance and Economics, 11, 134-140.

Huang, B.N., Hwang, M.J., Peng, H.P. (2005), The asymmetry of the oil price shocks on economic activities: An application of the multivariate threshold model. Energy Economics, 27(3), 445-496.

Huntington, H.G. (1998), Crude oil prices and U.S. economic performance: Where does the asymmetry reside? The Energy Journal, 19(4), 107-132.

IMF. (2008), Pakistan 2007. IMF Country Report No. 08/21. Washington, DC: International Monetary Fund.

IMF. (2014), Pakistan. IMF Country Report No. 14/357. Washington, DC: International Monetary Fund.

Jalles, J.T. (2009), Do oil prices matter? The case of a small open economy. Annals of Economics and Finance, 10(1), 65-87.

Jbir, R., Zouari-Ghorbel, S. (2008), Recent oil price shock and Tunisian economy. Energy Policy, 37(3), 1041-1051.

Kahn, G.A.Jr., Hampton, R.Jr. (1990), Possible monetary policy responses to the Iraqi oil shock. Federal Reserve Bank of Kansas City Economic Review, 2, 19-32.

Kemal, A.R., Arby, M.F. (2004), Quarterisation of Annual GDP of Pakistan. Statistical Paper Series No. 5. Pakistan: Pakistan Institute of Development Economics.

Kinnefors, A., Wribe, L. (2006), Inflationary Effects of Changes in the Price of Oil: The Case of Sweden. Available from: http://www.diva-portal.org/smash/get/diva2:4476/FULLTEXT01.pdf.

Kumar, S. (2005), The Macroeconomic Effects of Oil Price Shocks: Empirical Evidence for India. SSRN Working Paper Series, No. 900285.

16 Pakistan has huge gas potential. Roughly around 29 Trillion Cubic Feet (TCF) of gas has remained to be discovered. Similarly, over 50 TCF of Shale Gas in the lower Indus Basin (and approximately 150 TCF in the whole Indus Basin excluding Baluchistan and KPK regions) remains to be exploited because of missing policy incentives, absence of geological data and lack of know-how and technologies.

LeBlanc, M., Chinn, M.D. (2004), Do High Oil Prices Presage Inflation? The Evidence from G-5 Countries. Working Paper Series from Centre for International Economics, UC Santa Cruz. Available from: http://www.esholarship.org/uc/item/9rr929sm.pdf;origin=repeccitec.

Lee, K., Ni, S., Ratti, R.A. (1995), Oil shocks and macroeconomy: The role of price variability. The Energy Journal, 16(4), 39-56.

Lescaroux, F., Mignon, V. (2008), On the influence of high oil prices on economic activity and other macroeconomic and financial variables. Working Paper No. 2008-05, April, CEPII.

Malik, A. (2010), Oil prices and economic activity. South Asia Economic Journal, 11(2), 223-244.

Malik, A. (2012), Power Crisis in Pakistan: A Crisis of Governance? PIDE Monograph Series 2012. Islamabad, Pakistan: Pakistan Institute of Development Economics.

Mork, K.A. (1989), Oil and the macroeconomy when prices go up and down: An extension of Hamilton's results. Journal of Political Economy, 97(3), 740-744.

Mork, K.A., Olsen, O., Mysen, H.T. (1994), Macroeconomic responses to oil price increases and decreases in seven OECD countries. The Energy Journal, 15(4), 19-35.

O'Brien, D., Weymes, L. (2010), The impact of oil prices on Irish inflation. Quarterly Bulletin (Central Bank of Ireland), 3, 66-82.

Pesnani, R., M. Saleem and S. Rahooja (2008), _Fuel Price Trends: An Analytical Review_. Available at http://www.sbp.org.pk/departments/ihfd/OilPriceAnalysis. [Last accessed on 2016 Aug 30].

Sadorsky, P. (1999), Oil price shocks and stock market activity. Energy Economics, 21(5), 449-469.

State Bank of Pakistan. (2015), Monetary Policy Statement, January, 2015. State Bank of Pakistan, Karachi, Pakistan.

Stuber, G. (2001), The changing effects of energy price shocks on economic activity and inflation. Canada: Bank of Canada Review. 2001.

Tatom, J.A. (1988), Are the macroeconomic effects of oil price changes symmetric? Carnegie–Rochester Conference Series on Public Policy, 28, 325-368.