# Energy economics

Economics

In Pakistan, besides making adjustments at the macro level, what is required is to make rational choices about the development of energy mix for he future to reduce the risk of oil price fluctuations in the global energy market. JELL: Energy Economics By Backslashes Introduction Oil prices have risen continuously since 2003 reaching a peak of SIS$ 137/Bibb in July 2008, but after that a declining trend has set in. In general, oil prices have always remained fairly volatile. Since sass it was the fifth main negative oil shock.

These oil price shocks in general, and the recent surge of sass in particular, have become a grave concern for the developing economies. Economists around the world are apprehensive about its potential adverse impacts in terms of creating inflationary erasures in the economy, increasing budget deficit and balance of payment problems. 2 Fall Mali is Senior Research Economist, Pakistan Institute of Development Economics, Islamabad. Email: [email protected]Com 224 Pakistan with a population of nearly 160 million has been on the path of rising GAP growth in the past few years.

But since the last fiscal year, the situation has changed. The upward trend in oil prices which continued for at least five years is regarded as one of the contributory factors. In the energy mix for the year oil accounts for 29 per cent of the total energy used in Pakistan. Although the intensity with which oil is used in total energy consumption has declined in the last few years but still it is the second largest source of energy used after natural gas, which accounts for 40 per cent.

As far as the energy intensity is concerned, it has remained almost constant since 1990-91 (that is, 1 per cent), despite the fact that the decrease in

energy intensity is considered as the most promising route for reducing vulnerability to oil shocks (Bacon 2005). 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) (Figure 1).

Almost 82 per cent of the demand for petroleum products in the country is met through imports. Pakistan spent almost 57 per cent of export earnings on oil imports in (Government of Pakistan 2008). Therefore, the international oil price Figure 1. Pakistanis Oil Production and Consumption, Thousand Barrels per Day (1990-91 to 2007-08) Source: Pakistan Energy Year Book (various issues), published by Hydro Carbon Development Institute of Pakistan, Ministry of Petroleum and Natural Resources, Government of Pakistan. HTH Cast Economic journal, 1 1, 2 (2010): 223-244 225 fluctuations have a direct bearing on the macro economy of the country, especially on the oil price-GAP relationship. The share of net oil imports in GAP has increased substantially from -3. 13 in 1990-91 to -7. 43 in 2007-08. 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. The goal in this article is, therefore, to shed light on the nature of the impact of oil shocks on the macroeconomic conditions of Pakistan.

First, this article will analyze the impact of oil price on the output growth of Pakistan using the open economy IS function along with the monetary policy function, assuming the positive role of the State Bank of Pakistan (prepare monetary policy) to sustain price stability and output growth. Second, this study will examine the non-linear relationship between oil prices and output.

If there exists a non-linear relationship then what is the critical value or threshold level after which it becomes negative.

The article is organized as follows : introduction is followed by the discussion on theoretical linkages and an overview of empirical literature. Pakistanis macroeconomic situation with reference to oil prices is discussed in the third section. In the fourth section, the methodology and data are explained. In the fifth section empirical results are analyzed. The sixth section reflects on some policy implications drawn from the findings. Final section is the conclusion. Theoretical and Empirical Background Theoretical Linkages Higher oil prices are expected to affect a macro economy through various channels.

Oil price increase leads to a transfer of income from importing to exporting countries. It changes the balance of trade between countries and exchange rates. Net oil-importing countries normally experience deterioration in their balance of payments, putting downward pressure on exchange rates if the amount of oil imports and other factors remain the same. At a given exchange rate, more domestic output is needed to pay for the same volume of oil imports. If the domestic currency depreciates in response to induced payments deficits, this further cuts the purchasing power of domestic income over imported goods.

Since important trading partners are also likely to suffer income losses, slower growth of external demand exacerbate these direct impacts. Higher oil prices have an oppressive tendency on the supply side as well. Since oil is used as an input in the production process, rising input costs means lower

profits for producers. Lower profits may then result in the decline in investment spending. In addition, petroleum products are used to generate electricity and in the transport sector. Thus, when prices of petroleum products go up, transport 226 costs and electricity bills will also go up accordingly.

This leads to inflation, reduce non-oil demand and lower investment in net oil-importing countries. Lower investment spending will in turn have a significant impact on employment and output. It would reduce real wealth and consumption spending. Moreover, tax revenues go down and the budget deficit goes up owing to the rigidities in government expenditure. Increase in budget deficit would then compel interest rates in the upward direction. 5 Fiscal imbalances would be aggravated in those developing countries that provide direct subsidies on oil products to protect poor households and domestic industry. The burden of subsidies tends to grow as international prices rise, adding to the pressure on government budgets and increasing political ND social tensions. An alternate explanation available in the literature is that it is not the rise in oil price that reduces the economic activity, but the response of the monetary policy to the oil price shock (Barky and Killing 2004). In addition, the adverse impact of higher oil prices on oil-importing developing countries is generally more evident for highly indebted countries (EIA 2004).

Overview of Empirical Literature Oil price shocks have received considerable importance in the empirical literature. Oil prices are generally viewed as an important source of economic disturbances, for he reason that the oil shocks of mid- and late-sass were followed by low growth, high unemployment and

high inflation in most of the developed countries. However, on the contrary, GAP growth and inflation had remained relatively stable in much of the industrialized world after the shocks of late-sass and of 2000 (although they were of the same size and magnitude comparable to sass) (Blanchard and Gal. 2007).

But the situation remained sound only until 2007; 2008 has witnessed a worse recession around the developed world, especially in the US, in confirmation with what had happened after sass' oil shock. Although on the empirical side Hamilton (1983) pioneered the literature on the subject, theoretically it was Bruno and Cash' (1982) study that has analyzed in detail the effects of oil prices of the sass on output and inflation.

They took the case of I-J manufacturing and developed a theoretical model and concluded that higher input prices have played a significant role in the slowdown since 1973 throughout the Organization for Economic Co-operation and Development (COED) countries. Hamilton (1983) empirically establishes a negative relationship between oil prices and macroeconomic variables. Hamilton in a series of studies on the subject (in 1983, 1996 and 2003) established a vital role of oil price increase in most of the US recessions. He has stressed on the importance of oil prices on the macroeconomic activities.

Later on many researchers further supporting and extending on Hamiltonians earlier work, while using different estimation procedures 227 impact of an oil price increase on the behavior of different macroeconomic variables (for example, Feeder 1996; Kisser and Goodwin 1986; Sounder and Bartlett 2007; Guy and Kitties 2005; Hung et al. 2005; 2007, 2008; Lee al.

1995; Moor 1989). The focus in most of these studies was on the developed countries. They reiterated the possibility of adverse impact of rising oil prices on economic growth in these countries.

These studies present numerous theoretical perspectives on the oil price shock hypothesis, as well as empirical evidence on the impact of oil shocks on the growth, through both direct and indirect channels (Feeder 1996). In addition, it has been shown that there is an asymmetric relationship between oil price shocks and economic recession, and whether or not it depended on other variables (Lee et al. 1995; Saddlers 1999). The implication of this literature is that indirect transmission mechanisms may be the vital source through which oil price shocks have macroeconomic impacts.

Some studies have established that the increase in oil price led to a decline in GAP while the decrease in oil price does not stimulate the economic activity (Moor 1989; Moor et al. 1994). Similarly, Hooker (1996) challenged Hamiltonians 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. He found that oil prices do Granger cause a variety of US agronomic variables in data up to 1973 but not in the data afterwards.

Oil prices were exogenous before 1973, but not afterwards. Hung et al. (2005) empirically investigated the threshold level and concluded that the change or volatility in oil price above that level better explains its impact on economic activities. While Hissing (2007, 2008) derived the critical value of oil price above which its impact on output becomes negative. Most of the

earlier studies concerning oil price shocks and volatility and economic activities have been conducted in the context of developed economies.

Research concerning the impact of oil price volatility in the context of developing countries is very limited and quite recent. 7 Raffia et al. (2008) estimated the impact for Thailand; Kumar (2005) for India; Canada and Garcia (2005) for six Asian countries including Thailand, Singapore, South Korea, Malaysia, Philippines and Japan; Jibe and Aquaria-Corbel (2008) for Tunisia; and Abscessing (2001) for Association of South East Asian Nations (SEAN), including NINE (newly industrialized economies) and COED countries.

These studies have also confirmed the negative impact of real oil prices on output and other macro variables, using different theologies, in linear and non-linear specifications controlling for asymmetries in the oil price data. In general, empirical literature has suggested that oil-importing economies are negatively affected by oil price increases. The extent to which the economies are usually hurt depends on the specific structure of different economies but as far as Pakistan is concerned no serious attempt has been made so far to empirically understand the impact of oil prices.

To my knowledge, this is the first in- depth study analyzing the direct impact of oil price shocks for Pakistan. South Asia Economic journal, 1 1, 2 (2010): 223-244 28 Pakistanis Macroeconomic Situation Before discussing methodology and empirical results, this section will examine how the macro economy of Pakistan has behaved in the last couple of years, focusing on its capacity to withstand the rising prices of 011. 8 Output Growth The economy

of Pakistan has shown a high growth trend (for the last five years) (Table 1), resulting in a substantial increase in the demand for energy.

It is somehow difficult to identify the factors that have been responsible for the high growth in Pakistan in the presence of high oil prices. One of the reasons could be that the nonusers have been shielded by limiting the direct pass through of international price to domestic oil price via adjusting petroleum development levy (PDP). In addition, the extensive use of fuel subsidies in the form of price differential claim (PDP) was helped by strong foreign reserves position until in other words, it may have contained output losses in the high growth years.

In addition, the continued strong performance of the services sector and on the demand side the consumption expenditure had proved to be the main source of GAP growth in those years; here credit flow to the private sector in the form of consumer financing played significant role. 9 But since situation has started changing. Private credit is showing a downward trend (Table 1), credit to small and medium enterprises also declined, given high interest rates, because of monetary tightening and undocumented trade (Khan 2008). Foreign exchange reserves also declined.

All these factors had an adverse impact on the GAP growth in Further, the high price of oil in the international market and declining volumes of exports along with private transfers in resulted in the current account deficit equal to 8. 4 per cent of GAP, which was in surplus until 2003-()4? 1. 8 per cent of GAP (Table 1). The overspent consumed its budgetary target of bank borrowing (PACK 130 billion) by January 2008, much earlier than the

targeted time, and the utilization of public sector development programmer (STEPS) remained significantly lower than the allocated. 0 In short, in the beginning of oil price shock, GAP might have grown in Pakistan given the domestic policy relaxations, but the situation has changed since Fiscal Development pursuing a sound fiscal policy. The fiscal deficit declined to the level of only South Cast Economic journal, 11, 2 (2010): 223-244

Private credit (growth rate) Average ICP increase (per cent) Terms of trade (1990-91 = 100) Exports in SIS$ (growth rate) Imports in SIS$ (growth rate) Trade balance (SIS$ billion) Current account including official current transfers (in terms of GAP) in per cent Foreign exchange reserves (billion SIS$) Petroleum taxes (custom duty, excise & sales tax) (in billion PACK) Petroleum development surcharge (in billion PACK) Revenue as a percentage of GAP Surplus as a percentage of GAP Total debt (% growth) Debt-GAP ratio (%) source: MIFF (2008) and state sank of Pakistan (2008). Ere cent of GAP in but since then it is rising and reached to the level of- 7. 4 per cent of GAP in (Table 1). In the government could not keep the fiscal deficit within the projected limits because of freezing domestic oil and electricity prices besides slow growth in revenue. The high ratio of tax revenue to GAP is needed to reduce fiscal deficit. For Pakistan, revenue GAP ratio as shown in Table 1 is not very encouraging. Moreover, rapidly growing economies generally experience more rapid growth of non-oil taxation, and hence are better able to withstand the fiscal impacts of a less than fully passing on of international oil price increase.

In Pakistan, non-oil taxation is more or less the same for the last few years. While on the other side, fuel taxes have important revenue implications for

Pakistan. 11 Taxes on petroleum products are the largest source of indirect revenues in Pakistan. Petroleum product prices are higher than the import parity price because while this share was only 12 per cent in 2000-01 (Table 1). 12 Moreover, rising current account deficit and a large fiscal deficit has increased the stock of total debt and liabilities by 27 per cent from PACK 5, 046. 4 billion in to PACK 6, 426. 4 in (Table 1). Domestic and external debt rose by 25. 6 per cent and 28. Per cent, respectively, in In addition, debt-GAP ratio which declined consecutively from 97. 7 per cent, in 2000-01 to 57. 9 per cent in goes up again to 61. 3 per cent in (Table 1). Inflation and Monetary Policy Despite the fact that the government showed reluctance in full passing on of oil price increase, high oil prices has become an important factor (along with rising house rents and shortage offooditems) contributing to high inflation in Pakistan in the past few years. General price level (for virtually all goods and assets) has been increasing 9. 3 per cent in considerably very high compared to the previous years).

In and average inflation was near 8 per cent (Table 1). However, regardless of monetary tightening 3 (high interest rates) by the State Bank of Pakistan, average inflation Jumped to 12 per cent in This Jump in inflation can surely be attributed to the modernization of fiscal deficit (7. 4 of GAP), which reached 25 per cent in October 2008. Balance of Payments Our petroleum imports account for 27 per cent of total imports (and represented up to 57 per cent of export earnings) in In 1999-2000 the share of petroleum imports was 27 per cent of total imports and accounted for 33 per cent of total export earnings.

Improving terms of trade would mean that a smaller South Asia Economic Journal, 11, 2 (2010): 223-244 231 volume of exports would be needed to pay for a given quantity of imports. For Pakistan this ratio, however, is decreasing (Table 1), that is, more exports are needed to offset the burden of rising import bill. The government, however, has failed to improve the export performance. On the other hand, significant increase in imports has negatively impacted on the trade deficit. Pakistanis trade deficit has increased substantially in the last couple of years, from SIS$ 1. 5 billion in 2000-01 to SIS$ 20. 2 billion in (almost 45 per cent growth). Imports of petroleum products (in value terms) in the fiscal year have also registered a sharp increase, nearly 47 per cent (substantial increase in furnace oil import, largely for electricity generation purpose). The imports of crude oil which declined in again went up by 40 percentage points (Government of Pakistan 2008).

As discussed last few years, external financial sector (that is, remittances, US aid and foreign inflows from FAD) has shown a solid performance until It helped the overspent in the maintenance of the fiscal situation. However, this was only for a short term. The government extensively utilized this facility but had not made substantial efforts to explore other options to reduce trade deficit or explore areas that would have decreased its fiscal burden. Furthermore, Pakistanis exchange rate after remaining stable for the last four years has depreciated sharply by 1 1. Per cent in The loss in the value of rupee can surely be attributed to a combination of rise in the current account deficit, fall in the financial inflows and increase in political disturbances (State Bank of Pakistan 2008). Methodology and Data Issues

This study will examine the impact of crude oil price fluctuations on output growth for Pakistan using an open economy IS function, an extended monetary policy function and augmented Phillips curve, including real effective exchange rate, debt- GAP ratio and real foreign exchange reserves. The macroeconomic model to be estimated for Pakistan is specified as follows: Y = f(Y, l, G, R, S, ?, Pop, D, F) Open Economy IS Function, I = f (II-a, Y - p, ? -6, I t) Monetary Policy Function, n = n e + NY - B ? + pop) Augmented Phillips Curve, where Y = real GAP I = real interest rate G real government spending R = real government revenue South Asia Economic 232 S = real stock price D = real total debt ? = real effective exchange rate (ERE) Pop = real crude oil price per barrel F = real foreign exchange reserves = real world interest rate n = inflation rate Tie = expected inflation rate a = target inflation rate potential output 6 = target real effective exchange rate B, N, p = positive parameters Applying the implicit-function theorem and solving for three unknowns, Y, I and n, equilibrium output is given by Y = F(Pop, G, R, S, ?, I t, D, F, n e; a, p, 6, N B, p) (1) By assuming that with the increase in real crude oil price, aggregate spending (or output) may or may not decline.

In other words, to check if the relationship between oil prices and output is linear or non-linear, a quadratic function for the real oil price will be used. If the relationship is non-linear then we expect the coefficient of the squared term to be negative. With the rise in oil price inflation rate is expected to increase, Central Bank (that is the State Bank of Pakistan) is expected to raise real interest rate, which would lower aggregate spending. Further, government deficit is expected to increase. The impact of deficit spending is

expected to be negative if deficit crowds out public saving and resource inflow encourages corruption and resource outflow (Squid and Mali 2001). Rise in the crude oil price is going to output.

As discussed earlier, rising current account deficit and a large fiscal deficit as a consequence of rising price of crude oil in the global market has increased the stock of total debt and liabilities in Pakistan. At the same time, the existence of foreign exchange reserves can help sustain the impact of rising oil price thus having a positive impact on output. A higher real stock price is expected to cause households to increase consumption spending because of the wealth effect and business firms to increase investment spending (Hissing 2007). As an alternative to real stock price, real gross capital formation is used in this study and is expected to have a positive effect on real output.

Another channel through which oil prices can induce changes in real economic activity is through the exchange rates. Depreciation of Pakistani rupees is expected to have a negative influence on the real economic activity. The selection of oil price variable is difficult as well as important. Some of the empirical studies analyzing the impact of oil price shocks have used world price 233 of crude oil (in SIS$) divided by the Consumer Price Index in the US (for example, Sounder and Bartlett 2007; Hissing 2007), while some have used world oil price converted into respective country's currency by means of the market exchange rate (for example, Abscessing 2001; Moor et al. 1994).

The main difference between the two oil prices is that 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 inflation levels. Some of the studies have used both the 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 (for example, Canada and Garcia 2005; Kumar 2005). In this article, both oil price variables are used alternatively, that is, real crude oil price equal to the nominal world crude oil price per barrel divided by the Consumer Price Index in the US.

Also, nominal world oil price converted into local currency deflated by the domestic Consumer Price Index. Figure 2 shows the movement of both the real oil prices (in US $ and in Pakistani rupees [PACK]). Except for the period 1980-85 (where may be as a result of high domestic prices) both the series have shown the effects of the oil shocks of 1990, 1999-2000 and 2003-04 onwards, as well as the sharp fall in the oil price after the market collapsed in 1986 and in 1998-99. The correlation coefficient between oil prices in PACK Figure 2. Real Oil prices in US$ and Pakistani Rupees Source: International Financial Statistics Database, International Monetary Fund. Note: 01 is oil prices in SIS$ and 03 in domestic currency.