The Effects of Oil Price Shocks on Monetary policy in Iran

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ABSTRACT

Changes and increases in the price of oil are effective on the aggregate economic. So, it's important to study on oil price shocks, because they affect on economic growth& monetary policy.
In this paper a structural and generalized VAR modeless has been considered for Iran in order to study the direct effects of oil price shocks on output and prices and reaction of monetary variables to external shocks over the period 1991:I–2008:I (1370:I_1386: IV). Empirical analysis shows that inflation rate increase and exchange rate decrease and gross domestic product has fluctuations.

Keywords: Oil price shocks, monetary policy

JEL: E31, E32

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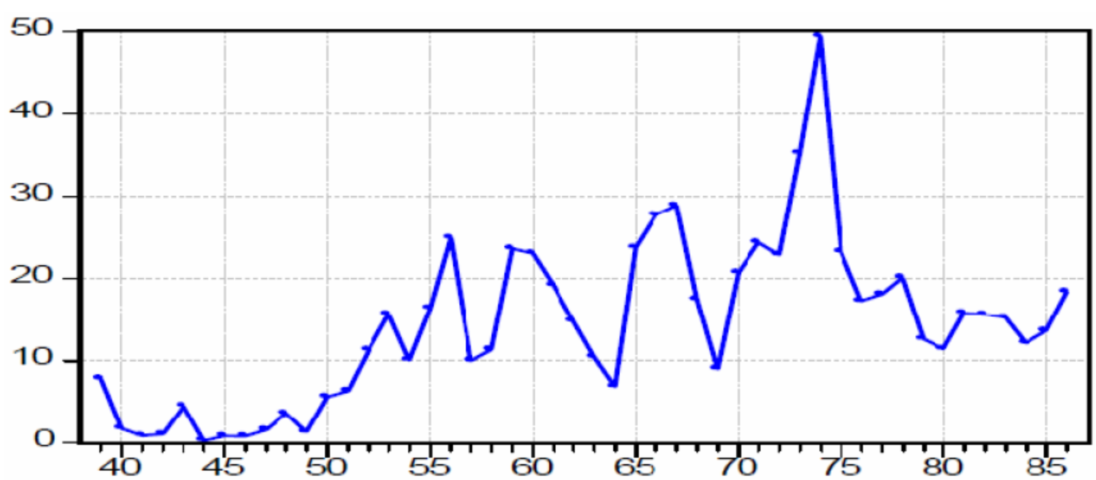
INTRODUCTION

Among the shocks related to supply process, the shock of oil price is one of the most important factors that have affected the world economy since 1970s. (Abrishami and other (2006)). Increase in the oil price during recession, escalation in the rate of unemployment and inflation, and aggravation in the budget deficit problems, have affected many oil importer Countries Yet, on the other hand the mark-up on oil in an oil producing country like Iran, leads to increase in the State revenue and helps the government pursue and go on with its development projects; although, since Iran is contented with selling crude oil, and it imports commodities and oil products from other Countries, this will lead to increase in the price of the oil products as a result of mark-up on crude oil.

However, capability of the Country to reduce the consumption of these products and to resort to other domestic sources of energy, for their low prices, and the level of dependence on imported oil products, can double the vulnerability of the State. The aforementioned factors and the lack of adequate independency of the Central Bank are instrumental in inflation of the Iran's economy. As it is illustrated by Diagram No. 1, the Country has experienced two different kinds of inflationary policy during the past decades. During the execution of the first inflationary policy, from 1959 to 1973(1340to1352), prices rose at low level and on one figure basis and were quite more stable with less fluctuation During the execution of the second inflationary policy, which has been continuing from 1974(1353) to the present time, the two figure increase in the prices was at high level, instable and far more fluctuating. It should be notified that, the inflation rate was in increasing process till 1995(1374) and started to decrease since 1996(1375), yet still fluctuation

Fig.1 inflation
Source: Iran central bank

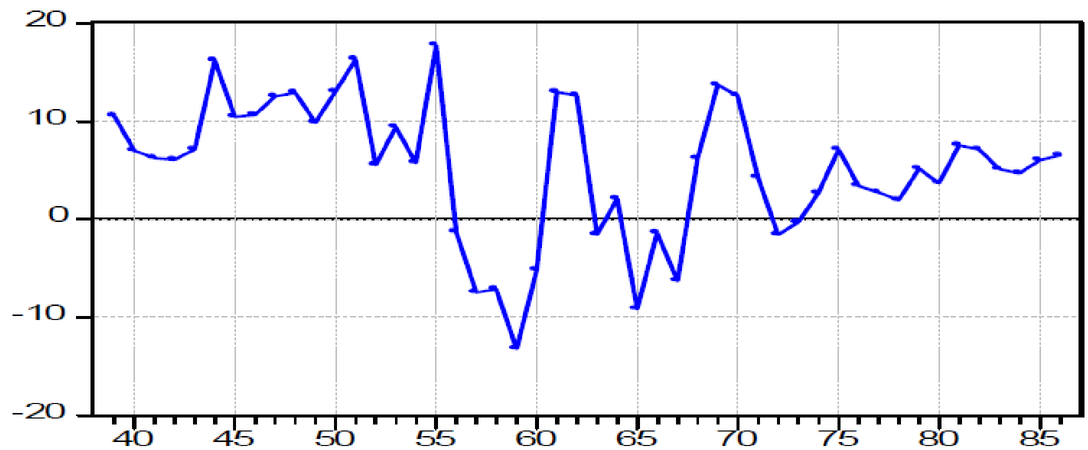


When the State economy faces an oil price shock, the role of the Central Bank gets more significant; that is, the Central Bank should take actions to stable the inflation rate and to commence producing, which are very difficult tasks to deal with. In this situation if the Central Bank starts to reduce the interest rate to prevent the actual rise in GDP that will increase rate.

And on the other hand if the Central Bank policies aim at controlling the inflation, the economy will face growth reduction. (Nota Di Lavoro(2005)).

This matter is also true in Iran's economy; however, the only existing difference is that the growth of Iran's economy does not fall because of increase in the oil price. The Central Bank tries to decrease the interest rate to protect home industries, and this policy intensifies the inflation pressure, because of inequality of the inflation rate with the interest rate which is mainly for the interest rate is prescribed and ordered.

Fig.2 Gross domestic product
Source: Iran central bank



As it is illustrated in the above diagram, the economy growth of Iran is deeply depending upon oil income. Recession period and boom of the State economy growth process are directly and indirectly affected by the rise and fall of oil price. For instance, during 1982(1361) and 1983(1362) when the Country was struggling with the war (Iran- Iraq), there can be found the two figure rate of economy growth and a great deal of increase in the oil income; however, during the ending years of the war1988 (1367), the economy growth reduced severely, because of decrease in oil price and oil income as a result.

LITERATURE REVIEW

Study of Ch. Kamps and Ch. Pierdzioch(2002) has entitled,*" Monetary Policy Rules and Oil Price Shocks "*. their analysis shows that it is important to distinguish between alternative price indices (CPI, core CPI, and GDP deflator) when modeling the effects of oil price increases. Their results demonstrate that targeting the change in the GDP deflator is an inferior monetary policy strategy in the presence of oil price shocks. **Study of K. Lee and Sh. Ni(2002),** has entitled *" On the dynamic effects of oil price shocks: a study using industry level data"* This paper analyzes the effects of oil price shocks on demand and supply in various industries whit VAR models. The result show for many other industries, with the automobile industry being a particularly important example, oil price shocks mainly reduce demand. The paper suggests that oil price shocks influence economic activities beyond that explained by direct input cost effects, possibly by delaying purchasing decisions of durable goods. **Study of J. Cunado and F. Perez de Gracia(2004),** has entitled *" Oil prices economic activity and inflation: evidence for some Asian countries"*, they studied for six Asian countries over the period 1975Q1–2002Q2. The results suggested that oil prices had a significant effect on both economic activity and price indexes, although the impact was limited to the short run and more significant when oil price shocks are defined in local currencies and found evidence of asymmetries in the oil prices–macro economy relationship for some of the Asian countries. **Study of R. Jiménez-Rodríguez , M. Sanchez(2004),** has entitled *" Oil Price Shocks and Real GDP Growth: Empirical Evidence for Some OECD Countries"*, This paper estimated Multivariate VAR analysis is carried out using both linear and non-linear models. They found evidence of a non-linear impact of oil prices on real GDP. Among oil importing countries, oil price increases are found to have a negative impact on economic activity in all cases but Japan. Moreover, the effect of oil shocks on GDP growth differs between the two oil exporting countries in their sample, with oil price increases affecting the UK negatively and Norway positively. **Study of J. Cunado and F. Perez de Gracia(2004),** has entitled *" Oil prices economic activity and inflation: evidence for some Asian countries"*, they studied for six Asian countries over the period 1975Q1–2002Q2. The results suggested that oil prices had a significant effect on both economic activity and price indexes, although the impact was limited to the short run and more significant when oil price shocks are defined in local currencies and found evidence of asymmetries in the oil prices–macro economy relationship for some of the Asian countries. **Berument and Ceylan (2005)** examined how oil price shocks affect the output growth of selected Middle East and North African countries that are either exporters or net importers of oil commodities. In this respect, they used a structural vectorautore-gressive (SVAR) model, focusing explicitly on world oil prices and the real GDP over the period of 1960-2003. Their impulse response analysis suggests that the effects of the world oil price on GDP of Algeria, Iran, Iraq, Jordan, Kuwait, Oman, Qatar, Syria, Tunisia and UAE are positive and statistically significant. However, for Bahrain, Egypt, Lebanon, Morocco and Yemen they did not find a significant impact on oil price shocks. **Study of M. Mehr ara and K. Niki oskuee(2006)** has entitled, *"oil impacts and its dynamic effects for variable macroeconomic"*. The SVAR model was used in this article and for to introduce structural impacts of Blanchard was used long run limitation approach. The result of this estimate for Iran was compared with three oil exporting countries (Indonesia, Kuwait and Saudi Arabia, Countries with same economics conditions) in 1960-2003. Analyzing data was done by FEVDs and IRFs. . The results show that, external degree of oil price in both Kuwait and Saudi Arabia is less than Iran and Indonesia. moreover, the impact on oil price have been the main reason of change in GDP and imports in Iran and Saudi Arabia, as the impact on imports is the main reason in the Indonesia and Kuwait. The impact of oil price is the positive factor on imports, GDP, and price indicators in any countries. **Olomola and Adejumo (2006)** examined the effects of oil price shocks on output, inflation, real exchange rate and money supply in Nigeria using quarterly data from 1970 to 2003. Using VAR methodology they find that oil price shocks do not have any substantial effect on output and inflation. Oil price shocks only significantly determine the real exchange rate and in the long run money supply. Olomola and Adejumo conclude that this may squeeze the tradable sector, giving rise to the "DutchDisease". **Study of** M. **Farzanegan and G. Markwardt(2007),** has entitled, *" The Effects of Oil Price Shocks on the Iranian Economy"*. Due to the high dependence on oil revenues, oil price fluctuations have a special impact on the Iranian economy. By applying a VAR approach, this paper analyzes the dynamic relationship between asymmetric oil price shocks and major macroeconomic variables in Iran. Contrary to previous empirical findings for oil net importing developed countries, oil price increases (decreases) have a significant positive (negative) impact on industrial output. Unexpectedly, we can not identify an significant impact of oil price fluctuation on real government expenditures. The response of real imports and the real effective exchange rate to asymmetric oil price shocks are significant. Furthermore, the response of inflation to any kind of oil price shocks is significant and positive.

METHODOLOGY

The structural approach to time series uses economic theory to model the relationship among the variables of interest. Unfortunately, economic theory is often not rich enough to provide a dynamic specification that identifies all of these relationships. Further more, estimation and inference are complicated by the fact that endogenous variables may appear on both the left and right sides of equation.

Vector Auto Regression (VARs)

The vector auto regression is commonly used for forecasting system of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach sidesteps the need for structure modeling by treating every endogenous variable in the system as a function of the lagged values of all the endogenous variables in the system the mathematical representation of varies:

$$Y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + B x_t + \varepsilon_t$$

Where Y_t is a K vector of endogenous variables, x_t is a d vector of exogenous variables, $A_1, \ldots A_P$ and B are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated with all of the right hand sides variables. If economic theory is used to provide the link between forecast errors and fundamental shocks, we call the resulting model a SVAR. We assume that the economy is described by a structural from equation:

$$B_0 y_t = k + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \ldots + \beta_p y_{t-p} + u_t$$

$$B_L y_t = u_t$$

$$B_L = \beta_0 - \beta_1 L - \beta_2 L^2 - \ldots - \beta_P L^P$$

Is a matrix polynomial in the lag operator L, y_t Is an k×1 Data vector and u_t is an k×1 structural disturbances vector. A sufficient number of lag of p are included so that u_t is vector white noise u_t is serially u_n correlated and var(u_t) = Ω Diagonal matrix where diagonal elements are the variances of structural disturbances . If each side of (1) is pre-multiplied by β_0^{-1} ,the result is a reduce form equation:

$$Y_t = A_1 y_{t-1} + A_2 y_{t-1} + \ldots + A_p y_{t-p} + \varepsilon_t$$

$$Y_t = A_L y_t + \varepsilon_t$$

$$A_L = A_1 L + A_2 L^2 + \ldots + A_p L^p$$

Is a matrix polynomial in lag operator L.
In order to recover the parameters in the structural form equations, Blanchard and Watson (1986) suggest a generalized method (structural VAR) which allow non-recursive structures and impose restrictions only on contemporaneous structural parameters.
Then if

$$B(L) = \beta_0 + \beta^0(L)$$

The parameters in the structural form equation and those in the reduce equation are:

$$A(L) = -\beta_0^{-1} + \beta^0(L)$$

In addition, the structural disturbances and the reduce form residuals are related by:

$U_t = \beta_0 \varepsilon_t$

Since $\Sigma = E(\varepsilon_t, \varepsilon_t)$, it implies that we can to summarize, it's possible to recover the structural shocks and variance through the imposition of a sufficient number of restrictions on the β_0 matrix defined by equations that capture the instantaneous correlations among the endogenous variables but the SVAR attempts to identify the variance decomposition and impulse response functions by imposing a priori restrictions on the covariance matrix of the structural errors. But the SVAR approach has also some draw backs, one of them is validity of this a prior restrictions in long run.
In order to overcome this problem we use generalized VAR that was developed by Pesaran and Shin (1998). in this paper we have also Generalized VAR and SVAR. We use SVAR for short-run and GVAR for long run relationship between variables.

As a first step we check the properties of the used variables in order to determine the appropriate specification for VAR estimation. The order of integration for each variable is determined using Augmented Dickey and Fuller(1979). The results are reported in table 1 in the Appendix B. When all variables are first differenced, we find evidence that are variable are stationary. Considering that the variables of the model follow a I(1) process, we analyze in second step whether there is a long relationship among these variables. To test this. We imply Johansen co integration tests (see johansen 1991, 1995) see table2 in Appendix B. The optimal lag length is 1. The selected lag length is based on different criteria. Following the results of IRFs and VDC analyses for asymmetric formations of real oil prices within the Iranian macro economy are presented.(see table3 in Appendix B)

Model of Macroeconomics

In this section we briefly describe a simple macroeconomic model for the countries considered in the study. We consider both long-run and short-run restrictions based on economic theory; while the former are expressed as linear restrictions on the co integrated vectors in order to capture a money demand function and/or an excess demand relationship, the short-term restrictions are imposed on the residual covariance matrix on the basis of the economic theory.
Because of its implication on policy behavior much applied research in monetary economics has been devoted to the specification of the money demand function. Much of the empirical research on money demand has estimated a conventional money demand function of the following functional form:
$M/P=\beta_0+\beta_1 Y-\beta_2 i-\beta_3 \Delta P$
Where M is nominal money balances, P the price level, Y the output level, i a short-term nominal rate of interest and P the price level. The parameter measure respectively the long-run income and opportunity cost elasticity’s.
With the variables considered in the study we can also specify a long-run relationship expressing the excess output in which the difference from trend is a direct expression of inflation rate, exchange rates and interest rate.
$y\text{-}t=\beta_4-\beta_5 e-\beta_6 i-\beta_7 \Delta P$
While increases in inflation and interest rates (implying, respectively, a real appreciation of exchange rates and a higher cost of capital) are supposed to have a negative impact on output, the theoretical literature (see, for example, the studies of Edward (1989), Kamin (1996), Cavalo, Reinhart and Vegh (1994)) provides evidence of both positive and negative effects of exchange aying attention to the short-term on the basis of the economic theory, in this part the Macroeconomics Model shows in table4 in Appendix B.

In this Article the model is explained by taking advantage of two Blocks, to point out the short-term dynamics. The two relations of the 1st Block specify the equilibrium of money market, and the other relations of the 2nd Block specify the equilibrium of goods and services market.
On demand for actual money, it is presumed that considering the Iran's economic condition, interest rate and oil price and GDP are under pressure during a short-term period. Three other variables are taken into account:

$$e_m = c_1 u_m + c_2 u_r + c_3 u_y + c_4 u_o$$

Also, regarding the interest rate in a short-term period, it is presumed that there is no data lag, the indicators of macroeconomics are able to forecast the trade cycles, and the monetary policies .Further, it is presumed that the oil price affects the determination of interest rate in a short-time period, as well. Consequently, the structure of Model is going to be as follows:

$$e_r = c_5 u_r + c_6 u_e + c_7 u_o$$

In order to establish equilibrium for goods and services market, two equations are brought forward as follows, which indicate the short run dynamic relationship between the interest rate and the production level. For this purpose, the production level is taken into consideration in a way that changes in economic activities are in relation with the interest rate, the rise and fall of oil price, and the fluctuations exchange rate.
On the other hand it is presumed that all parts of the economy will be affected by oil price fluctuation; therefore:

$$e_y = c_8 u_y + c_9 u_e + c_{10} u_o$$

The other presumption is that the inflation is in relation with exchange rate in a short-term period because of the management method of the State exchange system, lack of necessary capital mobility and non-formation of exchange market, the exchange rate is explained as follows:

$$e_p = c_{11} u_p + c_{12} u_e$$

Now, it is time to proceed to exchange market which is considered as a function of selfish, for low value of non-oil exportation in Iran, and can influence the exchange rate directly:

$$e_e = c_{13} u_e$$

In conclusion, in order to take the oil price originated shocks into account, there is a limitation defined for the oil price (which influences all variables of the domestic economy as a non-central variable) in this equation:

$$e_o = c_{14} u_o$$

we estimate the equation and report table 4 in Appendix B. Where u_r, u_m, u_p, u_y, u_e, u_o are the residuals in the reduced form equations, which represent unexpected movements (given information in the system) of each variable and er, em, ep, ey, ee,
e_o are the structural disturbances, that is money supply shocks, money demand shocks, price shocks, GDP shocks, oil price shocks and exchange rate shocks, respectively

EMPIRICAL RESULTS

In this paper we use two method for our analyze: Generalized VAR and structural VAR because of Generalized VAR use for long-run relationship between variables and SVAR for specification relationship between variables that for specification relationships between variables in short-run.

Having verified the existence of long-run relationships we can proceed to examine the short-run among the variables considered in the study. In particular, in order to assess the relationship between oil price shocks and aggregate demand activity we use impulse-response and variance decomposition as they trace over time the effects on a variable.

Using the model presented in perfidious section our aim is to investigate the effect of oil price shocks on the economic activity in short-run. Before considering the impulse-response analysis and variance decomposition, we can analyze the estimated coefficients of the structural part of model (see table4 in Appendix B). GDP is positive correlated with oil price in this model some of the equations have employed oil price that there are statistically significant.

Variance decomposition analysis

The impulse response functions illustrate the qualitative response of the variables in the system to shocks to oil price. To indicate the relative importance of these shocks requires variance decomposition. It shows us how many unforeseen changes or variation of the variables in the model.

Table 6 in Appendix B demonstrates the variance decomposition of the VAR model. For inflation, positive oil price shock initially account for about 22 percent of change in inflation in the long run. Decreasing to a share of 10 percent in the four years after shock, also the other important aspect of the nonlinear oil shock can be seen in the effects on exchange rate fluctuation while the oil price shocks play a marginal role on variations in this variable. The oil price change explains for about 41 percent of fluctuation in the exchange rate in the first horizon, decreasing to about 14 percent in the fourth year after the shock. Despite the share of oil price shock on the variations of GDP that in the1 quarter about 8 percent, this share of impacts till the end of period about 6 percent. The effects of positive oil price shocks in the first till fourth period increase (M_1) and decrease the end of period about 1 percent. This behavior also can see in interest rate variable but in the 8 period decreases at the end of period about two percent in the four years after shock.

CONCLUSIONS

In this article, devising S-VAR and G-VAR models, it is tried to explain the impact of oil price shock over the monetary policies. As has been mentioned, devising series of structural equations, the presence of oil in goods, services and monetary sector, is approved in a significant manner.

Likewise, devising IRFS, the impact of oil price shock over other alternates is discussed in this article. In analyzing GDP as an alternate presents an integrated proportional relation in short terms, but in long run it turns into a fluctuating relation.

The shocks resulted from oil price are in a positive relation with M_1 variable and a negative relation with interest rate which in general terms in world be a fluctuation relation for M_1 . It would also have increase with interest rate in long run. It shall be noted that the impact of oil price shock over interest rate would be a descending one at the beginning. But as of the third quarter it turns into an ascending relation which keeps growing.

It has also been presented in this article that regarding oil price shock over foreign exchange rate we may claim that at the beginning there would be a descending reaction while in long run it turns ascending .(In other words , first a negative trend and then a positive one.)

Considering the above said matters, it may be concluded that increase in oil price for an exporting country like Iran would not result in appropriate outcomes. And as was mentioned earlier, it would bring up huge fluctuations to the economy to get rid of these fluctuations which are mostly due to global oil price fluctuations, the policy making shall be based upon the separation of economics from oil revenues. as well as moving towards the alternate energy resources for domestic industries and agriculture section.

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Appendix:

Appendix A):
Data sources and description: In our research we use quarterly data for the period of 1991: I to 2008: I (1370:I to 1386:IV). The variables considered in this paper are as follow:
Real gross domestic product, quarterly constant prices (1996)
Inflation: in the yearly changes in Iranian consumer prices and has been extracted from Iran central bank via DataStream.
Interest Rate: announce Via Iran central bank every year and it constant whole year.
Money Aggregate (M_1): is quarterly adjusted – national currency and billions.
Exchange rate: Iran economic has two different exchange rate, official and non-official. We use non official exchange rate market.
Iran cured oil price: In the quarterly average of monthly world market prices for Iranian crude oil that has extracted from the OPEC database.
GDP: We use central bank of Iran database that quarterly calculate.
(At constant prices of 1997-98(1376))

Appendix B):
Table 1:

	ADF			
	Without trend		With trend	
Variables	level	First diff.	level	First diff.
EXCHANGE RATE	2.217688	-3.823490***	-1.000930	-7.284230***
GDP	4.424887	0.431404	0.597114	-44.08454***
INF	-0.646433	-5.025835***	-1.982104	-4.937087***
INTREST RATE	-0.016794	-8.062258***	-2.014880	-8.015242***
M1	-0.865469	1.877390	-0.322032	-3.312368*
OIL PRICE	3.700800	-5.277532***	0.877404	-6.273268***

We denote with */**/***
The rejection of the null hypothesis at a 10/5/1 percent significance level.

Table2:
VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1537.803	NA	2.15e+15	52.33	52.54	52.41
1	-1144.796	692.7577	1.20e+10	40.23	41.7*	40.8*
2	-1098.703	71.87	8.86e+09	39.88	42.63	40.96
3	-1072.719	35.23	1.37e+10	40.22	44.24	41.79
4	-1045.432	31.44	2.25e+10	40.52	45.8	42.58
5	-962.4468	78.76*	6.56e+09*	38.93*	45.47	41.48

Table 3:

Series: GDP M1 OILPRICE INTRESTRATE EXCHANGERATE INFLATION

Lags interval: 1 to 1

Selected (0.05 level*) Number of Co integrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	3	3	2	3	2
Max-Eig	3	3	2	2	2

*Critical values based on MacKinnon-Haug-Michelis (1999)

Table 3:
Series: GDP M1 OILPRICE INTRESTRATE EXCHANGERATE INFLATION
Lags interval: No lags

Selected (0.05 level*) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	3	3	3	3	2
Max-Eig	3	3	3	4	3

*Critical values based on MacKinnon-Haug-Michelis (1999)

Table: 4

Co integration Restrictions :
B(1,1)=-1,B(1,2)=0,B(1,5)=0
B(2,2)=-1,B(2,6)=0
Convergence achieved after 171 iterations.
Restrictions identify all co integrating vectors
LR test for binding restrictions (rank = 2):
Chi-square(1) 0.323457
Probability 0.569538

Co integrating Eq:	CointEq1	CointEq2
GDP(-1)	**-1.00**	**0.008308** **(0.00405)** **[2.05376]**
M1(-1)	**0.00**	**-1.00**
OILPRICE(-1)	**0.316** **(16060.1)** **[8.21]**	**0.004597** **(0.00061)** **[7.51310]**
INTRESTRATE(-1)	**-110321.6** **(16060.1)** **[-6.86930]**	**341.2630** **(524.543)** **[0.65059]**
EXCHANGERATE(-1)	**0.00**	**-1.510018** **(1.32573)** **[-1.13901]**
INFLATION(-1)	**-8731.462** **(4577.27)** **[-1.9]**	**0.00**
@TREND(70Q1)	**498.89**	**-3.591110**
C	**83267.12**	**26.39856**

Error Correction:	D(GDP)	D(M1)	D(OILPRICE)	D(INTRESTRATE)	D(EXCHANGERATE)	D(INFLATION)

Table: 5

	Coefficient	Std. Error	Prob.
C(1)	6108.854	562.3656	0.0000
C(2)	-4138.294	881.8398	0.0000
C(3)	2019.515	816.7455	0.0134
C(4)	-3367.510	1043.073	0.0012
C(5)	0.007049	0.000649	0.0000
C(6)	0.003155	0.000825	0.0001
C(7)	0.003057	0.000960	0.0014
C(8)	2067.762	190.3529	0.0000
C(9)	-945.2835	273.8442	0.0006
C(10)	431.4296	272.1136	0.1129
C(11)	2.513584	0.231394	0.0000
C(12)	1.381923	**0.351099**	0.0001
C(13)	329.1641	30.30201	0.0000
C(14)	-2.617649	0.240974	0.0000
Chi-square(7) = 15.38645		Probability = 0.1314	

Values in parentheses represent, respectively, standard errors of the contemporaneous coefficients and p-values for log-likelihood tests.

Table: 6

Horizon	M1	INFLATION	OILPRICE	EXCHANGE RATE	INTRESTRATE	GDP
generalized forecast error variance decomposition for variable GDP						
0	0,0029014	0.1284E-6	0,04725	0,099873	0.3440E-4	1
1	0,11627	0,066462	0,037222	0,082979	0,047178	0,78217
4	0,11979	0,052032	0,025173	0,074033	0,081544	0,65991
8	0,17957	0,043896	0,016358	0,075632	0,093657	0,50642
12	0,2734	0,044653	0,048135	0,066329	0,11133	0,41386
16	0,37291	0,033234	0,065589	0,067288	0,15092	0,34291

generalized forecast error variance decomposition for variable INF						
0	0,013395	1	0.2169E-3	0,28449	0,20837	0.1284E-6
1	0,021446	0,99638	0.2860E-3	0,27079	0,22745	0,0013927
4	0,09063	0,91728	0,0025298	0,18278	0,30266	0,0030504
8	0,34036	0,57894	0,0065618	0,12752	0,4104	0,0035023
12	0,4672	0,46033	0,0088524	0,10022	0,49257	0,0027841
16	0,40527	0,39923	0,10119	0,80698	0,41563	0,0050592
generalized forecast error variance decomposition for variable EXCHANGERATE						
0	0,0063044	0,28449	0.4130E-4	1	0,062288	0.099873
1	0,023468	0,24323	0.020116	0,94464	0,03643	0,062973
4	0,11105	0,093439	0,15655	0,63397	0,018166	0,020269
8	0,31262	0,046625	0,17447	0,32398	0,11068	0,012135
12	0,42944	0,059713	0,13927	0,21898	0,22601	0,013238
16	0,45418	0,053691	0,14014	0,1828	0,24122	0,016972
generalized forecast error variance decomposition for variable M1						
0	1	0,013395	0.099394	0,0063044	0,60118	0.0029014
1	0,98384	0,013073	0.089740	0,0084455	0,63534	0,0026231
4	0,91236	0,05283	0,14531	0,020104	0,75249	0,0069652
8	0,88628	0,089411	0,098447	0,038344	0,78642	0,014459
12	0,8221	0,097882	0,040104	0,040794	0,74471	0,028034
16	0,81271	0,13289	0,017329	0,059066	0,75038	0,034433
generalized forecast error variance decomposition for variable INTRESTRATE						
0	0,60118	0,20837	0.10199	0,062288	1	0.3440E-

1 4 8 12 16	0,67646 0,64012 0,64607 0,68645 0,6956	0,23216 0,28742 0,31652 0,26818 0,27533	0.11897 0,15489 0,11131 0,05055 0,02711	0,049708 0,11422 0,11754 0,084159 0,088974	0,96211 0,90636 0,86868 0,80445 0,8129	4 0,002803 1 0,003091 1 0,005721 9 0,015183 0,017909

Table7:
Roots of Characteristic Polynomial
Endogenous variables: GDP M1 OILPRICE INTRESTRATE EXCHANGERATE INFLATION
Exogenous variables: C
Lag specification: 11

Root	Modulus
1.01	1.01
0.99	0.99
0.81	0.81
0.790375-0.123110i	0.79
0.790375+0.123110i	0.79
-0.28	0.28