Modelling Iran's Business Cycles Based on Oil Price Shocks

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Abstract

This paper analyzes the effects of oil price shocks on the Iranian business cycle using the framework of real business cycle theory. A theoretical framework is modified to investigate cyclical behaviour of the economy in response to oil price shocks. Production function approach based on a real business cycle model that substitutes oil price shocks for technology shocks is developed to analyze the Iranian economy from 1959 to 2004. The strategy of this study is to set up a simple Cobb-Douglas production function model and explore the extent to which it can account for the observed behaviour of Iranian economy.
This research adds to an up-and-coming body of evidence supporting the hypothesis that business cycles are influenced by oil price shocks in the international oil market. It also provides a platform increasing our understanding of the cyclical behaviour of Iran's economy, feeding into literature of primary commodity dependent economy. The observed cyclical behaviour of the Iranian economy seems to be influenced by the current shocks which seen an unexpected and unanticipated oil price shocks in the global oil market. This study provides an opportunity to identify to some extent to which macroeconomic fluctuations in a planned economy which are dominated by the oil sector and highly dependent on oil export earnings, can be explained by changes in the price of oil.The time series behaviour of oil prices is found to be crucial in explaining the patterns of the Iranian business cycle. Oil prices are found to influence other exogenous variables affecting the economy, thus augmenting the impact of an oil price shock on the economy. We find that the theoretical correlation between output and the price of oil is lower than its empirical counterpart. The empirical results show that the model can reproduce a business cycle path of the Iranian economy, especially in those periods when shocks in the price of oil were most dramatic. The results show that the model is able to mimic the Iranian response to shocks quite accurately but is less predictive of cyclical paths during periods of stability.

Keywords: Real business cycle theory, oil price shocks, Iranian economy, Business Cycle, Modelling

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1. Introduction

The aim of this paper is to explain the factors affecting the Iranian business cycles, and to provide a suitable framework for the analysis of macroeconomic fluctuations. A common argument is that the business cycle is caused not only by fluctuations in aggregate demand, but also by random shocks in the supply side of economics. Within the real business cycle (RBC) framework, the factors, such as oil price shocks, affecting the business cycle of the Iranian economy and supply side are identified and estimated.
This paper explores the ability of a modified RBC model to explain the time profile of Iran's real output. We specify and estimate a model which is an extension of the RBC model and which is designed to explain determinants of the time path of real GDP. It also attempts to model output and looks at its ability to identify the turning points of Iranian business cycles. The model, in short, explains the movements of real output.

This paper also examines how unforeseen shocks have an impact on the path of output. To achieve this, the production function approach is used to test hypotheses about various types of shock. The shock is unanticipated and is defined in terms of the price of oil and the exchange rate. We generally have to proxy this shock because it is not directly observable.
The objective of RBC approach is to understand the character of real fluctuations. This approach attempts to explain booms and recessions in the economy as responses to random external shocks. Overall, the RBC approach has generated many new insights and techniques that assist in modelling the macroeconomy. RBC literature stresses the importance of technology shocks as a potential source of business cycle fluctuations. Technology shock is the real shock in the real business cycle theory. Romer (1996) argued that the importance of understanding the causes of aggregate economic fluctuations is the central goal of macroeconomics.

RBC models contribute to understanding of business cycles and the construction of unexpected technology shocks within these models. An oil price shock as an alternative can be accounted in the real business cycle theory as a real shock. Rebelo (2005) suggests that an oil price shock provides evidence to be a believable mechanism which yielded the unanticipated, temporary supply shocks needed by the RBC models. These models provide an opportunity to investigate the impacts of oil price shocks in the business cycles of a primary dependent and planned economy, such as the Iranian economy, to identify the oil price shocks over the different periods of planning.

A business cycle is apparently observable, but understanding the nature of the cycle and its causes needs more investigation. The conventional view was that business cycles were temporary deviations from trend. This idea provided the justification for involvement of monetary and fiscal policies to stabilise the economy and reduce the effects of cyclical fluctuations in economic activity. It is supposed that the conventional view such as real business cycle theory offer more convincing explanation of the business cycle. This approach implies that deviations from the trend change in output are a sign of cycles and present useful information on the economy (Harrison, 1999).

2. Literature Review

In the last three decades, macroeconomic research has attempted to construct a model of the aggregate variables, which is theoretically consistent with past observations and which can be used for policy planning and analysis. An influential group of classical macroeconomists, led by Kydland and Prescott (1982), have developed a theory that takes a strong stand on the sources of shocks that cause cyclical fluctuations. This theory, known as the RBC theory, argues that real shocks to the economy are the primary cause of the business cycle. Real shocks are disturbances to the real side of the economy; for example, those shocks that affect the production function, the size of the labour force, real government expenditure, and the spending and saving decisions of consumers (Abel and Bernanke, 1992).
The central prediction of the theory is that real phenomena, and not nominal ones, cause the business cycle. Real shocks are contrasted with nominal shocks, which are shocks to money supply or money demand, and fiscal shocks to aggregate supply and demand. Kydland and Prescott (1982) seek to model a competitive general equilibrium theory which is essentially the Ramsey-Solow Neoclassical model of economic growth. It is attractive to say that the Solow residual represents the growth of knowledge as technology shocks in the short-run.

RBC theory assumes that exogenous technology shocks are the main source of aggregate fluctuations in the economy. They (1982) stress the importance of technology shocks as a source of business cycle fluctuations, the shock that drives the business cycle is the same as the shock that generates economic growth and in this respect technological change is seen as the main driving force. Technology is assumed to evolve as a stochastic process. Employing Kydland and Prescott (1982) methodology requires two steps. The first concerns measurement, data series must be consistent with model series. The second step concerns reporting, the same statistics should be computed for the model and the revised data. In order to achieve the dynamics required to statistically mach the data, it is necessary for the postulated technology shocks to be highly persistent (King and Rebelo, 1988). Kydland and Prescott (1991) also stress that the RBC model is impracticable in the sense that it aims only to capture only certain features of the data rather than to provide a complete explanation of them.

The RBC approach suggests that growth and business cycles can be treated within an integrated theory. Kydland and Prescott (1982) and Prescott (1986), argued that one cannot separate growth from business cycle issues, which need to be within an integrated theory. Nevertheless the RBC model can explain a great part of the fluctuations in an economy. King and Plosser (1988) also suggested alternative specifications and extensions to the basic neoclassical framework. First, they show how to incorporate stochastic growth into the model so that the shock that drive the growth process also drives the cyclical properties of the model. Second, following Romer (1986), Lucas (1988), and King and Rebelo (1987), they consider models that generate endogenous growth. The idea of using endogenous growth elements to study business cycles argues that many authors have successfully incorporated endogenous sources of growth in dynamic statistical general equilibrium models and shown that this line of research can lead to substantial improvement over simple RBC models (Matheron, 2003). Third, they show how one can incorporate government actions into the framework. This opens up an important area of research for these models because it enables them to begin the analysis of government policies that are thought to be important in evaluating business cycles (King and Plosser, 1988). RBC theory regards stochastic fluctuations in productivity as the source of fluctuations in economic activity (Stadler, 1994).

The neoclassical model of capital accumulation, augmented by shocks to productivity, is the basic framework for RBC analysis (Stadler, 1994). Plosser (1989) argued that the basic neoclassical model of capital accumulation can provide an important framework for developing our understanding of economic fluctuations. Danthine and Donaldson (1993) suggested that RBC approach implies a methodology for the study of business cycles, which involves two components: an empirical review and quantitative theory. It also comprises the dynamic general equilibrium models, which can be evaluated either quantitatively or qualitatively in terms of their ability to reproduce the basic features of business cycles. Such comparisons are useful in highlighting similarities and deviations, which are both necessary ingredients to further the development of good theory. A ‘good’ theory of the business cycle is quantitative as well as qualitative (McGrattan, 2006).

There are issues that RBC models have been used widely elsewhere and with potentially useful adjustment can be applied for the Iranian economy as an opportunity to analyze and explain unexpected shocks. The observed cyclical behaviour of the Iranian economy seems to be influenced by the current shocks which seen an unanticipated oil price shocks in the international oil market. The RBC model provides a platform to increase our understanding of the output behaviour of the Iranian economy, and attempts to find the nature of these shocks based on historical time series data due to movements in GDP and oil price and examine the relationship between oil price and business cycles. Jones and Leiby (1996) argued that research effort has gone into introduce oil price shocks in RBC models and statistically testing their importance as a contributor to business cycles. Lama (2005) identified and extracted the cyclical behaviour component of economic time series in developing countries using RBC approach.

3. Methodology and Research Design

In order that the modified RBC has utility in accounting for aggregate fluctuations in Iran’s economy, it has to be tested and the model properties under alternative have to be computed. Three issues of the RBC model can account for business cycle variability. First the model assesses the role of the price of oil in business cycles and how changes in the variability of oil shocks alter the characteristics of them. The second feature requires the modification of the RBC model which was originally developed to analyze technology shocks, by substituting oil price shocks for technology shocks. The third issue is that Iran's economy is separated into two sectors, the oil and non-oil sector, and the nature of shocks provides an opportunity for an analytical level of consideration.

To examine the effects of oil price shocks on the business cycles of the Iranian economy, real business cycle methodology, which is usefully modified in this context, as an appropriate methodology must be employed to explain and evaluate the effects of oil price shocks on the economy. To assess the ability of the model to account for aggregate fluctuations, we consider the role of oil price shocks and compute the properties of the RBC model under alternative specifications for preferences which is a plausible method to account for the cyclical patterns in driving aggregate fluctuations in Iran.

The alternative approach of this study is using a structural approach which is mutually exclusive with the causality approach. The structural approach is more appropriate, arguably, because one of the clear points is that the effect of unexpected shocks, by their nature, is not usually straightforward enough to include the Granger and/or causality framework. Because of the limitation of sample data, the structural model is the best model to apply, because it gives a good estimation of variables in the economy. It interprets dummy variables, their definition and the results, and analyses all shocks in the same manner. A structural equation expresses the endogenous variables as being dependent on the current realization of another endogenous variable. It also can be used as a reduced form.

The usual way to apply RBC theory is to use the production function approach which is consistent with the Cobb-Douglas function and growth theories. To develop and understand the relationships between oil price shocks and business cycles, using a production function approach, the analysis is undertaken from a viewpoint, which considers that there is a country production function – an approach that assumes a relatively efficient and given oil prices at the international oil market. We analyse the impact of oil price shocks on primary commodity dependent economies such as Iran.

4. The Model

This section presents a model that can be empirically tested and explained the effects of oil price shocks on Iranian business cycles by using a production function approach developing RBC methodology. The model is modified firstly by expressing the variables as first difference and logarithms. Second, we replace the technology shock variable in the KPR model by one defined in terms of oil price shocks. The model will be further modified for the structure of the Iranian economy and will allow us to analyze the effect of oil price shocks on macroeconomic fluctuations. Formally a production function expresses the output of economy as a function of all its inputs. Econometricians have concentrated on the utilization of the production function, because of its ability to explain returns to scale, resource allocation, elasticity of substitution between inputs, and so it is possible to employ it at the macroeconomic level by using the Cobb-Douglas production function and economic growth. The notion of an aggregate production function has been used to provide empirical description of intertemporal differences in the economic growth. Desai (1976) argued that the importance of the Cobb-Douglas production function comes from its simplicity and flexibility as well as the empirical support it has received from data for various industries and countries. Ackerberg *et al.* (2005) suggest that production functions are a fundamental component of all economies, and have a long history in applied economics.

A Cobb-Douglas production function relating output (Y_t) in period (t) to labour (n_t), and capital stock (k_t) is defined as follows:

$$y_t = Ae^{\lambda_t} k_t^{\alpha} n_t^{\beta} \quad (1)$$

where A is the temporary change in total factor productivity, e is the exponential; α *and* β are returns to scale, λ is the trend parameter, and t is the time index. Taking logarithms and first differencing:

$$\log y_t = \log A + \alpha \log k_t + \beta \log n_t + \lambda_t \quad (2)$$

$$\Delta \log y_t = \Delta\lambda + \alpha\Delta \log k_t + \beta\Delta \log n_t \quad (3)$$

$$\dot{y} = \dot{\lambda} + \alpha\dot{k} + \beta\dot{n} \quad (4)$$

The steady state equation of the production function defines the rate of growth of output ($\dot{y}$) as a function of growth of capital ($\dot{k}$); growth of labour ($\dot{n}$), and trend ($\dot{\lambda}$). Equation (4) has often been used to analyze the relationship between the growth of output, capital and labour.

The model is based on a key feature of the Iranian economy where output is divided between the oil sector (oil-GDP) (Y_t^o) and the non-oil sector (non-oil-GDP) (Y_t^{no}).

$$GDP \Leftrightarrow Y_t = Y_t^o + Y_t^{no} \quad (5)$$

The two sub-sectors have production functions:

$$Y_t^o = F(k_t^o, n_t^o, z_t) \quad (6)$$

$$Y_t^{no} = G(k_t^{no}, n_t^{no}, z_t) \quad (7)$$

where z_t defined as technology shocks in the RBC model are replaced with oil price shocks here. It is assumed that oil price shocks generate an externality effect on output in both sectors. Note that the nature of z_t is different in the oil and non-oil sector and will be explained in more detail later. Equation (6) shows that output for the oil sector is a function of the share of capital and labour in the oil sector; and oil price shocks, whilst equation (7) shows that output for the non-oil sector is a function of the share of capital and labour in the non-oil sector, and oil price shocks.

First, consider the production function in equation (6) which uses the rate of change in each variable modified for the oil sector. Three models are considered. The null hypotheses are presented as follows:

Model (A) $\quad y_t^o = \lambda + \mu_1 poil_t + \alpha k_t^o + \beta n_t^o + u_{1t} \quad$ (8)

Model (B) $\quad y_t^o = \lambda + \mu_2 er_t + \alpha k_t^o + \beta n_t^o + u_{2t} \quad$ (9)

Model (C) $y_t^o = \lambda + \mu_1 poil_t + \mu_2 er_t + \alpha k_t^o + \beta n_t^o + u_{3t}$ (10)

where y_t^o is output (GDP) of the oil sector, $\mu_i, \lambda, \alpha,$ and β are parameters and assumed constant, $poil$ is the price of oil (in US dollars), k_t^o is capital, n_t^o is labour, er is the exchange rate (nominal or real), and u_{it} is a classical error term.

Model (A) relates oil output in terms of a change in the price of oil. Model (B) relates oil output in terms of a change in the exchange rate. Model (C) relates oil output to both.

The production function in equation of (7) uses the rate of change in each variable modified for the non-oil sector. Here, shocks enter from the government sector. Government expenditure is largely based on oil revenue that may fluctuate exogenously. The non-oil production function can be defined as follows:

Model (D) $y_t^{no} = \lambda + \mu_3 g_t + \alpha k_t^{no} + \beta n_t^{no} + u_{4t}$ (11)

Model (D) shows that output growth in the non-oil sector (y_t^{no}) is related to the share of capital (k_t^{no}) and labour (n_t^{no}) in the non-oil sector, and government expenditure. It is assumed that the oil sector impacts on the non-oil sector via government expenditure.

5. The Hypotheses

Evidence suggests that two sectors exist in Iran; one is the oil sector, the other is the non-oil sector. Oil revenues fluctuate over time in order with changes in the price of oil and/or exchange rate. The non-oil sector depends upon the government policy and five-year plans. The planning system is designed by the government to allocate revenues for public expenditure. Government expenditure is largely based on foreign exchange revenues (about 60%) and the government operates a budgeting system to allocate the resources for the non-oil sector. This opportunity allows us to take into account any changes in the price of oil, exchange rate, in planning system. The production function approach is modified for Iran's economy to allow for this.

In view of the foregoing observations the following are the main hypotheses to be investigated in the study:

1. The coefficient of capital and labour are positive.
2. The shock variable has an adverse effect on output.
3. The quadratic form of the shock variable captures negative shocks better than positive shocks.
4. There is a significant relationship between shocks and output.

6. Empirical Estimation

As noted earlier, output in Iran involves two sectors: oil and non-oil. The purpose of this specially developed production function model is to analyse and evaluate the impact of oil price shocks on the Iranian business cycle. This information and information obtained from the initial analysis of the study is used to specify and examine the hypotheses for the production function approach. The hypotheses are defined in order to investigate the nature of shocks and how they impact on output.

6.1. The Oil Sector Production Function

The aim is to take the production function specified in Model (C) to allow the shock variable to enter through the price of oil and/or exchange rate. We can consider a range of hypotheses for (z_t). There are a number of possible hypotheses for (z_t). To find a comprehensive model for oil output, we can allow changes in the price of oil and the exchange rate to take place simultaneously.

Hypothesis (1): The shock is defined as the square of the deviation between the actual and expected planned price of oil ($PS2$) and the square of the deviation between the actual and expected planned exchange rate (QXX). Model (1) is defined as follows:

Model (1) $$\Delta Log(y_t^o) = \lambda + \alpha \Delta Log(k_t^o) + \beta \Delta Log(n_t^o) + \mu_4 PS2_t + \mu_9 QXX_t + \mu_2 D_2 \qquad (12)$$

Table 1 shows the results of OLS regression of model for the oil sector. The results of trend coefficient show that oil output is steady growth rate about 0.06. Therefore, oil sector introduce the trend and it is trend dominated. Results from the initial analysis of data for the oil sector shows that the oil output is growing steadily. Therefore, whatever changing the price of oil, changes the oil revenue and it is not possible to differentiate exchange rate dimension and oil price changes for steady trend behaviour of the oil sector.

Table 1- Oil Price and Exchange Rate Shocks in the Oil Sector

Variables	Model 1
Dependent (DLOG(YO))	β (t-ratio)
Intercept	0.073 (1.89)
Capital (DLOG(KO))	0.87 (1.87)
Labour (DLOG(NO))	0.17 (0.32)
Quadratic of Oil price shocks (PS2)	-0.0005 (-1.51)
Quadratic of ER shocks (QXX)	-0.000001 (-0.85)
Intercept Dummy (D2)	-0.57 (-5.45)
R-Squared (R^2)	0.46
Adjusted R-Squared ($\overline{R}^2$)	0.39
Number of observations	46
D.W	2.08

Compiled by Author, data source: Central bank of Iran

6.2. The Non-Oil Sector Production Function

Suppose that the non-oil sector captures the cyclical behaviour of business cycles. The oil sector is regulated by the government and can affect the non-oil sector. This effect is captured through two channels:

1. The oil sector affects the non-oil sector by generating petrodollars that substantially impact on the economy's capacity to import capital and intermediate goods that are employed in non-oil sector production.
2. The oil sector and its output are totally exogenous as oil prices are determined in the world oil market, and the quantity of oil that Iran can export is set by OPEC.

Based on planning system in Iran, oil revenues transfer to the government budget. Oil revenues in excess of the budgeted amount are transferred to the oil stabilization fund (OSF). If the realized oil revenue is less than the annual budget allocation, the government draws from the OSF the amount required to compensate for the shortfall in its expenditure. In this way the government can smooth the expenditure in order to oil revenue fluctuations.
The final stage to use the production function specified in Model (D) and to allow entry of the shock variable through government expenditure. We can consider a range of hypotheses for (z_t).

Hypothesis (2): The shock variable is defined as the proportion of government expenditure in total GDP (SG) and the first difference of oil GDP with a one period lag (Y_{t-1}^{o}). Model (15) is defined as:

Model (2)
$$\Delta Log(y_t^{no}) = \lambda + \alpha \Delta Log(k_t^{no}) + \beta \Delta Log(n_t^{no}) + \mu_{16}(SG_t) + \mu_{17}\Delta Log(Y_{t-1}^{o}) + \mu_2 D_2 \quad (13)$$

The results show that most of the coefficients, especially the coefficient of the government expenditure in total GDP and the first difference of logarithm of oil GDP variable are significant. The result reported in Table 2, show that this model is a better fit. The results show that the role of government in the non-oil sector is positive and significant, and that the dummy variable for the Iranian revolution and war has a negative effect on the intercept of output.

Table 2- Shocks in Non-Oil Sector

Variables	Model 2
Dependent (DLOG(YNO))	β (t-ratio)
Intercept	-0.05 (-1.94)
Capital (DLOG(KNO))	0.76 (6.78)
Labour (DLOG(NNO))	0.03 (0.86)
Government Expenditure Share (SG)	0.003 (2.21)
GDP in Oil Sector (DLOG(YO(-1))	0.08 (2.74)
Intercept Dummy (D2)	-0.08 (-2.99)
R-Squared (R^2)	0.66
Adjusted R-Squared ($\overline{R}^2$)	0.61
Number of observations	46
D.W	2.02

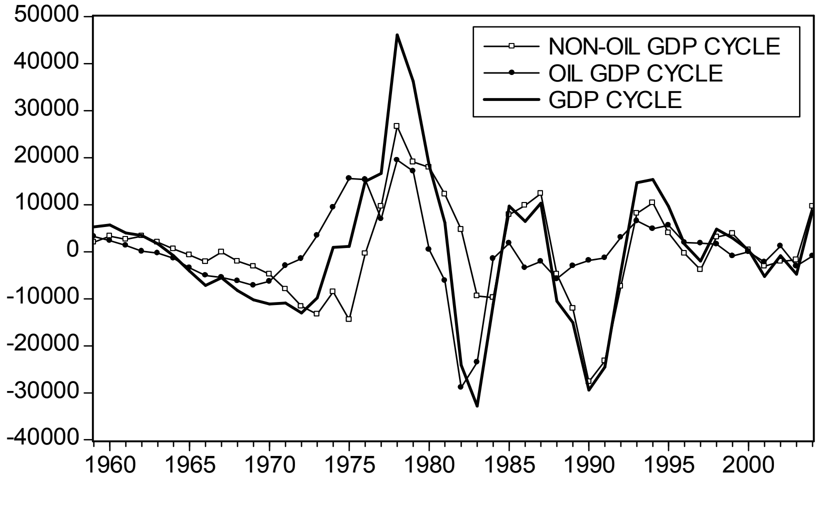
Compiled by Author, data source: Central bank of Iran

It has been shown that the coefficients on the capital variable show that capital has a positive effect on output; the results of a t-test reveal that these coefficients are significant for the non-oil sector, and insignificant for the oil sector. It has also been shown that for all models the coefficients of the

labour variable are insignificant and have no effect on output. The price of oil shock has a small, negative effect on oil output and is insignificant statistically. Moreover, the coefficient of the price of oil in all regressions is not significantly different from zero. The coefficients of the exchange rate variable are insignificant and show it has a negative effect on oil GDP. As a result, we reject the hypothesis that there is a significant statistical relationship between the oil price shocks and output for Iran.
The results show that the role of government in the economy is positive and significant, but that the sign of the coefficient of dummy variable indicate that there is a significant downward shift and negative effect on output.

6.3. Cyclical Behaviour of the Iranian Economy

In this section, we evaluate the cyclical behaviour of aggregate economic activity level in oil and non-oil output, based on the results obtained. Given the limitations of available data and plausible transmission channels of the effects of the oil price shocks on the economic activity, we use simple models which empirically test the inverse relationship between oil price shocks and economic cycles. In order to do this, we discuss our empirical results on the effect of oil price shocks for selected models of the oil and non-oil sectors. Thus the result shows the underlying cyclical behaviour of the Iranian economy.

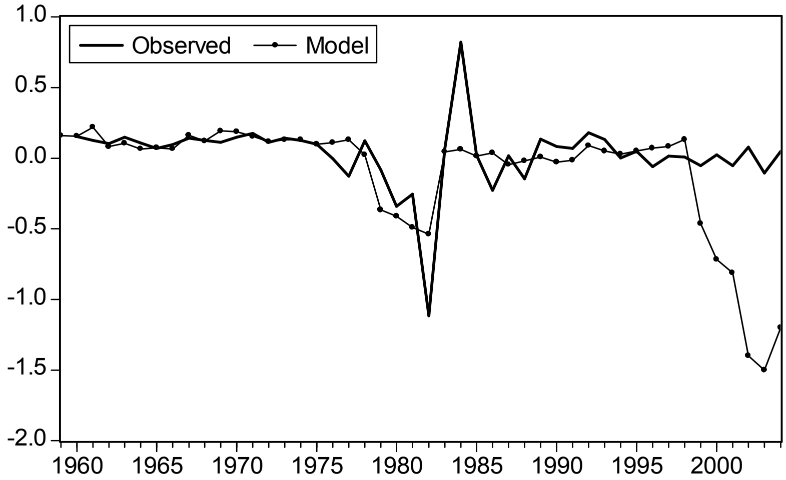


Compiled by Author, data source: Central Bank of Iran, Historical time series, 1959-2004

Figure 1- Cyclical Output

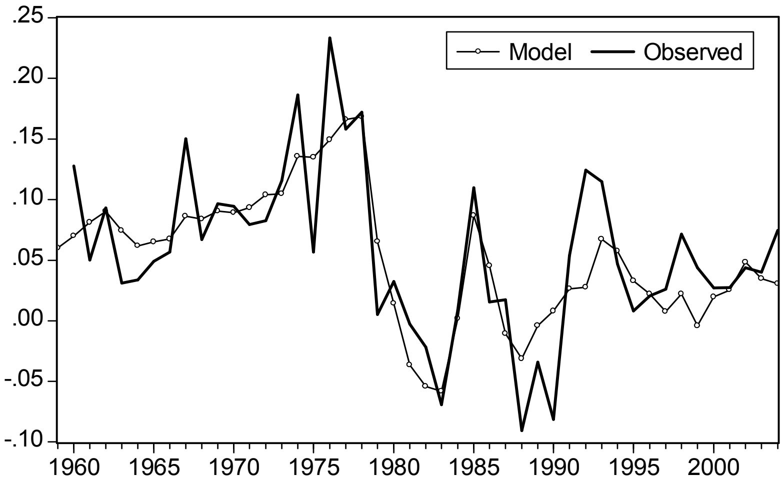
Figure 1 shows cyclical behaviour of oil, non-oil, and total GDP for the Iranian economy and provides a snapshot of the Iranian business cycles during the period 1959-2004. This cyclical component, obtained from the HP-filter, is defined as the deviation of actual from trend. As we might have expected, total GDP, oil and non-oil GDP follow each other closely over the business cycle in Iran. The Figure also show that the fluctuations in the prediction of oil GDP are much smaller than those historically observed. We can also see that the economy has experienced several business cycles during the period of study, three turning points - 1978, 1987, and 1994 all of which are shown in Figure 1.

In order to understand the cyclical behaviour of the Iranian economy, we investigate the behaviour of the fitted values of the estimated models against their known historical values. We use the "best" fitting models for oil (model 1) and for non-oil (model 2) to generate the fitted values based on the historical data. The two selected models for oil and non-oil output were replicated using the parameter values of each model. The actual (observed) and fitted (model) values for the two sectors are illustrated in Figures 2 and 3. The Figures suggest that the predictions of the selected models are consistent with the observed patterns for oil and non-oil sectors in accounting for the response of these sectors, except during the second oil price shock.



Compiled by Author, data source: Central Bank of Iran, Historical time series, 1959-2004

Figure 2- Real and Predicted Oil GDP in Iran



Compiled by Author, data source: Central Bank of Iran, Historical time series, 1959-2004

Figure 3- Real and Predicted Non-Oil GDP in Iran

These Figures also show that the instability in replicated data is somewhat underestimated at the beginning of the sample. For example, averaging this period of positive fluctuations between oil price changes and output growth together with the 1974-75 and 1979-81, periods of negative fluctuations misses the possibility that the dynamic response of the variables in the model is different for oil price decreases than it is for oil price increases. Throughout the early 1980s, oil prices were important negative factors affecting output.

Finally increasing political instability, accompanied by a debt crises in the later years are features the model is obviously demonstrating. Saez and Puch (2002) using a similar model for developing countries came to conclusions consistent with this research.

7. Discussion and findings

Results of the econometric analyses provided a degree of support for a number of the hypotheses, in particular, that the shock variable has an adverse effect on output. Results show that there is a negative relationship between oil price shocks and output in Iran's economy.
The positive and significant coefficient for capital in the non-oil sector, but partly insignificant in oil sector lends support to our hypothesis that the coefficient of capital is positive. The negative and insignificant labour coefficient was not able to support our hypotheses that the labour is positively related to output. This may reflect the problem that the quality of data for labour is poor.
The estimated models explain how the oil shock variable impacts on the macroeconomic fluctuation and cyclical behaviour of the Iranian economy. The production function approach is applied within the theoretical framework of RBC theory for the macroeconomic level and uses OLS regression technique to model the GDP of the entire economy, which is conventionally divided into oil and non-oil sectors. The production function in each sector is specified and estimated. The model was used to test the significance of hypotheses using various definitions of the shock variable to capture unanticipated oil prices shocks. The distinction between the exchange rate and the price of oil after converting it into the local currency explains the issue of the relative inflation rate and purchasing power parity between the nominal and real exchange rate used to evaluate the price of oil in nominal or real term. It was found that neither positive nor negative effects of exchange rate shocks have any significant effect on oil output. Therefore, it can be concluded that positive shocks that are unforeseen have a greater effect on output rather than negative shocks. However, the results show that both nominal and real exchange is not significant and there is not much difference to choose between them.

The results revealed that both government expenditure and oil GDP with a one period lag had a significant and positive effect on the non-oil sector. So, the government can play an important role in the economy by designing five-year plans and making plausible policies when the oil prices changes by adjusting the shocks in the oil sector, and smoothing government expenditure in the non-oil sector. The results suggest that predictions based on the model are consistent with the observed patterns for oil and non-oil sectors. In particular, the model does particularly well in accounting for the response of these variables during the second major oil price shock (1979-88). This shock not only accounts for macroeconomic fluctuations but also satisfactorily explains the cyclical behaviour of the economy.

8. Summary and Conclusions

The aim of the study was to investigate the effects of oil price shocks on the Iranian economy. To understand the nature of macroeconomic fluctuations and to develop a theoretical framework of the relationship between oil price shocks and the business cycle, the research was conducted using a modified version of the widely accepted RBC model. In order to model the Iranian business cycle, a modified version of the production function approach was developed and employed to evaluate cyclical behaviour of the economy for period 1959-2004.

The hypotheses tested here were that oil price shocks have an adverse effect on output, that asymmetrical positive shocks are more significant than negative, that the quadratic form captures negative shocks better than positive ones and that, overall, there is a significant relationship between shocks and output. The models used to test these hypotheses have been modified from RBC theory, using a production function approach which is consistent with the Cobb-Douglas production function.

The conception of a production function has been used to provide empirical explanation of intertemporal differences in the economic growth. To adopt the framework of the production function approach to the Iranian economy, a number of assumptions have been made. Oil price shocks are a linear function of lags of past data which are defined as the deviation of oil prices from those predicted in each five-year plan. Macroeconomic fluctuations may occur if the movement of output is controlled from proceeding beyond a certain point or if some lags of the dependent variable are present in the model. The lag hypothesis by itself is not capable of explaining the recurrence of cycles of constant amplitude such as oil output, except non-oil output which indicates a damp cycle using second order lag of dependent variable. However, when the model is subject to continually external disturbances such as unexpected shocks, fluctuations may result in steady state.

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