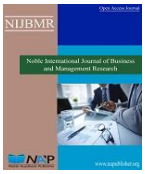
Noble International Journal of Business and Management Research
ISSN(e): 2520-4521 ISSN(p): 2522-6606
Vol. 06, No. 02, pp: 25-33, 2022
Published by Noble Academic Publisher
URL: www.napublisher.org
DOI: https://doi.org/10.51550/nijbmr.62.25.33



Original Article **Open Access**

The Oil Revenue, Exchange Rate and Stock Market Investment in Iran

Article History

Received: 06 May, 2022
Revised: 13 June, 2022
Accepted: 20 June, 2022
Published: 25 June, 2022

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Abstract: The purpose of this study is to investigate the effect of oil revenues and exchange rate on the amount of investment in the stock market in Iran using seasonal data in the period of 2008-2019. To this end, the effect of oil revenues, exchange rate and inflation on the amount of investment in the stock market in Iran has been estimated using a Markov-switching model. The results from a two-regime regression show that oil revenues, exchange rate, and inflation are regime-dependent and have different effects on the investment in the stock market in Iran. The results show that in regime (1), oil revenue and exchange rate coefficients are positive and inflation is negative. In regime (2), inflation and exchange rate coefficients are negative and oil revenue is positive.

Key Words: Oil Revenue, Exchange Rate, Inflation, Stock Market, Markov-Switching, Iran.

1. Introduction

In recent decades, oil has played an important role in shaping and organizing the economy, political development and industry in all economies; therefore, its price has always been one of the most important components in the economic and political modeling of developing and developing countries has been found. Iran, with its huge oil reserves, is considered as an influential producer in the global oil market, which is also under the influence of changes in the oil market. The country's high dependence on oil revenues has made this source of revenue a major source of public financing for the country and, consequently, directly and indirectly affecting the country's economic activities.

The increase in government spending reflects an increase in the monetary base and an increase in imports. An increase in imports, coupled with a decline in inflation expectations due to the abundance of the economy, lead to a slight shift in the liquidity price of consumer goods, leading to a gap in liquidity and inflation. The rupture of the liquidity-inflation relationship means that despite rising liquidity, the inflation rate does not rise. In that case, the government will continue to increase spending without worrying about high inflation. Exchange rate stabilization and rising imports, however, reduce the investment incentives and encourage rent-seeking activities. As a result, investment and employment decline gradually, and as oil revenues rise and inflation rates rise rapidly. Therefore, inflation rupture and liquidity growth are temporary and will not last long. Currency fluctuations through risk and uncertainty affect the stock market and stock price index. Iran is one of the countries rich in oil and holds the fourth-largest oil reserves in the world, accounting for 11.31 percent of the world's oil reserves (Central Bank of Iran, 2012 In this situation, any impulse to oil markets can affect the structure of the economy through different channels.

Given the impact of the economies of oil-dependent countries on the price of oil and its fluctuation in general terms, oil prices are also recognized as an important and fundamental factor in financial markets. The stock market is an organized entity formed for the purpose of trading stocks or any other securities. Reasonable reasons for using oil prices as fundamental components in stock market analysis can be the valuation of stock prices by the discounted value of future cash flows (whether cash dividends and price increases) influenced by macroeconomic events (Bahar and Nikolova, 2009).

Shabbir *et al.* (2020) examined the effects of oil prices and gold on the Pakistan's stock market using ARDL method in the period 1991-2016. The results showed that oil prices and gold have a significant effect on the stock market.

Nurmakhanova and Katenova (2019) studied the relationship between oil price, stock prices, and exchange rate using monthly data over the period 2007- 2017 in Kazakhstan. The results showed that based on Granger causality test, exchange rate and stock prices are affected by oil price in Kazakhstan.

Fotros and Houshidari (2017) have examined the effect of worldwide oil price (WTI) price fluctuations on Tehran Stock Exchange and Dubai Stock Exchange, using monthly data over the period 2004-2016 and the multivariate GARCH method. According to their findings, shocks of world crude oil prices have had a positive and significant effect on the volatility of the Dubai Stock Exchange and on the Tehran Stock Exchange.

Basher *et al.* (2015) using the Markov-switching model, examined the impact of oil shocks on real exchange rates for a sample of oil exporting and importing countries. The findings of their study suggest that the national currency's value-added pressure is a consequence of oil demand shocks in oil-exporting countries. There was also weak evidence of the impact of supply shocks on exchange rates in these countries. Global aggregate demand shocks also affect exchange rates in both groups of exporting and importing countries, but the specific and systematic effect of a decline or increase in the value of the national currency is not detectable.

Apolos *et al.* (2015) examined the relationship between GDP, exchange rate, import, export and inflation rate in Nigeria in the period 1986–2013. The results show that there is a positive significant relationship between GDP, exchange rate and export. The results also show that exchange rate fluctuations have affected Nigeria's economic growth.

Liang *et al.* (2013) in a study, examined the relationship between the stock market and the currency market in (ASEAN) countries, using the Granger causality method and the DOLS method. The results of their study supported the Branson and Frankel equilibrium hypothesis; in other words, their findings indicated that the exchange rate had a negative effect on equity prices in the countries under study.

Zhao (2010) examined the dynamics of the relationship between the real exchange rate and the stock price of China during the period 1991-1999. Multivariate GARCH models were used in this study. The results show that there is no sustainable long-run equilibrium relationship between the real exchange rate and the stock price, and past changes in the stock market have a greater impact on the future volatility of the currency market. In addition, there is the overflow effects of our two-way volatility between the two markets.

Hamilton (2009) argues that demand-side shocks arising from the process of world industrialization occur especially in countries such as China. Failure to respond quickly to supply-side shocks can cause significant changes in oil prices. Demand-side shocks, however, affect most of the stocks traded in the financial markets and oil futures in the oil markets.

Morley (2009) examined the relationship between stock price and short-term and long-term exchange rates for England, Japan, and Switzerland over the 1985–2005 period using the boundary test. The results indicate the long-run relationship between the exchange rate and the stock price for these countries. Also, the results of estimating error correction models suggest a positive relationship between exchange rate and stock price.

Aydemir and Demirhan (2009) examined the relationship between stock prices and exchange rates in Turkey and found that there was a two-way causal relationship between the exchange rate and all stock market indices.

The purpose of this study is to investigate the effect of oil revenues and the exchange rate on the stock market in the Iranian economy. This paper is organized as following. The second section describes the data and analysis method. The third section presents the research model and the results of the estimation and ultimately, the fourth section summarizes and concludes the research.

2. Theoretical Background, Data and Analysis Method

The importance of oil in the economies of developing oil-rich countries, such as Iran, is such that its price changes affect the prices of a large number of exporting countries' goods and services. Given that oil revenues make up a large part of the export revenues and revenues of the Iranian government's annual budgets, any increase or decrease in its prices directly or indirectly affects the country's economy and is one of the most important economic indicators. That is, it affects the exchange rate. On the other hand, many investment decisions, foreign trade, etc. depend on the exchange rate. On the other hand, oil is a factor of production in most sectors and industries. An increase in oil prices increases the cost of production for companies and consequently reduces the productivity of oil-importing countries (Jimens and Sanchez, 2004).

Oil has been one of the factors of production which generate income fluctuations, i.e., an increase in oil revenues increases output volatility and vice vera. One consequence of injecting foreign exchange earnings into the economy is an increase in the central bank's foreign reserves, which has a monetary inference. However, studies have shown that the effect of monetary shocks on asymmetric production is

also covered (Cover, 1992; Ravn and Sola, 1996). Also, given the increase in aggregate demand due to the injection of oil export revenue and, as a result of rising inflation, one of the strategies to counter inflation is to increase imports (especially in the case of exchangeable goods). With the increase in imports generally done to counter inflation, many manufacturing sectors will be severely damaged and will be out of the production cycle, and therefore some of the investment made in the economy remains unused. As production declines and unemployment increases, imports decline as foreign exchange earnings decline. Part of the imports will focus on capital goods and manufactured machinery, resulting in reduced investment, production, and employment. Sections that were excluded from production were a result of widespread imports of consumer goods during the period of increased oil revenues (Emami and Adibpour, 2011).

In addition, the state of the economy of a country is sensitive to the exchange rate fluctuation of that economy. Currency market changes affect households, firms, and government spending. Currency fluctuations also have implications for the financial system of a country, especially the stock market. Three events (Asian monetary crises, the emergence of floating exchange rates in the early 1970s, and financial market reforms in the early 1990s) have forced financial economists to determine the link between the two markets. In addition, the internationalization of capital markets has led to large amounts of capital flows between countries, leading investors and firms to study the exchange rate fluctuation and its effect on the floating exchange rate system, increasing the firm's competitiveness. Any decrease in export has a negative impact on the domestic stock market. But, for an import-oriented country, it can have a positive effect on the stock market by reducing input costs (Yucel and Kurt, 2003). This is due to the reduction in domestic import costs and, consequently, the decline in relative prices of domestic products relative to foreign products. Identifying stock market fluctuations and the factors that influence them provides a powerful tool for managing the risks that investors and firms face. Currency fluctuations have attracted much attention in the financial economies of developing and developed countries due to their requirements in the financial markets, especially the stock market. There are different relationships between exchange rate volatility and stock market returns. A decrease in the value of the domestic currency leads to higher stock market prices in long-term, while in the short-term reduces stock market returns. The openness of the economy of a country is considered a cause of fluctuations in its stock market. Besides, with the emergence of globalization, developing economies are becoming more integrated with developed economies through the consequences of increasing export and import flows. Since development programs in Iran are aimed at expanding non-oil exports and fluctuations in oil prices along with non-oil export fluctuations can lead to exchange rate fluctuations and create unwanted fluctuations in the process through stock market volatility Wide fluctuations in the real exchange rate are characteristic of developing countries. Developing countries, including Iran, have a high degree of uncertainty about macroeconomic variables. Growth, inflation, exchange rates, and other macroeconomic variables are more susceptible to fluctuations in industrialized countries, and the effects of these fluctuations and their persistence can lead to more structural problems in different economic sectors. (Kazerouni and Dolati, 2007). Currency fluctuations through risk and uncertainty affect the stock market and consequently the stock price index by influencing the investors and investors' decisions. The exchange rate and its fluctuations are considered the correct and optimized choices of foreign exchange systems and will have a significant impact on investment, export and import in the country. Therefore, they are of great importance for the economic authorities of the country. These fluctuations have specific effects on the private sector investment, both the raw material importing sector and the commodity-exporting sector, affecting the amount of import and export of intermediate goods and production-related capital. An increase in oil prices as a factor of production will lead to a shift to the left in the supply and demand curve, which will result in higher prices and lower productivity. Due to the positive currency shock, labor demand will rise and wages will rise. Increasing wages will increase commodities in the non-tradable sector, which will result in lower profits for export sectors. Ultimately, the impact of the sudden surge in oil prices will lead to a devaluation of the currency and an increase in the real exchange rate. This will reduce the competitiveness of the country in the international arena and ultimately reduce production in the economically viable sectors and reduce the value-added of these sectors (Pishbahar and Baghestani, 2014). With little reflection on the structure of the economy of Iran and other major oil-exporting countries that are heavily dependent on oil sales revenue, it is strongly suspected that many of the shocks to the economy stemmed from the oil shocks and are in fact a set of economic relations and characteristics of these countries shaped in a way that any oil shocks, whether oil price shock or oil revenue shock, in addition to their direct effects on indirect GDP growth, also have a monetary base, trade balance, and status. The state budget balance has undergone a transformation and this channel will have a series of real and monetary flows and consequences for the country. The direct effect of oil price changes on GDP for

both exporting and importing countries is that the oil price changes, especially indirectly through their increase, can be from both the trade balance and the budget balance channel (Bahmanyar and Fotros, 2012). Due to the dependence of the Iranian state budget on oil revenues (According to the latest statistics, 55 to 60 budgets depend on oil revenues) changes in oil prices have a significant impact on the Iranian economy, as well as the main source of influence on financial aid, subsidies and economic activities (Samadi *et al.*, 2009).

Oil revenues can affect a country's economic activities in two ways. One is through the impact on the supply side of the economy that these impacts are manifested primarily by interruptions and by their impact on the country's productive capacity. Another is through the impact on aggregate demand, which in the short-term can have an impact on the country's economic activities. Economists do not consider oil revenue fluctuations to the benefit of oil-exporting countries as they are forced to impose greater restrictions on imports of goods and services in developing countries, including Iran, as oil revenues decline. Most of their imports are capital goods and raw materials needed by the manufacturing sector. Restrictions on imports can have adverse effects on the country's manufacturing sector. The result of such conditions will be inflationary pressures, rising exchange rates, economic downturns and rising unemployment in society (Liang *et al.*, 2013). Some believe that oil prices do not have a significant impact on other markets because monetary and fiscal policies affect inflation and macroeconomic variables in which oil prices are taken into account (Apergis and Miller, 2009). Increasing oil prices will increase the oil earnings of oil-exporting countries, which will also change the volume of trading on the stock exchange.

In this study, the effect of explanatory variables on the stock market is investigated using a Markov-Switching Model. Independent variables include oil revenue, exchange rate, and inflation, and the dependent variable is the number of shares traded in the Iranian stock market. Research period for variables is consists of quarterly data from 2008 to 2019. The model under study inspired by Kilian (2009) and Basher *et al.* (2015) model as follows:

$$I_t = \beta_0 + \beta_1 Aoil_t + \beta_2\, CPI_t + \beta_3\, Ex_t + \varepsilon \qquad (1)$$

where in,
I_t: Stock market investment - number of shares traded
$Aoil_t$: Oil revenues (constant 2010)
CPI_t :Inflation - consumer price index
Ex_t :Free market exchange rates.(US dollar)

The data of this study are taken from the Central Bank of Iran, Statistical Center of Iran site, time series data and statistical yearbook.

3. Discussion

In the present study, the Augmented Dickey-Fuller unit root test (ADF) has been used to test the stationary of variables. This test is one of the most common unit root tests in time series data.

Tables 1 and 2 show the results of the test stationary of variables. According to the results of Table (1), none of the variables are at the stationary in the level, so the variables are examined with a first difference.

Table 1. The unit root test results (at level)

Variable	t statistics	Prob
I_t	-1.3668	0.5947
$Aoil_t$	-0.3038	0.9194
CPI_t	1.2074	0.9981
Ex_t	0.9490	0.9957

Source: Research findings

Table 2. The unit root test results (first difference)

Variable	t statistics	Prob
I_t	-3.3639	0.0069
$Aoil_t$	-7.7499	0.0000
CPI_t	-4.1656	0.0013
Ex_t	-6.6715	0.0000

Source: Research findings

As Table (2) shows, all variables are I (1). Given that the probability level value for all variables is less than 0.05, it is therefore concluded that all the variables studied are integrated of order 1, that is I (1).

The first step in estimating the Markov-switching model is to ensure the nonlinearity of the time series data. The maximum likelihood (LR) test was used for this purpose and the results of this test are presented in Table (3).

Table 3. LR test results

Statistics value	Prob
7276.513	0.0000

Source: Research findings

As the results of the above table show, because the p-value is less than 0.05, the variables studied follow a Markov-Switching pattern, so linear methods were not appropriate for estimating model parameters. Therefore, a nonlinear Markov-switching method is used in this study.

3.1. The Results of Estimation of Regression Specification

Table 4 shows the results of the model estimation using the Markov-switching model of MSI type.

Table 4. Results of Markov Switching Estimation of Regression

Variable name	Coefficient	Standard deviation	Statistical value t	prob
Regimes (1)				
c	0.4996	0.0723	6.9029	0.0000
D $Aoil_t$	0.0580	0.0319	1.8177	0.0691
D CPI_t	-2.2846	0.2123	-10.7850	0.0000
D Ex_t	0.1827	0.0471	3.8782	0.0050
Regimes (2)				
c	1.2262	0.4505	2.7214	0.0065
D $Aoil_t$	0.2257	0.0325	6.9353	0.0000
D CPI_t	-0.4188	0.1030	-4.0626	0.0031
D Ex_t	-2.1438	0.7084	-3.0262	0.0414

Reference: Research findings

The results of Table 4 can be explained as follows:

Based on the obtained results, the stock market in Iran can be defined in the form of two regimes. A regime with more variance (boom or regime 1) and a regime with less variance (recession or regime 2) that are compatible with the real conditions of the Iranian economy, because the boom is more scattered in the Iranian economy, which is mainly due to oil revenues, and the recession is less scattered.

The results show that in regime (1), oil revenue and exchange rate coefficients are positive and inflation is negative. This means that in the period of economic boom, oil revenue and inflation and exchange rate affect the amount of investment in the stock market and the relationship between oil revenue and exchange rate with investment in the stock market is positive and the relationship between inflation and investment in the stock market is negative. All results are based on economic theories. Because investing in the stock market increases the exchange rate by increasing the demand for foreign exchange and imports. As a result, with the increase in oil revenues, the amount of investment in the stock market also increases. Because investing in the stock market is inversely related to inflation, and as inflation increases, investment decreases, reducing oil imports and revenues and the demand for currency. An increase in the exchange rate will increase the price level of imported goods in the domestic market. Therefore, it is expected that the demand for this category of goods will decrease and the demand for

domestically made goods will increase. In addition, with the increase in the exchange rate, the relative price of the country's export goods in foreign markets decreases, and as a result, demand for these goods is expected to increase. As a result, domestic production may shift to foreign markets and a smaller share of the domestic market may be sold. Therefore, in general, it is expected that imports will decrease, exports will increase, domestic prices will increase, and domestic production will increase, and as a result, investment will increase, which will also increase oil revenues in Iran.

The results show that in regime (2), inflation and exchange rate coefficients are negative and oil revenue is positive. This means that in the period of economic boom, oil revenue and inflation and exchange rate affect the amount of investment in the stock market and the relationship between inflation and exchange rate with investment in the stock market are negative and the relationship between oil revenue and investment in the stock market is positive. All results are based on economic theories. Because Iran's oil income is mainly provided through oil exports and sales, and with the decrease in exports, oil income also decreases, but investment in the stock market increases. Inflation has a negative effect on investment in the stock market, which means that if inflation increases, it will reduce the amount of investment in the stock market. The exchange rate during the recession has a negative effect on the amount of investment in the stock market, which is consistent with macroeconomic theories because with the increase of the exchange rate, the amount of investment in the stock market decreases.

3.2. Estimating the characteristics of each regime

According to Table (5), the length of stay in the recession is 9 periods (season) and the boom period is only 3.91 (season). According to this table, regime 1 is the most stable, because if the economy enters this regime, there will be 9 periods in this regime. Also, this regime has the highest probability, which means that if it were selected randomly from the sample under study, it would be at 89% probability. This stability in the stock market can be attributed to the oil structure of the Iranian economy, which has made the stock market highly dependent on the turbulent developments in the global oil market.

Table 5. Characteristics of each regime

	Probability of being in each regime	Average duration of the regime
Regimes (1)	89	9
Regimes (2)	74	3.91

Reference: Research findings

Figures 1 and 2 show the probability of being in regime 1 and 2 during the span of the study.

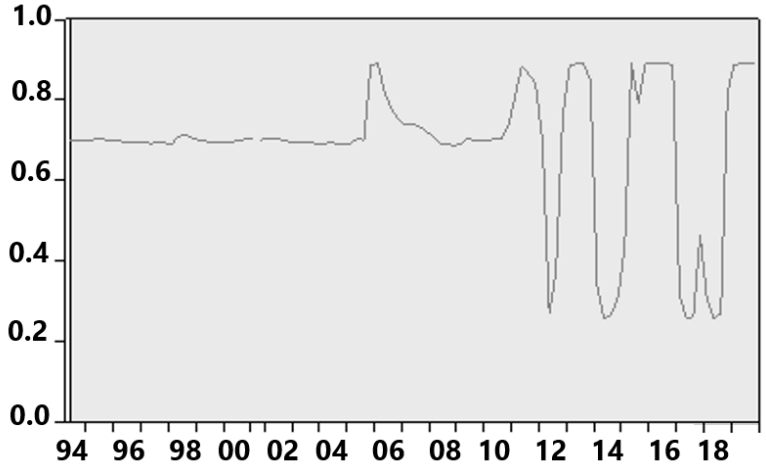

Figure 1. Probability of remaining in boom period
Reference: Research findings

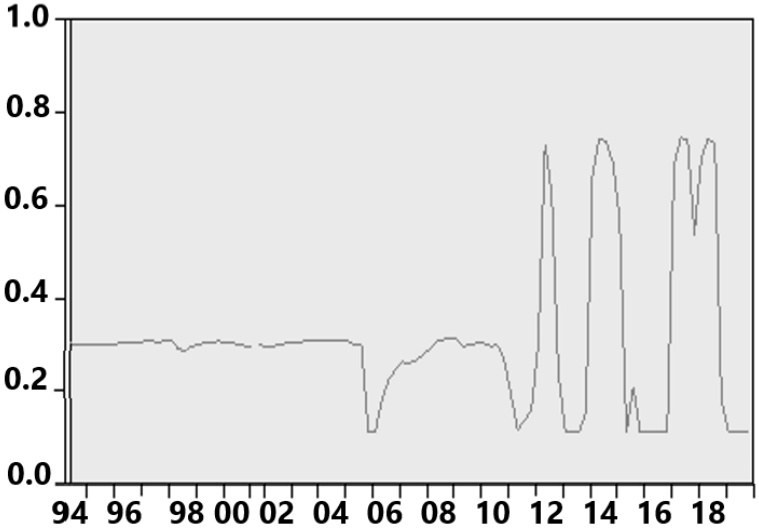

Figure 2. Probability of remaining in recession
Reference: Research findings

Table 7 shows the year-to-year charts of each regime or, in other words, the business cycles of the Iranian economy during the period 1991-1999.

Table 7. Years in each regime

Regimes (1)	2005-2011 2014-2015 2017-2019
Regimes (2)	1994-2004 2012-2013 2016

Reference: Research findings

As the results of the table 7 shows the boom periods of the Iranian economy are longer than those of the recession. Moreover, they are constantly fluctuating.

4. Concluding Remarks

Given the impact of exporting crude oil and petroleum products on the country's economy and providing a large share of public revenue to the state budget, the performance of the oil sector is of particular importance. One of the most important issues facing the country's financial system is the dependence of tax revenues and other government revenues on oil export earnings, which means that increasing oil revenues increases direct and indirect revenues, thereby giving greater opportunity.

Also, the effect of the exchange rate on the amount of investment in the stock market has been positive and has led to an increase in the exchange rate has increased the oil revenues, exports, and domestic production, and imports have decreased, which in turn has increased the amount of investment in the stock market.

In this study, the effect of oil revenues and exchange rates on the amount of investment in the Iranian stock market was investigated using the Markov-Switching (MS) model for the period of 2008-2019. At first, using the Augmented Dickey Fuller test, all the variables were I (1).

The results show that in regime (1), oil revenue and exchange rate coefficients are positive and inflation is negative. This means that in the period of economic boom, oil revenue and inflation and exchange rate affect the amount of investment in the stock market and the relationship between oil revenue and exchange rate with investment in the stock market is positive and the relationship between inflation and investment in the stock market is negative.

The results show that in regime (2), inflation and exchange rate coefficients are negative and oil revenue is positive. This means that in the period of economic boom, oil revenue and inflation and exchange rate affect the amount of investment in the stock market and the relationship between inflation and exchange rate with investment in the stock market are negative and the relationship between oil revenue and investment in the stock market is positive.

Based on the results of this study, the following suggestions are presented in order to maximize the effectiveness of investment in the Iranian stock market:

1. With the increase in oil prices, the country's oil revenue increases, so it is possible to increase investment in the stock market, because in this case, stocks are bought more and the stock price increases.
2. Directing the huge flood of oil revenues towards stock market investment and production.
3. Control and limit uncontrolled imports by the country's oil revenues and create a balance in imports for non-oil exports and not by relying on oil-derived currencies.

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