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Research Article

The Effectiveness of Different Decimals of Iranian Stock Market Returns from the Asymmetric Effects of Exchange Rate and Oil price Shocks in the Presence of Covid-19

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Aabstract
The current research was conducted with the aim of investigating the effect of asymmetric shocks in the exchange rate and oil price on the performance of the Iranian stock market using monthly data from 2011 to 2021. the quantile regression model is examined in deciles ranging from 0.1 to 0.9. The results show that the quantile estimates were not symmetrical, but in other conditions such as recession, normal, boom and strong growth, oil shocks had a significant negative impact on stock market returns. The impact of exchange rate shocks on stock market returns was not significant in severe recession conditions. But in the conditions of recession, normal, boom and high boom, exchange rate shocks have a positive and significant effect on the performance of the Iranian stock market. In addition, in this research, the effect of exchange rate and oil shocks during the COVID-19 epidemic was analyzed, which had a significant effect on the effectiveness of oil shocks on stock returns. This asymmetric effect was observed in different negative and significant deciles. Therefore, it can be seen that fluctuations in the global oil price and exchange rate expose some of Iran's key indicators, including the capital market, to instability.
Keywords: Asymmetric effects, Covid-19, Currency shock, Stock returns, Oil shock, Quantile regression

Introduction

One of the basic requirements of countries to follow the path of development and reach is manage a composites and organized capital market. The effect of the market on the performance of the economy is significant, so that its absence has a negative effect on the performance of the economy. One of the important components of financial markets is the stock market, which has played a significant role in the economic boom or recession of countries, and any recession or boom in this market has been associated with significant changes in economic variables, policies and decisions (Salmani Bishak et al., 2014) Investors in the stock market always consider the stock price index when making investment decisions. Therefore, understanding the factors affecting stock prices and their fluctuations is crucial. Several factors can influence the performance of the stock market. Some of these factors are domestic and related to company operations, such as earnings per share, dividend yield, price-to-earnings ratio, etc. Additionally, there are external factors that are influenced by variables outside the scope of the domestic

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economy (Monjazeb et al., 2022). Oil prices and exchange rates, as powerful external variables, have always impacted various macroeconomic variables, including stock market returns, and have consistently posed numerous issues and challenges to the Iranian economy (Zeinoldini et al., 2020). The exchange rate is one of the factors that affect the commercial relations of economic enterprises with the world (Sadorsky, 1990). In addition to the exchange rate, the price of oil is another important factor that affects the volume of production in manufacturing companies; Oil price shocks by oil-producing economies have been the subject of important theoretical research in the modern literature. This issue affects not only the countries that need to import petroleum products, but also the economic variables in the producing countries (Köse and Ünal, 2020). Iran is a single-product economy based on oil revenues and obtains a major part of its revenues from oil sales; oil price fluctuations severely affect the country's income level and subsequently its economic growth (Heidarzadeh Henzaei and Farahani, 2018). Therefore, understanding the form and strength of this relationship is important for investors to plan appropriate investment strategies (Mokeni, 2020).

Furthermore, due to the COVID-19 pandemic and intensified political tensions such as the Russian attack on Ukraine this year, the price of crude oil has experienced significant fluctuations. Iran, on the other hand, is an important oil-exporting country in which the government owns oil resources. Therefore, the changes in the oil market have a decisive role in the country’s fiscal policies and budgets. The oil sector, on the one hand, provides the foreign exchange needed by the private and public sectors to strengthen the flow of capital, and on the other hand, provides a large part of the revenue for the general government budget. Iran's national economy is highly dependent on revenues from oil exports, and since these revenues are a function of two factors of world oil prices and the volume of oil exports, so the oil price variable has a higher degree of erogeneity among macroeconomic variables (Fotros and Hoshidari, 2016). The increase in oil prices is accompanied by increased government revenue and expansion of the monetary base, which has inflationary effects. Inflation, in turn, has a positive impact on stock prices. The fluctuations in exchange rates also affect the production and income of businesses, consequently causing changes in their stock prices (Baradaran Khanian et al., 2017). Oil price shocks affect African markets through its cost effect on production, which leads to an increase in the cost of finished goods. Hence, a systematic quantification of the nexus between oil price shocks and stock market returns will offer insights to governments to deal with the situation in ways to gain the needed benefits from oil exports in light of their dependence of imported goods and services (Enwereuzoh and et L, 2021)

Therefore, according to the principle that investors carry out investment activities with the aim of obtaining returns and always carefully examine the existing and potential risks in their calculations and then make decisions. Also, since the economy of Iran and the stock and securities market specifically is strongly affected by oil price and exchange rate fluctuations, it is necessary to be aware of the price uncertainties of these two economic variables.

This study employs the quantile regression approach to examine the asymmetric effects of oil and exchange rate shocks on the stock market. This method allows us to analyze the impact of oil and exchange rate changes in different stock market conditions (severe recession, recession, normal, prosperity, and high prosperity). Generally, the cash flow of oil-producing and consuming firms exhibits different reactions to positive and negative stock market shocks, leading to an asymmetric relationship between oil market shocks and stock market returns. Additionally, the heterogeneous sensitivity of investors to positive and negative oil and exchange rate shocks may amplify the asymmetric effects of oil and exchange market shocks on stock returns (Monjazeb et al., 2022). The examination of asymmetric relationships allows investors and policymakers to determine whether oil and exchange rate shocks have different effects on stock returns. This enables them to identify suitable strategies or models to minimize risk and maximize returns when facing market uncertainties in the currency and oil markets.

Therefore, the aim of this research is to investigate the asymmetric effects of exchange rate shocks and oil shocks on the stock market returns in Iran, utilizing the quantile regression approach.

In the continue, firstly, the theoretical foundations and studies are presented. Then, the specification of the model, analysis, results, discussion and conclusion are summarized.

Theoretical foundations and research background

The exchange rate probably plays an important role in predicting the stock price through two channels as follows: On the one hand, since the exchange rate is an important factor in the production of many goods, changes in the exchange rate may affect the flows of affect the future liquidity of companies (Sadorsky, 1990). On the other hand, changes in currency prices may affect the discount rate. An increase in currency prices is often an indication of inflationary pressures. Central banks usually show it by increasing interest rates (Huang et al., 2017).

The impact of an oil price shock on large and small economies alike is deeply etched in history. Before the 1970s the price of oil was relatively stable. The first major oil crisis began in 1973, which was identified as the first oil price shock. Degiannakis et al. (2017) define oil price shock as the difference in the expected price of oil due to an unexpected change in the oil market. This follows from the invisible hand of the forces of demand and supply (Adaku Enwereuzoh et al. 2021). The price of oil has become one of the most unstable variables due to the various events that have occurred in the market in recent decades. Considering the constant changes in oil prices, understanding the relationship between these changes and other economic variables has attracted the attention of economists and researchers (Hamilton, 1983 and 1996; Mork et al., 1994; Lee et al., 1995; Barsky and Kilian, 2004; Ratti and Vespignani, 2016; Mokeni, 2020). An outstanding work on oil price shocks and macroeconomic performance is done by Hamilton (2009). Since, considerable works have been published on oil prices and their impact on stock markets in major oil-producing countries (Köse and Ünal, 2019).

The effect of oil price changes on the stock market

Huang et al. (2017), divided the theoretical and empirical relationship between oil price and stock price index into two general categories: 1) according to the oil is used as a production input in manufacturing, an increase in oil price leads to the increase in production costs and this in turn affects the stock price index; 2) The price of oil affects the stock price index through the discount rate and in the form of the expected inflation rate and the real interest rate. In such a way that the increase in the price of oil in the countries that import it leads to an increase in domestic inflation, followed by an increase in the expected inflation rate. Then the discount rate has also increased, and as a result, it leads to an increase in the stock price index. In the economic literature, it is stated that countries with natural resources such as oil and gas earn huge incomes by their excessive export. These revenues may be due to a sudden increase in oil prices at a particular time. Earning these incomes causes the Dutch disease in these countries (Samadi et al., 2016).

The effect of exchange rate changes on the stock market

In general, the relationship between the exchange rate and the stock index is analyzed in two flow-oriented and stock-oriented models. The most important flow-oriented model is the model proposed by Dornbusch and Fisher (1980). Based on this model, the change in the exchange rate in the form of a change in the performance of export-oriented and import-oriented stock exchange companies affects the stock index. In the form of a flow-oriented model, the exchange

rate has a positive effect on the stock price, which can be explained through the improvement of the trade balance, and this issue requires an increase in the companies' share of exports. On the contrary, in stock-oriented models, the determining factor of the exchange rate is the capital account. The most important of this model is introduced by Branson (1983) and Frankel (1983). According to this model, with a decrease in stock prices, the wealth of domestic investors decreases and leads to a decrease in the demand for money and interest rates, and with a decrease in interest rates, capital outflows increase and the media for an increase in the exchange rate is provided (Pavlova and Rigobon, 2007).

Literature Review

In this section, previous studies are reviewed in two categories, internal and external studies.

The approach used in the research of Zainaldini et al. (2022) is the quantile regression method, and the parameters affecting the stock price index were investigated in 0.9-01 deciles. They found that there is no significant relationship between the world price of gold and the stock price of the Iranian Stock Exchange. Also, in all studied deciles, there is a negative and significant relationship between OPEC oil price and Tehran Stock Exchange index. Xi et al (2021), show that the consequences of oil price uncertainty shock on stock returns are nonlinear and dynamic and show high asymmetry and heterogeneity. In addition, the COVID-19 pandemic exacerbated the implications of positive and negative changes in crude oil volatility on China's stock returns. Lin and Su (2020) show overall negative relationships between oil price uncertainty changes and Islamic stock returns, and in fact there is an asymmetry. Fatiti and Hadahri (2019), in a study, examined the causal relationships between the uncertainty of economic policies, oil prices, investors' sentiments among nine indices in Islamic markets. They found out using the uncertainty of intermittent economic policies, oil prices and also investor's inclinations may improve the forecast of stock returns. By estimating the two-factor arbitrage pricing model and using the random coefficient model, Smith Mahapatra and Bahadri (2019) By estimating the two-factor arbitrage pricing model and using the random coefficient model, they provided evidence that in the post-crisis period, stock returns show a significant reaction to foreign exchange rate fluctuations. Bouri et al. (2017) showed that the correlation and non-linear relationship between gold and oil price fluctuations is positive on Indian stock index fluctuations. The results of Nahidi Amirkhizi’s study (2022) indicate that exchange rate fluctuations have a significant and positive effect on stock returns. The results of Amani et al.'s research (2019) indicate the asymmetric impact of positive and negative oil price shocks on different decimals of the real exchange rate under the influence of different market conditions. According to Zeinedini et al. (2019), the exchange rate change has a negative effect on the return of the stock price index, and the oil price, industrial production index, and exchange rate have a positive effect on the return of this index. The results of Aminian et al study (2017) showed that the coefficient of oil shocks for periods of deep recession, recession and normal has a negative and significant effect on the returns of industrial stocks, but the effect of these oil shocks is not significant in the case of boom and deep boom conditions. The findings indicate that oil shocks have asymmetric effects on the returns of industrial stocks in different market conditions.

Methodology

In the present study, the asymmetric effects of exchange rate and oil shocks on the stock market returns in Iran are examined using data from economic information providers, including the website of the Tehran Stock Exchange, the website of the Statistical Center of Iran, the World

Bank database, and the data from the Central Bank of the Islamic Republic of Iran. This research is of an applied nature. The present study was conducted using a statistical sample including 132 months of time series data related to Iran during 2011 to 2021.

The quantile regression model is used with a similar idea for conditional quantiles. Like normal (mean) regression, applications such as examining the relationship between descriptive variables and quantiles, as well as predicting them, are also possible for this type of regression. Despite this, perhaps the most important application of quantile regression is to identify the shape of the distribution of the dependent variable of the model at different levels of descriptive variables. This is done by fitting multiple regression models for different quantiles on a data set.

Quantile regression, unlike ordinary regression, utilizes the minimum sum of weighted absolute residuals to estimate model parameters, a method known as the least absolute deviations (LAD) approach (Koenker and Bassett, 1978). Quantile regression does not rely on the assumptions of homoscedasticity and the presence of influential outliers that are imposed by ordinary regression, thus allowing for model estimation at any quantile level. In essence, quantile regression is robust to outliers (Bozorg Asl et al., 2018). In fact, in this method, outlying data points, which manifest their influence through large residuals, do not have the possibility to affect the regression estimates at least absolute deviations (Salarijazi, 2017). Quantile regression, with a careful and comprehensive examination of the response variable, allows for the inclusion of explanatory variables at all parts of the distribution, not just the central location, particularly in the tails of the distribution (both the lower and upper tails). Furthermore, quantile regression is suitable when the error distribution is non-normal and in distributions with long-tailed and asymmetric sequences, as well as in the presence of heteroscedasticity in the regression (Chen and Chalhoub-Deville, 2014).

In linear regression models, the assumption of normality is necessary to reach a statistical inference. However, quantile regression is not sensitive to distributional assumptions because the estimators assign greater weight to the local behavior of the distribution near a specific quantile. Therefore, statistical inference in quantile regressions can be independent of the specific form of the distribution, and the estimators can be performed accordingly (Maciejowska et al., 2016).

The model used in this study is specified based on the work conducted by Lin and Su (2020), Tsai (2012), Zainal-Din et al. (2022), and Aminian et al. (2018) as follows:

$$Y_t = \alpha_0 + \alpha_1 Soil_t + \alpha_2 Lrex_t + \alpha_3 Lm_t + \alpha_4 Inf_t + \alpha_5 Y_{t-1} + \varepsilon_t \quad (1)$$

$$Y_t = \alpha_0 + \alpha_1 Srex_t + \alpha_2 Lm_t + \alpha_3 Inf_t + \alpha_4 Y_{t-1} + \varepsilon_t \quad (2)$$

So that**:**

Stock return (y_t): The stock price was extracted from the official website of Tehran Stock Exchange on a monthly basis, and finally, the stock return was obtained as a logarithm of the total index in each period compared to the previous period multiplied by a percentage.

$$Y_t = \ln(\frac{p_t}{p_{t-1}}) \times 100 \quad (3)$$

Oil price shock ($Soil_t$): In this research, oil price shocks were extracted from Hodrick-Prescott method. In this regard, the oil price data announced by the Central Bank was used.

Inflation rate (Inf_t): In this research, the consumer price index was used to measure the inflation rate variable. The logarithm of the consumer price index in each period compared to the previous period is multiplied by a hundred and is considered as the monthly inflation rate. The monthly data related to this variable was extracted from the World Bank.

Real exchange rate (rex_t): In this research, the real exchange rate based on consumer prices is used. The following relationship is used to calculate the real exchange rate index based on the consumer price index:

$$rex = ex * \frac{cpi_{us}}{cpi_{ir}} \quad (4)$$

Where in eq. (4); *ex*, the nominal exchange rate of Iran; cpi_{us} is the consumer price index in the United States, cpi_{ir} is the consumer price index in Iran. Finally, the logarithm of the real exchange rate has been used in the first equation.

Currency shock ($\mathbf{Srex_t}$): To calculate the currency shock, using the nominal exchange rate announced by the central bank, the real exchange rate, which was calculated using equation (4) and then extracted using the Hodrick-Prescott filter method.

$\boldsymbol{Lm_t}$**:** Liquidity logarithm includes money plus pseudo-money and is extracted from the Central Bank of Iran in billions of Rials.

Extraction of oil and currency shocks using Hodrick-Prescott method

Usually, in empirical studies, any unpredicted values of time series variables are considered as shocks related to that variable, so that the regression lag of the increase in exchange rate or oil price is considered as unpredicted shocks. Another method of obtaining predicted and unpredicted shocks is the use of univariate filtering methods. In Hodrick-Prescott filter method, time series Y_t is obtained from the sum of two growth components g_t and cyclic component c_t:

$$y_t = g_t + c_t \text{ , for=1,...., } t \quad (5)$$

Growth values (trend) are obtained by minimizing the sum of squared deviations of the time series variable Y_t from its trend g_t. In fact, the Hodrick-Prescott filter trend values are the values that minimize the following relationship:

$$Min \{\sum_{i=1}^{T} C_t^2 + \gamma \sum_{t=1}^{T} [(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2\} \quad (6)$$

In the above equation, *T* is the number of observations and γ is a parameter that determines the degree of smoothness of the c_t trend. Now, according to the explanations provided, we can extract exchange rate and oil price shocks and call them psex and psoil. In fact, these expressions are predicted shocks or expected shocks of exchange rate and oil price. Unpredicted exchange rate shocks are also obtained from the difference of exchange rate and expected exchange rate shocks according to the mentioned contents:

$$Sex=ex-psex \quad (7)$$

Unpredicted oil price shocks can also be obtained from the difference between oil price and expected oil price shocks:

$$Soil=oil-psoil \quad (8)$$

The general description of quantile regression is as follows. For the random variable Y, the probability distribution function is as follows:

$$F(y)=prob\ (Y \leq y) \quad (9)$$

The τth quantile of Y is defined as the following inverse function:

$$Q(\tau)=inf\{\ y:F(y) \geq \tau\ \} \quad (10)$$

Where $\tau<1<0$ *is.*

For the random sample *{y1, y2, ..., yn}* of *Y*, it can be said that the mean of the sample minimizes the sum of the following deviations:

$$min_{\xi \in R} \sum_{i=1}^{n} |y_i - \xi| \tag{11}$$

Also, the quantile of the τth sample (τ), which is similar to Q(τ), can be proposed as a solution to the following optimization problem:

$$min_{\xi \in R} \sum_{i=1}^{n} \rho_\tau (y_i - \xi) \tag{12}$$

Where, we have:

$$\rho_\tau(z) = \mathrm{z}\big(\tau - I(z < 0)\big), 0 < \tau < 1 \tag{13}$$

Just as the average of the sample that minimizes the sum of squares of the residual:

$$\hat{\mu}=argmin\ _{\mu \in R} \sum_{i=1}^{n} (y_i - \mu)^2 \tag{14}$$

The linear conditional mean function $E(Y|X = x)=\acute{x}\beta$ can be obtained by solving the following equation:

$$\hat{\beta} = argmin\ _{\beta \in R^p} \sum_{i=1}^{n} (y_i - \acute{x_1}\beta)^2 \tag{15}$$

At the end of the linear conditional quantile function, $Q(\tau|X = x)=\acute{x}\ \beta(\tau)$, can be estimated by solving the following equation for each quantile τ∈(0,1):

$$\hat{\beta}(\tau) = argmin\ _{\beta \in R^p} \sum_{i=1}^{n} \rho_\tau (y_i - \acute{x_1}\beta)^2 \tag{16}$$

Where the quantile value of β ̂(τ) is called τ-th quantile regression (Tian et al., 2018).

Result and Discussion

Estimation and analysis of the model

Descriptive statistics and Reliability test of variables

Descriptive statistics related to the variables used in the research are reported in the Table 1. As can be seen, the average stock return is 11.68%, the real exchange rate is 10.08 billion Rials, the logarithm of oil price is 4.20 dollars, the liquidity logarithm is 16.21 billion Rials, and the inflation rate is 1/81%.

Table 1. The results of descriptive statistics of research variables

Variables	Descriptive Statistics				
	Jarque-Bera	Minimum	Maximum	Middle	Average
Stock returns	15.79	10.00	14.41	11.22	11.68
Real exchange rate	82.56	9.31	12.55	9.64	10.08
Oil prices	4.81	2.84	4.80	4.15	4.20
Liquidity	6.10	14.89	17.69	16.22	16.21
Inflation	44.95	-1.05	6.82	1.44	1.81

According to the Jarque-Bera statistic in the above table, except for the oil price variable, all other variables, especially the stock market return variable, have non-normal distributions. Therefore, employing OLS regression may lead to incorrect results. However, quantile regression, by disregarding this assumption, can estimate the model effectively.

The results of Jarque-Bera test show that the return of the stock market is not symmetrical and is skewed to the right (skewness coefficient, 0.75). Considering that this distribution is skewed to the right and has outliers, it is appropriate to use quantile regression to investigate the factors affecting the dependent variable in all distribution points, including outliers.

In the following and before estimating the model, the data should be tested and checked in terms of reliability, which is one of the ways to avoid false regression. Therefore, the reliability in significance level values for all variables were determined using the Dickey-Fuller test. The results of the test showed that only the variables of liquidity and the reliability real exchange rate were not reliable, which became reliable after taking the difference once (Table 2).

Table 2. Reliability test

Variables and resources	Symbol	ADF	Critical values			Probability level
			1%	5%	10%	
Stock returns, Tehran Stock Exchange website	Y	-7.05	-3.99	-3.42	-3.13	0.00
Oil price, central bank	Oil	-3.33	-3.46	-3.46	-2.57	0.05
Oil price shocks, research calculations	Soil	-11.28	-3.99	-3.99	-3.13	0.00
Real exchange rate, central bank	rex	-9.7	-4.03	-4.03	-3.14	0.00
Real exchange rate shock, research calculation	Srex	-15.79	-3.99	-3.99	-3.13	0.00
Liquidity, central bank	Lm	-8.59	-4.03	-4.03	-3.14	0.00
Inflation rate, World Bank	Inf	-4.94	-3.99	-3.99	-3.13	0.00

Estimation of the model Quantile

Considering that some of the research variables were reliable and others were reliable with one-time differentiation, it is necessary to perform the co-integration test before estimating the model to ensure the existence of co-integration between the variables (Table 3).

Table 3. Cointegration test

Unrestricted Cointegration Rank Test (Trace)				
No. of CE(s)	Eigenvalue	Trace	Critical Value	Prob
At most 1	0.10	33.68	24.47	0.00
At most 2	0.04	13.74	12.32	0.02
At most 3	0.02	5.49	4.12	0.02
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
No. of CE(s)	Eigenvalue	Trace	Critical Value	Prob
At most1	0.10	19.9	17.79	0.02
At most 2	0.04	8.25	11.22	0.1
At most 3	0.02	5.49	4.12	0.002

Estimation of the first model Quantile

In the first model, we examine the effects of oil shocks on stock returns on a monthly basis in the period of 2011-2021. The first part includes the first and second deciles, which correspond to the market in a deep recession (up to 20% low dispersion), the second part includes the third

and fourth deciles, which correspond to the market in a recession (20 to 40% dispersion). The third part includes the fifth and sixth deciles, which correspond to the market in a normal state (40 to 60 percent dispersion), the fourth part includes the seventh and eighth deciles, which correspond to the market in a boom state (60 to 80 percent dispersion). And the fifth section includes the ninth deciles and later, which corresponds to the market in a state of deep boom (more than 80% high dispersion).

The estimation results for the first model are as follows:

The first model: $Y_t = \alpha_0 + \alpha_1 Soil_t + \alpha_2 Lrex_t + \alpha_3 Lm_t + \alpha_4 Inf_t + \alpha_5 Y_{t-1} + \varepsilon_t$

Table 4. Estimation results in different deciles of quantile regression (first model)

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Fixed	0.07	0.02	-0.09	0.03	-0.18	-0.41	-0.32	-0.34	-0.53
Probability	0.70	0.92	0.71	0.9	0.46	0.09	0.17	0.25	0.13
Soil	-0.01	0.08	0.11	-0.246	-0.249	-0.290	-0.292	-0.326	-0.320
Probability	0.76	0.19	0.08	0.00	0.00	0.00	0.00	0.00	0.00
Lrex	-10^6 * 3.03	-10^6 * 1.82	-10^6 * 2.46	-10^6 * 5.10	-10^6 * 4.00	-10^6 * 4.45	-10^6 * 3.79	-10^6 * 3.91	-10^6 * 1.85
Probability	0.01	0.2	0.12	0.76	0.01	0.00	0.01	0.04	0.43
Lm	-0.001	0.0004	0.0005	0.0007	-0.001	-0.001	-0.003	-0.006	0.002
Probability	0.70	0.91	0.92	0.89	0.82	0.82	0.45	0.28	0.75
Inf	0.0003	0.0001	-0.0000006	0.0001	-.0005	-.0009	-.0008	-.0007	-.0006
Probability	0.29	0.70	0.88	0.8	0.15	0.02	0.03	0.10	0.26
Y t-1	0.99	0.99	0.98	0.97	0.97	0.96	0.99	0.98	0.95
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R^2	0.92	0.93	0.93	0.93	0.93	0.94	0.94	0.95	0.94

The obtained results (Table 4) show that the coefficient of oil shocks for the period of severe recession (decile 0.1, 0.2) of the stock market does not have a significant effect on the stock returns of companies, in fact, the capital market is indifferent to these shocks in the state of severe recession. The coefficient of oil shock has a negative and significant effect on the return of the market shares during the recession (decile 0.3, 0.4). In normal conditions (decile 0.5, 0.6), the effect of oil shocks is negative and significant. In terms of boom condition (decile 0.7, 0.8), the effect of oil shocks is negative and significant. So, with an increase of one unit in oil shocks, the stock returns will decrease by about 0.299 and 0.32 percent units. Finally, in deep boom (decile 0/9) conditions, this effectiveness has reached 0.320.

It can also be seen that the impact of the oil shock on stock returns in quantiles has an increasing trend. In other words, it can be said, in the conditions of the capital market boom, oil shocks cause more losses to companies and investors, but in the conditions of deep recession of the capital market, these shocks do not affect the market. According to these results, it can be said that the first hypothesis of the research that the effect of oil shocks on stock returns is confirmed in different market conditions (Figure 1).

Based on the evidence, when the government in the country does not face problems and sanctions in terms of oil sales and the return of currencies from oil sales, it will not sell government shares in the stock market, and in such a situation, the entry of liquidity into the market will also decrease. The increase in the volume of stock market transactions leads to a decrease in the stock index. On the other hand, because oil is considered as an important input in production, an increase in the price of oil causes an increase in energy costs for manufacturing companies, which affects the company's profit. It reduces the stock prices and lowers their

prices. Now, if the price of oil decreases in this situation, considering that the refining companies and the petrochemical industry account for about 35% of the stock market value. Therefore, it is natural that with the decrease in oil prices, their profit will decrease and it will reduce the return of stocks. Now, when the country is facing oil embargoes, the government will sell government shares in the stock market, and in such a situation, the entry of liquidity into the market will also increase, which will lead to an increase in the stock index as the volume of stock market transactions increases,

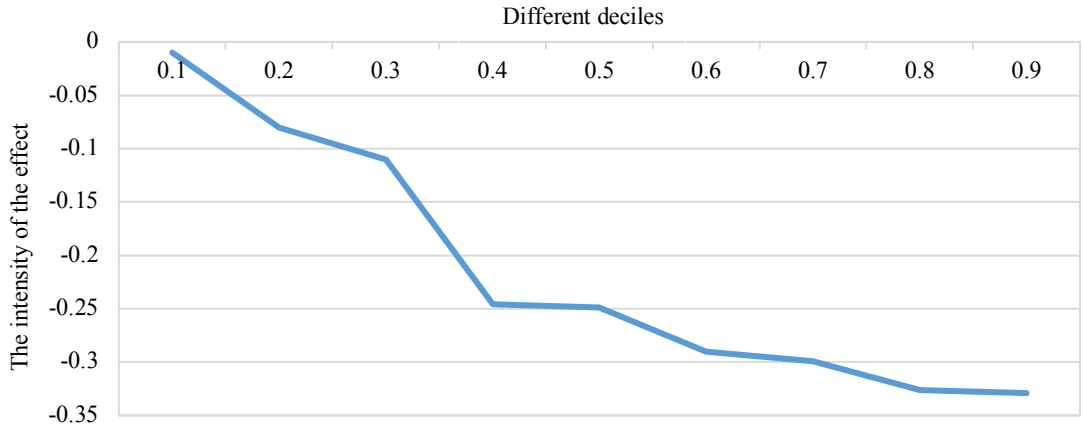

Figure 1. The severity of the impact of the oil shock on stock returns in different quantiles

A clear example of such conditions was the years 2012 and 2018. The estimated regression coefficient for different quantiles is above 0.90. In the next step, the Standard Wald test is used to examine the symmetry of the quantile regression and the equality of quantile slopes. If the null hypothesis is rejected, it indicates the asymmetry of the quantile model and the inequality of slopes across different quantiles.

The results of the Wald test indicate that the examined model is asymmetric, meaning that the behavior of the variables and their impact on the dependent variable varies across different quantiles. Additionally, the quantile slopes are not equal across different quantiles. Therefore, the variables in this model, including the oil shock variable, have different effects when the return rate is very low and the market is in a recession compared to when the return rate is high and the market is booming. Based on the estimation findings, it can be inferred that for predicting the return rate, attention should be paid to its level because the analysis and prediction differ across lower, middle, and upper quantiles (See Table 5).

Table 5: Wald test results

Result	Prob	Chi-square statistic	Null hypothesis	Test
asymmetric	0/01	42/35	Asymmetric	Symmetry of the quantile model
Inequality	0/01	83/21	Equality of the slope of the decimals	Equality of quantile slope

Estimation of the second model Quantile

The estimation results in the second model, which examines the impact of currency shocks on stock returns in different market conditions, are as follows:

The second model: $Y_t = \alpha_0 + \alpha_1 Srex_t + \alpha_2 Lm_t + \alpha_3 Inf_t + \alpha_4 Y_{t-1} + \varepsilon_t$

Table 6. Estimation results in different deciles of quantile regression (second model)

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Fixed	0.04	0.48	0.52	0.82	0.74	0.72	0.50	-0.25	0.95
Probability	0.91	0.16	0.11	0.00	0.03	0.22	0.52	0.80	0.22
Srex	-10^7 * 9.87	-10^6 * 2.55	-10^6 * 3.78	-10^6 * 3.72	-10^6 * 3.57	-10^6 * 4.42	-10^6 * 5.13	-10^6 * 2.03	-10^6 * 1.45
Probability	0.74	0.32	0.00	0.00	0.01	0.01	0.04	0.054	0.69
Lm	0.0003	-10^5 * 6.01	0.0006	-0.0007	0.005	0.003	-0.0007	-0.001	-0.007
Probability	0.93	0.98	0.88	0.87	0.31	0.53	0.88	0.84	0.13
Inf	0.00	0.00	0.001	0.001	0.001	0.001	0.01	-10^5 * 5.25	-0.001
Probability	0.84	0.2	0.03	0.00	0.01	0.11	0.35	0.97	0.30
Y t-1	0.99	0.94	0.94	0.91	0.91	0.91	0.95	0.99	0.98
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R^2	0.92	0.93	0.93	0.93	0.93	0.93	0.94	0.98	0.93

The results show that the exchange rate shock does not have a significant effect on stock returns in deep recession conditions (decile 0/1, 0/2). In recession conditions (decile 0/3, 0/4), it has a significant effect on stock returns, which is a positive effect. Also, the coefficient of currency shock on stock returns is positive and significant under normal conditions (decile 0/5, 0/6). In the conditions of booming (decile 0/7, 0/8) stock market, the impact of currency shocks will be 5.13%, which is also positive and significant; and finally, in deep boom (decile 0/9), the currency shocks do not have a significant effect on stock returns. Therefore, it can be seen that the impact of currency shocks on stock returns is different in different market.

Due to the increase in liquidity in the country, the exchange rate increases through the creation of inflationary effects, because when inflation increases in the country, in order to maintain the competitiveness of domestic goods, the incentive to increase the exchange rate in the country increases, and now if the efficiency of the parallel market As the currency market is more than the stock market, it can cause liquidity to leave the stock market and enter the currency speculation sector and create more harmful effects. When the country is facing sanctions and reduced currency supply, the government will sell stocks with the aim of controlling the exchange rate and inflation as well as financing its budget. Liquidity will also be provided by natural persons, which will result in an increase in the stock index. The estimated regression coefficient for different quantiles is above 0.90.

The results of the Wald test in this model show that the next step, the Standard Wald test is used to examine the symmetry of the quantile regression and the equality of quantile slopes. If the null hypothesis is rejected, it indicates the asymmetry of the quantile model and the inequality of slopes across different quantiles (Figure 2).

In addition, the results indicate that the examined model is asymmetric, meaning that the behavior of the variables and their impact on the dependent variable varies across different quantiles. Additionally, the quantile slopes are not equal across different quantiles. Therefore, the variables in this model, including the exchange rate shock variable, have different effects when the return rate is very low and the market is in a recession compared to when the return rate is high and the market is booming. Based on the estimation findings, it can be inferred that for predicting the return rate, attention should be paid to its level because the analysis and prediction differ across lower, middle, and upper quantiles.

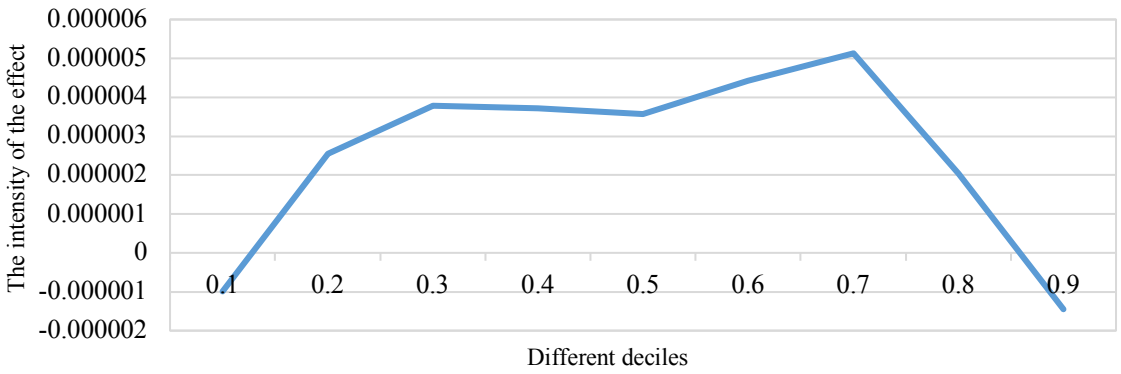

Figure 2. The intensity of the currency shock effect on stock returns in different quantiles

Estimation of models during the epidemic of Covid-19

Therefore, examining the asymmetric effects of exchange rate and oil shocks during the 132-month period from 2011 to 2021 led the researcher to investigate these models during the COVID-19 era as well.

After entering the virtual variable D in two models, it was observed that the probability level of this variable in the first model is less than 0.05, which shows the impact of the Covide-19 epidemic on stock returns; therefore, it is possible to check the relationship between the variables in this model during the epidemic. But the probability level of this variable in the second model is higher than 0.05. Considering that the Covide-19 epidemic was officially announced by the Chinese government from December 2019 (equivalent to December 2019), the period under review in this section was considered from December 2018 to March 2021:

Table 7. The estimation results in different deciles of quantile regression (first model during Covid-19 epidemic)

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Fixed	8.12	8.13	8.13	-7.50	-11.62	-32.33	-32.21	-43.51	-4352
Probability	0.75	0.76	0.77	0.78	0.67	0.35	0.32	0.17	0.17
Soil	-0.22	-0.23	-0.23	-0.08	-0.16	0.40	0.36	0.43	0.44
Probability	0.60	0.63	0.63	0.86	0.74	0.56	0.60	0.51	0.51
Lrex	-0.32	0.38	-0.38	-0.31	-0.47	-0.41	-0.41	-0.47	-0.47
Probability	0.01	0.01	0.01	0.08	0.00	0.00	0.00	0.00	0.00
Lm	0.0008	0.0009	0.0009	-0.002	-0.00	-0.007	-0.007	-0.009	-0.009
Probability	0.86	0.87	0.87	0.68	0.57	0.29	0.29	0.14	0.1
Inf	-0.31	-0.32	-0.32	0.59	0.87	1.91	1.92	2.60	2.60
Probability	0.82	0.83	0.83	0.70	0.58	0.34	0.30	0.15	0.15
Y t-1	0.98	0.99	0.99	0.92	0.96	0.75	0.75	0.71	0.71
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R^2	0.83	0.85	0.81	0.77	0.74	0.72	0.71	0.71	0.71

The obtained results show that during the Covide-19 epidemic, oil shocks in all conditions (deep recession, recession, normal, boom and deep boom) have an effect on the stock returns of Tehran Stock Exchange. The oil shock coefficient is negative in all deciles as well as the entire period, but the impact rate is more negative in this period; And in fact, the impact of oil shocks on stock returns has been greater in this period.

The estimated regression coefficient for different quantiles is above 0.70. Also, based on the results of the equality test of the slope coefficients, the slope coefficients between the quantiles

in this model are not equal. Also, based on the results of the symmetry test, at a significance level of 5%, the null hypothesis of symmetric coefficients in the quantile regression is rejected.

Conclusion and Suggestions

Economic growth and development require extensive and efficient financial markets. Since economic growth and development requires large investments and these investments can never be financed on the basis of short-term resource market (money market), creating a strong and efficient capital market constitutes the basic infrastructure of long-term financing for the fundamental plans of any country. Many variables can affect the stock market, including exchange rate variables, oil prices, and monetary policy.

In this research, using a quantile regression approach, the impact of exchange rate and oil price shocks on Tehran stock market ecoefficiency was investigated in two models during the two periods of 2011-2021 (Covid-19 epidemic).

Considering the non-normal distribution of stock market returns as the dependent variable and the limitations imposed by the assumptions of OLS method regarding the normality of error terms, the model was estimated using the quantile regression approach, which relaxes this assumption.

Considering the reliance of Iran's economy on oil revenues, with the increase in oil prices, there will be an expectation of economic prosperity in Iran, and this can provide the basis for an increase in the stock price index. In other words, the increase in government financing resources, the expansion of investments, the prosperity of the foreign sector of the economy and, in short, the expectation of economic growth due to the increase in oil income, can have a positive effect on economic activities. Therefore, the formation of these expectations can increase the expected profits of companies and, as a result, increase the stock price index. But sometimes, based on theoretical bases, it can be explained that with the continued increase in the price of oil, with a greater increase in economic efficiency in the competing assets of financial assets such as land and housing in this period, it causes capital to be transferred from the stock market to this sectors, so that the positive effects of the increase in oil prices in increasing the money capital available to the people with a greater increase in the efficiency of competing assets due to speculative demand in these assets, the process of capital withdrawal from the stock market and its transfer to the sector has increased the competition. Therefore, the stock price index of companies will take a downward trend. But oil prices have decreased during the Covid-19 pandemic, stock returns have been on the rise; Because the government did not reduce its expenses by increasing the sanctions and reducing the price of oil, therefore it led to a budget deficit; The government provides part of this budget deficit in the form of debt to the central bank, which leads to an increase in the monetary base; This increase in the monetary base as well as the volume of liquidity leads to a decrease in purchasing power. Therefore, more capital goes to the financial markets, including the stock market, to preserve the assets. In fact, in recent years, with the growth of the monetary base and the deterioration of Iran's economy, price changes in capital assets have been evident. It seems that with the spread of the Covid-19 virus, Iranian investors have considered entering the stock market as the most appropriate way to reduce risk due to high inflation expectations. The growth of Iran's stock market index during the outbreak of the Corona virus does not indicate the improvement of Iran's economic situation, it is actually an inflationary index and depreciation of the currency. The results indicate that in both models, the effects of the examined variables on stock market returns depend on the level of stock return. This means that the impact of the model variables differs when stock returns are low compared to when they are high. The research findings show that the oil shock variable in the 132-month period under study (during the years 2011 to 2021) has a significant negative relationship with stock market returns in various market conditions,

and the intensity of this effect varies across quantiles, increasing from lower to higher quantiles. In other words, during periods of economic boom, the influence of oil shocks on stock market returns is greater than during periods of recession. During the COVID-19 pandemic, oil shocks had a negative and significant impact on stock market returns in all conditions (severe recession, recession, normal, boom, and high boom). However, the magnitude of the impact during this period is more negative, indicating a higher intensity of the influence of oil shocks on stock returns during the COVID-19 period.

Furthermore, the results demonstrate a positive and significant relationship between exchange rate shocks and stock market returns in recession, normal, and boom conditions. The intensity of this impact varies across quantiles.

Therefore, based on the findings that indicate the asymmetric effects of exchange rate shocks on stock market returns, it can be concluded that these shocks also play a significant role in influencing stock market performance.

Financial theory argues that in a well-developed financial market, currency risk is a part of unsystematic risk. Exchange rate fluctuations can affect the company in two ways: the direct effect can be on the net monetary and real assets of the company and the indirect effect can be influence through total demand, the cost of imported goods, competing imported goods and inflationary expectations. In fact, the increase in the rial income exchange rate increases the sales and especially exports and improves the competitiveness of manufactured products. Therefore, with the increase in the exchange rate, the profit from the export of export-oriented companies - which accounts for most of the market value of the industries admitted to the stock exchange - has increased and has shown its effects in improving the total market price index and increasing the market efficiency.

According to the available statistics, the stock market in Iran's current economy is very shallow and plays a very small role in it. Apart from the low depth of this market, the ownership structure of this market is another reason for its failure. Currently, most of the shares in this market belong to government and semi-government companies, according to the statistical report of the Tehran Stock Exchange Organization in 2015, the companies in the first ten industries that have the largest market share -they are mainly governmental and quasi-governmental; In other words, 80% of this small capital market is in belong to state and semi-state enterprises, and the private sector has very little access to the capital market. Therefore, it can be claimed that the majority of stock market activities are owned by large legal entities. Also, the structure of the market indicates the dominance of legal entities over real ones in the stock market transactions, which indicates the block nature of transactions and their concentration in the hands of legal entities that have high information rent. Therefore, the percentage of floating shares in the capital market is low. All these reasons cause the floating shares to have a low percentage in this market and lead to the possibility of price manipulation and interference in the market prices, the risk of liquidity and the unfairness of the company's stock prices.

Based on the research results, it is suggested that:

Based on the research results, it is recommended to analyze and predict investor behavior in the stock market under various market conditions, including recession, normal, and boom. It is important to differentiate and understand these different market conditions. As the Iranian stock market has not yet reached full maturity, it is necessary to provide appropriate education and training to investors in order to prevent irrational behavior.

The results showed that the reactions of stock returns to oil price shocks are different from lower to higher quotients, so diversifying portfolio investment will play an important role in reducing risk.

According to the results of the research, if the goal is conventional growth in the stock market, it is better for the central bank to follow the optimal currency policy that fits the

country's specific requirements and conditions and is compatible with the conditions of the monetary policy and the inflationary situation. It protects the stock market from instability. Therefore, predictions and policies must be based on the asymmetric behavior of this variable.

Due to the managed floating currency system and the fact that the government directly controls and maintains the market exchange rate at a certain rate by injecting dollars from oil revenue into the market; it is suggested that the exchange rate should be rationally adjusted annually so that the competitiveness of the country's export sectors does not decrease, and in practice, maintaining the exchange rate does not lead to the strengthening of the country's imports.

It is obvious that in the case of annual exchange rate adjustments, the country will be safe from currency shocks that have many negative effects in the long run.

It is also suggested that the annual adjustment of the exchange rate should be done according to the difference in inflation inside and outside the country, because if no adjustment is made, the difference in inflation accumulates in the long term and has no result other than creating impulse and a sudden jump in the exchange rate.

Resources

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