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## The Impact of Interest Rate Changes on Stock Returns of Private Banks Accepted in Tehran Stock Exchange

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ARTICLE INFO	ABSTRACT
<p>Article History:            Received 7 October 2019            Received in revised form            16 November 2019            Accepted 28 February 2020            Available online 1 March 2020</p>	<p>The main objective of this research is to study the effect of interest rate changes on stock returns of private banks accepted in Tehran Stock Exchange. The research hypotheses test was performed by regression analysis using the ordinary least squares (OLS) method and combined data. The statistical population of the research includes three private banks accepted in Tehran Stock Exchange which their seasonal returns are studied during a 6-year period from 2005 to 2010. Levin-Lin-Chu unit root test indicates that the interest rate variable and other variables are reliable at the first order difference. Results show that the interest rate has a significant negative effect on the stock return of private banks accepted in the stock exchange with 95% confidence level. So, one unit change in the interest rate leads to 10.83 units decrease in the stock return of private banks accepted in Tehran Stock Exchange.</p>
<p>Keywords:            Interest Rate, Efficiency of Stocks,            Multivariable Regression, Ordinary            Least Squares (OLS)</p>	

### 1. INTRODUCTION

In the economic literature, different terms are used for a more explicit interpretation of the interest rate. These different terms result from different economic situations and examples, and are occasionally determined in a special school of thought. Some different types of the interest rate include: monetary interest rate, product interest rate, salary interest rate, own interest rate, nominal interest rate, real interest rate, biological interest rate, technological interest rate, equilibrium interest rate, natural interest rate, neutral interest rate, between-time interest rate and within-time interest rate. Of course, different types of the interest rate are related together and affect each other. The interest rate can have other names based on different economic situations. For example, the equilibrium interest rate may be called the natural interest rate if it is consistent with the natural and potential economic situation and leads to the

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economic stability. Also, the natural interest rate which is related to the lack of unemployment and or inflation is called the neutral interest rate. Generally, interest rates are the most important components of the economic system. So, it can be claimed that economy is just a relationship among different interest rates [1]. The interest rate influences the economy through limiting the level of employment, imposing inflation and a negative effect on the optimality of resource allocation, creating uncertainty and instability, and preventing the economy from reaching a stable equilibrium situation. Keynes believes that the monetary interest rate has a special role in limiting the level of employment.

Despite the fact that “the interest rate” seems to be a boring subject, investors attempt so much to understand its effects. According to financial theories, the interest rate and its fluctuations are one of the main factors in companies’ evaluation and affect the stock return rate. This article addresses the significance of the relationship between “the interest rate” and the stock return. Empirical results show that the effect of the interest rate on financial variables depends on the specific economic condition [2]. The interest rate has a negative relationship with the Exchange Overall Index according to Gordon equation that a high interest rate leads to the decrease of the current value of the future cash flow and decrease of attractiveness of investment opportunities. As the interest rate is one of the main components of the discount rate, an increase in the interest rate leads to an increase in the return rate expected by investors, and as result, it leads to the stock price decline [3]. Low interest rates increase the stock value which results in the increase of commercial investments and also reduces the probability of financial bankruptcy [4]. A high bank interest rate makes risk-averse investors to withdraw their capital from market and move toward the money market, and demands risk-averse investors to take much risk. As a result, their expected return increases in the capital market which is an obstacle to investment and reduces the economic growth. However, the low interest rate encourages the high capital flow in the stock market to receive a higher expected return rate [5]. Policymakers must save the stock market using instruments such as the interest rate decrease [6].

## **2. THEORETICAL BACKGROUND AND LITERATURE REVIEW**

Based on an economic relation and equation in most of countries in the world, when banks’ interest rate changes slightly, the attractiveness of investment in the money market is reduced due to the decreasing adjustment of the interest rate, and capitals are sent to other markets, including the capital market. A significant factor which affects the stock price in the stock exchange is the discount rate or interest rate expected by investors that is a combination of the nominal interest rate (premium and stock risk). Considering a fixed risk premium factor, the lower the nominal interest rate, the higher the stock price in the market, and as a result, we will observe an increase and growth in stock indices [7]. Taylor Law about the interest rate anticipation is now very famous in bank and scientific circles in the world. According to this law, the interest rate is a function of the targeted inflation rate and the distance between the real GDP and potential GDP which is called “the output gap”. Of course, we cannot expect central banks to pay attention to two factors of inflation and output gap for monetary investments.

For example, in 1987 before October financial crisis, U.S. Federal Reserve increased the interest rate due to the high rate of inflation and output gap. But, immediately after Wall Street financial crisis and due to the lack of liquidity, it reduced the interest rate which resulted in the increase of liquidity. Another advantage of Taylor Law is assisting analysts and professionals in financial markets to anticipate the interest rate. Accordingly, in the stock market, an increase in the interest rate due to the high rate of companies’ financial expenses and the discount rate leads to the decrease of the intrinsic value of companies (their stocks). Recent studies of Morgan Stanly also show that the correlation between long-term interest rate – which is a function of inflation – and S&P500 index during 1972 – 2003 was approximately -0.15 [8].

Most studies conducted on the interest rate fluctuations show that there is a negative relationship between interest rate changes and stock return of financial corporations. Results indicated that in different regulatory regimes, banks sensitivity to interest rates changes had a different effect [9]. The effects of long-term interest rate changes on stock return of banks accepted in Athens stock exchange were studied by Drakos, K. [10].

In order to study the relationship among variables, he evaluated a set of combined data using GARCH model. The relationship between interest rate changes and banks stock return in Japan was studied by Brouserd. They conducted their research in two different regulatory regimes. In the first regime (1975-1983), there is a precise adjustment of financial system and a significant monitoring of banks’ activities, while in the second regime (1984-

1994), there is a period of financial liberalization and interest rate liberalization. Results showed that interest rate changes had a significant negative effect on Japanese banks stock return in the rigid monitoring period, but this relationship was weak in the period of interest rate liberalization. The effect of public announcement of nominal interest rate changes on Australian banks stock return during 1990 – 2005 was studied by John Vaz et al. [11]. Despite previous studies in which banks stock return showed a negative (positive) relationship due to the increase (decrease) of the interest rate, they found out that some stock returns of Australian banks did not show a negative effect due to the announcement of an increase in the interest rate.

The effect of the news about interest rate of Central Bank of Australia and US federal on different parts of Australian financial markets during 1998 – 2006 was studied by Kim and Neguwin [12]. GARCH model was used in order to study the effect of the news about interest rate on financial markets. Research results indicated that the news about interest rate of Central Bank of Australia had a significant statistical effect on the condition through the daily return or loan granting changes, exchange rate and stock exchange. Also, they found out that the news about an increase in the interest rate led to a fluctuation in most parts. The effect of interest rate changes on the stock market return and fluctuations in Korea during 1992 – 1998 was studied by Konan Leon (2008). For the evaluation, he used GARCH model. Results show that the interest rate has a high predictive power relating to the stock return and a low predictive power relating to fluctuations in Korea stock exchange. The effect of exchange rate and interest rate changes on Turkish banks stock return was studied by Kasman et al. [13].

For the evaluation, they used OLS and GARCH model. Their results suggest that exchange rate and interest rate changes have a significant negative effect on banks stock return. They also found out that the sensitivity of the stock return to the exchange rate and interest rate changes was much stronger than the market return.. During research (2002-2010), the interest rate increased 4 times and also decreased 4 times. Study results showed that there was a significant negative relationship between interest rate changes and the stock return. When the interest rate increased, the stock price decreased and when the interest rate decreased, the stock price of banks in China increased. Mostafa Karimzadeh [14] in his research studied the amount of the long-term effect of each macro-financial variable on stock price index using Vector Auto Regression (VAR) method with distributed lags. The estimation results showed that there was a co-integration vector between the stock price and macro-financial variables.

The estimated long-term relationship shows the significant positive effect of liquidity and the significant negative effect of real bank interest rate and exchange rate on the stock price index. The effect of interest rate fluctuations in the money market on investors' decision making and capital market performance during 1994 – 2009 was studied by Safarzadeh and Jalalinejad [15]. From objective point of view, the type of research was applied and from method point of view, it was a correlation research. Results obtained from research hypotheses test confirm a relationship between banks deposits interest rate and capital market activity. Of course, there is a negative correlation between these variables which indicates that this relationship is inverse, i.e. with the decrease or increase of deposits interest rate, the capital market activity rate increases or decreases. The effect of Central Bank's monetary policy on Tehran Stock Exchange activity was studied by Reza Torabi [16].

In this research, variables relating to the monetary policy include three variables of the amount of partnership bonds issued, amount of liquidity and the interest rate, and for the evaluation of Tehran Stock Exchange activity, two variables of transaction rate and price index, and cash return were used. The relationship between monetary policy variables and Tehran Stock Exchange was studied using related economic indicators and each hypothesis was tested separately. Results show the positive relationship of the amount of liquidity and interest rate with issued partnership bonds, and no significant relationship was demonstrated between independent variables and market price index (market return).

The relationship between the growth rate of overall stock index and a set of macroeconomic variables such as inflation, liquidity growth rate, exchange rate, bank interest rate and oil income was studied by S. H. Sajjadi et al. [17]. In this research, data were analyzed seasonally during 1995 – 2007 using Vector Auto Regression (VAR) method with distributed lags. Test results showed that there was a long-term relationship between the growth rate of overall price index and dependent variables so that there was a significant relationship between coefficients of liquidity growth rate and inflation rate with growth rate of overall price index at 95% confidence level, and the significant negative relationship between coefficients of oil income, exchange rate and bank real interest rate was rejected. The effect of macro variables on Tehran Stock Exchange Index was studied by Abbasian et al. [3]. Macro

variables include the exchange rate, trade balance, inflation, liquidity and interest rate. They studied the exchange overall index by seasonal data during 1998 – 2005.

The method used in this research is the co-integration method together with error correction models, implicit response functions and variance analysis. Findings indicate the positive effect of exchange rate and trade balance in the long term on the stock exchange, and the negative effect of inflation, liquidity and interest rate.

### 3. DATA AND METHODOLOGY

The research method is correlational, i.e. the study shows a relationship and correlation between variables through regression and research methodology using ex post facto method (using pas information). Data relating to exchange banks’ stock return were collected through resorting to the Securities and Exchange Organization using Rahavard Novin software, and data relating to the research dependent variable were collected through economic indicators issued by the Central Bank; then, they were prepared for the analysis through summarization and calculations in Excel spreadsheet. The final analysis was performed using EvIEWS7 software. Other required research information was collected through study of books, articles, researches and web sites. In this research, RET (dependent variable symbol (stock return rate of private banks accepted in the stock exchange)), IR (interest rate symbol) and FER, SC and IO (control variables symbols) show the exchange rate, company size and oil income, respectively. In order to test the reliability of variables, the unit root test was used.

This test was conducted using Levin-Lin-Chu test. Levin-Lin-Chu test results show that the return rate is reliable. Other variables are reliable at the first order difference level. In the next section, we used multivariate regression equation in order to study the relationship between two variables. In this section, first we studied the regression normality using Jarque-Bera statistic. By entering a dummy variable in the model, it was normalized. In order to study the existence of an autocorrelation, Durbin–Watson Statistic was used and in order to study the variance anisotropy, the Likelihood Ratio Test was used. In order to use the fixed effect model in contrast to the total combination of data, Chu test was used, and as the pool model was verified, Hausman test was not required. After conducting all above tests, the model was estimated and solved according to the previous tests.

### 4. DESCRIPTIVE STATISTICS OF VARIABLES

According to the combination of cross-sectional data with time series data for research hypothesis test, totally 72 observations are formed and descriptive statistics relating to them are provided through the following table.

**Table 1.** Descriptive statistics of variables

explanation	company size (billion rial)	interest rate (percent)	stock return rate (percent)	oil income (billion rial)	exchange rate (rial)
symbol	CS	IR	RET	IO	FER
mean	9070	0/04	0/08	56200	9556/86
median	7115	0/04	0/04	49642/06	9287/45
maximum	35079	0/04	0/9	130000	10415
minimum	1452/5	0/03	-0/57	1780	8920
Standard deviation	7122/6	0/004	0/25	29781	484/84
Observations Number	72	72	72	72	72

#### 4.1. Unit root test (Levin, Lin & Chu)

The reliability or unreliability of a series can significantly affect the behavior and characteristics of variables. Totally, unreliability of variables or in other words, randomness of variables time series makes the estimated regression to be false. If time series variables used in the estimation of the model coefficients are unreliable, while there may not be any conceptual relationship between model variables, the coefficient of determination (R<sup>2</sup>) can be

very vague and makes the researcher to have incorrect inferences about the amount of relationship between variables. H0 and H1 hypotheses relating to this test are as follows:

- H0 :The variable has a unit root
  - H1:(Static variable expression) The variable does not have a unit root
- Results of this test for research variables are provided as follows:

**Table 2.** Levin, Lin &Chu test results

test (Levin, Lin & Chu)LLC			
variable	Pause number	statistic	Prob.
exchange rate	level	-0/76	0/469
return rate	level	-7/22	0/000
oil income	level	-1/31	0/095
interest rate	level	0/73	0/769
company size	level	3/58	0/999

According to the probe value for all variables except the interest rate, H0 hypothesis is accepted. It means that our variables have a unit root; therefore, they are not reliable and they must become reliable by making difference at higher orders. As a result, Levin-Lin-Chu test was conducted for the first order difference of the model’s unreliable variables:

**Table 3.** Levin, Lin &Chu test results

test(Levin, Lin & Chu)LLC			
variable	Pause number	statistic	Prob.
exchange rate	First order difference level.	-5/10	0/000
oil income	First order difference level.	-5/09	0/000
interest rate	First order difference level.	-4/73	0/000
company size	First order difference level.	-4/86	0/000

As it was observed in the above table, according to the probe value and t statistic, all unreliable variables become reliable at the first order difference level.

**4.2. Pearson Correlation Coefficient**

In order to study the relationship between variables, Pearson Correlation Coefficient was used and its results were provided in table (4). Results show that there is a negative relationship between interest rate fluctuations and the stock return of private banks accepted in the stock exchange.

**Table 4.** Correlation test result

Return Rate	Oil Income	Variables
-0/21	1	Interest Rate
1	-0/21	Return Rate

Then, in order to study the effect of interest rate fluctuations variable on the stock return of private banks accepted in Tehran Stock Exchange, the following equation is defined:

$$RET_{it} = \alpha_i + \beta_1 IR_{it} + \beta_2 FER_{it} + \beta_3 CS_{it} + \beta_4 IO_{it} + Dum_2 + \epsilon_{4t} \tag{1}$$

### 4.3. Autocorrelation test

Lack of an autocorrelation is one of the classic hypotheses which must be considered in the equations. For the study, Durbin–Watson Statistic was used.

**Table 5.** Autocorrelation test result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IR	-38.33	17.4	-2.2	0.03
FER	-0.0002	0.0001	-1.62	0.1
CS	6.05E-15	5.69E-15	1.06	0.29
IO	-1.19E-16	1.22E-15	-0.09	0.92
Dum <sub>2</sub>	0.003	0.001	2.28	0.02
C	3.99	2.098	1.9	0.06
R-squared	0.17	Mean dependent var		0.08
Adjusted R-squared	0.11	S.D. dependent var		0.25
S.E. of regression	0.24	Akaike info criterion		0.08
Sum squared reside	3.88	Schwarz criterion		0.27
Log likelihood	2.92	Hannan-Quinn criter.		0.16
F-statistic	2.77	Durbin-Watson stat		2.15
Probe(F-statistic)	0.02			

According to table (5), Durbin–Watson Statistic is based on the above table (2.15) for the regression model of the first hypothesis. As these values are close to number 2 and they are at the numerical interval of (1.5-2.5), the lack of correlation among components and error of the research hypothesis regression model are demonstrated.

### 4.4. Variance anisotropy test

In order to conduct the variance anisotropy test, the likelihood ratio test was used. Results are observed in table (6).

**Table 6.** Variance anisotropy test results

statistic	Statistic amount	significance level
Cross-section Chi-square	1/20	<b>0/54</b>

H0 hypothesis suggests that there is no variance anisotropy. According to the significance level, H0 hypothesis is accepted and H1 hypothesis is rejected. As a result, our regression does not have variance anisotropy.

### 4.5. Chu test

Chu test is conducted for the use of the fixed effect model in contrast to the total combination of data. The null hypothesis (H0) is based on constrained values and the opposite hypothesis is based on the unconstrained values. Hypotheses of this test are as follows:

- H1: Fixed Effect Model
- H0: Pooled Model

Chu test results are provided in table (7). The aforementioned results show that data in this hypothesis follow the pool model. Therefore, after the verification of pool model, OLS method is used which is called LS in the version 7 of Eviews software.

**Table 7.** Chu test results

Statistic	Statistic Amount	Significance Level
Cross-section F	0/53	<b>0/58</b>
Cross-section Chi-square	1/20	<b>0/54</b>

**4.6. The model estimation & test of hypothesis**

According to Chu test, the regression model must be estimated through a combined method (shared effects method). The model estimation was done based on a dependent variable and the final result of the model estimation is further studied according to the best fitting. In order to test the hypothesis, the following regression model is used:

$$RET_{it} = \alpha_i + \beta_1 IR_{it} + \beta_2 FER_{it} + \beta_3 CS_{it} + \beta_4 IO_{it} + \beta_5 Dum_1 + \varepsilon_{4t} \tag{2}$$

The regression test results are summarized in table (8) based on OLS method.

**Table 8.** Results of testing the hypothesis

variable	Coefficient	t-statistic	significance level
c	4/29	3/75	<b>0/000</b>
First-order differential (IR)	-25/71	-2/24	<b>0/02</b>
First-order differential (FER)	-0/0002	-3/13	<b>0/002</b>
First-order differential (CS)	0/00000000000000482	1/53	<b>0/13</b>
First-order differential (IO)	-0/000000000000000751	-0/11	<b>0/91</b>
Dum2 (dummy variable)	0/005	12/93	<b>0/000</b>
Adj.R-squared	<b>0/72</b>		
Durbin-Watson statistic	<b>1/99</b>		
F statistics	<b>39/12</b>		
F statistics (sig)	<b>0/000</b>		

According to table (8), it is determined that company size and oil income control variables have a negligible significant effect on the regression equation of the second hypothesis so that it can be ignored. Therefore, the new equation is defined as follows:

$$RET_{it} = \alpha_i + \beta_1 IR_{it} + \beta_2 FER_{it} + \beta_5 Dum_1 + \varepsilon_{4t} \tag{3}$$

The final results of the hypothesis model test using OLS method are summarized in table (9).

**Table 9.** Final results of testing the second hypothesis

variable	Coefficient	t-statistic	significance level
c	4/08	3/59	<b>0/000</b>
First-order differential (IR)	-10/83	-2/23	<b>0/028</b>
First-order differential (FER)	-0/0002	-2/85	<b>0/005</b>
Dum2 (dummy variable)	0/005	12/99	<b>0/000</b>
Adj.R-squared	<b>0/72</b>		
Durbin-Watson statistic	<b>1/99</b>		
F statistics	<b>63/94</b>		
F statistics (sig)	<b>0/000</b>		

Based on t statistics probability and the significance level (prob.), the interest rate has a significant effect on the stock return of private banks accepted in the stock exchange with 95% significance level. Interest rate fluctuations have a negative effect on the stock return so that with 1% change in the interest rate, the stock return of private banks accepted in the stock exchange decrease for 10.83%. Among control variables, the exchange rate has a negative effect on this relationship; however, this effect is so negligible so that with one unit increase in the exchange rate, stock return of private banks accepted in the stock exchange will decrease for 0.0002 units. Intercept and dummy variables with 99% confidence level have a positive effect on this relationship. The determined coefficient shows that about 72% of the dependent variable changes are explained in the model by significant variables. In this model, DW coefficient shows a successive correlation in the model. The probability level of F statistic is less than 1%; therefore, the fitted model is correct with 99% confidence level. Finally, our hypothesis that there is a significant

relationship between interest rate changes and stock return of private banks accepted in Tehran Stock Exchange is accepted. The final equation of this hypothesis is as follows:

$$RET_{it} = 4.08 - 45.12IR_{it} - 0.0002FER_{it} + 0.005Dum_1 + \varepsilon_{4t} \quad (4)$$

## 5. CONCLUSION AND SUGGESTION

In this research, the effect of the interest rate on the stock return of private banks accepted in the stock exchange was tested by estimating the multiple regression models through the combined data method. Results indicate that the interest rate has a significant negative effect on the stock return of private banks accepted in the stock exchange with 95% significance level. So, with 1% change in the interest rate, the stock return of private banks accepted in the stock exchange decreases for 10.83%. Among control variables, the exchange rate has a negative effect on this relationship; however, this effect is negligible so that with one unit increase in the exchange rate, the stock return of private banks accepted in the stock exchange will decrease for 0.0002 units. The regression equation is significant according to the significance level of statistic. In the present research, like most of other researches, there is a significant negative relationship between the interest rate and banks stock return.

For example, results of this research are consistent with results of Kasman et al. [13] research which studies the effect of exchange rate and interest rate changes on the stock return of Turkish banks. Their results suggest that changes in the interest rate and exchange rate have a significant negative effect on banks' stock return. Study results showed that there was a significant negative relationship between interest rate changes and stock return. In addition to the aforementioned cases, the effect of long-term interest rate changes on stock return of banks accepted in Athens stock exchange was studied by Drakos, K. [10]. Their research results also indicated that the interest rate had a significant negative relationship with stock return of banks accepted in the stock exchange.

According to research results and achievements relating to the inverse relationship between the interest rate and banks stock return, financial decision makers and investors must pay attention to the interest rate regulated by the Central Bank in order to maximize the efficiency and profitability. Considering the aforementioned factor by real and legal persons who invest in the stock exchange, this factor can be effective in the increase of the investment portfolio return. Exchange banks managers must also provide necessary precautions when financial investors use these instruments in order to achieve their economic objectives and neutralize this negative effect. Decrease of stock risk through cost and debt management, diversifying granted facilities, increase of bank deposits interest rate, and bonus shares issuance can be effective actions. In addition to the aforementioned cases, the increase of capital can prevent the uncontrolled decrease of price and stock return.

The best way for the increase of capital and stock return is the shared method. In this method, most of the times, one side of this sharing is cash receivables and this source leads to the increase of liquidity. On the other side, there are retained earnings or reserves which prevent the capital outflow from the company. Finally, according to the fact that the interest rate leads to the decrease of real stock return of exchange private banks which may result in the decrease of investment in the private sector of the country's economy, and as the relationship between banks and the capital market is an evolutionary relationship, one of the methods of capital market development is the development of banks; in other words, many countries with strong banks usually have a big capital market; therefore, the following methods must be studied and performed in order to guarantee the least income of investors:

Stock coupon, stock with guaranteed profitability, insuring investors, possibility of risk sale and purchase, devising new market handling methods, investors support by the Exchange Organization using different methods, etc.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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