

A study on the effect of interest rate on performance of stock exchange: A case study of Tehran Stock Exchange

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ABSTRACT

Interest rate plays an important role on financial market in any different sectors from real state to auto industry. An increase on interest rates will increase cost of borrowing money from banks, which reduces profitability. The proposed study of this paper investigates the relationship between bank interest rates on performance of stock exchange over the period 2001-2010. The proposed study categorizes interest rates into five different categories including short-term interest rate, special short-term rate, one-year, two-year, three-year, four-year and five-year terms. The results of performing regression analysis have confirmed that there are some positive and meaningful relationship between interest rate in all groups and performance of stock exchange.

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1. Introduction

Interest rate plays an important role on fighting against inflation or heating up the economy. A lower rate of interest rate reduces the cost of borrowing for industry, which could increase motivation among business owners to expand their business. On the other hand, when inflation hikes, central banks of most countries increase prime interest rates to cool down their economies. There are literally various studies on the effects of different factors on Tehran Stock Exchange (TSE) (Ghalibaf Asle et al., 2012; Khodaei Valahzaghari & Samadi, 2013; Tehrani et al., 2013; Hemmati & Sayadi, 2013; Mohammadpour Zarandi & Tabatabaei Mozdabadi, 2013). Raei and Bahrani Jahromi (2012) implemented decision makers' feedbacks based on multiple criteria decision making method to detect an appropriate portfolio. They first selected some important financial criteria and then using decision makers' opinions and by implementation of some fuzzy network analysis and they detected appropriate weights of the asset. The proposed model used two multiple criteria techniques namely TOPSIS and VIKOR and the model was examined for some real-world data from TSE. The results of the implementation of the proposed model were also examined against Markowitz traditional model.

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Houshmand Neghabi and Morshedian Rafiee (2012) studied the effects of different influential factors on capital structure of different sectors of industries listed on TSE. They used the financial information of 107 selected companies from 18 various industries listed on TSE over the period of 2004-2011 covering 40% of total number of companies listed in this stock exchange. They used ordinary least square technique to examine the relationships. The results of the survey indicated that there was a positive relationship between tax rate and firm's growth rate, and capital structure. The result of the survey also indicated that there was a negative relationship between firm's profitability and capital structure. However, there was no evidence to believe that there had been any relationship between fixed assets and capital structure. They concluded that there was a negative relationship between firm's profitability and capital structure but the results of our survey did not indicate that there was any difference between the mean of profitability in various sectors.

Mohammadzadeh et al. (2012) presented an empirical study to find important issues as barriers for investment on TSE market. The study categorized the issues into two groups of real world and legal issues. Since there were different issues involved as major barriers, the study used analytical hierarchy process to rank them. The study extracted 18 important factors, which influenced investors' participation on TSE and using Borda method, prioritized them. The results of their survey indicated that in terms of real issues, Increase in quality of firms Financial Statement was number one priority followed by Increase stock exchange and agents' proficiency and electronic equipment, Unchangeable investment market rules and bounding organization managers to flow them and Strict supervision on agents' activities. In terms of legal issues, good supervision of provisions to force firms to reveal information correctly and restrict their secret bargaining was the most important factor followed by Using indirect investment guideline instead of direct investment, Increase in quality of firms' Financial Statement and Investors' training toward their rights.

2. The proposed study

The proposed study of this paper considers the effect of interest rate on performance of stock exchange. The main hypothesis of this survey is as follows,

Main hypothesis: There is a meaningful relationship between interest rate and stock exchange index.

The main hypothesis of this survey consists of the following eleven sub-hypotheses,

1. There is a meaningful relationship between interest rate and major index of Tehran Stock Exchange.
2. There is a meaningful relationship between interest rate and the primary index of Tehran Stock Exchange.
3. There is a meaningful relationship between interest rate and the secondary index of Tehran Stock Exchange.
4. There is a meaningful relationship between interest rate and cash return price index of Tehran Stock Exchange.
5. There is a meaningful relationship between interest rate and cash return index of Tehran Stock Exchange.
6. There is a meaningful relationship between interest rate and Pharmaceutical Industry index of Tehran Stock Exchange.
7. There is a meaningful relationship between interest rate and Auto Industry index of Tehran Stock Exchange.
8. There is a meaningful relationship between interest rate and Oil Industry index of Tehran Stock Exchange.
9. There is a meaningful relationship between interest rate and Chemical Industry index of Tehran Stock Exchange.
10. There is a meaningful relationship between interest rate and Cement Industry index of Tehran Stock Exchange.

The proposed study of this paper investigates the relationship between bank interest rates on performance of stock exchange over the period 2001-2010. The proposed study categorizes interest rates into five different categories including short-term interest rate, special short-term rate, one-year, two-year, three-year, four-year and five-year terms. The study chooses the information of 100 firms from five industries including auto industry, chemical, oil and gas, cement and Pharmaceutical. Since we intend to use regression analysis, we need to confirm whether all data are normally distributed or not. Table 1 demonstrates the summary of performing Kolmogorov-Smirnov test.

Table 1
The summary of Kolmogorov-Smirnov normality test

Index	Mean	Standard deviation	Change coefficient	Before conversion			After conversion		
				KS	P-Value	Result	KS	P-Value	Result
Total	10579.13	3531.48	0.333	5.17	0.00	Not normal	0.97	0.12	Normal
Primary	11250.55	4464.71	0.3968	7.31	0.00	Not normal	1.03	0.10	Normal
Secondary	14275.56	7548.34	0.528	11.18	0.00	Not normal	1.11	0.08	Normal
Cash price	41190.17	26394.77	0.058	11.12	0.00	Not normal	1.11	0.18	Normal
Cash	4575.73	886.05	0.193	5.96	0.00	Not normal	0.87	0.14	Normal
Pharmaceutical	575.52	223.72	0.389	9.09	0.00	Not normal	0.99	0.11	Normal
Auto Industry	3942.2	1578.02	0.400	2.83	0.00	Not normal	0.24	0.58	Normal
Oil and Gas	26655.95	3971.76	0.149	5.26	0.00	Not normal	0.79	0.22	Normal
Chemical	516.16	126.26	0.244	3.13	0.00	Not normal	0.39	0.48	Normal
Cement	219.2	61.76	0.281	6.38	0.00	Not normal	0.38	0.48	Normal

As we can observe from the results of Table 1, none of the variable is normally distributed but when we perform a conversion all of them have been normally distributed based on Kolmogorov-Smirnov test when the level of significance is five percent. Therefore, we can use the following regression analysis to test all hypotheses of this survey.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \varepsilon, \quad (1)$$

where $x_i, i = 1, \dots, 7$ represent short term interest, special short term interest, 1-year, 2-year, 3-year, 4-year and 5-year interest rates, respectively. Next, we present details of our finding for testing all hypotheses of this survey.

3. The results

In this section, we apply stepwise regression analysis to test different hypotheses of this survey.

3.1. The first hypothesis: Interest rate and Total index

The first hypothesis of this survey is associated with the relationship between interest rate and Total index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 86349.4 - 8808.67x_1 + 2250.124x_2 + 11143.43x_3 - 10776x_7 + \varepsilon, \quad \text{Adjusted R-Square}=0.494 \quad (2)$$

$$\begin{array}{cccccc} & 2215.83 & 288.31 & 81.89 & 262.32 & 262.35 \\ \text{t-value} & 38.9 & -30.66 & 31.14 & 42.48 & -41.08 \end{array}$$

As we can observe from the results of Eq. (2), three variables did not come to the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the first hypothesis of the survey.

3.2. The second hypothesis: Interest rate and primary index

The second hypothesis of this survey is associated with the relationship between interest rate and primary index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 110254.8 - 10187.9x_1 + 2555.31x_2 + 13562.88x_3 - 13437x_7 + \varepsilon, \quad \text{Adjusted R-Square}=0.733 \quad (3)$$

	1831.5	239.55	69.28	203.298	262.35
t-value	60.12	-42.53	36.88	66.71	-64.39

As we can observe from the results of Eq. (3), like the first hypothesis, three variables did not appear on the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the second hypothesis of the survey. The regression analysis can approximate approximately 73% of the changes on primary index.

3.3. The third hypothesis: Interest rate and secondary index

The third hypothesis of this survey is associated with the relationship between interest rate and secondary index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 185252.8 - 15743.3x_1 + 2575.17x_2 + 25115.55x_3 - 25868.0x_7 + \varepsilon, \quad \text{Adjusted R-Square}=0.928 \quad (4)$$

	1603.34	209.72	60.66	177.9	182.37
t-value	115.5	-75.07	86.96	141.18	-141.84

As we can observe from the results of Eq. (4), like the previous hypotheses, three variables did not appear on the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the third hypothesis of the survey. The regression analysis can approximate approximately 93% of the changes on secondary index.

3.4. The fourth hypothesis: Interest rate and cash index

The fourth hypothesis of this survey is associated with the relationship between interest rate and cash return index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 5694.74 + 415.94x_2 - 320.61x_7 + \varepsilon, \quad \text{Adjusted R-Square}=0.819 \quad (5)$$

	207.962	5.03	13.27
t-value	28.37	82.77	-24.16

As we can observe from the results of Eq. (5), five variables did not appear on the results of regression analysis. Therefore, only two variables are statistically meaningful and the results confirm the fourth hypothesis of the survey. The regression analysis can approximate approximately 82% of the changes on secondary index.

3.5. The fifth hypothesis: Interest rate and cash price index

The fifth hypothesis of this survey is associated with the relationship between interest rate and cash price index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 628866.4 - 63605.4x_1 + 20588.3x_2 + 86012.78x_3 - 82124.2x_7 + \varepsilon, \quad \text{Adjusted R-Square}=0.842 \quad (6)$$

	7982.8	1048.17	305.12	857.93	890.92
t-value	78.78	-60.68	67.48	100.26	-96.97

As we can observe from the results of Eq. (6), three variables did not come to the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the fifth hypothesis of the survey.

3.6. The sixth hypothesis: Interest rate and Pharmaceutical index

The sixth hypothesis of this survey is associated with the relationship between interest rate and Pharmaceutical index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 6422.21 - 625.36x_1 + 197.14x_2 + 826.38x_3 - 833.21x_7 + \varepsilon, \text{ Adjusted R-Square}=0.839 \quad (7)$$

92.71	10.58	3.49	10.48	11.49
t-value 69.3	-59.12	56.44	78.84	-72.52

As we can observe from the results of Eq. (7), three variables did not come to the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the sixth hypothesis of the survey.

3.7. The seventh hypothesis: Interest rate and Auto industry index

The seventh hypothesis of this survey is associated with the relationship between interest rate and auto industry index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 24140.58 - 2744.76x_1 + 522.98x_2 + 2750.21x_3 - 2430.50x_7 + \varepsilon, \text{ Adjusted R-Square}=0.234 \quad (8)$$

1217.84	157.91	45.01	144.17	144.19
t-value 19.82	-17.38	11.62	19.08	-16.86

As we can observe from the results of Eq. (8), three variables did not come to the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the seventh hypothesis of the survey.

3.8. The eighth hypothesis: Interest rate and Oil & gas index

The eighth hypothesis of this survey is associated with the relationship between interest rate and oil & gas index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 120601.4 - 5534.62x_1 + 2063.36x_2 + 9119.61x_3 - 11412.4x_7 + \varepsilon, \text{ Adjusted R-Square}=0.412 \quad (9)$$

2671.78	348.07	99.04	315.62	315.72
t-value 45.14	-15.90	20.83	28.89	-36.15

As we can observe from the results of Eq. (9), three variables did not come to the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the eighth hypothesis of the survey.

3.9. The ninth hypothesis: Interest rate and chemical index

The ninth hypothesis of this survey is associated with the relationship between interest rate and chemical index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 1724.95 - 226.39x_1 + 24.65x_2 + 152.40x_3 - 103.25x_7 + \varepsilon, \text{ Adjusted R-Square}=0.525 \quad (10)$$

89.83	10.25	3.39	10.16	11.14
t-value 19.20	-22.09	7.28	15.0	-9.27

As we can observe from the results of Eq. (10), three variables did not come to the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the ninth hypothesis of the survey.

3.10. The tenth hypothesis: Interest rate and cement industry index

The tenth hypothesis of this survey is associated with the relationship between interest rate and cement industry index of Tehran Stock Exchange. The implementation of stepwise regression technique yields the following results

$$y = 1065.26 + 39.28x_1 - 47.02x_2 + 130.5x_3 + 190.2x_7 + \varepsilon, \text{ Adjusted R-Square}=0.820 \quad (10)$$

27.03	3.09	1.02	3.06	3.35
t-value -39.41	12.74	-46.16	-42.7	56.77

As we can observe from the results of Eq. (10), three variables did not come to the final results of regression analysis and only four variables are statistically meaningful and based on the results we can confirm the ninth hypothesis of the survey.

4. Conclusion

In this paper, we have presented an empirical investigation to study the effect of interest rate on different stock exchange as well as five important sectors on Tehran Stock Exchange. The study has collected the necessary information over the period of 2001-2010 and using stepwise regression model, different hypotheses have been examined. The results of the survey have indicated that the interest rate could influence all major indices as well as primary and secondary stock exchange.

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