2528-9705

*Örgütsel Davranış Araştırmaları Dergisi*
Journal Of Organizational Behavior Research
Cilt / Vol.: 3, Sayı / Is.: S2, Yıl/Year: 2018, Kod/ID:81S28

# IMPACT OF INTEREST RATES ON INVESTMENT AND LIQUIDITY

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## ABSTRACT

*The objective of this study was to investigate the effect of interest rate on investment and liquidity in the Tehran Stock Exchange companies. For that purpose, first, a review of the literature on the subject of research is provided and then the variables concerned in the research are described and its theoretical foundations are briefly outlined in which the interest rate is known as an independent variable and investment and liquidity are regarded as associated variables. In this research, the statistical population includes all the companies listed at the Tehran Stock Exchange among which a sample of 160 companies were selected from the statistical community for the period of 5-150 years (2011-2015) after the screening method, and the sample size, according to the filtration rule, involved and studied 800 years companies. The data were collected using Rahavard Novin software, EViews was also used for descriptive analysis of data, hypothesis testing and regression model extraction. The research methodology is practical in terms of its objective, descriptive in terms of its implementation, and of correlation type. The findings of this research indicate that there is a negative relationship between the interest rate and investment and there is a direct relationship between the interest rate and liquidity in the companies listed at the Tehran Stock Exchangey.*

**Keywords**: *Interest Rate, Investment, Liquidity*

## INTRODUCTION

Studies on developing economics show the involvement of various variables in the economic growth and development. One of the important variables that has recently taken the special attention of economic thinkers is the variable of interest rate. Although the variables such as expected inflation, general level of prices, etc., are effective in explaining this matter, the results of the research showed that economic growth is sensitive to changes in the interest rate. Today it has made the interest rate variable as one of the most effective instruments of macroeconomic policy making and a factor for stabilizing the economic growth of the countries (Azimi Ghanzagh, 2009). The stock exchange is the entity for collecting savings and liquidity of the private sector in order to finance long-term investment projects. Indicators of this market are affected by several factors, the most important of which are the economic variables. Capital formation is a major element in the economic growth. The variable of interest rate is one of the most efficient tools in policy making for development of capital and investment. The speed and capability of stock liquidity are important factors in investment decisions in the capital market. Aside from the risk and returns, investors pay particular attention to their liquidity in selecting investment options (Heidari, 2012).

Investment has a decisive role in the economic growth. One of the main goals of countries is to achieve sustainable economic growth and development. In the economic literature, capital has

Geliş tarihi/Recieved: 02.10.2017 – Kabul tarihi/Accepted: 12.01.2018 – Yayın tarihi/Published: 21.08.2018

been regarded as the lifeblood of an economic system and its formation has been emphasized as the most determinant factor of the economic growth and development. The rate of growth and economic development depends on the accumulation and productivity of the economy and the two depend on how the investment process works. In the field of economic growth and development, monetary and credit institutions and the security market, which are the main pillars of financial markets, have a significant role in providing the economic and productive capital. Capital market, as one of the pillars of the market, has a significant role to play in mobilizing financial and capital facilities in order to optimize the allocation of resources for the economic growth and development of countries. The role and importance of the financial system in the process of economic growth and development of countries is that it is possible to look into the difference between the developed and underdeveloped economies in terms of the efficiency and effectiveness of their financial systems. The long-term non-inflationary growth of the economy and the increase in production and employment need to equip the financial resources and their optimal allocation to the national economy, and this will be possible with the help of organized and efficient financial markets in which there is a variety of financial instruments and transparency of information (Bahonar, 2012).

One of the most effective factors for evaluating financial decisions is the interest rate; the interest rate as an economics variable is influenced by the monetary policies in the economy. The main function of the interest rate in a capitalist system is to direct small, medium and large savings to investing and increasing production in the society. Also, regarding the role of interest in economics schools, it should be noted that in addition to the role of interest in the supply and demand of money and the creation of a balance in the money market, the market plays a fundamental role because one of the determinants of the national income is investment, and investment is also a function of the interest rate. As the overall demand decreases with increasing interest rates, the surplus supply is created in the market, and, as a subsequence, the inventory will increase, and ultimately, the national income and national output will decrease (Nicoumaram, 2007).

## THEORETICAL FOUNDATIONS AND AN OVERVIEW OF THE RESEARCH BACKGROUND

Keshavarzian Peivasti (2009) in a study based on the main question of the research, how is the effect of the interest rate liberalization on the macro-variables of the economy of the country during the study period (1966-2002)?, states that in the system of simultaneous equations, the money demand, investment, and growth functions were estimated, and by proving the McKInnon-Shaw hypothesis in Iran, the positive effect of financial liberalization on investment and economic growth has been extracted. The real interest rate in the investment equations with growth has a positive relationship and it indicates that with increasing the real interest rate in the banking system of the country, the amount of investment and production will increase; it shows that with the increase in the interest rate, a large amount of people's money will be absorbed by the banking system and the economic stability will be resulted. In a paper by Khatibi (2012), a system model is estimated using the three-stage least squares method (3SLS). In the system of simultaneous equations of the estimated investment and saving functions, the McKInnon-Shaw hypothesis is ensured in Iran; that is, an increase in interest rates has a positive effect on the private investment in Iran.

In the research by Seyed Al-Mousavi (2009), the effect of bank interest rates and return rates on investment in the Iranian economic growth in the years 1997 to 2007 was investigated and explained. At first, the rate of return on investment and the rate of profit of banks and the rate of economic growth were calculated. The data were analyzed by SPSS14 and Eview3 softwares. The results of the research show that there is a positive correlation between the banks interest rate and the economic growth rate; it means the changes in these two variables are the same, but there is no positive correlation between the return on investment and the economic growth rate. There are no significant relationships between the banks interest rate and the investment return rate.

Kazemi (2012) in a research on the Tehran Stock Exchange studied the relationship between stock liquidity, which is calculated with the criterion of the gap between the price of stock purchase and sale and the investment opportunities during the years 2003 to 2010. Findings indicate a positive and significant relationship between the stock liquidity and investment opportunities to the company. In addition, the results show that there is a negative and significant relationship between the stock liquidity and expected returns of the shareholders. In other words, stock liquidity is one of the factors that increases the opportunities of investment in a company and reduces the cost of ordinary stock capital.

Ghaemi and Rahimpour (2010) investigated the effect of declaring seasonal profits on stock liquidity. In their study, they used the effective ratio of gap between supply price and demand price as a stock liquidity criterion. The results show that during the study period, there was no significant increase in stock liquidity after seasonal profit declarations.

The findings of Daryabari research (2015) indicate that there is a significant and direct relationship between stock liquidity shock and the expected returns in the companies listed at the Tehran Stock Exchange.

Izadinia and Rasaeeyan (2010) examined the relationship between the distribution of ownership and liquidity of shares in the Tehran Stock Exchange. The results of this research showed that there is a significant relationship between liquidity and market value of the company, the final stock price, stock return volatility, price volatility, market beta and percentage of trading days. This is while there is no significant relationship between specificity of liquidity and ownership scattering.

Mehrani and Rasaeeyan (2009) investigated the relationship between stock liquidity criteria and the annual returns of stock in the Tehran Stock Exchange during the period of 2002-2007. The liquidity criteria used in the above mentioned research include the discrepancy between the bid price of the purchase and sale of shares, the turnover of the company stock, the volume of the transactions in Rials, the number of transactions, and the number of days of the transaction in the Tehran Stock Exchange. The results of the hypothesis testing indicate that there is no significant relationship between stock returns and the bid price difference between the purchase and sale of shares, the turnover of the company stock, the volume of transactions in Rials, and the frequency of the transactions, and there is a rarely significant relationship between the annual return on equity and the percentage of days of transaction.

Yahyazadeh and Khoramdin (2008) investigated the effect of variables of the ratio of lack of liquidity and factors affecting equity, including firm size, the ratio of book value to stock market value, and the ratio of surplus market returns on surplus of the stock returns in the Tehran Stock Exchange. In that research, the Amihud ratio was used as a factor of non-liquidity. The results

of their research showed that there is a reverse relationship between changes in the ratio of non-liquidity and surplus stock returns.

Jebal Ameli (2005) in a study entitled "estimating the investment function in Iran with an emphasis on qualitative variables" shows that the private sector investment in Iran has a reverse reaction to changes of the real interest rates (Ehsani, 2012).

Kharaj (2003) in a research entitled "the effect of savings and investment on bank interest rate" examined the long-term relationship between interest rates and investment and saving variables in Iran over the years 1973 to 2001. His results show that the (short-term and long-term) saving variables and the private investment would influence interest rates, but the government investment is not a function of the interest rates (Ehsani, 2012).

Shakeri and Khosravi (2005) in an article titled "the Mckinnon and Shaw theory test in the Iranian economy" investigated the relationship between the investment rate in Iran's economy and the real bank interest rate. In that research, it was found that the investment rate in the Iranian economy rises in general by increasing the real bank interest rate (up to 2%), but it begins to decrease at higher real interest rates (from 2%). In other words, at a real interest rate of over 2%, a banking crisis occurs which confirms Stiglitz's argument that high real interest rates would increase the risk of bank lending (Ehsani, 2012).

Mckinnon and Shaw (1973) were the first economists who strongly opposed the ideas of interest rates and investment. These two economists believed that rising interest rates would increase savings and bank finance, and ultimately can lead to higher investment.

Sundrajan and Thankur (1980) in their study of India and Korea emphasized the phenomenon of crowding out effect through a non-tariff system and presenting an econometric model, and studied the effect of public sector investment on private sector investment, production and savings, and concluded that increasing government spending would increase interest rates and reduce private sector investment.

Green and Villanueva (1997) stated that in exploring the effects of private sector financing in developing countries, the economic growth factors and per capita income levels, the existence of economic stability which is measured by inflation rates, excessive foreign investment, real interest rates, and government investment rates have a positive impact on the private sector investment.

Marshall (2006) dealt with the relationship between stock returns and liquidity in the Australian Stock Exchange. In his research, he used a new liquidity criterion. The stated eligibility criterion is the average value of orders. The results indicate that liquidity is an important determinant for stock returns.

Fujimoto and Watanabe (2006) examined the relationship between non-liquidity and fluctuations of the stock return. The liquidity criteria used in their research were the turnover of stocks and the price difference offered by the relative purchase and sale of shares. It was found that the higher the lack of liquidity of the stock, the more fluctuations will be in stock returns.

Warman and Thirlwall (1994), aiming at examining the relationship between interest rates, savings and economic growth, used the Mackinnon model test on the effect of financial liberalization on growth. Using the estimation of financial saving equilibrium model, total savings and private savings (Co-Rc) and (Cochrane Orcutt LS) the least squares method, they came to the conclusion that financial liberalization, through stimulation of bank credit savings, would enhance the investments and may ultimately lead to economic growth in the country.

## RESEARCH HYPOTHESES

### *The main hypothesis*

- The interest rate has a significant effect on investment and liquidity.

### *Minor hypotheses*

- The interest rate has a significant and negative effect on investment.
- The interest rate has a significant and positive effect on liquidity.

## RESEARCH METHODOLOGY

The research method is practical in terms of objectives, and in terms of implementation, it is descriptive and correlational. It is practical because the present research attempts to examine the impact of interest rates on investment and equity. It is descriptive because its purpose is to describe the circumstances or phenomena under investigation and to better understand the existing conditions. And, it is correlational because of the relationship between variables in the research. The present research studies the relationship between variables and seeks to prove this relationship in the current situation based on historical data. Therefore, it can be categorized as post-event type. The present research is descriptive in terms of data collection in which historical data of sample companies and market information were collected through the library method. The research period consisted of 5 consecutive years from 2011 to 2015, and the research hypotheses were based on the actual data of these years. The statistical sample was selected according to the following method and based on the following conditions:

1. Companies that have entered the stock during 2011-2015.
2. Companies that have been withdrawn from the stock during 2011-2015.
3. Companies that are part of the financial investment companies and financial intermediaries.
4. Companies whose financial year does not end in March.
5. Companies that have changed their fiscal year in the course of the study.
6. Companies whose equity was negative.
7. Companies whose trading symbols have been stopped for more than 4 months.

As a result of applying the conditions and considerations in the systematic deletion sampling, 160 companies were selected from the statistical population for the tests. The study period is 5 consecutive years; therefore, the final volume of the sample is 800 years- company (160 * 5). EViews were used for descriptive analysis of data and hypothesis testing and extracting the regression model.

## RESEARCH RESULTS

In descriptive analysis, using the descriptive statistics tables and indicators such as central tendency and measures of variation, the collected data are described. This contributes to the clarity and explanation of research data. The results of the descriptive analysis of the data are presented in table. 1.

**Table 1: Descriptive statistics**

| Variables / Descriptive Statistics | Model variables | | |
|---|---|---|---|
| | Interest rate (Bahreh) | Investment (Invest) | Liquidity (Liq) |

| | | | |
|---|---|---|---|
| Mean | 0.750951 | 0.830772 | 2.583333 |
| Median | 0.775330 | 0.873220 | 2.567000 |
| Maximum amount of series | 0.986565 | 0.989765 | 4.356000 |
| Minimum amount of series | 0.344567 | 0.545635 | 1.297000 |
| Standard deviation | 0.134417 | 0.120676 | 0.922544 |
| Skewness | -0.680160 | -0.600632 | 0.501000 |
| Elongation | 3.023738 | 2.786908 | 2.191521 |
| Jarque-Bera statistics | 51.82900 | 41.67647 | 44.41394 |
| Probability level (prob) | 0.000 | 0.000 | 0.000 |
| Number of observations | 800 | 800 | 800 |

### *Unit Root Tests for the Panel Data*

Before estimating and evaluating the model, first, it is assured of the stability and non-stability of data used in the model. If in estimation of econometric equations non- stability data were used, because the data do not have fixed variance and mean over time, t and f statistics would not be valid and the estimated model would be biased and unusable, and a false regression would be posed. In such regressions, while there may not be any meaningful relationship between the model variables, the determination coefficient obtained may be very high and cause the researcher to make inferences about the degree of correlation between variables. The results of this test are shown in table. 2.

**Table 2: the unit root test results for variables (a model with y-intercept)**

| Stability tests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tests variables | LLC | Prob | IPS | Prob | ADF-Fisher | Prob | pp-Fisher | Prob |
| Bahreh | -41.9854 | 0.000 | -31.895 | 0.000 | 321.786 | 0.000 | 343.789 | 0.000 |
| Stability rate | At level | | At level | | At level | | At level | |
| Invest | -63.9866 | 0.000 | | 0.000 | | 0.000 | | 0.000 |
| Stability rate | At level | | At level | | At level | | At level | |
| Liq | -44.786 | 0.000 | -32.567 | 0.000 | 321.678 | 0.000 | 432.678 | 0.000 |
| Stability rate | At level | | At level | | At level | | At level | |

Source: research calculations

Based on the results of the stability test in table. 2, at the 99% confidence level, all variables in the tests of Levin Lin- Chou, IPS, and Dickey Fuller are augmented by Fisher and Phillips- Proun Fisher at the stability level. These results were extracted from the numerical value of Levin Lin and Chu, IPS statistics, augmented Dicky Fuller of Fisher and Phillips- Proun Fisher, as well as the probability level of these statistics. For the company's life cycle variable, for example, with regard to the fact that the Levin Lin and Chu tests statistics equaled (- 41.9854) and that (the critical level is not between - 2 and 2), and, the probability level for this variable is zero (prob <0.01), As a result, this variable is at the stability level and does not need to be differentiated. The same analysis is available for other variables too.

**Testing Hypothesis 1: the interest rate has a significant and negative effect on investment.**

[H0]: the interest rate does not have a significant and negative effect on investment.

[H1]: the interest rate has a significant and negative effect on investment.

$$\text{Invest}_{it} = \alpha_0 + \beta_1 \text{Bahreh}_{it} + \varepsilon_{it}$$

**Table 3: results of F Limer and Hausman tests**

| Test type | F Limer test | Hausman test |
|---|---|---|
| Statistics value | F = 9.5254 | $X_2$ = 10.6587 |
| P-value | 0.0000 | 0.0000 |
| Model type | Panel | Fixed effects |

Source: research calculations

Based on the results of the F Limer test in table. 3, in the estimation of the model (1), given that the numerical value of this test is equivalent to (9.5254), and the P-value also equals zero at the 95% confidence level, in other words, p-value <0.05, so the null hypothesis is based on the pooling of the rejected model and the alternative hypothesis (panel) is supported. So for all the studied sections (companies), a panel method can be used to estimate the model. Also, according to the results of the Hausman test for the first hypothesis, given that in the case α = 0.05, the Hausman statistics for the model equals (10.6587) and, on the other hand, the p-value <0.01, so the null hypothesis is rejected. The rejection of the null hypothesis (H0) indicates that the random effects method is maladaptive and that the fixed effects method should be used.

**Table 4: results of the fixed effects of model 1**

| The fixed effects model | Coefficients | Standard deviation | T-statistic | P-value | Research results |
|---|---|---|---|---|---|
| Bahreh | -0.432 | 0.026 | -16.601 | 0.0000 | H0 is rejected |
| C | 1.187 | 0.074 | 16.008 | 0.0000 | |
| e | 0.328 | 0.207 | 1.049 | 0.237 | |
| R | 0.592 | | | | |
| $R^2$ | 0.350 | | | | |
| D.W | 2.110 | | | | |
| F Fisher | 8.338 (prob = 0.0000) | | | | |

With regard to the results of the fixed effects model presented in the table. above, in the studied companies, according to the t-value (-16.615) which is greater than the critical level (-1.96 to 1.96), and the relevant level of probability that equals (0/000) and p-value <0.05, the interest rate has a negative and significant relationship with the dependent variable (investment); therefore, at a confidence level of 95%, the null hypothesis [H0] in the hypothesis (1) is rejected and the alternative hypothesis [H1] is supported.

The correlation coefficient (R) obtained indicates that the explanatory variable of the model can explain 0.592% of the variations in the dependent variable. Regarding the adjusted coefficient of determination of 0.350, it is clear that this coefficient is high and it means that it is capable to explain the model appropriately. The calculated Durbin-Watson statistics (WD = 110/2) indicate that there is no autocorrelation in the model and the independence of the errors from each other (the difference between the actual values and the predicted values by the regression equation) is confirmed. According to the F Fisher test (8.338) and (prob = 0.0000), the entire regression fitness is valid and the significance of the overall model is confirmed.

### Kao Co-integration test (Engle-Granger based)

The main idea in the analysis of co-integration is that although many economic time series (containing random processes) are instable, the linear combinations of these variables may be stable (and without randomized processes) in the long run. The co-integration test is done using the panel method in the present study by the Kao method. This test has a Dickey Fuller statistic.

Table 5: Kao co-integration test

| Long-term relationship of variables | Kao co-integration test | |
|---|---|---|
| | Test statistic (Dicky Fuller) | p-value |
| Interest rate with investment | ADF = 3.6598 | 0.0000 |

Each hypothesis is accepted at the 99% confidence level. Given the fact that the test statistic in the above five modes is greater than the critical value and the p-value is less than 0.01, the null hypothesis stating non- cointegration is rejected and the alternative hypothesis (co-integration and the existence of a long-term relationship) is accepted. These results indicate that there is a strong long-term relationship between the variables in each of the estimated models.

**Hypothesis 2: the interest rate has a significant and positive effect on liquidity .**

[H0]: the interest rate has no significant and positive effect on liquidity.

[H1]: the interest rate has a significant and positive effect on liquidity.

$$Liq_{it} = \alpha_0 + \beta_1 Bahreh_{it} + \varepsilon_{it}$$

Table 6: results of the F Limer and Hausman tests

| Test type | F Limer test | Hausman test |
|---|---|---|
| Statistics value | F = 9.5287 | $X_2$ = 10.3698 |
| P-value | 0.0000 | 0.0000 |
| Model type | Panel | Fixed effects |

Based on the results of the F Limer test in table. 6, in estimating the model (2), given that the numerical value of this test is equivalent to (9.5287), the p-value at the 95% confidence level also equals zero; in other words, p-value <0.05. Therefore, the null hypothesis based on the pooling model is rejected and the alternative hypothesis (panel) is supported. So for all the studied sections (companies), a panel method can be used to estimate the model. Also, according to the results of the Hausman test for the first hypothesis, given that in the case of $\alpha = 0.05$, the Hausman statistic for the model is (10.6587), and on the other hand, the p-value <0.01, so the null hypothesis is rejected. The rejection of the null hypothesis (H0) indicates that the random effects method is maladaptive and that the fixed effects method should be applied.

Table 7: results of the fixed effects of model 2

| The fixed effects model | Coefficients | Standard deviation | T-statistic | P-value | Research results |
|---|---|---|---|---|---|
| Bahreh | 0.698 | 0.089 | 7.824 | 0.000 | H0 is rejected |
| C | 3.679 | 0.028 | 129.504 | 0.000 | |
| e | 0.036 | 0.053 | 1.680 | 0.425 | |
| R | 0.812 | | | | |
| $R^2$ | 0.659 | | | | |
| D.W | 1.774 | | | | |
| F Fisher | 16.781 (prob = 0.0000) | | | | |

Source: research calculations

Based on table. 7 and the results of F Limer and Hausman tests, the second model is a fixed effect panel type. As shown in Table (7-4), the interest rate variable has a positive and significant effect on the dependent variable (liquidity) according to the t statistic and its probability level at the 95% confidence level, and for one unit increase in the interest rate variable, liquidity in the boom period will increase by 0.698 units; thus, at the confidence level of 95%, the null hypothesis [H0] in hypothesis 2 is rejected.

Other calculated statistics including correlation coefficient (0.812), adjusted coefficient of determination (0.763), Durbin–Watson statistic (1.774), and F Fisher test statistic (prob = 0.0000) (16.781), indicate the appropriateness of the total fitness of the regression.

### *Kao co-integration test (Engle-Granger based)*

**Table 8: Kao co-integration test**

| Long-term relationship of variables | Kao Coagulation test | |
|---|---|---|
| | Test statistic (Dicky Fuller) | p-value |
| Interest rate and investment | ADF = 2.5142 | 0.0000 |

Based on the results of the co-integration test in table. 8, the existence of long-term relationships between the variables of each hypothesis is accepted at the 99% confidence level. Given that the statistic value of the test in the above mode is greater than the critical value and the p-value is less than 0.01, the null hypothesis stating non- cointegration is rejected and the alternative hypothesis (co-integration and existence of long-term relationship) is accepted. These results indicate that there is a strong long-term relationship between variables in each of the estimated models.

## DISCUSSION AND RESULTS:

The policy of interest rate is among the most controversial strategies for economic adjustment in the developing countries; so that the change of this variable can affect many of the economic activities in the short and long terms. Studies in the development economics show the involvement of various variables in the economic growth and development. One of the important variables that has recently been considered by the economic thinkers in a specific way is the variable of interest (bahreh) rate. The purpose of the person who participates in the securities market is clear. He wants to get more profits and benefits from this market.

According to the results of the research, the interest rate has a significant relationship with investment and liquidity at the 95% confidence level and the hypothesis H0 is rejected. Since the relationship between the interest rate and investment is negative, and with the increase in the interest rate, investment will decrease and the relationship between the interest rates and liquidity is positive and direct, and increasing the interest rate will increase the liquidity too. Also, at a 95% confidence level and with a negative relationship between interest rates and investment in the companies listed at the Tehran Stock Exchange during the period from 2011 to 2015, it can be concluded that the higher the interest rate in these companies, the more the investment will decrease in these companies. At the 95% confidence level and with a positive relationship between the interest rate and liquidity in companies listed at the Tehran Stock Exchange during 2011-2015, it can be concluded that the higher the interest rate in these companies, the greater the liquidity will be in these companies.

- It is suggested that if the interest rates is rising and the same is predicted to happen in the future too, instead of dividing their profit among shareholders, the companies invest it. Of course, they should take into account other factors, for example: does this offer affect the stock price and will not reduce its price?
- The result of behavioral studies in this research shows that it is probable that the reduction in interest rates may lead to increased competition between enterprises.

- By reducing interest rates and paying off cheap loans, the motivation for investment in the economic enterprises can be created and it can lead to sustainable employment and development.
- At the corporate levels, when interest rates decrease, and the change of this trend is expected in the short run, investment in the early return plans is suggested.
- At the corporate level, when the interest rate is reduced, and it is anticipated that this trend will change in the short term, it will be possible to receive supportive facilities from the banks and purchase the raw materials.
- The government can boost the market by implementing policies and instruments that reduce interest rates and lead the liquidity towards financial markets.
- If policies are adopted at macro level, which can lead liquidity to production, recession can be eliminated.
- When interest rates are rising, increasing financing through the sale of stocks and the use of accumulated profits at the time of cash supply for the company costs a lot for the company.
- In the event that the company has a high level of liquidity and it is predicted that interest rates will decrease in the future and that the time value of money will decrease, it is suggested to invest in assets that are less affected by the interest rates.

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