DETERMINANTS OF ORI001 TYPE GOVERNMENT BOND

Yosandi Yulius
Faculty of Economics, Universitas Persada Indonesia Y.A.I
e-mail: yosandi77@yahoo.co.id

Abstract

The need to build a strong bond market is amenable, especially after the 1997 crises. This paper analyzes the influence of deposit interest rate, foreign exchange rates, and Composite Stock Price Index on yield-to-maturity of Bond Series Retail ORI001, employing monthly data from Bloomberg information service, 2006(8) to 2008(12), using Generalized Autoregressive Conditional Heteroscedasticity type models. It finds the evidence that deposit interest rate and exchange rate have positive significant influence on the bond, and that stock index has a negative significant influence on the bond. It also finds that Deposit Interest Rate, exchange rate, and the stock index significantly influence the bond altogether.

Keywords: Interest rate, exchange rate, composite stock price index, yield-to-maturity, bond
JEL classification numbers: G12, G15

Abstrak

Kebutuhan untuk menciptakan pasar obligasi yang kuat telah disepakati bersama, terutama setelah terjadinya krisis di tahun 1997. Makalah ini menganalisis pengaruh tingkat bunga deposito, kurs valuta asing, dan Indeks Harga Saham Gabungan pada penghasilan jatuh tempo untuk Seri Obligasi Pemerintah Ritel ORI001 dengan menggunakan data bulanan dari Bloomberg, 2006(8) sampai 2008(12), dengan mengaplikasikan model dari *Generalized Autoregressive Conditional Heteroscedasticity*. Penelitian ini menemukan bukti bahwa suku bunga deposito dan nilai tukar memiliki pengaruh yang signifikan dan positif pada obligasi, dan indeks saham memiliki pengaruh signifikan negatif atas obligasi. Hal ini juga menemukan bahwa tingkat bunga deposito, kurs, dan indeks saham berpengaruh signifikan terhadap obligasi secara bersama-sama.

Keywords: Tingkat bunga, kurs, indeks harga saham gabungan, penghasilan jatuh tempo, obligasi
JEL classification numbers: G12, G15

INTRODUCTION

National Budget consists of state revenue, grants, expenditures, primary balance, surplus or deficit, and financing. Government expenditure plan is constructed by taking into account the government's ability to raise state revenue. When spending is bigger than revenues, which is known as deficit situation, the shortage is met by foreign loans. The government has issued Act No. 24/2002 concerning the issuance and management of the government bond (the special name is *SUN*, short for *Surat Utang Negara*) to enhance the professionalism of its management. Under this act, the issuance and management of the bond is meant for financing the current budget deficit, paying interest and principal of the bonds at maturity time. These type of bonds have been used for bank recapitalization and loan financing programs.

SUN is a bond issued by the government and sold to public, both domestic and foreign investors. Bonds are debt securities of medium or long terms that can be transferred, contains a promise from the issuing party to pay compensation in the form of interest on a certain period and pay

off the principal debt at a specified time to the purchaser or owner of the bond. According to Bodie et al. (2011), bonds are securities issued which is the affidavit of the borrower's debt to another party, by promising a certain number of payments at a specified time. According to Siamat (2005), bond is a proof of debt guaranteed by the insurer containing a promise of payment of interest or other appointments as well as the repayment of the principal are made on the maturity date.

Bonds are fixed-income instruments since the revenue is calculated based on a predetermined interest rate. Bond is one of the capital market instruments to raise money for the issuance. In general, companies or governments issue bonds in a relatively long period of time, which is about 2 to 30 years.

SBN market in Indonesia shows a positive trend. Value of government securities sold in 2008 was Rp 117.79 trillion, a 1700% growth compared to those in 2004, namely Rp 6.9 trillion. Mostly SBN is owned byf oreigner, namely about 80% (= Rp 87.61 trillion) in 2008. This is a 280% growth since 2005. This phenomenon enhances sovereign risk, namely if at the same time, foreign investors release its holdings (sudden reversal). Sovereign risk is also a risk arising from an increase in the value of debt in dollars, as a result of an increase in foreign exchange rate (especially USD) against the Rupiah. This is supported by the results of research of Aulakh et al. (2000) in several developing countries that the foreign exchange rate appreciation raises the total value of export and the value of foreign debt calculated in domestic currency.

To avoid disruption of sovereign risk and monetary stability, and also in order to cover the budget deficit in 2004-2008, the government on August 9, 2006 issue a Retail Bond 001 series, known as ORI001 series. These bonds are only sold to individuals of Indonesian citizens with a reasonable nominal value, with various advantages if compared with other investment instruments (shares, deposits and mutual funds). Another purpose of the issuance of these bonds is to avoid the fiscal position which has been dependent on foreign debt financing (ownership of government bonds by foreign investors), where this dependence is vulnerable to external shocks, which lead to monetary instability. According to Igor Matutinović (2005), the government policy in dealing with the intensity of the influence of the economic crisis through fiscal and monetary policy is a very appropriate step.

Concerning these fiscal and monetary policies, the government authorizes the state banks to conduct the task of selling the bonds. It can be inferred that the main purpose of the bond issuance are as follows. First, using SBN, in this case 0RI001, as the policy instrument to finance the ever increasing government budget.

Second, boosting the credibility of SBN as an investment benchmark in Indonesia through the possession of SUN by the Indonesia common people.

Therefore, when it was published in the primary market, it offers higher coupons than the average interest rate on bank deposits of government, and the coupon payments was made each month. In addition, the coupon payments and par value are guaranteed by the government. In addition, ORI001 can used as collateral to borrow money to the bank, and can be traded in secondary markets with the mechanism of the Stock Exchange or transactions outside the Indonesia Stock Exchange. The third is to avoid fiscal position that is always dependent on foreign debt, because the dependence is likely vulnerable to external shocks.

However, the good intentions from the policy of issuing ORI is facing obstacles, namely the fact that currently, Indonesian people are saving-oriented people, not investment-oriented people. Thus the inte-

est in the community to buy ORI is influenced by the level of bank deposit interest rates. The intention to buy the bonds series is also influenced by the advantages of buying stocks. According to Iswandono (1996), a rise in deposit interest rates due to government policies made investors to find a more favourable altern ative, making it difficult to increase investment in stock shares and bonds on the Stock Exchange.

Another thing to note is that interest rate movement affects the exchange rate (see Kuncoro, 1994, Among others). The exchange rate fluctuations will also affect inflation, which in the end affect the society's ability to buy bonds. Other factors that influence the fluctuations in foreign exchange is the rate of national income, government policy, and investor expectations of economic policies implemented by the government.

Thus, the public interest to buy ORI001, seen from the expected yield, is determined by many factors, namely the interest rate on bank deposits and CSPI from the point of view of investment instrument, and the exchange rate which affects the ability to buy bonds.

Time deposits are deposits in the Banks in which withdrawal can only be done at certain times or in accordance with maturity, so that deposits are known as time deposits (see, for example,Slamat ,2005) . In most banks, time deposits are liabilities of the largest component, with interest rates higher than savings interest rates. The criteria used by banks to determine the level of deposit interest rate is the composition of funds and funding needs of banks, the bank's internal policies, and the bank efficiency in managing the deposit of funds.

The high interest rate of time deposit is an important factor that attracts investors to put their money on the time deposit. If the time deposit interest rate is higher than the income earned from holding bonds, then the owners of the funds will put their funds into the bank. Ichiue and

Ueno (2007) found that the yield curve of bonds is affected by the fluctuations in interest rates, and that the interest rate fluctuates greatly. This means that fluctuation in growth rate affects the movement of the yield (yield) bonds. Therefore, the level of bank deposit interest rates affects the public interest to buy bonds, seen from the magnitude of the yield in bond holdings.

Another factor that affects the inten- tion of investor to buy bonds is exchange rate. Foreign exchange rates affect domestic inflation rate, which then affect the capability of those investors to buy bonds. Exchange rate can be defined as the price of foreign currency in units of another currency. Ichiue and Ueno (2007) have proved that the yield of bonds is affected by inflation, while one of the factors that affect inflation is the exchange rate movement. Exchange rate has an important role in clearing transaction involving more than one currencies. Exchange rate also reflects the relationship between product prices at home and abroad.

Based on the description, it can be concluded that exchange rate, in this case the USD IDR affect the trading price of bonds in the secondary market, and thus affect the intention of investors to buy ORI001.

According to the act of capital market in Indonesia, a share represents the ownership of some parts of an open company. Each shareholder receives a certificate proving that he or she own a certain percentage of the company. The percentage is decided by the amount of money he or she spent to buy the share.

The shareholders can trace the movement of its share or stock price by following the movement of stock price index. Stock price index movement is a record of the movement of stock prices since the start was first circulated until at some certain point. Indonesian Stock Exchange currently has 8 types of stock price index, which are continuously distributed via printed and

electronic media. Such information serves as one of the guidelines for investors to invest in the stock market. This study uses Composite Stock Price Index (*CSPI* = Harga Indeks Saham Gabungan = *CSPI*) in Bursa Effek Indonesia (*BEI*), an index that represents the movement of all shares on the Stock Exchange. *CSPI* was first introduced on 1 April 1983. Today the number of issuers listed on the Indonesia Stock Exchange has reached more than 400 issuers.

A stock prices index describes the general price movements of securities. It is also a benchmark for assessing the performance of an investment portfolio. *JCI* movement which brings about greater gains than the yield of bonds implies that the performance of investment portfolios is quite good, and prospects for derivative products are also good. In this situation, investors will be more interested in buying shares. This conclusion is supported by Stivers and Sun (2002) who investigate the yield on bond holdings, with respect to joint movement between stock returns and bond returns in two different time periods, and their relationship to stock market uncertainty. They found that in the first period, stock returns and bond returns move together, the average stock return is higher than the average return of bonds, and stock volatility is low. In the second period, stock returns and bond returns show a negative movement together, the average bond return is higher than the stock returns, and the stock volatility is high. Thus, it can be inferred that there was a relationship between *JCI* movements with bond yields. This means that the comparison between the yield on bonds and that of stocks are variables that affect the intention of investors to buy more stocks or bonds. It can be concluded that there is a possibility that the stock price index, which in this case is *JCI*, affect the intention of investors to buy bonds ORI001 series.

It has been mentioned in the previous description that the interest or coupon paid on holdings of bonds is called the yield. In practice, the current yield of bonds shows only cash income from investment bonds in the bond instruments,and has ignored all the losses and gains due to price changes in the secondary bond market itself.

To calculate the yields of bonds that include current income and income from the price changes until the maturity period, scholars calculate the yield to maturity (*YTM*). Bodie et al. (2011) define the yield to maturity as the present value of interest payment from the bonds holding, or the average yield obtained from a bond if purchased today and held to maturity. In other words, yield to maturity is the yield from holding a bond, assuming that: (a) the investor will hold the bonds until maturity time, (b) the bond issuer pays all coupon bonds, and (c) the investors reinvesting the earnings from the interest with the same profit level with the current yield. In addition, yield to maturity also includes potential gain from an increase of the price (capital gains) or losses as a result of a decrease in the stock price (capital loss).

The purpose of the study is to determine the effect of Bank Deposit Interest Rate, *USDIDR*, *JCI*, and Yield to Maturity of Government Retail Bonds ORI001 series. To accommodate such goals, the paper constructs the following hypothesis:

H_1 : Bank deposit interest rate positively influences the yield to maturity of ORI001.

H_2 : *USDIDR* positively influence the yield to maturity of ORI001.

H_3 : The Composite Stock Price Index positively influences the yield to maturity of ORI001.

H_4 : Simultaneously, Bank deposit interest rate, *USDIDR*Composite Stock Price Index positively influence the yield to maturity of ORI001.

METHODS

The study uses an associative causal method. Associative method aims to find a

relationship between two variables or more, whereas the causal method analyzes factors influence of the independent variable on the dependent variable.

The variables and their definitions in this study are as follows Yield to maturity ORI001 series is the yield obtained by investors when they purchase bonds at a certain period and hold it until maturity. Deposit rate is the average bank deposit rate for 12 months. Exchange rate (exchange rate USD) is the rupiah against the US $ (USD), a middle rate. Composite Stock Price Index is a leading indicator that describes the general price movements of securities brokerages, the Jakarta Composite Index closing each day.

This study uses secondary data from Bloomberg. It uses a sample of 3 years (August 9, 2006 to December 2008), 626 observations. Estimation will be done on two models, namely a multiple regression by the method of Ordinary Least Square (OLS), and ARCH or GARCH methods.

Multiple Regression with an Ordinary Least Square Method

This study uses regression analysis because the causality in this analysis has one direction, namely from the three selected independent variables on the dependent variable, whereas the opposite direction is assumed to be not occur. The estimated equation is as follows

$$Y_t = \theta_0 + \theta_1 X_{1t} + \theta_2 X_{2t} + \theta_3 X_{3t} + \varepsilon_t \qquad (1)$$

where Y_t is yield to maturity from ORI001, X_1 is US$/Rp (=*USDIDR* hereafter), X_2 is bank deposit interest, X_3 is *CSPI*, θ_1, θ_2 and θ_3 are regression coefficients for X_1, X_2 and X_3, respectively, θ_0 is constant, and ε_t is the stochastic error term.

To estimate the regression coefficients, we can use Ordinary Least Square (OLS) method. However, Gaus Markov

theorem (in Nachrowi and Usman, 2006) says that OLS will produce a good estimator, known as BLUE (Best Linear Unbiased Estimator), when the regression model meets the assumptions of classical regression, namely normality, no autocorrelation, no multicollinearity, and no heteroskedasticity. The assumptions can be summarized in mathematical expression as follows. (i) $E(u_i | X_i) = 0$, which means that the mean of the residuals is zero. (ii) $E(u_i | X_i - E(u_i | X_i))^2 = \sigma^2$, which means that the residual's variance is constant. (iii) $E(u_i | X_i - E(u_i | X_i))(u_j | X_j - E(u_j | X_j)) = 0, \ i \neq j$, which means that the covariance across residuals is zero.

GARCH Model

ARCH ((Auto Regressive Conditional Heteroscedastisity) and GARCH (= Generalized ARCH) model are often used to model the capital market returns, inflation, and interest rates. These data usually have the property that there is a period where the volatility is very high, and there are other periods where volatility is very low. Such volatility patterns indicate the presence of heteroscedasticity because there are variants of the magnitude of error depends on the volatility of the past errors. However, sometimes a variant of the error does not depend on independent variables only, but the variant is changing along with the time change.

The ARCH model was first found by Engle (1982). Different from other regression model who try to solve for the problem of heteroscedasticity, this model models the conditional heteroscedasticity. The model is also known as conditional variance model, since it models the conditional variance. By utilizing heteroscedasticity of the error correctly, you will get a more efficient estimator. The ARCH model can be formulated as follows:

$$Y_t = \theta_0 + \theta_1 X_{1t} + \theta_2 X_{2t} + \theta_3 X_{3t} + \varepsilon_t \qquad (2)$$

$$h_t = \eta_t \sqrt{h_t} \tag{3}$$

$$h_t = \alpha + \sum_{i=1}^{p} \beta_i \varepsilon_{t-i}^2 + v_t \tag{4}$$

where η_t is the standardized residual, h_t is the conditional variance, ε_{t-1}^2 is the ARCH term, β is the coefficient of ARCH term, and γ is the coefficient of the GARCH term.

Later on, Bollerslev (1986) incorporate the lag of the conditional variance as the independent variable, so that we have generalized ARCH, or better known as the GARCH model, as follows:

$$h_t = \alpha + \sum_{i=1}^{p} \beta_i \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \gamma_j h_{t-j} + v_t \tag{5}$$

where h_{t-1} is the GARCH term.

The significance of ARCH term can be acknowledged by testing the significance of β. If the probability of the *t*-test of β is less than 5%, than we can reject the null hypothesis that ARCH term is not significant. The significance of GARCH term can be acknowledged by testing the significance of γ. If the probability of the *t*-test of γ is less than 5%, than we can reject the null hypothesis that GARCH term is not significant.

Since the findings of ARCH by Engle (1982) and GARH model by Bollerslev (1986), various models try to develop better models to capture the conditional variance such as the GJR (Glosten-Jagannathan-Runkle) model by Glosten et al. (1993) which captures the asymmmetric effects of negative and positive shock to the conditional variance. The GJR model can be expressed as follows:

$$h_t = \alpha + \sum_{i=1}^{p} (\beta_i \varepsilon_{t-i}^2 + \lambda_j I_{t-j} \varepsilon_{t-i}^2)$$

$$+ \sum_{j=1}^{q} \gamma_j h_{t-j} + v_t \tag{6}$$

where

$$I_t \left\{ \frac{0, \ \varepsilon_t \geq 0}{1, \ \varepsilon_t < 0} \right\} \tag{7}$$

This model captures the possibility that the negative shock results in higher conditional variance. This can be done by simply testing the significance of λ. If the *t*-test of λ is bigger than the *t*-critical, or if the probability of the *t*-test is less than 5%, we can reject the null hypothesis that there is no asymmetric effect, otherwise.

Similar model to capture the asymmetric effects of negative and positive shocks has been made by Nelson (1991), well known as the Exponential model. The model can be written as follows:

$$\ln(h_t^2) = \alpha_t + \sum_{k=1}^{\infty} \beta_k g(z_{t-k}), \qquad \beta_1 = 1$$

where $\{\alpha_t\}_{t=-\infty,\infty}$ and $\{\beta_k\}_{k=1,\infty}$ are real, non-stochastic, scalar sequences.

To choose the best model, the paper applies the methods of Akaike Info Criterion (AIC) and Schwarz Info Criterion (SIC). The considered best model is that with the lowest AIC and SIC.

Some papers have used the GARCH family models to model the movement in stock markets such as Janakiramanan and Lamba (1988), In et al. (2003), and Worthington et al. (2003). Some other papers model the linkage across foreign exchange markets, namely Dungey and Martin (2000), and Hurley and Santos (2003). The linkage between stock and foreign exchange markets has been investigated by Johnson and Soenen (1998), Mustafa et al. (1999), and Rahman et al., (2002).

RESULTS DISCUSSION
The statistic of the data used in this paper is as follows:

Tabel 1: Descriptive Statistics of the Variables

Statistics	*YTMORI*	*USDIDR*	*DEPOSITO*	*CSPI*
Mean	9.393211	9368.216	7.980799	2047.816
Median	8.750000	9180.000	7.680000	2090.855
Maximum	16.60000	12650.00	10.37000	2830.260
Minimum	7.120000	8675.000	6.880000	1111.390
Std. Dev.	1.785122	650.5823	0.949405	441.3766
Skewness	1.231462	3.213114	0.850588	-0.156045
Kurtosis	4.317499	13.18023	2.710890	2.019046
Jarque-Bera	203.4969	3780.349	77.66528	27.63975
Probability	0.000000	0.000000	0.000000	0.000001
Sum	5880.150	5864503.	4995.980	1281933.
Sum Sq. Dev.	1991.663	2.65E+08	563.3564	1.22E+08
Observations	626	626	626	626

Source: Bloomberg and output of SPSS.

Tabel 2: Estimation of ARCH and GARCH Models

Models	R^2	Akaike Info Criterion	Schwarz Criterion	Prob (*F*-statistic)
ARCH (1)	0.346084	1.350767	1.393317	0.000000
ARCH (2)	0.339177	1.297672	1.347314	0.000000
ARCH (3)	0.340316	1.298805	1.355538	0.000000
ARCH (4)	0.411651	1.354284	1.418109	0.000000
GARCH (1,1)	0.339367	1.293395	1.343037	0.000000
GARCH (2,1)	0.439063	1.458249	1.514982	0.000000
GARCH (3,1)	0.430404	1.384738	1.448563	0.000000
GARCH (4,1)	0.429996	1.357909	1.428825	0.000000

Source: EViews estimation results.

Table 1 above shows that the data are normally distributed. Estimation of the models using OLS method on the transformed model is not able to produce a good model, because the resulting models are not free from heteroscedasticity problem, so the assumption of Best Linear Unbiased Estimation (BLUE) can not be met. The estimation is then performed using the GARCH method.

The basic GARCH model regarding the aforementioned variables can be formulated as follows:

$$YTMORI_t = \theta_0 + \theta_1 USIDR_{1t}$$
$$+ \theta_2 DEP_{2t} + \theta_3 IHSG_{3t} \quad (8)$$
$$+ \varepsilon_t$$

$$h_t = \eta_t \sqrt{h_t} \quad (9)$$

$$h_t = \alpha + \sum_{i=1}^{p} \beta_i \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \gamma_j h_{t-j} + v_t \quad (10)$$

This model allows us to have more than a single lag of both ARCH and GARCH terms.

To find the best model, the paper performs a few estimation using Eviews software package. The result of the estimation is presented at Table 2.

Table 2 shows that the best model is the model with ARCH(2), because this model has the lowest value of AIC and SIC. The regression test results are shown in Tables 3 and 4.

Based on Tables 3 and 4, we can construct the equation for the estimation results as follows:

$$YTMORI = -9.641 + 0.0014USDIDR$$
$$(0.000)\quad(0.000)$$
$$+0.7254DEP - 0.0004CSPI \tag{8}$$
$$(0.000)\qquad(0.000)$$

$$h_t = 0.0047 + 0.8157\varepsilon_{t-1}^2 + 0.3162\varepsilon_{t-2}^2 \tag{9}$$

Regression coefficient of $USDIDR$ is 0.0014, indicating that the influence $USDIDR$ on yield to maturity of ORI001 is positive and significant, shown by the significance value of 0.000. The positive influence of 0.0014 means that if $USDIDR$ increases by 1 point, the average of yield to maturity of ORI001 increases by 0.0014. The findings support the suggestion of Ichiue and Ueno (2007), that the yields of bonds is affected by inflation, which also means that the exchange rate affect the yield on its bond holdings.

Regression coefficient of deposit rate is 0.7254, indicating that the influence of deposit interest rates on yield to maturity of ORI001 is positive and significant, shown by the significance value of 0.000. The positive influence of 0.725435 means that if interest rate of deposits increases by 1 point, the average of yield to maturity of ORI001 increases by 0.7254. These findings support the conclusion of Ichiue and Ueno (2007), that the yield of bonds is affected by fluctuations in interest rates.

Regression coefficient of $CSPI$ is -0.0004, indicating that the stock index negatively affect the yield to maturity ORI001. The significance of this effect is shown by the probability of t value of 0.000, so that less than 5%. This means that if the stock index rose 1 point will cause a loss of yield to maturity ORI001 by 0.0004. These findings do not support the conclusion of Stivers and Sun (2002), in connection with joint movement between stock returns and bond in a variation of two different time periods, where stock returns and bond returns move together.

Tabel 3: Mean Equation

	Coefficient	Std. Error	z-Statistic	Prob.
DEP	0.725435	0.015700	46.20740	0.0000
USDIDR	0.001419	1.40E-05	101.5056	0.0000
CSPI	-0.000407	3.01E-05	-13.49542	0.0000
C	-9.641065	0.253407	-38.04578	0.0000

Source: EViews estimation results.

Table 4: Variance Equation

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.004714	0.000767	6.147590	0.0000
RESID(-1)^2	0.815684	0.089527	9.111041	0.0000
RESID(-2)^2	0.316179	0.057442	5.504280	0.0000
R^2		0.339177		
Adjusted R^2		0.332772		
Durbin-Watson stat		0.036519		
Akaike info criterion		1.297672		
Schwarz criterion		1.347314		
F-statistic		52.95180		
Prob(F-statistic)		0.000000		

Source: EViews estimation results.

The *F*-statistic value of the model is 52.95180, with a probability of significance of 0000 <0.05. This indicates that the independent variables in the form of deposits interest rate, USDIDR and JCI altogether significantly influence yield to maturity of ORI001.

CONCLUSION

This paper analyzes the effect of Deposit Interest Rate, *USDIDR*, and Composite Stock Price Index (*CSPI*) to Yield-to-Maturity Bond Series Retail *ORI*001, employing monthly data from Bloomberg from 2006(8) to 2008(12), using GARCH type family model . The estimation results in suggest the following. First, the significant tests found that the three variables, namely deposit interest rate, exchange rates, and *CSPI*, both partially and simultaneously, significantly affect yield to maturity of ORI001 type bond.

The coefficient of deposit interest rate is positive, supporting the finding of Ichiue and Ueno (2007). The coefficient of *CSPI* is negative, which did not support the finding of Stivers dan Sun (2002). From the results, the paper suggests government bonds should be sold mainly for the domestic traders. When about 80% of the bonds were held by overseas traders in 2008, there were worries that when those traders sell the bonds at the same time (*sudden reversal*), then it might lead to panic in domestic market.

Monetary policies construction should consider the interest rate of ORI001 type bond, in order that deposit interest rate and corporate bond interest would not reduce the motivation to by ORI001 type bond.

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