

# Two stage least square method for prediction financial investment and dividend

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## Two stage least square method for prediction financial investment and dividend

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**Abstract.** There are 3 financial decisions in Financial Management Science including funding, investment and dividends. This study aims to determine whether there is interdependence between investment and dividend variables. The research method used two stage least square (2SLS). This research uses two equations of investment and dividend. The result of the research on investment equation shows that dividend has no effect to investment. The result of the research on dividend equation also shows that investment has no effect on dividend. These results indicate that investment funding does not depend on internal equity but can come from external equity and external finance. Thus, even if the company performs dividend division, Investment is still performed.

### 1. Introduction

Financial science is divided into 2, they are finance fundamentals and behavior finance. As stated by [1] there is a difference of emphasis from both. Fundamental finance emphasis on economy theory while behavior finance is based on the use of human psychology combined with economic theory. Financial science itself one of them learns about financial management. Financial management basically covers three areas: funding decisions, investment decisions and dividend decision [2], [3], [4]. Three decisions in financial management are mutually related to each other and can be explained based on financial statements of both the balance sheet and income statement. Funding decision explains how a company obtains the source of capital either from foreign capital or own capital. After obtaining capital, the management allocated funds obtained in the form of investments both current and fixed assets. Then the management operates the investment to gain profit. Once the company operates and earn revenue, the management must make dividend decision [2]. Decision or dividend policy determines how much percentage of profit is allocated as dividend and how much is allocated as retained earnings.

Based on the elaboration of financial management described above, this research limited to investment decisions and dividend decisions. Both decisions between investment and dividends, influence each other with each control variable based on fundamental finance. The management will try to increase the wealth of investors by increasing the company's growth. Company growth can be



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realized if management can use the best investment opportunities by making the right investment decisions. Investment decisions related to investment policies that require an understanding and carefulness of the determining factors and outcomes to be achieved. Internal and external factors need to be considered in making investment decisions both short and long term investments [5], [6]. Investment should be done as well as possible because the higher the investment opportunity the greater the company value determination, [7], [8]. Investments are defined as activities undertaken by investors in investments on certain assets and is expected to produce a large rate of return [9]. The investment equation in this study acts as an endogenous variable, while dividend acts as exogenous variable. Profitability and company growth will act as control variables.

Dividend equation indicates that Investment decision will affect dividend decision. The size of investment opportunity will determine the amount of funds needed and the dividend to be distributed [10]. Investment decision is made as best as possible because it will determine the level of risk of the company [11]. The higher the growth rate of the company signifies the higher the investment made and the more funds it needs. The amount of funds absorbed in investments, especially funds derived from profits after tax or profits available to shareholders, will reduce the profit to be distributed as dividends. The statement is in accordance with the opinion of [12] which states if the growth is high then the required funds are also high or large, so the higher the investment, the lower the dividend to be paid. Unless funding investments are heavily funded from external finance or debt, it tends not to affect the amount of dividend distribution. Conversely, if the percentage of profit to be distributed to shareholders as dividends is greater than the profit allocated as retained earnings, it will affect the company's investment as long as the investment is mostly derived from internal equity. Dividend policy is part of the financial management function in determining the percentage of profit to be allocated to shareholders and retained earnings [13]. Dividend equation acts as an endogenous variable in the others study is dividend, the exogenous variable is investment, and the control variable is firm size, firm growth and profitability. [14], [15] showed a negative relationship between investment and dividends.

This research focuses on companies incorporated in Jakarta Islamic Index (JII) with period of 2013 to 2016. The average of dividend and investment between 2013 and 2016 in table form is as follows

**Table 1.** Average Dividend and Investment 2013 - 2016

Information	2013	2014	2015	2016
Dividend	0.4376	0.7477	0.4114	0.3821
Investment	17.2268	-21.2179	40.3509	23.767

Source: JII data processed

Based on the tables 1, dividend and investment tend to be downward trend from 2013 to 2016. The tendency of the decline pattern can also be linked between dividends and investment during that period. Compared to 2013, 2014 period showed dividend payments experienced an increase followed by a decrease in investment. By contrast in 2015 compared to 2014 the decline in dividend payouts is followed by an increase in investment. Decreased of dividend payment occurred followed by investment decrease in 2016. This can be shown by the comparison of investment with dividends, which in 2016 showed a proportion of 62.2 which was smaller than in 2015 of 98,075.

The existence of dividend and investment interdependence shows the relationship between the two variables as explained in the science of financial management. Financial management science explains when a lot of profit is allocated to dividend distribution it will have an impact on the decrease in internal funds available to make investments or vice versa. This phenomenon becomes the main problem in this research that is by analyzing interdependence between variable dividend and investment along with each control variable that influence. Based on the problem, this research has two (2) hypotheses. Hypothesis 1 states that dividends have a negative effect on investment, while hypothesis 2 states that investment has a negative effect on dividends.

## 2. Methodology

The population of this study is 30 companies registered in Jakarta Islamic Index (JII) from 2013 to 2016. At this stage the amount of data in the population is 30 companies multiplied by 4 periods i.e 120 data from each variable. Because the sampling is performed by using purposive sampling method with certain criteria, 14 companies were filtered. The amount of data from each variable is 14 multiplied by 4 period i.e 56 data. But after the normality test, data outlier from 3 was obtained that they must be eliminated. In the end the number of companies used as research samples is 11 companies with 4 periods that the total data used is 44 data from each variable. Analysis technique of this research use 2SLS (two stage least square). Schematic framework of this research model is as follows:

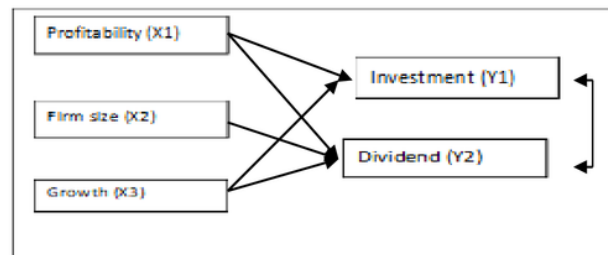


Figure 1. The Schematic Framework of The Research Model

Based on the schematic framework there are two equations namely investment (Y1) and dividend (Y2) which acts as an endogenous and exogenous variable. Both equations show dependence where the endogenous variable in one equation can act as an exogenous variable in other equations and vice versa. Analyzer used in this research is two stage least square (2SLS). The formulation of both structural equations in this study is:

$$\text{Equation of investment: } Y1 = a_0 + a_1 Y2 + a_2 X1 + a_3 X3 + e1$$

$$\text{The dividend equation: } Y2 = b_0 + b_1 Y1 + b_2 X1 + a3 X2 + a4 X3 + e2$$

Explanation:

Y1 = Investment      X3 = Growth  
Y2 = Dividend      a, b = coefficient regression  
X1 = Profitability    e1, e2 = error term

## 3. Results and Discussion

Prior to performing classical assumption test, normality test is performed. Normality test is performed by using Kolmogorov Smirnov on the investment equation and dividend equation are shown in the following table:

Table 2. The Test Result Normality

		Unstandart Residual	
		Investment	dividend
N		55	55
Normal Parameter	Mean	.0000000	.0000000
	Std Dev	13.84174081	.89279255
Most Extreme diff	Absolute	.127	.316
	Positive	.127	.316
	Negative	-.088	-.27
Test statistic		.127	.316

Asymp.Sig (2-tailed) .28<sup>c</sup> .000<sup>c</sup>  
 a. The distribution is Normal

The test result shows that both equations show normal distributed data, then it is feasible to do a classic assumption test. The result of 3 classical assumption tests of multicollinearity, heteroscedasticity and autocorrelation on equation of investment and dividend in this research are as follows:

**Table 3.** The Result of Classical Assumption Tests

	Result		Criteria	
	Investment	dividend	investment	dividend
<b>Multicollinearity (VIF)</b>			<10	<10
- Profitability (X1)	1.411	1.063	no	no
- Firm size (X2)	-	1.094	-	no
- Growth (X3)	1.091	1.094	no	no
- Dividend (Y2)	1.517	-	no	-
- Investment (Y1)	-	1.045	-	no
<b>Heteroscedasticity (Glejser)</b>			>0.05	>0.05
- Profitability (X1)	.181	.128	no	no
- Firm size (X2)	-	.237	-	no
- Growth (X3)	.226	.634	no	no
- Dividend (Y2)	.121	-	no	-
- Investment (Y1)	-	.058	-	no
<b>Autocorrelation (DW)</b>	2.280	2.150	no	no

Three (3) classical assumptions carried out in this study are multicollinearity, heteroscedasticity and autocorrelation. Multicollinearity test is used to determine whether there is correlation between independent variables. Multicollinearity does not occur if the VIF value is less than 10.00. Based on table 3, Investment equations and dividend equations of each independent variable do not occur multicollinearity. Heteroscedasticity test is used to find out whether in the research model there is variance inequality from observation residual one to next observation. If the residual variance does not change or is fixed then the criteria for homocedasticity are included. Heteroscedasticity occurs when the value is less than 0.05. Based on table 3, each exogenous variable of the two equations in this study showed no heteroscedasticity (independent).

Another test is Autocorrelation with Durbin Watson (DW test) which is used to see if there is a correlation between confounding errors of the present period (t) with the previous period (t-1). The Dw value of the investment equation is 2,280. The number of samples 44, independent or exogenous variables 3 ( $K = 3$ ) = 3.44 then the value of Dw table for dL of 1.3749 and dU of 1.6647.  $4 - dU = 4 - 1.6647 = 2.3353$  and  $4 - dL = 4 - 1.3749 = 2.6251$ . Because DW value at equation of investment equal to 2,280 less than value  $4 - dU = 2,3353$  hence concluded not happened autocorrelation both positive and negative. The DW value on the dividend equation shows the value of 2,150. Number of samples 44, independent or exogenous variables 4 ( $K = 3$ ) = 4.44 then the value of Dw table for dL of 1.3263 and dU of 1.7200.  $4 - dU = 4 - 1.7200 = 2.28$  and dL of  $4 - 1.3263 = 2.6773$ . Dw value on the dividend equation is 2,150 less than the  $4 - dU$  value of 2.28 indicates there is autocorrelation either positive or negative. Based on the three classic assumption test results, it can be concluded that this study meets the classical assumptions.

The level of significance in this study is 5%. Before testing two stage least square then regression test is done for both investment and dividend equation with each variable. Regression test results from each equation are presented in table 4.

**Table 4.** Test Regression

Information	Equation			
	Investment		divident	
	t	sig	t	sig
Constant	5.463	.000	1.951	.058
Profitability (X1)	.509	.614	3.782	.001
Firm size (X2)	-	-	-.267	.791
Growth (X3)	.492	.625	-1.879	.068
Dividend (Y2)	.299	.766	-	-
Investment (Y1)	-	-	.250	.804

The equation of investment shows a constant of significance of .000 and smaller than a level of significance of 5%. While the independent variables of profitability, growth and dividend have no significant effect. The dividend equation on the constant shows the significance of .058 and is greater than the level of significance of 5% used in this study. The independent variable shows a significant influence is the profitability at the level of significance 5%. While the variables of company size, growth and dividends have no significant effect on the level of synergy of 5%.

Regression test on each equation of investment and dividend equation yields Investment (Y1') and dividend (Y2'). The second stage least square (2SLS) test by including investment variable (Y1') and dividend (Y2') is entered into the equation and treated as an exogenous variable to replace the independence variables Y1 and Y2 other than using the previous variable as the control variable. The 2SLS test results are presented in the following table.

**Table 5.** The 2SLS Test Result

	Equation result	
	Investment	divident
Multiple R	0.083	0.083
R Square	0.007	0.007
Adjusted R Square	-.017	-.017
Std Error of The Estimate	9.383	9.383
Significance	0.592 (Y2)	0.592 (Y1)

Based on table 5 the investment equation shows multiple R of 0.083 with R square 0.007. The size of multiple R values will affect the size of R square. The greater the multiple R the greater the R square the greater or higher the ability of the independent variable to explain the variation of the dependent variable. R square value as the result of determination coefficient test on investment equation where investment as dependent variable can only be explained by independent variable consisting of dividend, profitability and company growth only equal to 0.7% while the rest of 99.3% explained by other variable. The contribution of independent variable on the equation of investment is very small so that will affect the other results, especially from the adjusted R square is very small and even minus that is equal to -.017 with a very large standard error of the estimate that is equal to 9,383. These unfavorable results strongly influence the significance of exogenously dividend variable to investment of 0.592 or 59.2% higher than the level of 5% significance used in this study.

The research hypothesis on the equation of investment is dividend has a negative effect on investment. The results of this study show dividends with positive coefficients and have no significant effect on investment. Therefore, the results of this study are not in accordance with the hypothesized in this study nor hypothesized by [16], [7], [14]. Which The researcher stated that if the dividend paid high then the profit allocated to retained earning becomes lower, consequently the investment opportunity becomes smaller. The insignificant influence with the positive direction indicates that the rise or fall of the dividend does not affect the rise or fall of the investment. If the dividend paid high

means that a lot of profit is allocated in dividend distribution compared to retained earnings. Retained earnings are one source of funding for investment. The results of this study indicate that investment funding does not only depend on retained earnings but funding can come from other components of own capital and foreign capital. It can be seen from regression test that investment is not influenced by profitability variable (X1) which is proxied with net profit compared to total equity and growth variable (X3) which is proxied with sales growth. Science of financial management stated that funding sources for investment can be from foreign capital both from short-term and long-term debt in the form of bonds and own capital both from retained earnings, paid up capital, issuance of new shares.

The dividend equation shows multiple R of 0.276 with R square of 0.076 or 7.6%. It shows that the independent variable of profitability, firm size, corporate growth and investment is only able to explain by 7.6% to the dividend dependent variable, the rest of 92.4% is explained by other variables. Standard error of the estimate is indicated by 0.212% this reflects the error rate is still better than the investment equation of 9.383. This is indicated by the result of investment significance of 0.070 or 7% higher with the level of 5% significance used in this study. It shows that investment with positive coefficient has no significant effect on dividend. These results indicate that the high or low investment does not affect the high or low dividends paid. While the hypothesis states that investment has a negative effect on dividends. The hypothesis explains that the high or low investment will affect the low or high dividend. The higher the investment will affect the low dividend distributed and vice versa. So the results of the research in this dividend equation are not in accordance with the hypothesized and also with the results of research [17], [14], [12]. As explained in the investment equation, the dividend equation also shows that investment funding is not purely funded from the profits earned by the company. Funding originates from debt and equity capital, either retained earnings, paid up capital or share issuance.

The explanation is in accordance with the views of financial management science concerning funding decisions. Funding decision is a decision on where the fund obtained from whether from foreign capital or capital itself or a combination of both. These results are also supported in the regression test prior to the 2SLS test which the profitability variables show a positive effect on dividends. It shows that dividend distribution to shareholders comes from the profit earned by the company and in accordance with the explanation financial management science about the dividend decision. The dividend decision explains what the proportion of profit after tax to be distributed to shareholders as dividend and what proportion of profit is allocated as retained earnings. So it can be concluded that both investment and dividend variables acting as exogeneous and endogenous variables show interdependent relationships with each other and according to the explanation of financial management science.

#### 4. Conclusion

Determination of investment and dividends should be performed in the best way as it will affect the perception of investors in determining stock prices. The results of this study on investment equations show that dividends have no effect on investment. While the dividend equation shows that investment does not affect dividends. This result happens because the size of the investment is not dominated by funding derived from internal equity but largely funded from external equity and external finance. Internal equity comes from retained earnings, external equity one of which comes from the emission of shares while external finance is from debt.

#### Limitations

This study has limitations in the narrow research variables, further research needs to be extended especially from the three financial decisions described in financial management science.



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