Dadang Prasetyo Jatmiko (UK)

The relationship between return, price to earnings ratio, price to book value ratio, size and beta in different data period

Abstract

This study uses five variables in which each of these variables were taken from 100 randomly selected companies from around 344 companies listed in Jakarta Stock Exchange (JSX), (MEDIA INDONESIA, 2013) in order to understand the relationship between price to earnings ratio (PER), price to book value ratio (PBV), size (log) and beta as independent variables with variable returns as dependent variable. The period of the data used is from 2010 to 2012 for the four independent variables and from 2009 until 2011 for the dependent variable.

In the return of 2009 there is one variable that is statistically proven to correlate with the return. The independent variable is the price to earnings ratio (PER), but the notation of PER is negative. However, the return of 2010 According to the table above, it appears that for the fault tolerance of 5%, none of the independent variables that are statistically proven separately correlated with returns. As for a return in 2011, seen that returns variable is statistically shown to correlate with a beta variable with a significance level of 0.007 and with a coefficient of 0.333. Pearson correlation analysis was also performed to Panel Data, unfortunately none of the independent variables that are statistically proven to have a relationship with the return. Furthermore, seen also how the relationship between the variables PER, PBV, log size and beta with multiple returns in a model as well as the relationship between PER, PBV, size and beta with the expected return.

Keywords: beta, PER, PBV, size.
JEL Classification: G12, G13, G14.

Introduction

Background. Most people have started to realize that the more money they have and unspent could have additional value through investment activity rather than to just keep it privately at home (Jones, 2004). Currently, there were 344 companies, which are divided into 9 sectors, registered as issuers (Media Indonesia, October 10, 2009). Amongst the instruments that they offer, respectively, the investor is able to invest in one or several existing instruments. The problem is, amongst all these instruments, which one is good and right in a case that they will be able to meet the expectations of investors.

In investing, the investor has to give up the consumption of a number of funds that they have today in exchange for investment assets (Jones, 2004). Given the willingness of these investors will likely yield at one or more financial benefits. In stock for example, investors holding these investment to get two forms of financial gain; dividends (for investors who wants to get ownership of the company) and capital gains (for investors who want a quick profit).

The theory is widely used as a reference for academicians in terms of return on investment. It is the establishment of the theory by Sharpe (1964), Lintner (1965) and Black (1972) and known as the Capital Asset Pricing Model (CAPM). This model states that the return is a function of (1) the risk-free rate (the return on risk-free investment instruments), (2) systematic risk investment instruments (beta) and (3) the risk premium to the expected (Keown, 2001). The model states that beta is the only independent variable that can affect stock returns. The study further states that, in addition to the beta apparently there are any other variables that affect the returns. Basu (1983) shows that the Price Earning ratio (P/E ratio) can help explain the return on the stock in the American Stock Market. The P/E ratio is shown to have a positive effect on stock returns. Fama and French (1992) found a negative relationship between size and PBV (price to book value ratio) with return on stocks of NYSE, AMEX and NASDAQ. In Indonesia, a similar study has also been carried out.

The author wants to prove whether in different data periods, the results of the study will show the same relationship between the variable returns as the dependent variable with the variable PER, PBV, size and beta.

Problem formulation. The return is an important variable in the investment activity. Any investor who has already set aside funds to purchase investment assets, of course expects a positive return on the asset value of his investments (Jones, 2004). Return is a variable that is very difficult to predict. Several studies have tried to find any variables that may explain the return. Starting from CAPM theory (which states that the beta is the only variable that could explain changes in return), many studies have been done to look for other variables besides beta that can explain the changes over the returns. Fama and French (1992) illustrated that the CAPM theory is not entirely true. They found the presence of other variables besides beta proven to explain the changes to the return of an investment. These variables have even greater influence in explaining returns than beta. These variables are the size and PBV.

Research objectives. The purposes of this study are:

1. To see if the variable PER, PBV, size and beta simultaneously can explain stock returns in the market; and
2. To measure how much the variable PER, PBV, size and beta are able to explain the changes over the returns.

Scope of the Study. This study is limited only to companies listed on the Jakarta Stock Exchange (JSX) in the period 2009 and 2013. All the companies are examined to determine the random selection of 100 companies that will be made the object of research.

Research methodology. In this study, the methods used are:

1. Literature study. This study was conducted to look for reference books as well as other data that can support research in several University of Indonesia (UI) libraries such as the Library of Extension Program Salemba (Jakarta), internet sites and others;
2. Descriptive statistics of study. This study was conducted to look for the relationship between the variables used in the study by using a statistical test program such as SPSS and Microsoft Excel.

1. Literature review

1.1. Investment. Investment is a commitment to the use, the sum of money on one or more assets to be held for some time to come (Jones, 2004). Investment is also a commitment to a number of funds with the purpose of generating revenues in the future as compensation to investors over the uncertainty of income in the future and the expected inflation rate (Reilly and Brown, 2002).

Investment means delaying the use of the funds to be consumed in the future (Jones, 2004). The willingness of an individual in delaying the use of their funds in a form yielding benefits that are financed (return) and the underlying value of the benefits that an investment action.

On the other hand, investment spawned one or several forms of risk. The risk in question may be general, that is attached to all existing investment instruments (general risk), as well as a special character, which may vary for each investment instrument (specific risk). In investing, an investor will be faced with the choice of investment instruments which are able to meet their expectations. The basic principles that apply in the investment world can be used as a reference for the investor in making an investment decision. The principle is known as the risk-return trade-off.

1.2. Rate of return (return). Return has two basic concepts; realized return and expected return. Realized return is the return that has been reported (ex post) or return that has happened or should have happened also. Realized return is the fact that has been going on making them, and can be measured with the appropriate data (Jones, 2004). Expected return on the other side is the return of estimated is a return of an asset or expected to occur in the foreseeable future. Since the expected return is merely the object of a hope or estimate, so it is not certain whether the return value of this will happen or not in the future. This is what underlies the emergence of investment risk (Jones, 2004).

Regarding the establishment of returns, this variable has two main components:

- Yield: This component is formed from the periodic flow of cash payments from the investment. It can be either interest or dividends.
- Capital gain: This component represents the difference of the sale price at the time of investment assets at a price at the time of purchase. Capital gains occur when the asset experiences an appreciation of the value of investment.

If both of these components are added, the result is commonly known as the total return. Mathematically, the establishment's total return is written as follows:

Total return = yield + price change,

where the component can yield valuable > 0, and component of the price change can be 0, > 0 or < 0.

As it is explained earlier that the shape of the components of cash flow (yield) on the above model consists of two forms, so for bonds, this component will be in the form of interest, while for stocks, this component will be in the form of dividends. In addition to total return, in the investment world are also known to other forms of the return value. One such form is known as relative return (RR). By definition, the RR is the total return for an investment over a specified time period and based on figures 1.0. For the models of RR is simply written as:

RR = *TR* (in decimal form) + 1.0.

1.3. Risk. Risk by definition can be interpreted as a possible realization of the difference between the return on investment asset with a value previously expected to happen. The greater the distance (variation) of the return value is expected to occur (expected return) to its actual value will return (actual return), the greater the risk of the investment assets.

Risks can come from a variety of sources. Some sources that may give rise to risks, among others:

- Interest rate;
- Market conditions;
- Rate of inflation;
- Proportion of corporate debt levels;
- The level of liquidity of investment assets;
- Fluctuations in currency values;
- Political and economic conditions.

All the sources that may contribute on the risk of investment can be grouped into two types of risk. Both types of risk are:

1. Systematic risk. Risks are classified into this type, it means that the risk cannot be removed and attached to all existing investment instruments. This risk arises due to macro factors (market).
2. Non-systematic risk.

Such risks are unique to each asset investment; it means that any assets may have different risks. This type of risk can be eliminated by such measures as stated by Markowitz to form on the investment portfolio.

The second type of risk is then used to form the value of total risk. For the modelling of the total risk can be written as follows:

Total risk = systematic risk + non-systematic risk.

This is in contrast to the opinion of Sharpe (1964), Lintner (1965) and Black (1972). Based on the theory of (CAPM) the investment instruments cannot be viewed only in the form of portfolio alone. For individual stocks, according to them, the level of risk is seen as the extent of the sensitivity of individual stock returns on the market return. Their sensitivity level is symbolized by the beta coefficient (β). They believe that the beta is the only form of risk that affects the returns. The CAPM theory has then done some research with regard to the truth of this theory. These studies conclude that there is in fact of any other form of risk besides the beta proven effect on return. Broadly speaking, the pre-research study has found the existence of at least three other variables besides beta also has an influence on the return. These variables are PER, PBV and size.

1.4. Relationship between rates of return with risks. In connection with the principle of risk-return trade-off, the magnitude of the return of an investment depends on the amount of risk inherent in the investment instruments. The larger (smaller) results in a greater risk (small) return that may be obtained. Based on these principles, then it is proper that every investor vying with each other in the search for an asset or a combination of some of the investment ssets that provide the highest return possibilities with the lowest risk. The question here is which of the assets can provide all of that?

CAPM beta variables are introduced as a form of risk that affects stock returns and some research by economists.

1.4.1. Efficiency of portfolio. The act of investments made, investors will be more efficient if they form a portfolio of many assets rather than just investing in one asset only. Formation according to the Markowitz efficient portfolio based on several assumptions such as:

1. All assets forming an investment portfolio should have a similar period of time, e.g. one year.
2. There is no transaction cost.
3. The used risk measure is the variance or standard deviation.

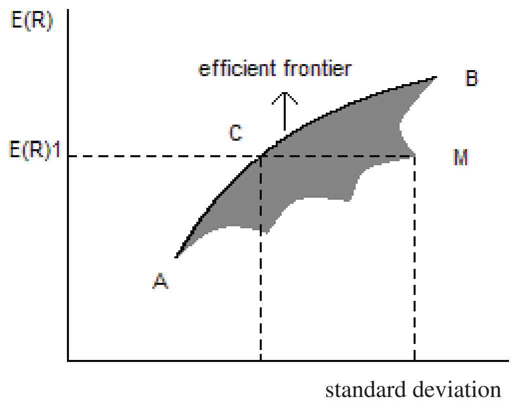

Fig. 1. Markowitz efficient portfolio

The curve above illustrates a series of portfolios that may occur. Areas in gray indicate areas where the portfolio may be the return and risk of each. AB curved line depicts the location of the most efficient portfolio with maximum expected returns and minimum risk. The image shows that the existence of a line drawn from the vertical axis $E(R)$ at the point $E(R)1$ which cuts the curve in two points, namely point C, which is located at the curved line AB, and the point M. The two points (which symbolize portfolio) C and M have the same expected return is $E(R)1$, but it appears that portfolio C has a smaller risk than a portfolio M. This also applies to all points along the curved line AB. In other words, a portfolio which is located along the line AB is shown to be more efficient than the portfolio beyond this line. Curved line AB is then known as the efficient frontier line.

1.4.2. Capital asset pricing model (CAPM). The concept of CAPM was introduced by Sharpe (1964), Lintner (1965) and Black (1972). This concept tries to look at the relationship between the return on an investment asset, not formed to assets in the portfolio alone, but rather the individual assets, with the accompanying risk.

$E(R) = R_F + \beta\ (R_M - R_F)$,

where $E(R)$ = the expected rate of return, R_F = rate of return on risk-free assets, R_M = rate of market return, B = risk of investment assets.

CAPM states that the return will be greater in value concurrently with the magnitude of the beta value of the investment. This relationship is illustrated in the graph as follows:

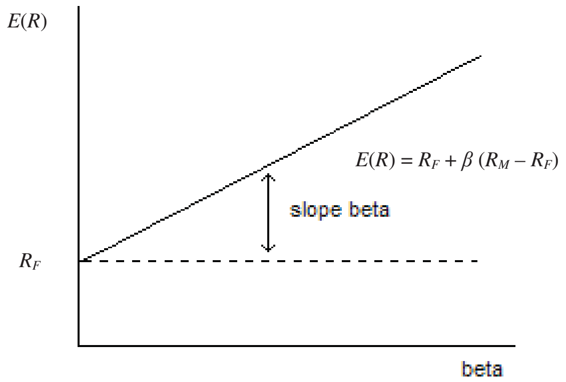

Fig. 2. Relationship between E(R) and Beta

The graph above shows that the minimum value of an investment asset and R_F is a beta value, which is multiplied by the value of the risk premium, is the excess return that investors might obtain. The larger the beta value, the larger the return that may be obtained. This condition is different from the findings of other economists. Further research on the influence of the truth CAPM states that the beta is flat and R_F value should be greater than the value according to the concept of CAPM. Here is a graph that explains it:

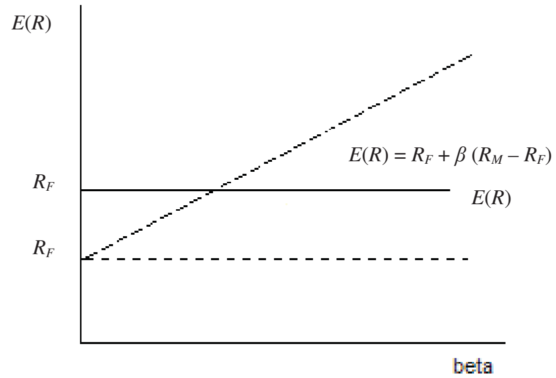

Fig. 3. Extent relationship between E(R) and Beta

The graph above shows that the individual apparently did not affect the beta return (beta influences flat) but it turns out there are other variables that affect the return. This condition is illustrated through the line $E(R)$ which is above the value of R_F it means that there are other variables that can add the value of the return.

1.5. Empirical facts against CAPM. Over time, some researchers discovered other facts with regard to the truth of this CAPM theory. The following table shows some of the names of researchers and their findings:

Table 1. Previous Study

Researchers (Year)	Results of Research
Dhika Febrianov and Anggoro Budi Nugroho (2014)	The result shows that earning per share (EPS) and price book value (PBV) have positive and significant effect toward stock return with level of significance of 5%. Then, price earning ratio (PER) has negative and significant effect toward stock return. Return on asset (ROA) and debt-equity ratio (DER) does not significantly impact the return of LQ45 for the period 2004-2013. The result of F-test also shows that three of independent variables from the regression model (EPS, PER and PBV) simultaneously impact the stock return.
Zeinab Kazemi and Amirreza Kazemikhasragh (2013)	The results obtained from this study show a reverse correlation between the said two variables. Moreover, no correlation between funds of capital increase and stock returns has been found. However, there is a correlation between funds of liabilities and stock shares accordingly.
Chandra Setiawan and Hesty Oktariza (2013)	The result indicates that risk-adjusted return of both stocks' portfolio is performed in a similar manner. Finally, using multiple regression analysis, the research finds that the financial ratios are simultaneously proven to have significant relationship with both of Sharia' and conventional stocks returns.
Perdana Wahyu Santosa and Harry Yusuf Laksana (2011)	The result of this research that VaR, beta, size, and liquidity positively related to stock return except the PBV.
Dwi Martani, Mulyono, and Rahfiani Khairurizka (2009)	The study finds that profitability, turnover and market ratio has significant impact to the stock return.
Fama & French (1992)	♦ When the stock portfolios formed based on size alone, found a positive relationship between the average return to beta. ♦ When the size is controlled by beta, found a strong negative relationship between the average return by size and there is no relationship between return and beta. ♦ The relationship between PBV with return is positive, but cannot replace sizes in assessing the return. ♦ There are two variables that can explain the changes over the returns, size and PBV. ♦ Size and PBV are a proxy of risk because of the rational, the difference in average returns occurs due to differences in risk.
Fama & French 1995)	♦ Portfolio with a large size and a low PBV more profitable than its portfolio with large size and high PBV. ♦ Portfolio with small size and low PBV more profitable than a portfolio with a small size and high PBV. ♦ Portfolio with a small size is less profitable than its portfolio with a larger size.

2. Research methodology

2.1. Object of the research. In this study, the object of the research are the companies listed on the Jakarta Stock Exchange in 2010 until 2013 According to MEDIA INDONESIA daily published Tuesday, October 10, 2013, there were 344 companies, which are divided into 9 sectors, listed as emitters of the total population, this study is limited to one hundred randomly selected companies. From each of these companies, this study took data on annual stock returns for the period 2011-2013, the value of PER, PBV value, and beta and size values of each company for the period 2010 to 2012.

2.2. Data collection. A number of data required to perform this research. The data includes:

- Annual Financial Report of 10 companies that became Object Research and audited in the year of 2011 and 2012. Financial statements are required to find the value of the ratio of PER and PBV. The data obtained through the official website the Jakarta Stock Exchange and Surabaya Stock Exchange as well as the site and through the study Reuters finance magazine INDONESIAN CAPITAL MARKETS DIRECTORY and FACT BOOK.
- A list of 100 companies become the object of the study period of 2010 and 2011 were taken from the internet via the website www.yahoo/finance.com.

2.3. Research variables. *2.3.1. Price to earnings ratio (PER).* PER or PE ratio by definition is the ratio between the market price per share (market price per share) to the value of the revenue generated per share (earnings per share). The PE ratio variable is one of independent variables which is used in the research model. In search of value PE ratio, there are several approaches that can be used. In this study, the approach used is considered by the authors' as is the simplest approach and can be searched by using only the data contained in the financial statements. The approach is:

$$PER = \frac{Market\ price\ per\ share}{EPS} \quad \text{or}$$

$$PER = \frac{Market\ value\ of\ equity}{NI}.$$

2.3.2. Price to book value ratio (PBV). Almost similar to the PE ratio, PBV also tries to compare the market value of equity of the company with other variables. PBV ratio compares the firm's equity market value to its book value. Calculations used in this study to search for PBV values are as follows:

$$PBV = \frac{Market\ value\ of\ equity}{Book\ value\ of\ equity}.$$

2.3.3. Size. The size value is the value of capital derived from the number of shares multiplied by the market price of such shares. In mathematics, the value of size is:

$$Size = current\ shares \times market\ share\ prices.$$

2.3.4. Beta (β). Beta is a relative assessment of risk – the risk of a portfolio of shares compared to the overall stock available (Jones, 2004). If the return of a security moves more (less) than the market return, so the return such securities is said to have volatilized (fluctuations in the price) is more (less) than the market. The calculation of these variables is done manually by the formula:

$$Beta(\beta) = \frac{\Delta Share\ return}{\Delta Market\ return}.$$

2.3.5. Annual stock return. The stock return that is used as the variable is an annual stock return. The calculations used to find the value of annual stock returns in this study is:

$$R = \frac{P_1 - P_0}{P_0},$$

where, P_1 = closing price at the time of the end of the year; P_0 = closing price at the time of the beginning of the year.

2.4. Model of the research. The model used is as follows:

$$Annual\ Return_t = \alpha + \beta_1\ PE\ ratio_{t-1} + \beta_2\ PBV_{t-1} +$$
$$+ \beta_3 size_{t-1} + \beta_4 beta_{t-1},$$

where, α = minimum value of the variable annual return on the condition of all its dependent variable is 0 (zero); Size = current shares x market share prices; β_1 = coefficient of the influence of the variable PE ratio of the annual return; β_2 = the coefficient of the influence of variable annual PBV to return; β_3 = coefficient of the influence of variable size on the annual return; β_4 = coefficients of the magnitude of the effect of beta-annual variable returns.

Through the above model, the author tries to analyze whether PER, PBV, size and beta can be used as an indicator in predicting the value of the stock return period. For these reasons, the authors use data annual stock return periods and the data PER, PBV, size and beta 1-year period earlier.

2.4.1. Statistical analysis. This study tries to find the relationship between the variables of stock returns with two other variables, namely PE and PBV ratio. Therefore a regression analysis is needed in analyzing the relationship. Through regression analysis, the relationship between the variables that exists will be illustrated through a regression equation or equation estimators. The regression equation was established to describe the relations that occur between these variables. The variables that are allegedly called the dependent variable, are usually described as the vertical axis on a diagram while explaining variables estimator are called the independent variable (Mulyono, 1991).

Type of the regression analysis used in this study is a multiple regression analysis because the number of independent variables in this study is more than one. The dependent variable is the rate of return of the stock market. While, the independent variables are: PER, PBV, size and beta. This study shows how much the four variables can explain the value of a variable rate of return of the stock market.

2.4.2. Correlation analysis. After regression analysis, the next stage is to examine the extent of independent variables that exist can explain the dependent variable. This stage is divided into two stages: the analysis of how large dependent variable can be explained by the independent variables simultaneously. It is known as the coefficient of determination and how much the relationship between the dependent variable with the independent variables separately or search for a correlation coefficient partial for each independent variable there.

2.5. The coefficient of determination (R^2 and R). The value of the coefficient of determination (R^2) indicates how much the regression line can explain the variations that can occur in the dependent variable. The larger value means the amount of the line or the regression equation also may explain the variable to be explained.

The coefficient of determination value between 0 to 1 A values of 1 means 100% of the total variation in the dependent variable explained by the regression equation. In such conditions, all of the values of the dependent variable that occur are located right on the regression line. This condition is extremely rare. Generally, the value of R^2 will always be worth more than 0 (zero) and less than 1 (one).

Regarding the way of calculation, there are some formulas that can be used as such:

$$R^2 = \frac{\Sigma(\hat{Y}-\tilde{Y})^2}{\Sigma(Y-\tilde{Y})^2} = \frac{RSS}{TSS},$$

$$R^2 = \frac{[n\Sigma XY - (\Sigma XY)(\Sigma Y)]^2}{[n\Sigma Y^2 - (\Sigma X)^2][n\Sigma Y^2 - (\Sigma Y)^2]},$$

$$R^2 = \frac{n(b_{1.23}\Sigma X_1 + b_{12.3}\Sigma X_1 \Sigma X_2 + b_{13.2}\Sigma X_1 \Sigma X_3) - (\Sigma X_1)^2}{n\Sigma X_1 - (\Sigma X_1)^2}.$$

Of the three approaches above, the authors prefer to use the approach number 2 on the grounds that the data takes more available than other approaches. In another approach, the variables forming the formula must first be sought before its value can find the value of the coefficient of determination.

2.6. The partial coefficient of correlation. The partial coefficient of correlation analysis was conducted after the results obtained from the coefficient of determination. Correlation coefficient search would be effectively done if the value obtained coefficient determination is close to 1 which means that the regression equation with all the independent variables simultaneously are able to explain most of the changes of the dependent variable. Moving on from the coefficient of determination like that, only then do an analysis of how much the influence each independent variable will be able to explain the changes in the value of the dependent variable.

Regarding the calculations, the value of the partial correlation coefficient can be searched by the following formula:

$$r_{12} = \frac{n\Sigma X_1 X_2 - (\Sigma X_1)(\Sigma X_2)}{\sqrt{[n\Sigma X_1^{\,2} - (\Sigma X_1)^2]}[n\Sigma X_2^{\,2} - (\Sigma X_2)^2]},$$

$$r_{13} = \frac{n\Sigma X_1 X_3 - (\Sigma X_1)(\Sigma X_3)]}{\sqrt{[n\Sigma X_1^{\,2} - (\Sigma X_1)^2]}[n\Sigma X_3^{\,2} - (\Sigma X_3)^2]},$$

where, r_{12} is the partial correlation coefficient between X_1 and X_2 X_3 if fixed; r_{13} is the partial correlation coefficient between X_1 and X_2 X_3 if fixed.

Partial correlation coefficient lies between -1 and 1; negative value ($r_{ij} < 0$) illustrates that it occurs every 1 increase in the value of the independent variable will lead to a decrease in the value of the dependent variable for them value of the correlation coefficient with the assumption that the other independent variables remain. Vice versa, a positive value ($r_{ij} > 0$) illustrates that occur every 1 increase in the value of the independent variable will lead to a decrease in the value of the dependent variable for the value of the correlation coefficient is also assuming other variables remain free.

3. Regression analysis testing

3.1. Test statistic model and variables. Significance testing of regression models performed by ANOVA (Analysis of variance) based on the decomposition of the total variation in Y (Square Sum Total). It becomes part described (Sum Square Regression) and unexplained (Sum Square Error). Of the decomposition, can be calculated distribution of the F statistic with the following formula:

$F = mean\ of\ \ square\ regression\,(MSR)/$
$/mean\ of\ \ square\ error(MSE),$

where, $MSR = SSR/k$ (independent variable), MSE = = SSE ($n - k - 1$).

After calculating the F statistic defined hypothesis as follows:

H_0; $\beta_1 + \beta_2 + \beta_3 + \beta_4 \leq 0$,

H_1; $\beta_1 + \beta_2 + \beta_3 + \beta_4$ one of which is > 0, it means that the model explains the dependent variable significantly.

The decision rules reject H_0 if F is in the rejection region is on $F > F\alpha$. F counts > F table.

Testing variable aims to measure the partial effect of each X on the response Y with the other X in the equation. This test can be done by examining the value of t statistics appropriately. Alpha is used in testing the following hypothesis is 5%. The hypothesis developed is as follows:

- PER positive effect on the annual return. This hypothesis is based on research taken Basu (1977) who found that stocks with a higher PER returns higher anyway.

H_0; $\beta_1 \leq 0$,
H_1; $\beta_1 > 0$.

The decision rules reject H_0 if $t > t\ \alpha/2$ or t count > t table. If H_0 is rejected, the hypothesis is about the positive relationship between PER with acceptable returns.

- PBV positive influence on annual return. This relationship was found by some researchers: Stattman economy (1980), Rosenberg (1985) and Fama and French (1992).

H_0; $\beta_2 \leq 0$,
H_1; $\beta_2 > 0$.

The decision rules reject H0 if $t > t\ \alpha/2$ or t count > t table. If H_0 is rejected, so the hypothesis is about the positive relationship between PBV with acceptable returns.

- Size negatively affects annual return. The basis of this hypothesis is a study by Banz (1981), Reinganum (1981) and Philip Brown (1983).

H_0; $\beta_3 \leq 0$,
H_1; $\beta_3 > 0$.

The decision rules reject H_0 if $t > t\ \alpha/2$ or t count > t table. If H_0 is rejected, so the hypothesis is a negative relationship between size with acceptable returns.

- Beta positive effect on the annual return. This hypothesis is based on the model in the form of CAPM theory which illustrates that the larger the beta value will be followed by the amount of return that may be obtained.

H_0; $\beta_4 \leq 0$,
H_1; $\beta_4 > 0$

The decision rules reject H_0 if $t > t\ \alpha/2$ or t count > t table. If H_0 is rejected, so the hypothesis is about the positive relationship between beta with an acceptable return.

3.2. Identify against regression problems. In analyzing regression testing, a regression model with all of its constituent variables must meet several requirements. One of the requirements is to be a part of some of the problems that can interfere with a good regression model. Some of the problems are, among others:

- Autocorrelation

The term of autocorrelation means there is a relationship between the error terms in the observation with the error term in the observation of others; consequently dependent variable on the observation relates to another observation (Mulyono, 2003). In other words, the autocorrelation is the correlation in time series data.

The autocorrelation problem can be identified by looking at the value of Durbin Watson statistic (DW). If there is no presence of autocorrelation, the DW statistic value indicates the value is greater than the upper limit value (d_U). Conversely, if there is any indication of autocorrelation, the DW statistic value will be worth less than the lower limit.

- Multicollinearity

Unlike the autocorrelation that is trying to find non-bias of a dependent variable, the problem of multicolinearity means there is a perfect relationship between the independent variables forming the regression model. There is a flurry of indicators that can be used as a means of identification of the problem of multicolienarity which include:

1. If the test F statistic indicates a significant value but is not on the test of t statistic;
2. If the value of R^2 is relatively large, but the test statistic t indicates value was not significant;
3. If the value of the variance inflation factor (VIF) indicates a number greater than one, then there is the problem of multicollinearity. VIF value itself can be found using the formula:

$$VIF_i = \frac{1}{1 - R_i^2},$$

where R_i is the coefficient of determination of regression to the independent variable i at n-1.

♦ Heterocedastity

Heteroscedasticity means that the presence of unequal error in term for each observation. This problem is often encountered in the data cross section. There are two methods in identifying this issue:

1. By the way look at the graph (informal method);
2. By the way do some tests (formal methods) such as Park test, test Glejser, Spearmen's Rank Correlation test, the Breusch-Pagan-Godfrey test and the Koenker-Basset test.

4. Analysis and discussion

4.1. Description of statistics. As explained in the previous chapter, this study tries to find the relationship between the four variables, which act as independent variables, namely: Price Earning ratio (PER), PBV, size and beta with variable returns as the dependent variable. In other words, there are five variables used in this study in which each of these variables were taken from 100 randomly selected companies from around 344 companies listed in Jakarta Stock Exchange (JSX), (MEDIA INDONESIA, 2013). The period of the data used is from 2010 to 2012 for the four independent variables and from 2009 until 2011 for the dependent variable.

Before entering the statistical calculations, the authors take several steps to ensure that the data used were normally distributed. This is so that statistical calculations will be done can produce output that is good. The first step is to eliminate the writer conducted the data variable is negative for PER and PBV.

PER variable has two variables forming the market price of the stock as the company's net income numerator and the denominator. Negative values for PER means that one of the constituent variables is negative and the condition may be the negative value occurs at a variable net income of the company, given that the price variable has a very small probability to be negative. PER removal of negative data to be done on the basis that if this variable is negative, the possibility of using this variable as a basis for selecting stocks by investors to be very small because the company does not have a good ability to generate revenue so that the model used, the PER will also influence very small and even closer to zero on return.

The next step in checking the normality of the data is to eliminate data that stray away from the overall data. In general, the limit outliers from the data are normally distributed three times the standard deviation value. The following table gives an idea of the amount of data, maximum value, minimum value, average value and standard deviation scores (condition after the data with a negative value of PER and PBV omitted).

Table 2. Descriptive statistics

	N	Minimum	Maximum	Mean	Std. deviation
PER11	66	1:00	318.00	41 258	70 056
PBV11	66	12:14	12:27	1,885	2,610
Size11	66	9.93	13:39	11,378	0824
Beta11	66	-2.53	46.30	1,844	6,511
PER 12	68	12:08	12345.86	217 081	1495.226
PBV 12	68	12:19	10.68	1,446	1,608
Size12	68	9.66	13:40	11,378	0.830
Beta12	68	-13.89	134.82	2,910	18 976
PER13	74	00:51	836.24	37 413	108 720
PBV13	74	12:14	42.04	2,034	5,239
Size13	74	9.94	13:56	11,392	0874
Beta13	74	-6.38	15:52	1,220	2,854
Valid N (list wise)	66				

In the process of normalization of the data variables, the authors use the help of the statistical program SPSS 16.0. The entire process of normalization of the data is done to make the amount of *N* that was originally 100 pieces of data to only 54 pieces of data. From this data, then performed a number of statistical calculation processes.

4.2. Pearson correlation analysis. *4.2.1. Pearson correlation analysis for annual data.* In this section I shall describe the relationship between each independent variable with returns separately. The following table Pearson correlation for the period 2010, 2011, 2012 (the period for variable returns) are used in this process:

Table 3. Pearson Correlation analysis 1

		Return12	PER11	PBV11	Size11	Beta11
Pearson Correlation	Return10	1,000	-0257	-0144	-0094	0081
	PER09	-0257	1,000	0376	0.009	0264
	PBV09	-0144	0376	1,000	0.400	0593
	Size09	-0094	0.009	0.400	1,000	0242
	Beta09	0081	0264	0593	0242	1,000
Sig. (1-tailed)	Return10	.	0.030	0.150	0249	0279
	PER09	0.030	.	0003	0475	0027
	PBV09	0.150	0003	.	0001	0000
	Size09	0249	0475	0001	.	0039
	Beta09	0279	0027	0000	0039	.

Table 3 (cont.). Pearson Correlation analysis 1

		Return12	PER11	PBV11	Size11	Beta11
N	Return10	54	54	54	54	54
	PER09	54	54	54	54	54
	PBV09	54	54	54	54	54
	Size09	54	54	54	54	54
	Beta09	54	54	54	54	54

For the period of return in 2010, of which there are four independent variables, there is one variable that is statistically proven to correlate simply with the return. The independent variable in question is PER.

In the table, the relationship is seen through figures 0.030 which are located in the seventh row in the column returns in 2010. This value indicates that the PER, the fault tolerance limit of 5%, statistically proven simple correlated with returns. However, if seen the value of the Pearson correlation for PER to return (-0.257), the figure shows a negative value. This condition is contrary to the theory that the relationship PER return is positive, as proposed by Basu (1977). This makes the correlation between PER with the return, which proved statistically significant, it cannot be said to be entirely true.

Table 4. Pearson Correlation analysis 2

Correlations						
		Return11	PER10	PBV10	Size10	Beta10
Pearson Correlation	Return11	1,000	-0008	-0074	0215	-0.002
	PER10	-0008	1,000	0076	0.120	-0038
	PBV10	-0074	0076	1,000	0.510	0717
	Size10	0215	0.120	0.510	1,000	0269
	Beta10	-0.002	-0038	0717	0269	1,000
Sig. (1-tailed)	Return11	.	0478	0298	0059	0495
	PER10	0478	.	0292	0194	0392
	PBV10	0298	0292	.	0000	0000
	Size10	0059	0194	0000	.	0.025
	Beta10	0495	0392	0000	0.025	.
N	Return11	54	54	54	54	54
	PER10	54	54	54	54	54
	PBV10	54	54	54	54	54
	Size10	54	54	54	54	54
	Beta10	54	54	54	54	54

Based on the table returns above 2011, it appears that for the fault tolerance of 5%, none of the independent variables that are statistically proven separately correlated with returns. This can be seen from the values contained in the row and column Sig. (1-tailed). At a glance, none of the independent variables that have values below 0.05 is only possible variable size which indicates the level of significance, but for fault tolerance by 10%.

For the return in 2012, it can be seen in the table that the variable return is statistically shown to correlate simply with the variable beta with a significance level of 0.007 and with a coefficient of 0.333. It means that in a simple model, the variable beta in 2011 has the ability to explain changes in return 3 2012 was 3.3%. However, for the other independent variables do not reveal any significant relationship.

Table 5. Pearson Correlation analysis 3

		Return12	PER11	PBV11	Size11	Beta11
Pearson Correlation	Return12	1,000	-0078	-0061	0031	0333
	PER11	-0078	1,000	0074	0.020	-0095
	PBV11	-0061	0074	1,000	0545	-0044
	Size11	0031	0.020	0545	1,000	0005
	Beta11	0333	-0095	-0044	0005	1,000
Sig. (1-tailed)	Return12	.	0288	0331	0413	0007
	PER11	0288	.	0298	0443	0246
	PBV11	0331	0298	.	0000	0375
	Size11	0413	0443	0000	.	0487
	Beta11	0007	0246	0375	0487	.

Table 5 (cont.). Pearson Correlation analysis 3

		Return12	PER11	PBV11	Size11	Beta11
N	Return12	54	54	54	54	54
	PER11	54	54	54	54	54
	PBV11	54	54	54	54	54
	Size11	54	54	54	54	54
	Beta11	54	54	54	54	54

4.2.2. Pearson correlation analysis for data panel. Unlike the annual data, the data pooled or panel data trying to do a regression on a number of independent variables on the dependent variable regardless of the year or period of the data. Regarding the process of doing a simple correlation analysis of panel data, the authors use the help of Eviews 4.1 statistical program and the following results are statistically processed done: (there are four tables in which each describes the relationship between the return of the independent variables separately).

Table 6. Pearson Correlation analysis 4

Variable	Coefficient	Std. error	t-Statistic	Prob.
C	0.117844	0.026911	4.379101	0.0000
PER?	-0.000250	0.000216	-1.158000	0.2486
Weighted Statistics				
R-squared	0.006838	Mean dependent var		0.192365
Adjusted R-squared	0.000631	SD dependent var		0.569591
SE of regression	0.569411	Sum squared resid		51.87670
F-statistic	1.101682	Durbin-Watson stat		1.980853
Prob (F-statistic)	0.295480			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.120241	0.033917	3.545119	0.0005
PBV?	-0.014290	0.016354	-0.873791	0.3835
Weighted Statistics				
R-squared	0.000406	Mean dependent var		0.184425
Adjusted R-squared	-0.005841	SD dependent var		0.565503
SE of regression	0.567152	Sum squared resid		51.46582
F-statistic	0.065002	Durbin-Watson stat		1.970720
Prob (F-statistic)	0.799085			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.398593	0.314675	-1.266678	0.2071
LOGSIZE?	0.043749	0.027113	1.613543	0.1086
Weighted Statistics				
R-squared	0.019562	Mean dependent var		0.195050
Adjusted R-squared	0.013434	SD dependent var		0.575109
SE of regression	0.571233	Sum squared resid		52.20910
F-statistic	3.192319	Durbin-Watson stat		2.044190
Prob (F-statistic)	0.075878			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.107402	0.024957	4.303410	0.0000
BETA?	-0.000437	0.001839	-0.237668	0.8124
Weighted Statistics				
R-squared	0.002252	Mean dependent var		0.193766
Adjusted R-squared	-0.003984	SD dependent var		0.572997
SE of regression	0.574138	Sum squared resid		52.74146
F-statistic	0.361062	Durbin-Watson stat		1.978661
Prob (F-statistic)	0.548767			

Through the four tables above, we can see that none of the independent variables that are statistically proven to have a relationship with the return. For example, in the first table, the table provides a description of the relationship between PER with returns in a simple model. PER will prove to have a relationship with the return if the value is under 0.0 the probability is 5. However, on the table, the figure of probability is 0.2486. Statistically it can be said that the PER is not shown to have a relationship with the return.

At other tables we also found similar things. The probability value for each independent variable is above 0.05. So, statistically it can be said that there is no independent variables shown to have a relationship with a variable return (for panel data). Here is the probability value for each variable based on the table above:

Table 7. Probability value

Variables	Value prob
PER	0.2 486
PBV	0.3 835
Log size	0.1 086
Beta	0.8 124

4.3. Analysis of multiple correlations. *4.3.1. Relationship PER, PBV, size and beta with the expected return for annual data.* After giving an overview of the relationship between independent variables with the return, in a simple model, both for annual data and panel data, the next process is to see how the relationship between the variables PER, PBV, log size and beta with the return in a model of multiple.

This section will try to look at the relationship between independent variables with a return to annual data. In the following table the results of multiple correlation analysis for each period of data:

♦ Return 2010 with free variable data 2009

Table 8. Result 1

Coefficients (a)						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,008	0995		1,013	0316
	PER09	-0.002	0001	-0264	-1803	0077
	PBV09	-0036	0039	-0171	-0920	0362
	Size09	-0054	0088	-0090	-0610	0545
	Beta09	0.019	0.012	0274	1,650	0105
a. Dependent Variable: return09						

ANOVA (b)						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1,631	4	0408	1,724	0.160
	Residual	11 586	49	0236		
	Total	13 217	53			
a. Predictors: (Constant), Beta08, Size08, PER08, PBV08						
b. Dependent Variable: return09						

According to the table above, the fruit obtained multiple regression models, namely:

Return10 = 1.008 – 0.002PER08 – 0.036PBV08 – 0.054Size08 + 0.019Beta08.

From the above model, four independent variables have significant value above 0.05. It can be said that the fault tolerance limit of 5%, none of the four independent variables were shown to affect returns.

In the second table, the information that can be taken is that seeing the results of the calculation of the value *F* (1.7 of 24), the model obtained was not significant. It means that, there is no variable independent in the model that could explain the variation of returns. For more details, it can be seen from the Sig. contained in the second table in which the numbers indicate values of 0.05.

♦ Return of 2009 with free variable data 2008

Table 9. Result 2

Coefficients (a)						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1598	0673		-2375	0.022
	PER09	0000	0000	-0015	-0112	0911
	PBV09	-0070	0.040	-0387	-1752	0086
	Size09	0.140	0061	0367	2,302	0.026
	Beta09	0003	0003	0177	0895	0375
a. Dependent Variable: return10						

ANOVA (b)						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0562	4	0141	1,475	0224
	Residual	4,667	49	0095		
	Total	5230	53			
a. Predictors: (Constant), Beta09, PER09, Size09, PBV09						
b. Dependent Variable: return10						

Based on the table above, a multiple regression model in explaining the return of 2009 formed where:

Return09 = 1.008 – 0.002PER08 – 0.036PBV08 – 0.054Size08 + 0.019Beta08.

We can see in the model that PER is not included. This is because according to the table above, the coefficient for the variable PER is zero. This means that regardless of the value of the PER, these variables did not contribute anything to return because it will always be zero. In other words, this variable is definitely not significant in explaining returns. To be sure, whether or not these variables are significant in explaining returns can be seen from the significance that is equal to 0.911. With fault tolerance limit of 5%, this variable is not significant in explaining returns. From the four independent variables that exist, there is only one variable that has a value below 0.0 sign 5 and the variable is a variable size. It's just that if we look at the value of the coefficient, this variable has a positive coefficient. These conditions violate existing theories. Banz (1981), Reinganum (1981) and Philip Brown (1983) stated through their research that the effect of size on the return is negative where the higher the value of size, the lower rate of return, although these variables are statistically significant to return, but this result is not acceptable.

- Return to 2011 with free variable data in 2010

Table 10. Result 3

Coefficients (a)						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0509	1,552		-0328	0744
	PER10	0000	0001	-0042	-0312	0756
	PBV10	-0041	0.078	-0085	-0529	0599
	Size10	0067	0.140	0076	0477	0636
	Beta10	0109	0.045	0325	2,409	0.020
a. Dependent Variable: return10						

ANOVA (b)						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3,667	4	0917	1,655	0176
	Residual	27 144	49	0554		
	Total	30 811	53			
a. Predictors: (Constant), Beta05, Size10, PER10, PBV10						
b. Dependent Variable: return06						

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0345	0119	0.047	0744
a. Predictors: (Constant), Beta10, Size10, PER10, PBV10				

Regression model to return in 2006 based on the above table is:

Return10 = -1.598 – 0.070PBV09 + 0.140size09 + 0.003Beta09.

Similar to the 2009 PER, PER variable in 2010 also turned out to have a coefficient of zero so this variable was not included in the regression model to explain returns in 2011. It's just for other variables, the variables found to be statistically correlated with returns in 2011 the variable is the beta. Value of the coefficient of this variable is positive, according to the existing theory. On the basis of these facts it can be said to return in 2011, PER variables significant in explaining returns with a coefficient of 0.109.

However, when we see from the results of the ANOVA table on the return in 2011, which formed a regression model is not significant. This means that the independent variables in the model can explain the lack of return. In Table Model Summary it is visible through the value of R square adjusted that the regression model can only explain the change of the dependent variable of 0.047 or 4.7%.

4.3.2. Relationship PER, PBV, size and beta with the expected return for data pooled.

Table 11. Result 4

Dependent Variable: RETURN?				
Method: GLS (Cross Section Weights)				
Date: 05/18/07 Time: 16:49				
Sample: 200 4.20 06				
Included observations: 3				
Number of cross-sections used: 54				
Total panel (balanced) observations: 162				
Convergence Achieved after 77 iterations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.143283	0.266233	-0.538186	0.5912
PER?	3.42E-05	0.000132	0.259531	0.7956
PBV?	-0.052692	0.016991	-3.101121	0.0023
LOGSIZE?	0.017632	0.023432	0.752477	0.4529
BETA?	-0.001293	0.001842	-0.702075	0.4837
Weighted Statistics				
R-squared	0.087665	Mean dependent var		0.084620
Adjusted R-squared	0.064421	SD dependent var		0.642393
SE of regression	0.621357	Sum squared resid		60.61530
F-statistic	3.771477	Durbin-Watson stat		1.951617
Prob (F-statistic)	0.005871			

For panel data regression models were formed as follows:

Return = -0.14 – 0.05PBV + 0.01Size – 0.001Beta.

PER for data panel also has a very small coefficient close to zero. In the model, the participation of these variables does not give any influence on the return. For the regression models, according to the processed software Eviews 4.1, the probability value of the F-statistics shows the significant numbers because its value is under 0.05. Hence, the model is said to be able to explain the variation of return of approximately 6.44% (seen from the adjusted R square). Although when it is viewed by the respective independent, the variables in the model, only variables that are statistically proven PBV significantly correlated with the return. A negative value of the coefficient is also in accordance with the existing theory. This reinforces the results of the data processing.

Conclusion

This study tries to find the relationship between the four independent variables, namely: PER, PBV, Size (log) and beta with variable returns as the dependent variable. In other words, there are five variables used in this study in which each of these variables were taken from 100 randomly selected companies from around 344 companies listed in Jakarta Stock Exchange (JSX), (MEDIA INDONESIA, 2013). The period of the data used is from 2010 to 2012 for the four independent variables and from 2009 until 2011 for the dependent variable.

Before entering the statistical calculations, the author takes several steps to ensure that the data used is normal. In order to distribute the return period of 2009, of which there are four independent variables, there is one variable that is statistically proven to correlate simply with the return. The independent variable is the price to earnings ratio (PER), but the notation of PER is negative. This condition is contrary to the theory that the relationship PER return has to be positive, as proposed by Basu, 1977.

According to the table above, it appears that for the fault tolerance of 5%, none of the independent variables that are statistically proven separately correlated with returns. As for a return in 2011, seen that returns variable is statistically shown to correlate simply with a beta variable with a significance level of 0.007 and with a coefficient of 0.333.

Pearson correlation analysis was also performed to panel data, unfortunately none of the independent variables that are statistically proven to have a relationship with the return. Furthermore, seen also how the relationship between the variables PER, PBV, log size and beta with multiple returns in a model as well as the relationship between PER, PBV, size and beta with the expected return.

Reference

1. Banz, Rolf, W. (1981). The Relationship between Return and Market Value of Common Stock, *Journal of Financial Economics*, 9, pp. 3-18.
2. Banz, R.W. & Breed, W.J. (1986). Sample-Dependent Result Using Accounting and Market data: Some Evidence, *Journal of Finance*, 41 (4), pp. 779-793.
3. Basu, Sanjoy, S. (1977). The Investment Performance of Common Stocks in relation to their Price-Earnings Ratios, *Journal of Finance*, 32 (3), pp. 663-682.
4. Black, F. (1976). The Dividend Puzzle, *Journal of Portfolio Management*, Vol. 2, pp. 5-8.
5. Brown, Philip, Allan, W.K. and Terry A. Marsh (1983). New Evidence on the Nature of Size related Anomalies in Stock Prices, *Journal of Finance Economics*, 12, pp. 3-12.
6. Chandra, S. & Hesty, O. (2013). Sharia and Conventional Stocks Performance of Public Companies Listed on Indonesia Stock Exchange, *Journal of Accounting*, *Finance and Economics*, 3 (1), July, pp. 51-64.
7. Dhika, F. & Anggoro, B. (2014). The Impact of Profitability Ratios, Market Ratios and Leverage Ratio toward Stock Return of LQ45 during 2004-2013, *Proceedings of 7th Asia-Pacific Business Research Conference 25-26 August 2014*, Bayview Hotel, Singapore ISBN: 978-1-922069-58-0.
8. Dwi, M., Mulyono & Rahfiani, K. (2009). The Effect of Financial Ratios, Firm Size, and Cash Flow from Operating Activities in the Interim Report to the Stock Return, *Chinese Business Review*, June, 8 (6) (serial No. 72), pp. 44-55.
9. Fama, E.F. & French, K.R. (1993). Common Risk Factors in the Return on Stocks and Bonds, *Journal of Finance Economics*, 33 (1), pp. 3-56.
10. Fama, E.F. & French, K.R. (1998). Value versus Growth: The International Evidence, *Journal of Finance*, 53 (6), pp. 1975-1999.
11. Lintner, J. (1956). Distribution of Incomes of Corporations Among Dividends, Retained Earnings and Taxes, *American Economic Review*, 46, pp. 97-113.
12. Perdana, W. & Harry, Y. (2011). Value at Risk, Market Risk and Trading Activity: CAPM Alternative Model, *Journal of Applied Finance & Banking*, 1 (4), pp. 239-268. International Scientific Press, 2011.
13. Strattman, Dennis (1980), Book Values and Stock Returns, *The Chicago MBA: A Journal of Selected Papers 4*, pp. 25-45.
14. Reinganum, M.R. (1981). Misspecification of Capital Asset Pricing: Empirical Anomalies Based on earnings' Yields and Market Value, *Journal of Financial Economics*, 9 (1), pp. 19-46.
15. Reinganum, Marc R. (1983). A direct test of Roll's conjecture on the firm size effect, *Journal of Finance*, 37, pp. 27-35.
16. Zeinab, K. & Amirreza, K. (2013). The Correlation Between Stock Return of Companies Calculated in the Index of 50 most Active Companies at Tehran Securities and Exchange Organisation and Cash Flows of Financing in the Said Companies, *International Monthly Refereed Journal of Research In Management & Technology*, Vol. 2, January, pp. 128-137.