

# Analysis of Relevance Concept of Measurement Capm Return and Risk of Shares

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Received: August 6, 2015

Accepted: September 10, 2015

Online Published: September 18, 2015

doi:10.5539/ijbm.v10n10p194

URL: <http://dx.doi.org/10.5539/ijbm.v10n10p194>

## Abstract

This study aims to ensure that the concept of CAPM still have strong relevance for use by financial experts, decision makers or management of companies and investors in the capital market to determine or quantify the risk or beta ( $\beta$ ) shares.

The method used is the econometric approach and try to compare earlier research model that has been used by researchers and financial experts in several different places and periods. The selected sample is the most actively traded shares on the Indonesian Stock Exchange (BEI) in the period September to November 2014. The data used is data weekly or every Wednesday, to avoid anomalies or abnormalities price on Monday and Friday.

The results obtained from this study are: (A) model that has been used or developed but the result is the same in the valuation of the beta ( $\beta$ ), but differ in the value of alpha ( $\alpha$ ) in each of these models, because the risk free return ( $R_f$ ) constant during the observation period, or there will be differences in the value of beta ( $\beta$ ) and alpha ( $\alpha$ ) when  $R_f$  is varied during the observation period. (B) According to research data, the ratio of non-linear or quadratic models is more relevant to use in assessing beta stocks, as comparison determinant coefficient ( $R^2$ ) of linear and non-linear models for the entire company shares were observed. (C) Results of measurement estimate stock return ( $R_i$ ) both with linear and non-linear models, shows that the concept is still relevant or CAPM model used in the measurement of beta ( $\beta$ ) shares. (D) non-linear model based Ln can not be used when there are negative returns or loss, as in this study, the data to for transformation will an error and SPSS simulation process can not be done. (E) In addition to the concept of CAPM still there are many important things that must be considered in relation to the risk and return of investment.

**Keywords:** capital asset pricing model (CAPM), arbitrage pricing theory (APT), capital investment

## 1. Introduction

The concept of capital asset pricing model or CAPM is the traditional concepts that are often found in the books of financial management, and is widely used by financial experts, management or enterprise decision makers and investors in the analysis of investment in the capital market. The concept is relatively simple CAPM application because the data is relatively easy to obtain through various information media. Data availability and relatively easy to obtain in the form of time series and cross section so facilitate researchers.

to access from a variety of sources available either manually or online system. Time series data are available various alternatives in the form of an annual period, quarterly, monthly, weekly and daily. Departing from the ease of data acquisition and understanding of CAPM concepts, so widely used in research and investment decisions in the stock market. On the other hand, the concept of CAPM is also heavily criticized, as in the study of Farma and Frence (1992) in Brigman and Houston (2010) who found that there was no historical relation between stock returns ( $R_i$ ) and beta ( $\beta$ ) market ( $R_m$ ). Furthermore, studies Farma and France (2001) in Harjito and Martono (2012) suggested that there are two variables that are consistently associated return stock that is (a) the size of the company and (b) the ratio of market to book value. The study also found that smaller companies provide higher yields, and higher return on stocks with market-to-book ratio is low. Instead after controlling for size company and market-to-book ratio, they found no association between beta stocks with the rate of return or return these shares.

The weakness of the CAPM concept feared by researchers and analysis, then they do innovation in a way modify or develop independent variables were considered related and not covered by the concept of CAPM. They

developed a model with variables that are considered more relevant, known as multivariable models. In multivariable model is assumed that the risk is caused by several factors, while the concept of CAPM measure of risk is confined to the return market ( $R_m$ ). This multivariable models as a positive step that is considered important in the theory of financial science, but still has weakness when applied in decision making. This is why the concept of CAPM remains the most widely used method of estimating the stock return. CAPM concept is still quite relevant and has the advantage, but in the development of the future is still possible to do modifications and enhanced as was done in this study. Previous models that have been developed to improve the CAPM concept as mentioned above, which adds several independent variables, but among the variables used in econometric turned out to contain weakness in the form of violation of classical assumptions in shape multicollinearity or there is a relationship between independent variables. Consequences for violations of the assumption of multicollinearity both statistically and in theory, it is not valid models used to estimate the dependent variable. Variable use inflation, interest rates and foreign exchange rates, in theory all three interrelated or occur multicollinearity among these variables, so it is not valid to use in assessing stock returns ( $R_i$ ). In addition, the three variables included in the variable mentioned already market return ( $R_m$ ) composite stock price index or CSPI used in CAPM model.

Empirical evidence shows that multicollienarity between variable inflation, interest and foreign exchange rates, for example (a) originated from changes in the dollar exchange rate will push up the price of the product in the country that uses the currency component of foreign and other related products in the market mechanism. (B) the price rise could potentially bring wisdom monetary authorities to curb inflation through changes in prevailing interest rates. Raise interest rates by the central bank is due to reasons of macro economic theory, namely the general interest must be greater than inflation in order to avoid rush or withdrawal society massively because the return on savings is less than the value inflation lowering the intrinsic value of the money saved in the bank. Another way people are in a rush to move their funds in accounts dollars or other foreign currencies, which have an impact on the value of the rupiah is getting worse, inflation is increasing, then the interest rises, and so on. Where the benefits of the concept of CAPM because only the market return ( $R_m$ ) as the only independent variable used in measuring the impact on stock returns ( $R_i$ ) was observed. The views of experts and practitioners who wish to modify and enhance the CAPM concept as found in the approach Arbitrage Pricing Theory (APT), but the result is not optimal, because of the weakness of the model innovation that is causing the invalid multicollinearity used in the valuation of stock return ( $R_i$ ). Based on the description above, in this study will be assessed the level of relevance of CAPM concept that uses linear models, while the socio-economic conditions increasingly complex and takes place nonlinear. that become the central issue in this study is whether the concept of CAPM is still relevant and reasonably fit for use in measuring the value of beta ( $\beta$ ) stock and stock return prediction ( $R_i$ ) was observed. The objective was to examine the relevance and appropriateness of the use of the concept of CAPM in an era of increasingly advanced technological developments and increasingly complex business environment, by comparing the CAPM concept with a model that will be developed.

Then the results will be tested or proved by using time series data development market return ( $R_m$ ) to changes in stock return ( $R_i$ ) seed company or the most active stocks traded on the Indonesia Stock Exchange .

## 2. Literature Review and Reserach Hypothesis

The model capital asset pricing model , or CAPM not only as an abstract theory which is much discussed in various literature sumer but this model has contributed and appeal of many parties to implement it in decision-making , notably by financial experts , management companies and investors .

CAPM model uses a variable stock return ( $R_i$ ) , return free risk ( $R_f$ ) and the market return ( $R_m$ ), which is described in equation form :

where

$R_i$  = return of shares required by securities  $i$ ;

$R_f$  = risk-free return or return free risk;

$R_m$  = market return or return market;

$B_i$  = beta coefficient on the variable ( $R_m - R_f$ ) against securities  $i$ ;

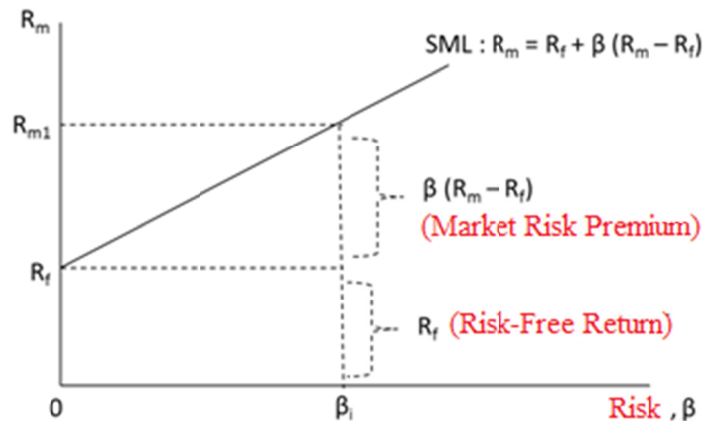
Assuming , as in Husnan (2009 ) , namely :

- a. Short sales allowed, that it can not sell the securities which are owned and use the cash generated to purchase other securities.
- b. There is a risk freelending and borrowing rate.
- c. Not considering the tax borne by the investor or tax free.

d. The investors have the same hopes and risks tentang ingkat expected profit from an investment opportunity or homogeneous expectation.

Based on the CAPM equation can be described the level of stock returns are expressed as the security market line (SML) or line securities markets or securities markets the following lines.

$$R_i = R_f + \beta_i (R_m - R_f)$$



SML slope of shares indicated by the beta ( $\beta$ ) describe the magnitude of changes in stock return ( $R_i$ ) at each increment of risk ( $R_m - R_f$ ), the greater the beta ( $\beta$ ), the slope of SML more upright, which means the higher the risk premium. Therefore, the slope of the SML line also shows the level of risk aversion has been somehow. Because the height of the risks in the economy or the increasingly steep SML shows the reluctance of investors to invest in the economy, but on the capital market phenomenon that occurs the greater the stock's risk premium, the higher the level of the stock return. This has caused the views high risk high return, ie the higher the risks faced on investment shares in the stock exchanges, the higher the possibility of obtaining the return. Conversely if a low risk, low risk premiums and the possible acquisition of shares lower return.

Risk free return ( $R_f$ ) based on the returns as interest consisting of (a) inflation-free real rate of return and (b) a premium of inflation or inflation rate is still at the boundary control by government and monetary authorities.

Applications CAPM for concept assess beta stock, can be seen in the following several previous studies:

1). Research conducted by Lintner published in Douglas (1968) as in Husnan (2009), estimating a beta of 301 stocks selected sample and is expressed in the model as follows.

$$R_{it} = a_i + \beta_i R_{mt} + e_{it}$$

2). Miller and Scholes (1972) in Husnan (2009) mentions the possibility of bias due to errors in estimating. According to him, if we want to estimate beta with CAPM, the equation that should be used is:

$$R_{it} = R_{FT} + \beta_i (R_{MT} + R_{FT}) + e_{it}. \text{ Or } R_{it} = a_i + \beta_i (R_{MT} + R_{FT}) + e_{it}$$

3). In Balck research, Jensen, and Scholes (1972) as in Husnan (2009), using the following model:

$$R_{it} - R_{FT} = a_i + \beta_i (R_{MT} + R_{FT}) + e_{it}$$

4). Studies conducted Husnan (2009), reported that the assessment of beta stocks on the stock Gresik period July 1994 to November 1996, uses monthly data, with the following model.

$$R_{it} \ln = \ln a_i + \beta_i R_{mt} + e_{it}$$

The estimation results with simulation data through software MicroTSP.60.

$$R_{it} \ln = \ln 0.0139 + 1.2048 R_{mt}$$

Adjusted R-squared 0.3539 which means  $R_m$  able to explain 35.39% change prob  $R_i$  with a significance level (F-statistic) 0.00039 and prob (t-statistic) 0.0004.

Besides using the model above, then the study will develop the model.

1). The non-linear model with data transformation to the Ln, as a research model development Balck, Jensen, and Scholes (1972) referred to above.

$$\ln(Rit - RFT) = \ln \ln ai + \beta i (RMT + RFT) + eit$$

2). The non-linear model with the transformation of data into a quadratic, as a research model development Balck, Jensen, and Scholes (1972) referred to above.

$$(Rit - RFT)^2 = ai + \beta i (RMT + RFT)^2 + eit$$

### 3. Research and Methodology

#### 3.1 Model Analysis

Based on the model that has been used earlier as noted above, this study used a more relevant model to estimate beta stocks. And as a comparison, the study also used simulated by using the model as in the previous studies and literature review reserach hyphotesis mentioned above.

To prove the relevance of the model, then the selected samples in this study are the stocks of companies included in the category of seed stock or the most actively traded on the Indonesia Stock Exchange. The data used are time series period September to November 2014 using weekly data on every Wednesday. Wednesday consideration is to obtain a rational price levels or avoid contention anomalies or abnormalities presumption stock market prices on Monday and Friday.

From these data dioleh appropriate measurement method that has been determined, the calculation is then processed through SPSS software version 22. In the simulation process, use the model as mentioned above, then the results were compared between one model with other models. Results of the comparison and analysis conducted in the end can be described estimation models are more relevant in assessing stock beta ( $\beta$ ) and stock return (Ri).

The model used in this study consisted of a model of linear and non-linear models as follows:

#### a. Model-1

Lintner study that was published by Douglas (1968) as in Husnan (2009).

$$Rit = ai + \beta i Rmt + eit$$

#### b. Model-2

Study Miller and Scholes (1972) as in Husnan (2009).

$$Rit = at + \beta i (Rmt - RFT) + eit$$

#### c. Model-3

Black studies, Jensen, and Scholes (1972) as in Husnan (2009).

$$Rit = RFT + \beta i (Rmt - RFT) + eit$$

For the econometric estimation for which data are available and the process of regression calculations with SPSS version 22, the simplified model used in the form of the following equation.

$$Rit - RFT = ai + \beta i (Rmt - RFT) + eit$$

#### d. Model-4

Non-linear models were developed in the form of quadratic.

$$(Rit - RFT)^2 = ai + \beta i (Rmt - RFT)^2 + eit$$

#### e. Model-5

Non-linear models developed by Husnan (2009).

$$Rit \ln = \ln \ln ai + \beta i Rmt + eit$$

#### f. Model-6

Non-linear models were developed from studies Black, Jensen, and Scholes (1972).

$$\ln(Rit - RFT) = \ln \ln ai + \beta i (Rmt - RFT) + eit$$

To prove the ability of the model to explain the phenomenon in terms of the return shares with a market return, will be proven by the statistics and their relevance to actual conditions. The statistics will be compared mainly to the beta coefficient stock, constants, the significance of the relationship between these variables and accuracy of models used or the appropriate amount of determinand coefficient ( $R^2$ ).

### 3.2 Determination of the Sample

To illustrate the relevance of CAPM kosep then in the study carried out observations of some leading stocks or the most actively traded on the Indonesia Stock Exchange during the period September to November 2014 using a sample weekly period as mentioned above, namely the period of 2 September 2014 until 12 November 2014 . Shares of the company were chosen as samples are (a) International Astra or ASII, industrial or automotive business, (b) Bank Central Asia or BBCA, banking business, (c) Bank Negara Indonesia 1946 or BBNI, banking business, (d) Warehouse salt or GGRM, the tobacco industry, (e) Hero Super Market or HERO, retail business, (f) Indofood Super Market or INDF, business retal and foodstuffs, (g) Kimia Farma or KAEF, binis pharmacy, (h) Gas perusahaa or PGAS, gas fuel business, (i) Cement Cibinong or SMCB, cement industry, (j) Wijaya Karya Beton or WTON, konstrusi service businesses, and (k) Unilever Indonesia or UNVR, distributor business.

### 3.3 The Definition and Measurement of Variables

The type of data collected from these companies are stock returns or  $R_i$ , return market or  $R_m$  and return free risk or  $R_f$ .

(A) Return of shares or  $R_i$ , is the rate of return or income derived from each of the company's shares as a result of changes in prices between the time or in every week as measured by calculation,

$$R_i = (P_{it} - P_{it-1}) / P_{it-1}$$

If the price happens ( $P_{it}$ ) is greater than the price of the previous week ( $P_{it-1}$ ), then there is a return or income, the opposite occurs when the price of ( $P_{it}$ ) lower than the previous week ( $P_{it-1}$ ), then the negative returns or loss , On the price difference divided by the price of the previous week ( $P_{it-1}$ ), so that the quantity of stock returns ( $R_i$ ).

(B) Return  $R_m$  market or obtained from the difference between the composite stock price index that occurred at that time ( $IHSG_t$ ) with the composite share price index of the previous week ( $IHSG_{t-1}$ ). Positive difference shows the income or return, otherwise the negative difference between the period showed a negative return or loss. Of the difference is then divided by the composite stock price index the previous week ( $IHSG_{t-1}$ ), in order to obtain the magnitude of the market return ( $R_m$ ) which is depicted in the following formulation:

$$R_m = (IHSG_{it} - IHSG_{it-1}) / IHSG_{it-1}$$

(C) Return  $R_f$  as free of risk or risk-free rate of return , in this case used the average deposit interest rate between banks . The deposit rate is expressed in annual percentage , so as to obtain a weekly risk-free return , the percentage of the split 52 or 52 weeks a year . Return free of risk or  $R_f$  formulated namely.

$$R_f = \text{Return of risk free annual} / 52$$

In the measurement of a relatively short period of time , then return free risk or risk-free rate of return tend to be constant , but in the long term are likely to change .

## 4. Research and Discussion

### 4.1 Data Research

Based on the results of research on secondary data obtained from the Indonesia Stock Exchange through [www.investmentworld.com/indonesia/stock](http://www.investmentworld.com/indonesia/stock) can be obtained and calculated the amount of stock return ( $R_i$ ), the market return ( $R_m$ ) and the risk free return ( $R_f$ ) required for calculates coefficients beta stock ( $R_m - R_f$ ) and alpha ( $\alpha$ ) will be done using SPSS software version 22. research data were calculated using the method of measurement as set forth in reseach and methodology referred to above with the following results

## Stock Return (Ri), Market Return (Rm) dan Risk Free (Rf)

Year	Stock Return (Ri)											Market R (Rm)	Risk Free (Rf)
	ASII	BBCA	BBNI	GGRM	HERO	INDF	KAEF	PGAS	SMCB	WTON	UNVR		
2014													
02-Sep													
10-Sep	0,00280	0,00296	0,00046	0,00079	0,00218	0,00014	0,00671	0,00025	0,00295	0,01688	0,00077	(0,01127)	0,00115
17-Sep	0,00006	0,00009	0,00003	0,00248	0,00067	0,00028	0,00005	0,00000	0,00004	0,00009	0,00053	0,00881	0,00115
24-Sep	0,00013	0,00030	0,00151	0,00032	0,00074	0,00002	0,00068	0,00005	0,00031	0,00062	0,00037	(0,00274)	0,00115
01-Okt	0,00084	0,00184	0,00232	0,00004	0,00000	0,00014	0,00071	0,00032	0,00191	0,00268	0,00020	(0,00640)	0,00115
08-Okt	0,00194	0,00172	0,00302	0,00002	0,00000	0,00137	0,01032	0,00095	0,00012	0,01069	0,00157	(0,03548)	0,00115
15-Okt	0,00211	0,00017	0,00214	0,00097	0,00145	0,00158	0,00585	0,00014	0,00051	0,00958	0,00026	0,00089	0,00115
22-Okt	0,00050	0,00070	0,00236	0,00040	0,00229	0,00111	0,00067	0,00020	0,00043	0,00383	0,00082	0,02245	0,00115
29-Okt	0,00235	0,00066	0,00020	0,00004	0,00152	0,00094	0,00101	0,00146	0,00290	0,00009	0,00090	(0,00004)	0,00115
05-Nov	0,00010	0,00047	0,00003	0,00684	0,00108	0,00004	0,02063	0,00003	0,00423	0,00125	0,00068	(0,00144)	0,00115
12-Nov	0,00042	0,00034	0,00087	0,00059	0,00050	0,00016	0,00118	0,00013	0,00001	0,00150	0,00004	(0,00355)	0,00115

Source : Indonesia stock exchange (<http://www.duniainvestasi.com/bei/prices/stock>).

## 1). Estimation Model-1

The estimation results with SPSS 22: using Lintner models are loaded by Douglas ( 1968) as in Husnan (2009) ,

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

Stock beta coefficient ( $\beta$ ) and alpha ( $\alpha$ ) of the equation Model -1 above , can be seen on each company observed as set forth in the following table:

Ri = $\alpha$ + $\beta$ Rm + ei					
No.	Code	Company	$\alpha$	$\beta$ Rm	R <sup>2</sup>
1	ASII	Astra Internasional	-0,0043	1,240	0,287
2	BBCA	BCA	0,012	0,724	0,121
3	BBNI	BNI	0,0113	1,570	0,380
4	GGRM	Gudang Garam	0,0094	0,198	0,006
5	HERO	Hero Super Market	0,0037	0,969	0,176
6	INDF	Indofood Super Market	-0,0056	0,400	0,061
7	KAEF	Kimia Farma	0,0108	2,674	0,292
8	PGAS	Perusahaan Gas	0,0037	0,360	0,072
9	SMCB	Semen Cibin (Holcim Indo)	-0,0230	0,555	0,088
10	WTON	Wijaya Karya Beton	0,0217	2,148	0,199
11	UNVR	Unilever Indonesia	-0,0008	1,231	0,507

Source : Indonesia stock exchange (<http://www.duniainvestasi.com/bei/prices/stock>).

-Lintner model implementation as table calculation results SPSS version 22 mentioned above, showing beta ( $\beta$ ) shares and alpha ( $\alpha$ ) as follows,

-Beta ( $\beta$ ) shares the company's overall result was observed consistently positive, which means that the higher the risk of the stock, the greater the possibility of obtaining a stock return ( $R_i$ ).

-Beta ( $\beta$ ) stock shows the magnitude of the changes that will occur in the stock return ( $R_i$ ) when there is a change of one unit in the variable ( $R_m - R_f$ ).

-Value or quantity of Beta ( $\beta$ ) shares, vary from one company to another company. This is mainly due to the performance of the company and the company's operating conditions in the face of changes in the macroeconomic environment or market that is reflected by the stock price index (CSPI). This can be seen in companies that have a relatively high beta stocks than other companies such as Unilever (UNVR) distribsi sector, following Bank Negara Indonesia 1946 (BBNI) banking sector, Kimia Farma (KAEF) pharmaceutical sector and Indonesia Astra

International (ASII) sector otomotive. Otherwise some companies are not sensitive to changes in its return when there is a change in Rom as the company Gudang Garam (GGRM) and Business Process Gas cigarette sector (PGAS) fuel sector. Beta stocks showed a relatively very small stock returns have changed very little when there is a change in Rm. Such conditions can be stated that the company has an operational system performance and stable business that are less affected to market changes, such as tobacco consumption and relatively stable gas on stable economic conditions or crises. The risk is relatively small shares of the investor but it is less interesting, because they expect return derived from changes in stock prices

- I- Alpha ( $\alpha$ ) shows the influence of other factors not accounted for in the study, so that in case the condition  $R_m = 0$ , then the stock return ( $R_i$ ) of alpha ( $\alpha$ ). In the econometric analysis model assumed that other factors constant alpha ( $\alpha$ ) is expressed as a constant.

- The results of the above study showed the amount of alpha ( $\alpha$ ) is not consistent between one company with another company. There are 4 companies that have a magnitude of alpha ( $\alpha$ ) which is negative as the company (a) International Astra Indonesia (ASII) automotive sector, (b) Super Market Indofood (INDF) sector of foodstuffs, (c) Cement Cibinong (SMCB) cement production, and (d) Unilever Indonesia (UNVR) distribution sector. While other companies have a value of alpha ( $\alpha$ ) is positive.

- Alpha ( $\alpha$ ) value negative indicates that there are other factors that are not accounted for in market variables that negatively affect stock return is concerned, and vice versa in case the value of alpha ( $\alpha$ ) is positive. Other variables that are not accounted for in these models but have an influence on stock returns ( $R_i$ ) among other fundamental corporate performance appropriate operational condition, so although the market return ( $R_m$ ) does not change, then returns appropriate shares will receive the amount of alpha ( $\alpha$ ), and suffered losses when the value of alpha ( $\alpha$ ) is negative.

- This model does not use the CAPM model as a whole because it ignores the return free risk factor ( $R_f$ ) or just use factor  $R_m$ , so the beta is generated possibility of a different result when compared to that using the CAPM model ( $R_m - R_f$ ) as independent variables

- 1. Estimation Model - 2

- The estimation results with SPSS 22: using the model Miller and Scholes (1972) in Husnan (2009),

-  $R_{it} = \alpha + \beta_i (R_{mt} - R_{ft}) + e_{it}$

- Stock beta coefficient ( $\beta$ ) and alpha ( $\alpha$ ) from the equation model - 2 above, can be seen on each company observed as set forth in the following table.

$$R_i = \alpha + \beta(R_m - R_f) + e_i$$

No.	Code	Company	$\alpha$	$\beta(R_m - R_f)$	$R^2$
1	ASII	Astra Internasional	-0,0029	1,240	0,287
2	BBCA	BCA	0,013	0,724	0,121
3	BBNI	BNI	0,0131	1,570	0,380
4	GGRM	Gudang Garam	0,0097	0,198	0,006
5	HERO	Hero Super Market	0,0048	0,969	0,176
6	INDF	Indofood Super Market	-0,0051	0,400	0,061
7	KAEF	Kimia Farma	0,0139	2,674	0,292
8	PGAS	Perusahaan Gas	0,0042	0,360	0,072
9	SMCB	Semen Cibin (Holcim Indo)	-0,0223	0,555	0,088
10	WTON	Wijaya Karya Beton	0,0241	2,148	0,199
11	UNVR	Unilever Indonesia	0,0006	1,231	0,507

Source : Indonesia stock exchange (<http://www.duniainvestasi.com/bei/prices/stock>).

- Beta ( $\beta$ ) observed overall stock company, the result was consistently positive, which means the higher the risk more and more stock likely acquire stock returns. This is consistent with the Model - 1 above, which shares the beta coefficient or positive and is equal between the Model-1 with Model-2. This happens because the risk free return ( $R_f$ ) value constant during the observation period. When changes or variations to the risk free return ( $R_f$ ) during the observation period coefficient or beta stocks will differ in value.

- Alpha ( $\alpha$ ) obtained the same tendency with the model-1 above that the 3 companies that together have an alpha ( $\alpha$ ) is negative, while the company Unilever Indonesia (UNVR) and other companies have value of alpha ( $\alpha$ ) is positive. The value of alpha ( $\alpha$ ) is different than the Model-1 mainly because it takes into account the Model-2 return free risk factor ( $R_f$ ) in measuring return market that expressed in ( $R_m - R_f$ ).

- Model - 2 is not use  $R_f$  as a constant variable in the equation as the CAPM model:

$$R_i = R_f + \beta_i (R_{MT} + R_{FT}) + e_{it}$$

but using a model or equation:

$$R_i = \alpha + \beta_i (R_{MT} + R_{FT}) + e_{it}$$

Supposedly relevant to the CAPM model are:

$$R_i - R_f = \alpha + \beta_i (R_{MT} + R_{FT}) + e_{it}$$

Analyzes relevant to the CAPM model used on the Model - 3 below.

#### 1. Estimation Model - 3

The estimation results with SPSS 22: using the model developed in the study Balck, Jensen, and Scholes (1972) as in Husnan (2009),

$$R_{it} = R_{FT} + \beta_i (R_{mt} - R_{FT}) + e_{it}$$

For the econometric estimation for which data are available and the process of regression calculation, the simplified models in the form of the following equation,

$$R_{it} - R_{FT} = \alpha_i + \beta_i (R_{mt} - R_{FT}) + e_{it}$$

Stock beta coefficient ( $\beta$ ) and alpha ( $\alpha$ ) from the equation model - 3 above, can be seen on each company observed as set forth in the following table.

$R_i - R_f = \alpha + \beta(R_m - R_f) + e_i$					
No.	Code	Company	$\alpha$	$\beta(R_m - R_f)$	$R^2$
1	ASII	Astra Internasional	-0,0040	1,240	0,287
2	BBCA	BCA	0,012	0,724	0,121
3	BBNI	BNI	0,0120	1,570	0,380
4	GGRM	Gudang Garam	0,0085	0,198	0,006
5	HERO	Hero Super Market	0,0037	0,969	0,176
6	INDF	Indofood Super Market	-0,0063	0,400	0,061
7	KAEF	Kimia Farma	0,0127	2,674	0,292
8	PGAS	Perusahaan Gas	0,0030	0,360	0,072
9	SMCB	Semen Cibin (Holcim Indo)	-0,0235	0,555	0,088
10	WTON	Wijaya Karya Beton	0,0230	2,148	0,199
11	UNVR	Unilever Indonesia	-0,0005	1,231	0,507

Source : Indonesia stock exchange (<http://www.duniainvestasi.com/bei/prices/stock>).

- Beta ( $\beta$ ) observed overall stock company, the result was consistently positive, which means the higher the risk the greater the possibility of obtaining shares of stock return. This is consistent with the Models 1 and -2 above, the beta coefficient, or positive stock and the value is the same, this is mainly due to the risk free return ( $R_f$ ) of its constant value during the observation period. When changes or variations to the risk free return ( $R_f$ ) during the observation period, the beta coefficient stock ( $\beta$ ) will differ in value.

- The results of the above study showed the amount of alpha ( $\alpha$ ) is not consistent from one company to the other company. There are 4 companies have a magnitude of alpha ( $\alpha$ ) is negative or equal to -1 Model, namely the company (a) International Astra Indonesai (ASII) automotive sector, (b) Super Market Indofood (INDF) sector of foodstuffs, (c) Cement cibinong (SMCB) and cement production (d) Unilever Indonesia (UNVR) distribution sector. While other companies have a value of alpha ( $\alpha$ ) is positive.



- Conclusion The comparison between the 3 models, it turns out there is no difference if it is used to estimate the stock beta ( $\beta$ ), so it can be stated that the 3 models have the same ability to measure the level of risk and stock return ( $R_i$ ).

- To see the excellence and relevance of measurements of beta ( $\beta$ ) stock, then in this study developed a model non-linear through the transformation of data into a quadratic Ln and as the Model- 4, Models - 5 and Models - 6 below.

#### 1. Estimation Model - 4

The estimation results with SPSS 22: Non Linear models in quadratic form , as follows ,

$$(R_{it} - R_{FT})^2 = \alpha_i + \beta_i (R_{mt} - R_{FT})^2 + e_{it}$$

Stock beta coefficient ( $\beta$ ) and alpha ( $\alpha$ ) from the equation model - 4 above , can be seen on each company observed as set forth in the following table.

$(R_i - R_f)^2 = \alpha + \beta(R_m - R_f)^2 + e_i$					
No.	Code	Company	$\alpha$	$\beta(R_m - R_f)$	$R^2$
1	ASII	Astra Internasional	0,0010	0,598	0,056
2	BBCA	BCA	0,001	0,790	0,125
3	BBNI	BNI	0,0009	1,659	0,391
4	GGRM	Gudang Garam	0,0015	-1,317	0,070
5	HERO	Hero Super Market	0,0011	-0,473	0,060
6	INDF	Indofood Super Market	0,0004	0,736	0,262
7	KAEF	Kimia Farma	0,0041	3,337	0,046
8	PGAS	Perusahaan Gas	0,0003	0,428	0,145
9	SMCB	Semen Cibin (Holcim Indo)	0,0016	-1,178	0,104
10	WTON	Wijaya Karya Beton	0,0035	5,608	0,170
11	UNVR	Unilever Indonesia	0,0004	0,856	0,657

Source : Indonesia stock exchange (<http://www.duniainvestasi.com/bei/prices/stock>).

Model-4 non-linear or quadratic shape, which is the development of Model-3 above. Non-linear model estimation results indicate as follows,

- Coefficient, or beta ( $\beta$ ) and constant or alpha ( $\alpha$ ) different from the results of the linear model simulation or model-3.
- The value of beta ( $\beta$ ) shares are not consistently positive as Model-3. There are 3 companies which had a beta value of shares ( $\beta$ ) is negative, the company (a) Gudang Garam (GGRM) with the tobacco industry or the beta coefficient stock: -1.317, (b) Hero Supermarket (HERO) retail sector with a beta coefficient or stock: - 0.473, (c) Cement Cibinong (SMCB) cement industry with a beta coefficient or stock: -1.178. While other companies have a share beta coefficient ( $\beta$ ) is positive as it did in Model-3, but different quantity or value.
- The value of beta ( $\beta$ ) shares were negative indicates that the addition of a variable ( $R_m - R_f$ ) would lead to a decrease in stock returns ( $R_i$ ) of beta ( $\beta$ ) shares. This means that the stock returns negatively or inversely proportional to the risk of the stock. Which means that the greater the risks faced, the smaller the stock return. This is particularly relevant when compared with the company's business operations,

(A) Gudang Garam (GGRM) the tobacco industry, in the event of an increase in JCI is marked by the influence of macroeconomic variables, the interest of investors to buy shares in the company is reduced, because the raw materials are still the dominant cigarette industry uses imported components such as tobacco and others.

(B) Hero Super Market (HERO) retail business, JCI is not so encouraging increase in stock return ( $R_i$ ) of this company, because the components of the product resulting from a large number of goods sold still rely on imported raw materials. As a result, the stock return ( $R_i$ ) will tend to weaken if there is an increase or a composite stock price index in Indonesia Stock Exchange Composite Index.

(C) Cement Cibinong (SMCB) cement industry, the increase in JCI weakening the stock return ( $R_i$ ) is the cement industry. This is mainly due to the consumption of cement in the country is much related to the progress of

infrastructure construction. When turmoil macroeconomic variables that cause the JCI rises, then the impact will affect the price of raw materials required by the construction, and it also means that demand for cement will be affected. In the prediction of stock return ( $R_i$ ) conducted by investors in the shares of the cement industry is going to decline that caused the stock price does not go up and result in a stock return ( $R_i$ ) decreases

The accuracy of the linear model (Model-3) and non-linear models (Model-4) can be determined by comparing the  $R^2$  determinant coefficients obtained between the two models mentioned above. Determinant coefficient shows ability to explain the change in the dependent variable stock return ( $R_i$ ) as a result of changes in market returns independent variables and risk free return ( $R_m - R_f$ ). The greater the value of the determinant coefficient ( $R^2$ ) shows the better the model. Based on this view and pay attention determinant coefficient ( $R^2$ ) of each company of the 2 models in question, it can be concluded that the non-linear models or model - 4 is more relevant to use in measuring the beta value of the company.

COEFFICIENT DETERMINAND ( $R^2$ )			
Code	Model -3	Model -4	Diff
ASII	0,287	0,598	0,310
BBCA	0,121	0,790	0,669
BBNI	0,380	1,659	1,279
GGRM	0,006	-1,317	-1,324
HERO	0,176	-0,473	-0,648
INDF	0,061	0,736	0,675
KAEF	0,292	3,337	3,046
PGAS	0,072	0,428	0,356
SMCB	0,088	-1,178	-1,266
WTON	0,199	5,608	5,409
UNVR	0,507	0,856	0,349

#### 1). Estimation Model -5

Assessment of beta stocks as non linear models developed by Husnan (2009),

$$R_{it} \ln = \ln \ln a_i + \beta_i R_{mt} + e_{it}$$

This model can not be used because the data available there is a negative return or loss, so the process was not carried out due to an error performance transformation into value Ln, so that can not be processed through SPSS software. Ln non-linear models can be used when a data field is available change or are non-negative or positive returns or losses.

#### 2). Estimation Model - 6

Beta assessment of other stocks, as the development of studies Balck, Jensen, and Scholes (1972) as in Husnan (2009) but using a non-linear models as follows,

$$\ln (R_{it} - R_{FT}) = \ln \ln a_i + \beta_i (R_{mt} - R_{FT}) + e_{it}$$

Model-6 is the same as the Model-5, the available data can not be processed by Ln because negative returns or loss will occur error when transformed into value Ln. Ln non-linear models can be used when a data field is available change or are non-negative or positive returns or do not experience a loss.

### 5. Conclusion and Limitation Study

#### 5.1 Conclusion

Based on the description above, can be summarized as follows:

- 1). Assessment of beta ( $\beta$ ) stock produce the same figures for the use of Model 1, Model 2 and Model-3 because the risk free return ( $R_f$ ) constant during the observation period. If there is variation in the risk free return ( $R_f$ ) during the observation period, the stock beta ( $\beta$ ) will differ among the 3models mentioned.
- 2). The constant or alpha ( $\alpha$ ) differ between Model 1, Model 2 and Model-3 because there is a different treatment to retrun free risk indicators ( $R_f$ ), namely (a) Model-1 does not use return free risk ( $R_f$ ), (b) Model-2 using a risk

free return ( $R_f$ ) only independent variable ( $R_m - R_f$ ), (c) Model-3 using a risk free return ( $R_f$ ) on stock return ( $R_i - R_f$ ) and the market return ( $R_m - R_f$ )

- 3). Comparison of linear and non-linear models showed that non-linear or quadratic superior and more relevant use in estimating beta stocks. This is evidenced in the determinant coefficient ( $R^2$ ) which obtained the larger number of non linear model for the entire company that was observed during the period.
- 4). The results of the estimation of measurement stock return ( $R_i$ ) both with linear and non-linear models, shows that the concept or CAPM model is still relevant in measuring the beta ( $\beta$ ) shares. Selection of the best models and relevant in measuring the beta ( $\beta$ ) stock, is dependent on the distribution of the data and suitability in the selection of a good model of linear and non-linear.
- 5). The non-linear model with base Ln can not be used in this study because there are negative returns or loss, resulting in an error when transformed into value Ln, and can not be done with SPSS simulation process. Non-linear models Ln base on Model-5 and Model-6 can be used in other studies when the data in the form of a positive return or no loss.

### 5.2 Limitation Study

In the implementation of the capital asset pricing model, or CAPM, experts in finance, management or decision makers in the company and investors, should be aware of the limitations of the predictive ability of the risk and the return generated by the CAPM model. There are several other important matters related to risk and stock return. This is relevant with a view Husnan (2009) related to matters associated with risk and stock return. The important thing in question is (a) there is a relationship between risk with return or return on investment, (b) diversification is very important in reducing the level of risk without reducing the level of return, (c) return or refund is real important things in investments, and contrast with the return nominal, (d) the risk of investment is usually influenced by the duration period of an investment, which in the short term the possibility of such shares in the long-term risk but the risk is relatively low, and (e) there is no guarantee that the past will be repeated in the future, especially when associated with risk and investment returns of the past.

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