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How to calculate the risk (Beta) in Indonesia stock exchange (IDX): Empirical Test of LQ-45 Stock Period 2009-2018

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Abstract
This study aims to test the beta value on the Indonesia Stock Exchange (IDX), is it true that it tends to approach one as stated by Boumol (1971) and Pefindo, one of the rating agencies in Indonesia, in determining the beta value of correction. The test uses the Scholles Williams, Dimson, and Fowler Rorke methods, then the method that produces the beta value is closest to the future price. This research was conducted on LQ-45 stocks listed on the Indonesia Stock Exchange for the 2009-2018 observation period using a sample of 30 issuers. The stock price data used in this study is the monthly stock price for 10 years. The results showed that beta values could be corrected using the three methods mentioned above. Of the three methods, correction with the Dimson method produces a correction beta value that is closest to the predicted value in the future.

Keywords: IDX, beta, scolles williams, dimson, fowler rorke

1. Introduction

Beta as of risk measurement continues to be debated by experts, both theoretically and empirically.

- Kothari, Shanken, and Sloan (1950) and Kandel and Stambaugh (1995) say that beta can still be used if using annual data, not monthly or daily data.
- Fama and French (1992, 1993, 1996) criticize the ability of beta to explain cross-sectional variation return equity.
- Black (1993) says with another perspective, what is needed in defining a measure of systematic risk or beta is the market model (market model), namely: $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$, The existence of the market model is independent or not bound to the CAPM. Even though the CAPM is really dead, beta still exists. So, beta has been used long ago, now, and will continue to be used in the future.
- Roll and Ross (1996) say that: "beta is dead, or if not dead is at least fatally, because beta cannot explain the return of securities.

Beta

Beta is a coefficient that measures the relative volatility of a stock or stock portfolio against market volatility which can be formulated as follows;

$$\text{Beta} = \frac{\text{Covariance (stock price, market index)}}{\text{Variance (market index)}}$$

or

$$\beta_i = \sigma_{im} / \sigma_m^2 \quad (1)$$

Beta stocks are calculated using past (historical) data and the results of these calculations are used to predict future prices. This causes an estimate of the risk generated, can deviate from the actual risk that will occur.

Previous Research

Table 1: Blume (1971) [1] in his observation found the following results

Portofolio	Period juli 1954 –juni 1961	Period juli 1961–juni 1968
1	0,393	0,620
2	0,612	0,707
3	0,810	0,861
4	0,987	0,914
5	1,138	0,995
6	1,337	1,169

There is a tendency beta value towards to one, if the first period of the portfolio beta is below one, then the next period will be an increase. Conversely for a portfolio with beta greater than one, then the next period will be a decrease. Meaning that the portfolio beta in the long run will move around one.

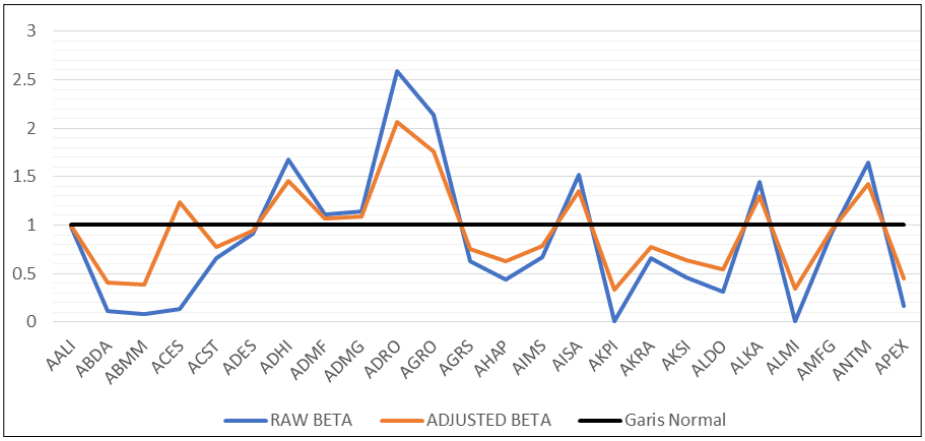
Blume formulated predictive beta in the future with the equation:

$$\beta_{i2} = 0{,}343 + 0{,}677\ \beta_{i1} \quad (2)$$

Where: βi2 = estimated beta in the future (period 2)

βi1 = beta now (period 1)

Pefindo, a rating agency in Indonesia, also made adjustments to beta. The Grafik below seen that the adjustments made are also using the principle that the beta adjusted for its value will go to one, as shown in the picture below.



Source: Pefindo.com / Pefindo sock / weekly beta / 8 June 2018

Fig 1: Grafik raw Beta dan adj Beta (Pefindo)

Both Blume and Pefindo seem to believe that the beta value will go to one, meaning there is no company whose beta value will continue to rise, or vice versa will continue to fall, away from one. Because once the value exceeds one, then in the next period the beta value will definitely go down to near one, and vice versa.

If this opinion is trusted, is very easy to determine the risk of a company! If the historical beta has exceeded one, the future beta must be smaller than the historical beta, or in other words, the company's risk in the future will immediately decrease (smaller than the past risk). Vice versa, if the historical beta (past risk) value is below one, then future risks will be greater than the risks of the past, the reality is not like that. Of course this will make the return predictions that will be generated also be biased, because in reality many companies have high or low beta values and even minus.

Based on the description above, the problem faced is "Is it true that the beta of a stock tends towards one and how to determine the beta value of a company"?

Problem formulation

Based on the description above, it can be concluded that the existing problems are:

1. Is there a bias in determining beta values for companies on the Indonesia Stock Exchange in the period 2009-2018?
2. What is the best model for correcting the beta value of companies in the Indonesia Stock Exchange in the period 2009-2018?

Research purposes

This research is expected to be able to assess a bias phenomena that occur in the Indonesia Stock Exchange, especially if using beta as a tool to measure risk. The results are expected to be one of the references for investors in determining the risk of a stock so that they can make the right decisions in investing to estimating return to be generated is more appropriate.

Theory

To calculate the beta value (correction), it is used the Scholes and William (SW) method, the Dimson Method (DIM), and the Fowler and Rorke (FR) Method.

1. Scoles and Williams Method

Scholes and Williams (1977) [15] formulated beta values that have been corrected are as follows:

$$\beta i = \frac{\beta i^{-1} + \beta i^{0} + \beta i^{+1}}{1 + 2.\rho 1}$$

Dimana : βI : Beta sekuritas ke-I yang sudah dikoreksi

βi^{-1} : Beta yang dihitung berdasarkan persamaan regresi $R_{i,t} = \alpha i + \beta i^{-1} R_{Mt-1}$, yaitu untuk Ri periode ke t dengan R_M periode *lag* t-1.

βi^{0} : Beta yang dihitung berdasarkan persamaan regresi

2. The Dimson Method

The Dimson Method (1979) is a simplification of the Scoles and Williams method as follows;

$$R_{i,t} = \alpha i + \beta i^{-n} R_{Mt-n} + \ldots + \beta i^{0} R_{Mt} + \beta i^{+n} R_{Mt+n} + \varepsilon it$$

Dimana : $R_{i,t}$: return sekuritas ke i periode ke-t

R_{Mt-n} : return indeks pasar periode *lag* t-n

R_{Mt+n} : return indeks pasar periode *lead* t+n

And

$$\beta i = \beta i^{-n} + \beta i^{0} + \beta i^{+n}$$

3. Fowler and Rorke methods

The method of Fowler and Rorke (1983) adds weight to the bias so that the resulting beta is not biased. Formulation and steps are as follows;

- Use the Dimson model regression equation
  $R_{i,t} = \alpha i + \beta i^{-1} R_{Mt-1} + \beta i^{0} R_{Mt} + \beta i^{+1} R_{Mt+1} + \varepsilon it$
- To get a serial return correlation the equation is used
  $R_{Mt} = \alpha i + \rho 1 R_{Mt-1} + \varepsilon it$
- For weights used

$$wi = \frac{1 + \rho 1}{1 + 2\rho 1}$$

Research Methods

The research object is a beta of issuers included in LQ 45 on the Indonesia Stock Exchange in the period of 2009-2018. This research data is the daily closing price. In accordance with the criteria for sampling data, the data sampled were 30 issuers.

Corrections are made using 3 methods, namely the method: Schole Williams, Dimson, and Fowler Rorke. Scholes Williams method, is to regress the issuer return with market returns that have lagged / leads. Beta correction is generated, then entered into the calculation formula of Scholes Williams.While the Dimson method, is to take a lag / lead market return and then do a multiple regression on the return of each issuer. For the Fowler Rorke method, is to use weighting, the results are then entered into the Fowler Rorke formula so that the beta value is corrected. Corrected market beta values are obtained from the arithmetic average beta value of each issuer.

Based on the market beta value, then the method that produces beta with the value closest to 1. is chosen and the method that has a correction value close to 1 is considered to be the best method.

Hypothesis

Hypothesis testing is done to see whether there is a beta bias in the issuers - issuers listed on the Indonesia Stock Exchange in the period 2009-2018. This test is carried out with one sample t test. The hypothesis is: the beta value of the LQ-45 stocks listed in the IDX for the 2009-2018 period is biased.

Results and Discussion

The data in this study are beta coefficients of each issuer listed on the IDX for the period 2009-2018.

Table 2: Result

Year	Beta-average	Number of Emiten	t	Significance	Result
2009–2018	0,345	30	-19,743	0,000	Biased

Source: Data processed

The results of the t test above, then the hypothesis Ho is rejected, so it can be concluded that the beta value of LQ-45 stocks listed in the IDX for the period 2009-2018 is biased.

Table 3: Results of Beta Correction

Lag/Lead	Beta Market Model	Beta SW	Beta D	Beta FR
1	0,304819	0,30775	0,4161	-0,053
2		0,34641	0,3753	0,3833
3		0,27442	0,5016	0,186
4		0,05183	0,0746	0,0726
5		0,02083	-0,168	-0,128

From the results of the above processing, then to make a correction of the beta value that is biased, is the Dimson Method with 3 lags and leads with a bias value of 0.5016. This method is considered the most appropriate because it is considered with a value close to 1, this method can correct the beta value that is biased. This result is in line with the research conducted by Elizabeth Lucky M. S. and Widuri Kurniasari (2006) [1] which states that there is a beta bias in the LQ – 45 Jakarta Stock Exchange in the 2000-2001 period. This bias beta value is corrected using the Dimson 3 lag and lead method.

The beta value is still biased because these three methods still have weaknesses. The weakness of the Williams Scholles method is that the beta value generated is affected by the high and low fluctuations in the joint stock price.

For the Dimson method, the occurrence of bias is possible because of the method of making corrections using lag addition / lead. If the bias over low stock beta in one period then becomes high in the previous / after period, this will cause the beta produced by the Dimson method to lose information for a certain period.

While the Fowler Rorke method, the weakness is in the correction period, the higher the lag / lead used, the divider for giving the weight will be lower.

Conclutions and Recommendations

Based on the tests carried out above, the results obtained that the beta value of LQ-45 shares listed on the IDX for the period 2009-2018 are biased. Beta can be biased possibly due to the existence of stocks that are not actively traded on the Indonesia Stock Exchange. As a result of the shares that are not traded, and still used in the beta calculation as a whole, the bias of the beta value will occur.

This biased beta value is corrected by three methods, namely Scholes Williams, Dimson, and Fowler Rorke. The most appropriate method to use is the Dimson method with a period of 3 lags / leads. The correction beta value obtained from this method is 0.5016 and is the value closest to 1.

Based on the results of the study it is recommended for investors to choose stocks that are actively traded so that the expected risk value (beta) is close to the actual value. Investors can choose issuers contained in LQ-45 because issuers listed in the LQ-45 are active stocks.

For the next researchers, it is expected to increase the number of samples to be used, it is expected that the more samples used, the more representative the market conditions will be. Besides that, researchers can also use new methods that can be used to correct a beta value that is biased so that the correction value can be better and close to 1.

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