Best-Beta CAPM (BCAPM) Optimal Portfolio Performance Using EROV, Sortino, and M2 Methods

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Abstract

This study discusses the optimal portfolio performance analysis using Best-Beta CAPM (BCAPM) with methods EROV, Sortino, and M2 were applied to stocks sharia incorporated the Jakarta Islamic Index (JII) in the period from October 1, 2014 – August 31, 2017. The results obtained from this study C portfolio showed an optimal portfolio. The proportion of each stock included in the optimal portfolio is stock UNTR (95.27%) and AKRA (4.73%) with a rate of return expected from optimal portfolio is 1.39%, while the risk of an optimal portfolio of 0.066%. Result of consistency test between the performance of stock portfolio with Kendall's tau test showed that that those methods was consistent in assessing the performance of stocks portfolio.

Keywords: Best-Beta, CAPM, EROV, M2, Optimal Portfolio and Sortino.

Introduction

In the current era of globalization, the capital market has experienced very rapid development throughout the world, including Indonesia**.** Based on obtained data from the IDX, the number of stock securities in Indonesia that went public as of January 2, 2017 was 539 consisting of various sectors. Of the many stocks that exist, investors are often faced with two things, namely profits (returns) and risks that arise due to uncertainty (Tandelilin, 2010:183).

In general, investment activities can be said to be high risk high return, meaning that with high investment returns, there is a big risk. Investors do not know what will happen in the future, so investors can only estimate the returns and risks obtained based on data that has been in the past. Risk cannot be avoided but can be minimized by implementing risk management. One way to reduce this risk is to form a stock portfolio. A stock portfolio is an investment consisting of various stocks of different companies with the hope that if the price of one stock decreases, while the other increases, the investment will not suffer a loss (Zubir, 2013: 2).

Bodie, et al said that there are two steps that must be taken in the investment process, first analyzing the returns and risks of the stocks included in the portfolio. The second is to form an optimal portfolio of the selected stocks (Zubir, 2013:2). The formation of the portfolio is done by forming the best model. One of the balance models in the formation of an optimal portfolio is the Capital Asset Pricing Model (CAPM) and the Best-Beta Capital Asset Pricing Model (BCAPM).

Capital Asset Pricing Model (CAPM) is a portfolio analysis model that relates risky assets to the market index (CSPI) and risk-free assets. The CAPM model was first introduced by William Sharpe, John Lintner, Jack Trenor, and Jan Mossin (Jogiyanto, 2008:487). This model plays an important role in the financial sector which is used to predict the relationship between expected return and the risk of an asset (Zubir, 2013: 197). The CAPM theory is based on the portfolio theory proposed by Markowitz. Based on the Markowitz model, each investor is assumed to diversify his portfolio and choose the optimal portfolio based on the investor's estimates of return and risk, at portfolio points that lie along the efficient portfolio line.

According to Reilly and Brown (2006), rational investors seek an acceptable level of risk to maximize the returns they will get. After selecting a portfolio, evaluating its performance is very important. Portfolio performance evaluation mainly refers to determining how a particular investment portfolio is carried out in relation to several comparisons based on benchmarks carried out. Evaluation can show the extent to which the portfolio is superior, lower or equivalent to the benchmark being compared (Ataie, 2012:01).

For this reason, this study discusses 'Best-Beta CAPM Optimal Portfolio Performance Analysis (BCAPM) Using EROV, Sortino, and M2 Methods' for the period October 1, 2014 – August 31, 2017. Investments in stocks here were from the Jakarta Islamic Index (JII) stock group.).

Theoretical Basis

A. Investment

According to Abdul Halim (2005:56), investment is the placement of funds in a given time with the aim of obtaining profits in the future. Investment can also be interpreted as delaying current consumption to be used in efficient production for a certain period of time. Investment in a broad sense consists of two main parts, investment in a broad sense consists of two main parts, namely investment in the form of real assets and investments in the form of marketable securities or financial assets. Real assets are tangible assets such as gold, silver, diamonds, art and other real assets. Financial assets are in the form of securities which are "claim" on real assets

One of the investment alternatives in the capital market is stocks. Investments in stocks are short-term investments and long-term investments depending on the purpose of the purchase. Investments in the form of shares are classified as long-term investments are usually carried out for various purposes, namely (1) to monitor the company, (2) to obtain a fixed income every period, (3) to establish a special fund, (4) to ensure continuity of supply materials, (5) to maintain the relationship between subsidiaries.

B. Optimal Portfolio and Portfolio

Portfolio is a combination or composite of assets, both real assets and financial assets owned by investors. A portfolio is categorized as efficient if it has the same level of risk and is able to provide a higher rate of return, or is able to generate the same level of profit, but with a lower risk. The optimal portfolio is the portfolio that an investor chooses from among the many choices available in an efficient portfolio set. The selected portfolio is of course in accordance with the investor's preferences regarding the return or risk that it can be endured.

C. *Best-Beta CAPM* (*BCAPM*)

The Best Beta Capital Asset Pricing Model is a simplified version of the CAPM. The similarity between CAPM and BCAPM is that they can be used to predict a linear relationship between the risk asset premium $E(X)$ and β that given by:

$$E(X) = \beta E(X_m) .$$

In the mean variance, all investors have the same perception as measured by the variance of the portfolio returns and may differ only in the degree of risk aversion. In Best Beta CAPM investors view risk as the second moment of excess return on assets and market covariance, while beta CAPM measures the shock of return on assets and market covariance.

$$\beta = \frac{E(x_m x)}{E(x_m^2)} = \frac{\mathrm{cov}(x_m x) + E(x_m) E(x)}{Var(x_m) + \left(E(x_m)^2\right)} = \beta^\beta$$

.

Another Important aspect is the difference in economic interpretation between variance and second moment, or in general for covariance $Cov(x_m x)$ and comment $E(x_m x)$ is a sign of a significant beginning of the BCAPM of the CAPM, because:

$$E(x^2) = \mathrm{var}(x) + \left[E(x)\right]^2 .$$

The magnitude of the second moment can be influenced by both, the variance and the expected return. Therefore, the variance inequality is not always interpreted $E(x^2)$ as a measure of risk. In the same way:

$$E(x_m x) = \mathrm{cov}(x_m x) + E(x) E(x_m) .$$

Stating that the component $E(x_m x)$ depends on both the covariance and the expected return. Without asset pricing theory, $E(x_m x)$ could be different because the random return "x" has no correlation with the market. $E(x_m x)$ expressed as a consumer measure. Under the terms we can express β^β as a modified measure of systematic risk assets.

Research Method

A. Population and Sample

The population used in this study were all shares of publicly traded companies listed in the Jakarta Islamic Index (JII) stock group on the IDX during the research period, namely October 1, 2014 – August 31, 2017. These shares were then selected as research samples using purposive techniques and random sampling.

The sampling technique is purposive random sampling based on certain criteria. These criteria are first: the samples taken are stocks that are always consistently included in JII, the two stocks based on stocks that consistently enter JII are selected stocks that have a positive mean return value and obtained 14 shares, the third is selected 4 stocks that have a positive value. the highest return, 4 stocks that have the lowest risk, 3 stocks that have high returns but high risk, and 4 stocks that have high returns and low risk.

B. Data Analysis Method

The method used in this research was quantitative analysis, which was used to analyze the performance of a portfolio containing stocks. The steps in analyzing the data to measure the performance of the portfolio are as follows:

1. Formation of Optimal Portfolio
   The formation of the optimal portfolio in this study would use the Best-beta Capital Asset Pricing Model (BCAPM), following the stages:
   a. Collect data on JII shares, JCI, and interest rates for Bank Indonesia Certificates (SBI) or BI rates.
   b. Calculate the expected return, variance, and standard deviation of JII shares. Then make a stock typology chart (Qudratullah, 2012: 21-33)
   c. Calculate the expected market return ($\overline{R}_m$), variance and standard deviation of the JCI market data.
   d. Calculating the risk-free rate of return (R_f) from interest rate data Bank Indonesia Interest Certificate (SBI).

$$R_f = \frac{\sum_{i=1}^{N} n_i}{n}$$

   e. Counting β^β from each portfolio formed

$$\beta^\beta = \frac{E(x_m x)}{E(x_m^2)} = \frac{\text{cov}(r_m r) + E(x_m)E(x)}{Var(r_m) + \left(E(x_m)^2\right)}$$

   f. Determine the proportion of funds invested in the portfolio using the Best Beta Capital Asset Pricing Model (BCAPM).

$$w_i = \frac{\Sigma^{-1}\left(\mu - R_f 1_p\right)}{1_p^T \Sigma^{-1}\left(\mu - R_f\right)}$$

   g. Calculating the optimal level of return and risk level of the portfolio formed by the Best Beta Capital Asset Pricing Model (BCAPM) method.

$$E(R_p) = \sum_{i=1}^{n}(w_i E(R_i))$$
$$\text{with}$$
$$E(R_i) = R_f + \beta^\beta\left(E(R_M) - R_f\right)$$

$$\sigma_p = \sqrt{\sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i=1}^{n}\sum_{j}^{n} w_i w_j \sigma_i \sigma_j} \quad , \text{with} \quad i \neq j$$

2. Optimal Portfolio Performance Measurement
   The measurement of optimal portfolio performance in this research would use 3 measurement indices, namely the EROV, Sortino and M2 methods. Systematically the three measurement indices are formulated as follows:

   ▪ EROV Method

$$EROV = \frac{R_p - R_f}{VaR} \text{ with}$$

$$VaR = -\left(R + Z_\alpha \times \sigma\right)$$

   ▪ *Sortino* Method

$$SOR = \frac{\overline{R}_p - \overline{R}_f}{\sigma_{down}} \text{ with}$$

$$\sigma_{down} = \sqrt{\frac{1}{N}\sum_{t=1}^{N}\left(R_{pt} - MAR\right)^2}$$

   ▪ *M²* Method

$$M^2 = \left(\left(\frac{\overline{R}_p - \overline{R}_f}{\sigma_p}\times\sigma_m\right)+\overline{R}_f\right) - \overline{R}_m$$

3. Consistency Test of Portfolio Performance Measuring Method
   This stage was used to determine whether the three methods of measuring portfolio performance were consistent or not in measuring portfolio performance and at the same time aim to provide answers to the hypotheses that had been made previously. There are 3 kinds of statistical tests used, namely the Kendall's tau test (Qudratullah 2017:354-360).

Results and Discussion

The results of the 19 stocks consistently listed in JII for the period October 2014 – August 2017, obtained 14 stocks that have a positive mean return (Table 1) which was then made a typology graph (Figure 1). There were four portfolios, namely portfolio A, B, C, and D. Portfolio A consists of 4 stocks with the highest return, portfolio B consists of 4 stocks with the lowest risk, portfolio C consists of 3 stocks with return but high risk criteria and portfolio D consists of of 4 stocks with high return and low risk criteria.
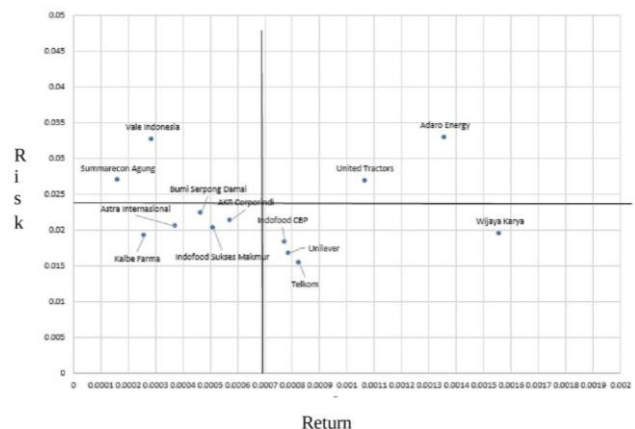

Figure 1. A Stock Typology Chart

Table 1. Fourteen Stocks with Positive Returns Jakarta Islamic Index.

No.	Code	*Return*	Risk	Ratio
1	ADRO	0.001360203	0.032972258	0.041252949
2	AKRA	0.00057324	0.021390270	0.026799119
3	ASII	0.000375177	0.020512189	0.018290423
4	BSDE	0.000467356	0.022441454	0.020825567
5	ICBP	0.000776794	0.018291971	0.042466382
6	INCO	0.000289703	0.032715831	0.008855117
7	INDF	0.000511695	0.020287943	0.025221647
8	KLBF	0.000217194	0.019244208	0.011286199
9	SMRA	0.0001625	0.026952166	0.006029207
10	TLKM	0.000825982	0.015370443	0.053738335
11	UNTR	0.00106787	0.026929634	0.039654074
12	UNVR	0.000789376	0.016756626	0.047108317
13	WIKA	0.02501449	0.706513557	0.035405534
14	WSKT	0.001561338	0.019512615	0.080016832

Source: www.idx.co.id which is processed

Optimal Portfolio Determination

The results of the calculation of the level of return and the level of risk from the optimal portfolios of Best-Beta CAPM, details can be seen in Table 2.

Table 2. Rate of Return and Level of Optimal Portfolio Risk.

No.	Portofolio	*Return*	Risk
1	Portofolio A (48% WSKT, 9% UNTR, 43% TLKM)	0,009720853	0,00014678
2	Portofolio B (29% TLKM, 38% UNVR, 19% ICBP, 14% KLBF)	0,008186903	0,00012056
3	Portofolio C (95% UNTR, 5% AKRA)	0,013928801	0,00066185
4	Portofolio D (26% TLKM, 37% UNVR, 18% ICBP, 19% WSKT)	0,008105526	0,00011443

Measurement of Stock Optimal Portfolio Performance

The measurement of optimal stock portfolio performance in this study would use 3 measurement indices namely EROV, Sortino and M2 which are shown in Table 3, Table 4, and Table 5.

1. EROV Method

Table 3. Optimal Portfolio Performance with EROV Method.

Stock Code	VaR	$\overline{R_p} - \overline{R_f}$	EROV
Portofolio A	0,003098566	-0,007558696	-2.439417545
Portofolio B	0,001639252	-0,009092646	-5.546826904
Portofolio C	0,014178700	-0,003350748	-0.236322676
Portofolio D	0.001286211	-0,009174023	-7.132596647

2. S*ortino Method*

Table 4. Optimal Portfolio Performance with the Sortino Method.

Stock Code	σ_{down}	$\overline{R_p} - \overline{R_f}$	SOR
Portofolio A	0,009270637	-0,007558696	-0.989578540
Portofolio B	0,003333166	-0,009092646	-1.005274933
Portofolio C	0,009268822	-0,003350748	-0.980992700
Portofolio D	0,005986496	-0,009174023	-1.262624574

3. M -*Square* (M^2) Method

Table 5. Optimal Portfolio Performance with the M-Square (M2) Method.

Stock Code	$\dfrac{\overline{R_p} - \overline{R_f}}{\sigma_p}$	σ_m	$\overline{R_m}$	M-square (M^2)
Portofolio A	-51,4967732	0,008948269	0,000227993	-0.4437554
Portofolio B	-75,4200926	0,008948269	0,000227993	-0.6578277
Portofolio C	-5,06270056	0,008948269	0,000227993	-0.0282509
Portofolio D	-80,171488	0,008948269	0,000227993	-0.7003445

Consistency Test of Portfolio Performance Measuring Method

This stage was used to determine whether the three methods of measuring portfolio performance were consistent or not in measuring portfolio performance and at the same time aim to provide answers to the hypotheses that have been made previously. The statistical test used is the Kendall's tau correlation test. Figure 2 was a consistency test table with the Kendall's tau correlation test:

Correlations

			EROV	Sortino	M2	EROV	Sortino	M2
Kendall's tau_b	EROV	Correlation Coefficient	1.000	1.000*	1.000*	1	1.000**	1.000**
		Sig. (2-tailed)	.	.	.		.000	.000
		N	4	4	4	4	4	4
	Sortino	Correlation Coefficient	1.000**	1.000	1.000*	1.000**	1	1.000**
		Sig. (2-tailed)	.	.	.	.000		.000
		N	4	4	4	4	4	4
	M2	Correlation Coefficient	1.000**	1.000**	1.000	1.000**	1.000**	1
		Sig. (2-tailed)	.	.	.	.000	.000	
		N	4	4	4	4	4	4

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 2. Kendall's tau correlation test.

Based on the test results obtained, in this study, a significance value of 0.000 between each measure of portfolio performance. This finding showed that the value of Sig $(0.000) < \alpha$ (0.05) which means it is proven that the null hypothesis (H0) was rejected. It can be concluded, at the 95% confidence level between the three portfolio performance gauges, that there was a correlation. This means that there was consistency in measuring the performance of the stock portfolio.

Conclusion

Based on the discussion above, there were several conclusions obtained from the 'Best-Beta CAPM Optimal Portfolio Performance Analysis (BCAPM) using the EROV, Sortino, and M2 Methods for the period 1 October 2014 – 31 August 2017, including:

1. The optimal portfolio obtained was portfolio C (consisting of 2 (two) stocks that have the highest return with a proportion of 95% UNTR shares and 5% AKRA shares. The return portfolio C was 0.008186903 and risk was 0.00066185.

2. Portfolio performance measurement using EROV, Sortino, and M2 methods has consistency in measuring stock portfolio performance at a 95% confidence level.

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