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Optimal Portfolios With Smart Beta, Alpha, Diversification, And Var On Horizon Indonesia's Stock Exchange

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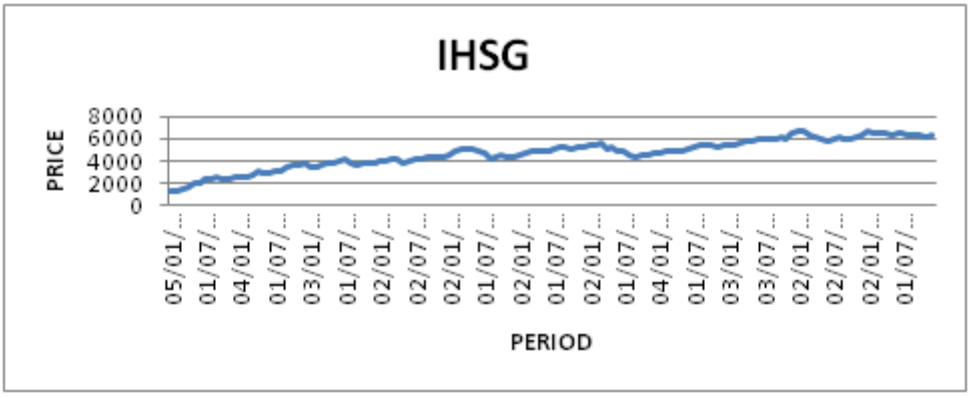
Abstract - Portfolios are one way of investing with a merger of several investment instruments within a portfolio group. Portfolio for the first time introduced by Markowitz (1952). Then theories began to be studied a lot by researchers that produced a lot of discoveries, in portfolio theory, there's the variable in diversification where this theory can suppress the level of risk that arises in an investment with a particular rate of return. This study adds variables used by Cazalet al (2014) where it adds value at risk variables (var). The study used a useful regression of logistics, finding a formula that produces binary codes 1 and 0, where one return of that stock over the market and zero returns obtained below the market. The formulas generated with the beta, alpha, diversification, and var variables could predict return levels with binary codes 1 and 0 by 72.5 percent, this may help investors to determine shares that have returns on the market to boost investment returns.

Keywords: Alpha, Beta, Diversification, Portfolio, Return, VaR

1. INTRODUCTION

Portfolios are grouping several stocks, bonds, and other types of investments into a useful portfolio maximize returns with a certain degree of risk. Indonesia is now expanding the stock investment indicated by the increase in the joint-stock price index (IHSG) as we can see in the 1st picture.

Figure 1: Price Movements IHSG 2009-2019



Source: Processed data

Based on figure 1 the price movements (IHSG) from 2009-2019, That the price of ihsg tended to increase annually this is due to the growth rate of the stocks recorded in the index. The index indicated that several shares together had been raised in price from the previous day the price of IHSG also went up, and vice versa. With a quick shift in share prices that will benefit investors so investors need to know quickly when to buy stocks and when the

right time to sell them, It would require a portfolio to regulate the proportion of shares to be included in the portfolio.

Portfolio research has been extensively studied by researchers the world over, the first to study it as Harry Markowitz 1952 With the famous journal portfolio selection adding that the purpose of the efficient portfolio is also efficient, diversification is one way to minimize the existing risk levels in an investment. Diversification is also a key factor in the success of optimal portfolio design.

The Markowitz portfolio model can assist investors in calculating what the level of risk and portfolio returns are, but the Markowitz model requires complex covariance calculations if there are large numbers of shares in a portfolio. Portfolio research develops with the emergence of research that supports Markowitz's theory; the development of portfolio theory developed by Willian Sharpe sparked a single index model. The single index model links the calculation of the return of each stock/security to the market return/market index. One of the advantages of the single-index model is beta, which is a measure of the sensitivity of stock returns/securities to the market. Sharpe (1964), Lintner (1965), and Mossin (1969) offer the Capital Asset Pricing Model (CAPM).

CAPM provides a condition where the beta calculation of stocks, bonds, and other investment instruments can be relied upon when the beta based on historical data does not match the current or future real risk, then the CAPM can be said to be less able in making investment decisions, it needs to be calculated another to be used as a benchmark in investment decisions. Some researchers have tested CAPM using econometrics techniques that produce accurate beta such as Scholes and Williams (1977) Dimson (1979), Fowler and Rorke (1983), and Cohen et al (1983).

Every test on the CAPM is formed because of the assumption that the capital market takes place efficiently. In the capital market does not run efficiently where the market is developing fluctuatively and dynamically. Several studies usually use monthly stock return data such as Black et al (1972) and Fama and Macbeth (1973) combining several shares into a portfolio to obtain a minimum level of systematic risk by distributing a maximum number of shares into the portfolio. Then test the regression on each stock, Litzenberger and Ramaswamy (1979) and Gibbons (1982).

Factors other than beta contribute to an increase in stock returns as examined by Basu (1977) suggested that a portfolio that has a low value (P / E ratio) has a higher rate of return than the CAPM calculation, then a high company size is an important factor, Banz (1981) and Reinganum (1981), the market requires a higher return on equity with greater dividend yield, Litzenberger and Reinganum (1979,1982), then Keim (1983) suggests that the returns generated are seasonal. Smart Beta is not only based on the price of the shares discussed, but researcher Davis (2015) examines the big data of the names of those stocks that are actively traded on the stock exchange, then utilizes the active companies included in a portfolio, allowing managers to manage the portfolio passively and Smart Beta strategies based on their weight.

With many researchers reviewing the robustness of CAPM in predicting stocks to be included in portfolios, there are several alternatives offered to strengthen the CAPM theory, such as the Alpha value to be interesting to discuss because normally the alpha value in CAPM is not far from the number zero if the alpha value is not equal to zero then something is less than the CAPM, so further research like Cazalet (2014) uses alpha as a risk premium that is useful as a tool to obtain more accurate risk predictions that are close to reality. The beta return function

is useful as a reduction in volatility, then the alpha return function is used to increase volatility, so when volatility is low, the alpha return is used as a tool aimed at finding high-performing stocks that exceed the market return. The active portfolio model is done by considering the value of Smart Beta in a relatively short/short period, then to feel the high expected return can use the Smart Alpha-model with long-term investment time this model tends to invest passively. Winther and Steenstrup (2016).

Smart Beta Strategy is one of the tools to increase portfolio return or increase diversification within a certain period, some things need to be considered in using the smart beta, first: increasing returns and tackling the level of risk that will arise, second: how long the cycle will be faced in the future -a crisis can be overcome by investors, third: determine the appropriate strategy in making investments to deal with risks that will arise. Marchioni et al (2015).

This study adds that the risk of individual assets can be calculated with variance, but risks that cannot be diversified are called systematic risks, and risks that can be diversified are called unsystematic risks. Risk can be measured from the results of the return or by the roots of the variants. Difference between variant and beta is variant measures the risk of the stock itself, then beta is a slope between stock returns and market returns. Research on the addition of Value-at-Risk (VaR) to measure the risk of market-related declines in various types of investments such as precious metals, oil, and the S&P 500 index diversified Hammoudeh et al (2013), then Cov VaR is also used to measure risk from the bitcoin market Borri (2019). The ability to design a portfolio depends on the exponential function of risk and the interpretation of the investors themselves. Rizal et al (2018). Then Idzorek (2017) explained in the journal Popularity and Asset Pricing describing the development of CAPM starting from rational and irrational investors.

A portfolio usually has the advantage of being able to reduce the level of risk arising from existing assets in the portfolio employing diversification. Research on the effect of diversification can be read in Wanger and Lau (1971) where the greater / greater the number of assets in the portfolio, the standard deviation/portfolio risk will decrease, but the systematic risk cannot be avoided. A highly diversified portfolio has a strong relationship with market risk. Portfolio research was also carried out in Indonesia such as Hendrawan and Salim's (2017) research, where the research made a portfolio design with Tobins'q and PER financial ratios, the result was that the Tobins'q medium portfolio received the highest expected return. EVA, ROE, and ROA ratios are also used in compiling portfolio composition where the highest expected return is found in a low ROE portfolio. Salim (2019). Not only stocks can be included in a portfolio but currencies/currencies such as research Salim et al (2020) merge several developed country currencies and the result is the USD currency against IDR becomes the currency that has the highest expected return and Sharpe performance of the currency used in that study.

This research will focus on the development of the theory of Fama and French (1992) which is considered traditional by researchers such as Cazalet et al (2014), where Cazalet (2014) developed the Fama and Franch theory adding the factor of beta return, alpha return, and diversification return to measure the return of a stock. So this study tries to add Value-at-Risk (VaR) to measure the risk of individual shares. Fogler (1982), Hammoudeh et al (2013), Borri (2019).

Then most portfolio studies use regular regression, so this study offers using Logistic or Ordinal Least Squares (OLS) regression, logistic regression / OLS uses a dummy to see the criteria of variables made in categories 1 and low 1, then logistic regression can predict the

odds of categorical variables, as for the research that conducted logistic regression for portfolio research such as Amihud (1989), Pinder (1996), Christophe (2007), Chen et al (2016), French (2017).

Based on the above phenomena, this study intends to first determine whether the variables beta, alpha, diversification, and VaR affect the expected stock returns, the second knows the ratio of return and risk, where 1 has the expected level of return above the market and 0 is below the market return, the third knows what percentage of accuracy in predicting expected stock returns by using variables beta, alpha, diversification, and VaR, the fourth to know the value of the constants of each variable beta, alpha, diversification, and VaR.

2. LITERATURE REVIEW

2.1 Portfolio

Portfolios are a combination of a group of assets combined into one, portfolio theory itself was introduced by Markowitz (1952) with the well-known journal Portfolio Selection which became the forerunner to optimum portfolio theory which discusses how to select one or more optimum assets that provide the highest return rate with a certain level of risk and the lowest risk with a certain rate of return. Portfolio theory has been used for financial instruments such as stocks and bonds. Portfolio theory is also carried out on physical goods such as capital goods investment budgeting (Capital Budgeting).

2.2 Risk and Return

"Low risk, low return", that's a phrase that is often heard in addition to "high risk, high return" in the investment world, in the investment process, especially in the capital market, the smaller the risk, the return obtained by a small investor as well and vice versa. A risk is a form of uncertainty about a situation that will occur in the future with decisions taken based on various considerations at this time. Risks in making investment decisions always try to minimize the various risks that arise.

The risk can be calculated using the root variant which can be called the standard deviation. Variance is one of the techniques in subjective probability sampling where the variance is the average of the mean squared error while the mean square error is obtained from the sum of the squares of the difference between Ri and the average of all results. The error of the average square is multiplied by the probability that is pi which is then added up. Weston and Copeland (1995: 433)

The level of risk in a portfolio is different from the risk of individual shares, if the shares are only one, the level of risk / single variant and is high and different from if several shares that have many different risks then the risk will be diversified and tend to decrease by itself.

2.3 Diversification

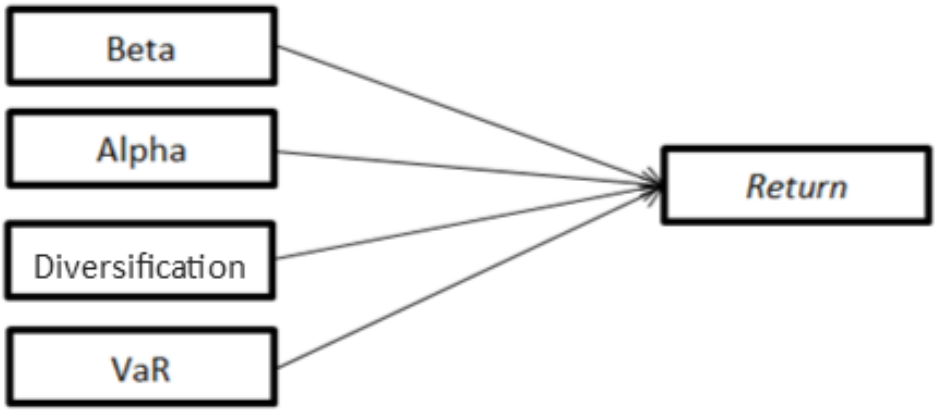
Diversification is carried out by Markowitz in which the combination of several assets into a portfolio that has a positive correlation with the aim of reducing the risk (variant) that will arise when the asset stands alone without reducing the returns obtained by each of these assets. A well-diversified portfolio will have a high correlation with the market in terms of risk, there is a part of the risk that can be eliminated by diversification, namely unsystematic risk and then there is the risk that cannot be diversified, namely systematic risk or market-related risk. By the way, non-systematic risk can be eliminated by diversification, investors only focus on the systematic risk that cannot be eliminated by diversification. Weston and Copeland (1995:456)

2.4 Framework

Changes in shares in a portfolio need to be done quickly so it needs the right formula to help investors in exchanging proportions in the portfolio, then this journal will discuss portfolio trading using the smart beta, alpha, diversification and VaR.

This study will design a portfolio that will exchange periodically for 3 months and will choose consistent stock returns obtained above the market (IHSG). Before making stock selection into a portfolio, logistic regression will be needed to look for constant values on each variable that produces binary value 1 is high which means the stock return is above the market then 0 the stock return is below the market return.

Figure 2: Framework



Source: processed data

Portfolios have been widely studied by previous researchers, so this research will add to the realm of research by introducing portfolio design with Smart beta, alpha, diversification, and VaR can design optimal portfolios, where optimal means having maximum return with a certain level of risk. This study will perform logistic regression calculations that produce constant values of each variable beta, alpha, diversification, and VaR, then will design an optimal portfolio with beta quantities, alpha, diversification, and VaR multiplied by constants so that the resulting binary code 1 and 0 where the number 1 return obtained by these shares is above the JCI market return, then 0 stock returns are below the JCI market return. Then this research will produce what percentage (%) accuracy to predict the level of return that will be obtained from the product of the constant value with the value of each independent variable.

3. RESEARCH METHODOLOGY

This research is included in quantitative research using stock returns. The population and sample used are all companies that have been listed on the BEI before January 2009, amounting to 353 companies/shares. The data used include monthly stock prices, IHSG prices, and risk-free (BI REPO) originating from Bank Indonesia from January 2009 to December 2019.

Counting return on the stocks/ IHSG

$$Ri = (Pt - P1)/P1 \quad (3.1)$$

R_i= Return stock /IHSG

P_t = Closing Price sell stock /IHSG day$_t$

P_1 = Closing Price sell stock /IHSG the previous day (t-1)

Calculate expected return E (R_i) from each stock and IHSG

$E(Ri) = \sum Ri/n$.....(3.2)

E (Ri) = return expected stock /IHSG

$\sum$ Ri = Number of shares /IHSG in a period

n = total number of periods

Calculate risk with variance (σ_{i^2}) from each share /IHSG

$\sigma^2 = \sum_{i=1}^{n} \frac{(R_{it} - E(R_i))^2}{n}$.....(3.3)

Standard deviation

$\sigma = \sqrt{\sigma^2}$.....(3.4)

σ^2 = stock return variance /IHSG i

R_{it} = return stock/IHSG i on day to t

E (R_i) = expected return stock/ IHSG i

n = number of observation days

Calculate Beta (β_i) and Alpha (α_i) each share.

Beta :

$\beta_i = \frac{\sigma_{im}}{\sigma_{m^2}}$.....(3.5)

β_i = Beta stock

σ_{im} = Covariance return between i-securities and market returns

σ_{m^2} = Varians return market

Alpha :

$\alpha_i = E(R_i) - \beta_i . E(R_m)$.....(3.6)

α_i = Alpha stock

$E(R_i)$ = expected return from stock investments i

β_i = Beta sekuritas ke-i

$E(R_m)$ = expected return market

Logistic Regression Model used:

$(R_i - R_F) = Ri_\beta + Ri_\alpha + Ri_d + Ri_{var} + \in$.....(3.7)

$Li = \frac{Pi}{1+Pi} = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4$.....(3.8)

Information:

P is the predicted probability formed from the dependent variable (Y)

P= One (1) is stock returns above-market returns

P= Xero (0) is stock returns below-market returns

$\beta 0, \beta 1, \beta 2, \beta 3X3, \beta 4$is a logistic regression constant that will be multiplied by the variable x consisting of:

X1= Return Beta

X2= Return Alpha

X3= Return Diversification

X4= Return Variance

Logistic regression has a requirement, one of which is the Hosmer and Lemeshow test where this test is useful to find out whether the data used is feasible to use and can be continued to the next Logistic regression test. The following are the terms of the Hosmer and Lemeshow test:

If the statistical value is ≤ 0.05, then the zero hypothesis is rejected, meaning the model is not able to predict the value of the observations or match the data.

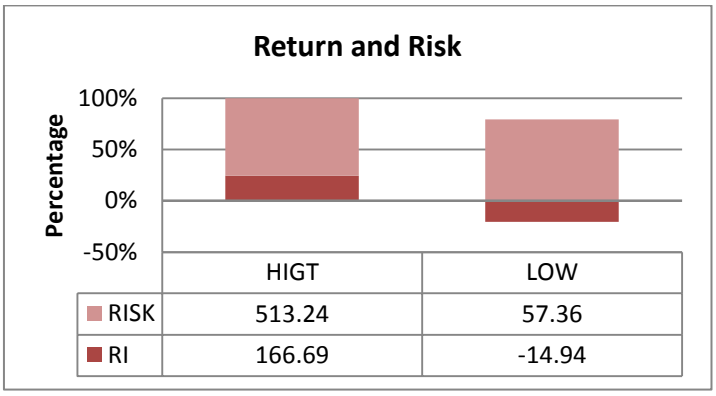
If the value is ≥ 0.05, then the zero hypothesis is accepted, meaning that the model can predict its observation value or match the data.

4. RESULTS AND DISCUSSION

Portfolio design is done to maximize return with a certain level of risk. This study offers a portfolio using the variables Beta, Alpha, Diversification, and VaR, then the variable is tested by logistic regression which is useful for getting constants for each dependent variable, then it is expected to produce accurate predictions with the results of binary number 1 calculation and 0, result 1 means that the stock/portfolio has a level of return that exceeds the market (IHSG) and then 0 stock/portfolio return is obtained below the market return (IHSG).

The portfolio offered is a portfolio that is calculated the level of return and risk every 3 months during the study period, in Picture 3 can be seen the amount of total return and risk obtained.

Picture 3: *Return and Risk*



Source: processed data

It is known that the results of the total return and risk of the portfolio from 2009-2019, that the highest return obtained by a portfolio consisting of stocks that have a rate of return above the IHSG market is symbolized by binary code 1 (high) with a return level of 166.69 and a risk level of 513.24, then a portfolio consisting of stocks that have below-market returns with a binary code of 0 (low) has a total return of -14.94 with a risk level of 57.36. These results prove that a good portfolio should have several stocks with a rate of return above the market return, not only that periodic composition of shares must be considered regularly to avoid losses for investors, for example when buying shares at the beginning of an investment with the code AAAA with a price of Rp 1100 then after 3 months later the price becomes Rp 1250 and 4 months later the price becomes Rp 1000, then investors are advised to sell for Rp 1250 then the investor has a capital gain of Rp 150 when selling the stock for Rp 1250, and if the investor does not regularly evaluate the portfolio composition, the investor will suffer a loss of Rp 100 in the 4th month, so the importance of evaluating investments is one of them by evaluating the portfolio regularly. This study offers constant values with Beta, Alpha, Diversification, and VaR variables which will be presented at the end of this reading.

Furthermore, it will be entered into a logistic regression test which is useful for knowing the optimal portfolio model with Beta, Alpha, Diversification, and VaR variables, the first time a Hosmer and Lemeshow data test will be performed which can be seen in Table 1:

Table 1: Test Hosmer and Lemeshow

Period	Test Hosmer and Lemeshow
3 Month	0.055

Source: processed data

The data used is feasible to perform logistic regression as evidenced by the results of the Hosmer and Lemeshow Test where the value of Hosmer and Lemeshow is 0.055 greater with an Alpha level of 0.05. Next, we will continue with the Log-Likelihood -2 test in Table 2:

Table 2: -2 Log Likelihood

Period	-2 Log-likelihood of early	-2 Log likelihood end	Difference	Chi-square Table Df 0.05;3
3 Month	447.033	388.097	58.936	7.81

Source: processed data

The value of -2 Log-Likelihood from the beginning to the end proves that the inclusion of independent variables in the model can improve the model, then coupled with a calculated Chi-Square value of 58,936 greater than the Chi-Square value of 7.81 proves that the inclusion of the independent variable can improve the portfolio model optimally. Next, we will discuss how accurately the model can predict binary values 1 and 0 for the optimal portfolio which can be seen in Table 3.

Table 3: Portfolio Predictions

Period	Early Prediction	End Prediction
3 Month	67.1 %	72.5 %

Source: processed data

Before entering the independent variable into the model, a prediction rate of 67.1% was obtained, then after the inclusion of the independent variable in the model, the prediction rate increased by 72.5%. This result proves that the inclusion of the independent variable can add a prediction result of 5.4%. The results in Table 3 illustrate that designing a portfolio with variables Beta, Alpha, Diversification, and VaR, can produce binary codes 1 and 0 with an accuracy of 72.5%. Then it will be continued with partial and simultaneous tests on each independent variable Beta, Alpha, Diversification, and VaR, and the dependent variable stock returns

Table 4: Partial and Simultaneous Test Results

Period	Partial								Simultaneously
	X1		X2		X3		X4		
3 Month	0.75	Push	0.000	Accept	0.000	Accept	0.093	Push	0.214

Source: processed data

The variable X2 Alpha and X3 diversification are influential in this study, the variable X2 Alpha is influential because stocks that have a positive alpha value above one (1) then the stock return exceeds the market return that is what you want to achieve to create an optimal portfolio, then X3 Diversification is a factor which cannot be released from the portfolio. Diversification is used as a determination of the composition of how% of a share will be included in the portfolio of the number of shares/assets in a portfolio. In the simultaneous test, it is known that all variables affect the return of 21.4% and the rest are explained by other factors not explained in this study. Next, discuss the core of the research is the optimal portfolio logistic regression model which will find the value of the constants of each variable that can be seen by the Optimal Portfolio logistic regression models.

The optimal regression logistics model

$$Rm - Rf = \frac{e^{-0.182887+0.042754X1+0.259152X2+57.866531X3+0.720669X4}}{1+e^{-0.182887+0.042754X1+0.259152X2+57.866531X3+0.720669X4}}$$

A logistic regression model is known where the value of the portfolio model constant is -0.182887 then 0.042754X1 +0.259152X2 +57.866531X3 +0.720669X4. These results will be a benchmark for investors in making quick calculations to determine whether the stock has a rate of return above the IHSG market with binary code 1 or a level of return below the market with binary code 0. Investors are only looking for the value of each variable Beta, Alpha, Diversification, and Var for shares to be included in the portfolio, then multiplied by the constant value of each variable

5. CONCLUSION

Investor certainly does not want a losing investment so need for a formula that can make it easier to calculate whether the shares are worthy of being included in the portfolio. This study has the results of calculations with formulas that produce binary code 1 which means that the stock has a level of return above the market with a certain level of risk then binary code 0 which means the return obtained under the market.

This research concludes that stock returns with portfolios with stock composition with binary code 1 High have a high level of return with a certain level of risk, and portfolios with binary code composition 0 have a negative rate of return because the returns of stocks that have binary code 0 have returned under the market there are even a number of these stocks get negative returns so that makes the portfolio get a negative return.

Then the accuracy of the model in predicting stock returns with binary codes 1 and 0 of 72.5%, then the variable Alpha x2, and Diversification x3 has a significant influence in predicting stock returns, a simultaneous test of all variables that 21.4% can be explained by the variables Beta, Alpha, Diversification, and VaR and the remaining variables/factors not explained in this study. The results of this study can be taken into consideration for investors who will invest in shares using the formula offered. Then for the development of science, especially investment science and this research portfolio offers further researchers to examine for the improvement of the accuracy of prediction results, then look for ways to improve the simultaneous test on the four variables in this study.

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