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OPTIMAL STOCK PORTFOLIO ISSUERS OF BUILDING CONSTRUCTION REGISTERED IN LQ45 BASED ON THE MARKOWITZ APPROACH

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ABSTRACT

Increased construction industry and accelerated infrastructure programs drive economic development globally and open opportunities for investors in the capital market. Rational investors will choose investments that provide maximum returns with certain risks, or otherwise certain returns with minimal risk, depending on individual investors' preferences. To minimize risk, one of the methods used is to form a portfolio. The purpose of this study was to find out how to assess the optimal portfolio of shares for building construction companies using the Markowitz approach. The data in this study are secondary based on daily stock prices obtained from the IDX during the period February 2018 to July 2018. The research method used is descriptive, quantitative research. The number of samples used is four issuers, with saturated sampling techniques. The analytical tool used to assess the optimal portfolio is the Markowitz model, and its data is processed using Microsoft Excel. The results showed that an efficient two-share portfolio was found in the combination of ADHI and WIKA issuers, an efficient three-share portfolio was found in a combination of ADHI, WIKA and WSKT issuers, and four-share portfolio alternatives for optimal portfolios were formed by a combination of ADHI issuers, PTPP, WIKA, and WSKT, which together produce the lowest risk level.

Contribution/Originality: The study is one of very few that have investigated optimal portfolio formation from one sector, namely building construction, and registered in the LQ45 Index with the Markowitz approach.

1. INTRODUCTION

The value of the construction sector depends on the work realization of projects completed within a quarterly period. The construction value index for the first quarter of 2014 until the fourth quarter of 2017 shows results that fluctuate with a tendency to increase. The fluctuations in the construction value index completed by the construction sector in Indonesia are shown in Figure 1:

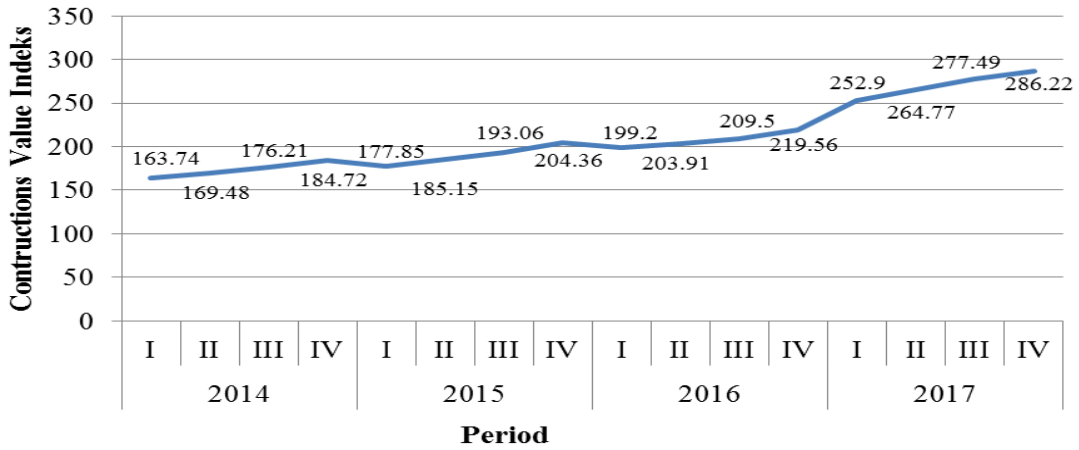

Figure-1. Value Contructuin Index Period (quarterly).

Source: Data processed.

Construction sector activities are a driving force in economic development. Provision of facilities and infrastructure can encourage other economic sectors. However, investment in the construction sector still has not shown a significant increase. During the period of 2014-2017, the conditions and business prospects of many entrepreneurs in the progress of the construction sector were generally more optimistic. The level of fluctuations that occurred in the business index value, business prospects and business problems are shown in Figure 2:

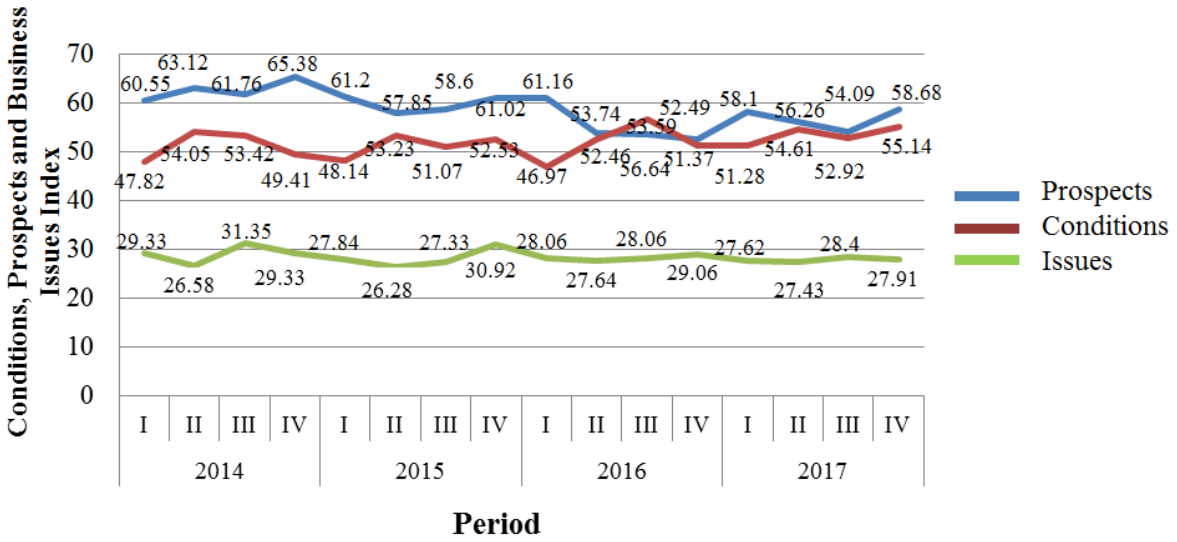

Figure-2. Conditions, Prospects and Business Issues Index (quarterly).

Source: Data processed.

Economic progress and setbacks have direct implications for the performance of this sector. The capitalization value of the construction sector continues to increase from year to year. The increasing stretch of the construction industry in the private sector and the accelerated infrastructure program launched by the government caused a trend of increasing capitalization value in this sector from year to year. It has now become the second largest construction market in Asia after China according to the Director-General of Construction Development (Andriani and Amelia, 2017). Construction companies are very promising for investors, but in reality there are still many investors who are still in the early stages of building their investment portfolios who do not take into account the possible risks and returns of their portfolios in advance.

Fabozzi's research states that investment analysis often faces the problem of assessing the risks faced by investors. Rational investors will invest their funds by choosing efficient stocks, which provide maximum returns with certain risks, or certain returns with minimal risk (Pardosi and Wijayanto, 2015). One that affects the increase

and decrease in stock prices is demand and supply. In accordance with the law of demand, if a certain company's stock is in demand by investors, it will increase the share price of the company, and *vice versa* (Firdaus *et al*., 2018).

The transaction intensity of each security in the capital market varies. Some securities have a very high frequency and are actively traded in the capital market. Some other have relatively little transactional frequency and tend to be passive. This has led to the development and level of liquidity of the IDX Composite to be less reflective of the real conditions that have occurred on the stock exchange. In Indonesia the problem is solved by using the LQ45 index. The LQ45 index consists of 45 shares on the IDX with high liquidity and large market capitalization, and passes selection according to several selection criteria. Based on this description of the background, the issues this study addresses are:

1. How to form an efficient alternative portfolio of two stocks;
2. How to form an efficient alternative stock portfolio; and
3. How to form an alternative portfolio of four efficient stocks; and
4. Which portfolio alternative results in optimal investment?

The ultimate aims of this study are to discover:

1. An alternative portfolio of two efficient stocks;
2. An efficient three-share portfolio alternative;
3. An efficient four-stock portfolio alternative; and
4. A portfolio alternative that produces optimal investment.

2. LITERATURE REVIEW

Investment. Investment is a commitment of money or other resources in the expectation of reaping future benefits (Bodie *et al*., 2014). Investment can be defined as a delay in consumption now to be included in productive assets for a certain period of time (Hartono, 2017). There are several reasons why individuals invests (Tandelilin, 2010):

1. To improve standard of living;
2. To reducing the impact of inflation; and
3. As an incentive to reduce the level of taxation.

There are five stages of investment decisions (Tandelilin, 2010):

1. Determination of investment objectives;
2. Determination of investment policies;
3. Selection of portfolio strategy;
4. Selection of assets; and
5. Measurement and evaluation of portfolio performance.

Capital market instruments in a practical context are more commonly known as securities. They are financial assets that declare financial claims. Capital Market Law No. 8 of 1995 defines securities as debt instruments, commercial securities, shares, bonds, debt-proof collective investments, participation units, futures contracts for securities, and any derivatives of securities (Tandelilin, 2010).

Return and Risk of Investment. According to R.J Shook, a return is an investment profit, either through interest or dividends (Fahmi, 2015). According to Raharjo, risk is the level of potential loss that arises because the expected return on investment is not in line with expectations (Fahmi, 2015). If it is associated with investor preferences for risk, then the risk can be divided into three, namely (Halim, 2005):

1. Investors who like risk or risk seekers
2. Risk-neutral investors
3. Investors who do not like risk or avoid risk

In general, the forms of risk and return relationships are as follows (Fahmi, 2015):

1. It is linear or in the same direction or the higher the return, the higher the risk; or
2. The greater the asset we place in the investment decision, the greater the risk arising from the investment.

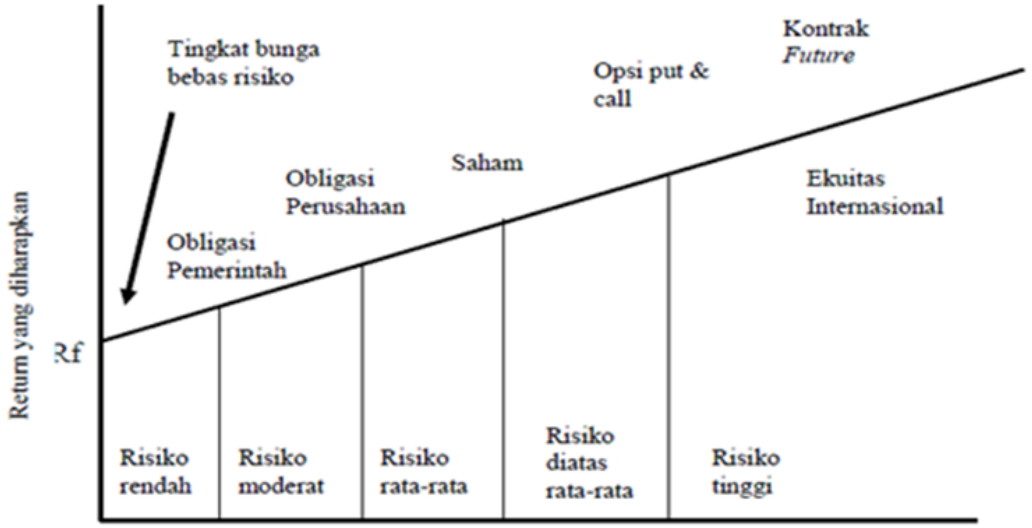

Figure-3. Relationship Return and Expected Risk.

Source: Fahmi (2015).

From Figure 3, it can be seen that the lowest risk is the one closest to RF (risk free), and the highest risk is in the position of contract "futures" and international equity. If carefully considered, the low risk occurs because the protection for low risk efforts has been applied very well. The greater the reserve (reserve) owned by an institution, the greater the ability of the institution to guarantee risk-free status.

Portfolio. The portfolio theory proposed by Herry Markowitz is, put simply, "Don't put all your eggs in one basketball." The concept of this theory is known as investment diversification, or investing that is not focused on one field, but rather on a portfolio as a collection of financial assets in a unit held or made by an investor, investment company, or financial institution (Fahmi, 2015) (Hartono, 2017). There are many possible portfolios that can be formed from the combination of risk assets available in the market. If there is the possibility of an unlimited number of portfolios, the question that arises is, "which will investors choose?" If the investor is rational, it is presumed they will choose the optimal portfolio (Hartono, 2017). To determine the optimal portfolio, it is first necessary to determine an efficient portfolio.

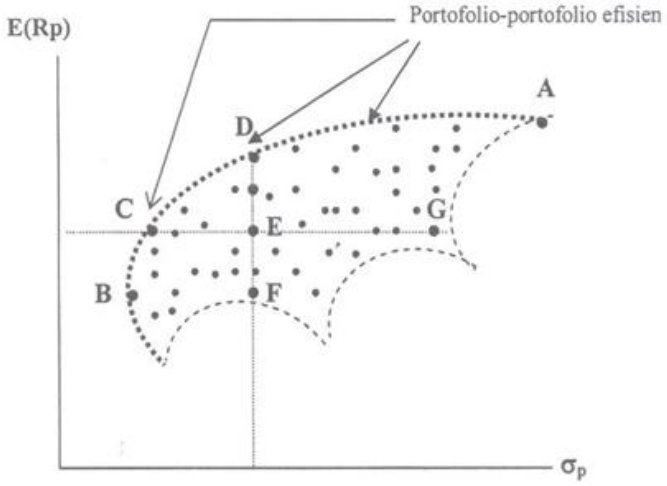

Figure-4. Efficient Portfolios.

Source: Hartono (2017).

From Figure 4, investors will choose portfolio D compared to portfolio E or portfolio F. Portfolio E is better than portfolio F and portfolio D is better than portfolio E, because with the same risk, the expected return of portfolio D is higher than the expected return of portfolios E or F. Thus, portfolio D is an efficient portfolio. In the same way it can also be explained that portfolio C is better than portfolio E or portfolio G. Portfolio E is better than portfolio G and portfolio C is better than portfolio E, because with the same expected return, the portfolio risk of C is smaller than risk of E or G. Thus, portfolio C is an efficient portfolio. In the same way, it can be determined that the points on curves A through B will contain efficient portfolios.

Return and Risk of Portfolio. The portfolio realization return (PRR) is the weighted average of the return on realization of each single security in the portfolio. By contrast, portfolio expected return (PER) is the weighted average of the expected return of each single security in the portfolio (Hartono, 2017). Unlike portfolio returns which are the weighted average of all single securities returns, portfolio risk is not a weighted average of all single security risks (Hartono, 2017).

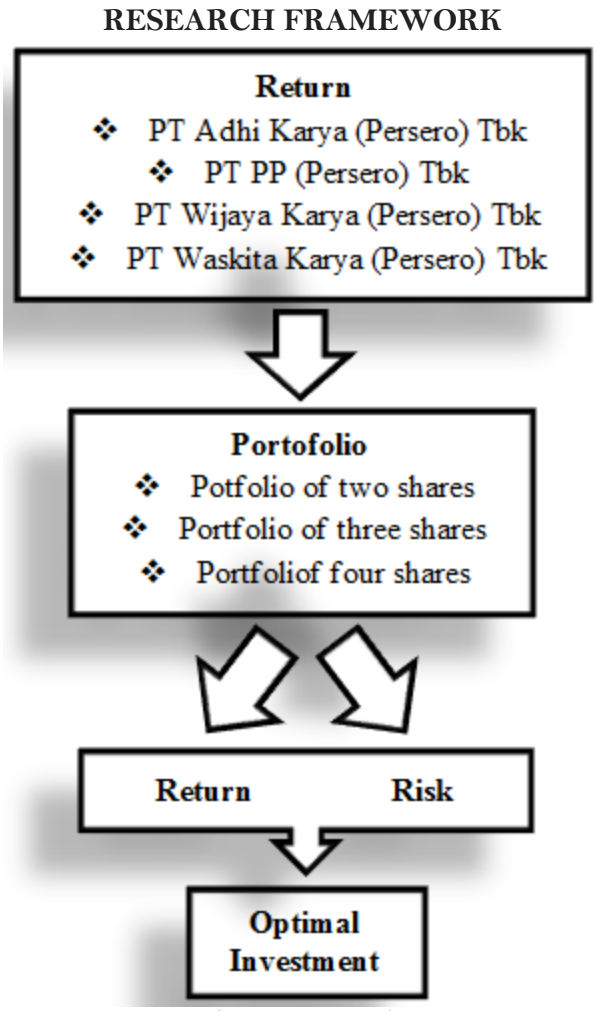

Figure-5. Framework.
Source: Data Processed.

Framework. From Figure 5 can be seen the latest conditions regarding investment in the developing construction sector which can provide opportunities and incentives for investors to invest. Considering that in economics shares have the character "high risk, high return", investing in them entails greater risk than other instruments. A portfolio is one way that is used to reduce the level of risk. The choice of each asset that will be combined in the portfolio must have different proportions. The determination of proportions here is based on the ratio of the best companies, such as Return On Equity (ROE), Earning per Share (EPS) and Book Value (BV).

Portfolio selection uses the optimal portfolio concept, the smallest risk of the Markowitz model. Markowitz considers that the optimal portfolio chosen by investors is in the efficient set. Every investor's preference for portfolios will be different because they have different utility functions, so that the optimal portfolio for each investor can also be different. Investor utility also reflects investors' response to risk.

3. RESEARCH METHODOLOGY

Types of Research. The research used in this study belongs to the quantitative descriptive category. According to Sugiyono (2014) quantitative research methods can be interpreted as research methods based on the philosophy of positivism, used to examine certain populations or samples. Sampling techniques are generally done randomly. Data collection uses research instruments, quantitative data analysis / statistics with the aim of testing a predetermined hypothesis. Descriptive methods are to describe the problems that occur at this time so that the benefits of research can be used now and in the future.

Operational Definition and Variable Measurement. Return variables calculate the expected return from a security. Risk variables calculate the risk level of a security

Population and Samples. This study uses a population of building construction sector companies that are in LQ45 stocks in the February 2018 period. This study uses a saturated sampling technique. A saturated sampling technique is where all members are used as samples.

Method of Collecting Data. The data collection technique used is the documentation method. The data used in this study are secondary data obtained by the authors of the documents that support this research.

Analysis Method. This stage is a very important and decisive stage in research. Data analysis techniques in quantitative research use statistics. In this study the existing data is processed with a computerized system that uses Microsoft Excel.

	Individual	Portfolio
Return	$E(R)=\frac{\sum(R_i)}{n-1}$	$E(Rp)=\sum_{i=1}^{n}[w_i \cdot E(R_i)]$
Risk	$\sigma=\sqrt{\frac{\sum[R_i-E(R_i)]^2}{n-1}}$	$\sqrt{Var(Rp)}=\sigma_p=\sqrt{i^2\cdot\sigma_i^2+j^2\cdot\sigma_j^2+2\cdot i\cdot j\cdot Cov(R_i,R_j)}$

Schedule for Implementation of Thesis Preparation. The study was conducted by collecting historical data from the daily share price of the building construction sector from February to July 2018, sourced from the Indonesia Stock Exchange.

4. RESULT AND DISCUSSION

Table-1. Covariance Calculations.

COVARIACES ($\sigma_{i,j}$)				
Shares	**ADHI**	**PTPP**	**WIKA**	**WSKT**
ADHI	0,00042	0,00031	0,00028	0,00030
PTPP	0,00031	0,00107	0,00056	0,00056
WIKA	0,00028	0,00056	0,00068	0,00052
WSKT	0,0003	0,00056	0,00052	0,00071

Source: Data processed (2018).

From Table 1, Covariance is a measurement that shows the direction of movement of the return values of two assets. Covariance is needed by investors in determining the composition of assets in order to get optimal investment. The overall covariant value is positive, with the largest covariance generated from the PTPP issuer

with WSKT, which is equal to 0,00056, while the smallest covariance value is generated from the ADHI issuer with WIKA which is equal to 0,00028.

Table-2. Correlation Calculation.

CORRELATION($\rho_{i,j}$)				
Shares	**ADHI**	**PTPP**	**WIKA**	**WSKT**
ADHI	1,00000	0,47239	0,53600	0,55202
PTPP	0,47239	1,00000	0,65933	0,64778
WIKA	0,53600	0,65933	1,00000	0,75667
WSKT	0,55202	0,64778	0,75667	1,00000

Source: Data processed (2018).

From Table 2, The correlation coefficient shows the magnitude of the relationship between the movement of two assets to each deviation. The overall correlation coefficient produced is positive with the largest correlation coefficient generated from the WIKA issuer with WSKT which is equal to 0.75667, while the smallest correlation coefficient is produced by the issuer ADHI with PTPP which is equal to 0.47239.

Overall, the level of expected return generated is negative. Even though the four issuers produce negative expectant returns, WSKT issuers have the smallest negative return of -0.214 percent, while the largest negative return on expectations is on PTPP issuers, which is -0.297percent. It can be interpreted that the PTPP emitter is very risky compared to other issuers, therefore investors must be observant in placing the proportion on each share of their choice.

Table-3. Portfolio Calculation.

Portfolio		σ_P	$E(R_P)$	**Cv**
ADHI		0,02039	-0,00262	-7,77405
PTPP		0,03264	-0,00297	-10,9833
WIKA		0,02602	-0,00219	-11,8553
WSKT		0,02660	-0,00214	-12,4511
(AP1)	ADHI, PTPP	0,02010	-0,00266	-7,56279
(AP2)	ADHI, WIKA	0,01957	-0,00252	-7,77709
(AP3)	ADHI, WSKT	0,01976	-0,00250	-7,89925
(AP4)	PTPP, WIKA	0,02561	-0,00231	-11,0806
(AP5)	PTPP, WSKT	0,02599	-0,00230	-11,2828
(AP6)	WIKA, WSKT	0,02465	-0,00217	-11,3645
(AP7)	ADHI, PTPP, WIKA	0,01610	-0,00260	-6,20459
(AP8)	ADHI, PTPP, WSKT	0,01597	-0,00253	-6,30282
(AP9)	ADHI, WIKA, WSKT	0,01464	-0,00230	-6,35758
(AP10)	PTPP, WIKA, WSKT	0,01680	-0,00240	-6,9844
(AP11)	ADHI, PTPP, WIKA, WSKT	0,01370	-0,00248	-5,52155

Source: Data processed (2018).

The calculation of the expected return of each issuer in Table 3 produces a negative return expectation value with varying levels of risk. This happens because the level of profit of individual stocks fluctuates with a downward trend. The results of the calculation of returns and risks cannot be separated from the influence of the macro and micro-economic conditions of the company. Non-systematic risk can be eliminated by diversifying assets in a portfolio, but not so with systematic risk. The picture of the Indonesian economy during the research period, which has still not improved, has a major influence on the investment climate in Indonesia, especially regarding stocks. Risks from Indonesia's economic conditions in portfolios are called systematic risks that cannot be eliminated by diversification (Oktaviani and Andi, 2016).

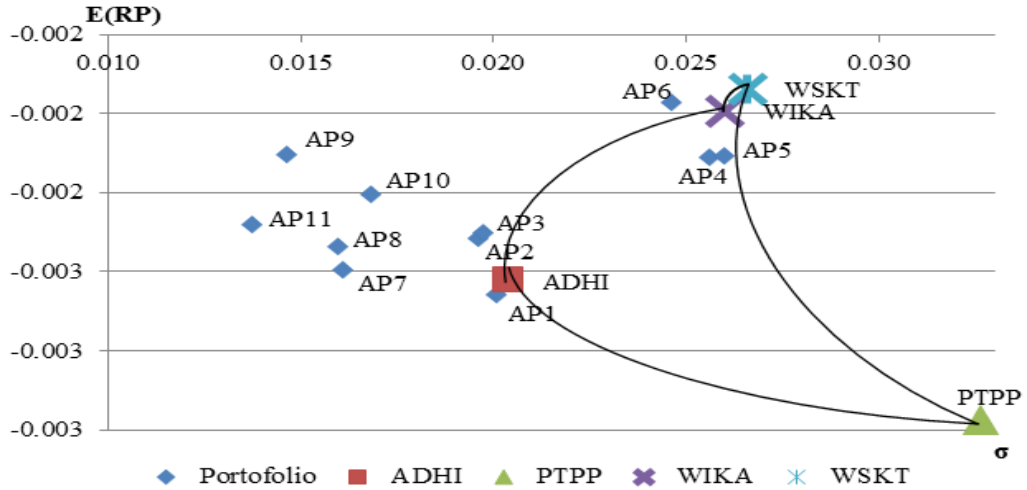

Figure-6. Portfolio Optimal.

Source: Data Processed.

From Figure 6, he selection of the optimal portfolio in this study is based on the optimal portfolio of the smallest risk of the Markowitz model, that is:

(1) An efficient portfolio of a combination of two assets based on the model, namely in Alternative Portfolio 2 (AP2), which is a combination of issuers ADHI and WIKA which produces a risk level of 1.957 percent with an expected return of -0.252 percent. The results of this study are in line with those of Astuti and Sugiharto (2005) who conducted research on the plastics and packaging industry. They found that portfolios with a combination of two shares (PT Argha Karya Prima Industri Tbk and PT Berlina Tbk) were efficient portfolios.

(2) An efficient portfolio of a combination of three assets based on the model, namely in Alternative Portfolio 9 (AP9), which is a combination of issuers ADHI, WIKA, and WSKT which produce a risk level of 1.464 percent with an expected return of -0.230. The results of this study are in line with Yuniarti (2010) who conducted research on the banking industry and found that the optimal three-share portfolio was a combination of 58.15 percent BBRI, 23.72 percent BBCA, and 18.13 percent BBNI. This combination would result in a maximum return and a minimum level of risk compared to the seven (7) shares sample in this paper.

(3) An efficient portfolio of a combination of four assets based on the model, namely in Alternative Portfolio 11 (AP11), a combination of four selected samples, *viz*, ADHI, PTPP, WIKA, and WIKA issuers which produce a risk level of 1,370 percent with an expected return of -0,248 percent. The results of this study are in line with Afriana *et al.* (2017) who conducted research on the LQ45 Index and found that the optimal portfolio value is the smallest standard deviation value between other combinations. The level of risk generated was 1.44 percent formed from a combination of BBNI shares (30 percent), PWON (15 percent), PTBA (5 percent), and KLBF (50 percent).

(4) Of all the efficient portfolios per share combination above, the optimal in the building construction sector has a combination of four shares, namely ADHI, PTPP, WIKA and WSKT issuers. In the proportion of funds to each issuer, a uniform of level of 25 percent produces the smallest risk equal to 1,370 percent with an expected return of -0,248 percent. These results are in line with Prabowo (2013) who examined the LQ45 Index and found that, based on the CAPM analysis and Markowitz Portfolio, the most profitable stocks to invest were UNTR, SMCB, ASII, INDF, and BBRI shares which produced the smallest risk is at 0.8831 percent with an expected return of 0.3027 percent.

5. CONCLUSIONS AND SUGGESTIONS

5.1. Conclusions

1. An efficient alternative portfolio of two shares is a combination of ADHI and WIKA (Alternative Portfolio 2) with weights of 75 percent and 25 percent respectively. This alternative portfolio produces a risk level of 1.957 percent with an expected return of -0.252 percent.
2. An efficient alternative portfolio of three shares is a combination of ADHI, WIKA, and WSKT (Alternative Portfolio 9) with weights of 30 percent, 35 percent and 35 percent respectively. This alternative portfolio produces a risk level of 1.464 percent with an expected return of -0.230 percent.
3. An efficient alternative portfolio of four shares is a combination of ADHI, PTPP, WIKA, and WSKT issuers with a balanced weight of 25 per cent. This alternative portfolio produces a risk level of 1.370 percent with an expected return of -0.248 percent.
4. An optimal portfolio from building construction issuers is an alternative four-stock portfolio consisting of ADHI, PTPP, WIKA, and WSKT issuers with the same proportion for each issuer (25 percent. The level of risk generated is 1.370 percent and the expected return -0.248 percent.

5.2. Suggestions

1. For investors interested in stocks, especially those in the construction and building sectors, it is recommended they invest in accordance with the optimal portfolio formed from ADHI, PTPP, WIKA, and WSKT with proportions the same for each issuer (25 percent). This portfolio produces a risk level of 1.370 percent with an expected return of -0.248 percent
2. Investors should also consider other factors that can affect future stock prices. A company's financial performance alone is not the only consideration.
3. Stocks that are used as populations or samples in this study are entirely those of building construction sub-sector companies. Further research by investors is recommended to determine the level and proportion of investment across various sectors to create the optimal portfolio.
4. This study finds that the optimal portfolio is formed from four SOE shares. Future researchers should consider the number and type of companies sampled so that results are more representative.
5. The Markowitz model is recommended for future research.

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REFERENCES

Afriana, T., Tarno and Sugito, 2017. Analysis of portfolio formation in companies registered in LQ45 with the Markowitz method approach using Gui Matlab. Gaussian Journal, 4(2): 251-260.

Andriani, G.A. and S. Amelia, 2017. Construction in figures 2017. Jakarta: Central Statistics Agency.

Astuti, D. and T. Sugiharto, 2005. Analysis of optimal portfolio formation in plastics and packaging industry companies listed on the Jakarta stock exchange case study (1999-2003). Proceeding, PESAT 2005. National Seminar.

Bodie, Z., A. Kane and J.M. Alan, 2014. Investments. 10th Edn., USA: McGraw-Hill, Inc.

Fahmi, I., 2015. Introduction to portfolio theory and investment analysis: Theory and question answer. Bandung: Alfabeta.

Firdaus, I., A. Sri and N. Fitri, 2018. Optimal analysis formation portfolio using a single index model. Economic Journal, 23(2): 203-225.

Halim, A., 2005. Investment analysis. Jakarta: Salemba Empat.

Hartono, J., 2017. Portfolio theory and investment analysis. Yogyakarta: BPFE.

Oktaviani, B.N. and W. Andi, 2016. Application of the single index model in the formation of the LQ45 optimal stock portfolio and the Jakarta Islamic index. Management Analysis Journal, 4(1): 189-202.

Pardosi, B. and A. Wijayanto, 2015. Analysis of differences in return and risk of optimal portfolio shares with not optimal portfolios. Management Analysis Journal, 1(4): 1-9.

Prabowo, H., 2013. Analysis of stock portfolios using the capm and Markowitz method. Binus Business Review, 4(1): 360-369.

Sugiyono, 2014. Management research methods. 3rd Edn., Bandung: Alfabeta.

Tandelilin, E., 2010. Portfolio and investment. Yogyakarta: Kanisius.

Yuniarti, S., 2010. Establishment of the optimal portfolio of banking shares by using a single index model. Journal of Finance and Banking, 14(3): 456-466.