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Construction Portfolio in Emerging Markets: Indonesia

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Abstract. This research aims to explore equity Portfolio using Elton Gruber, Markowitz, Market Capitalization, Equal Weighted, and Market as Portfolio and Using Stochastic Dominance. Monthly return used for period of 2015 to 2023. Elton Gruber Method is the highest cumulative return from December 2014 until December 2023. Using Safety First for portfolio, the return is varying range of 3.577% to 13.22% that Equal Weighted is the highest return using Roy Criteria. Using First-Order Stochastic Dominance (FSD), Portfolio of Markowitz Method has stochastic dominance comparing to others portfolio. Market Variable has impact for all portfolio return but interest has impact to Equal Weighted and Elton Gruber Method. Pandemic Era have only impact to Markowitz Method.

Keywords: Elton Gruber, Equal Weighted, Market Capitalization, Market Portfolio, Markowitz Method, Stochastic Dominance.

1. INTRODUCTION

Portfolio Equity is still very interesting to be discuss now because stock return could become the biggest return compared to other instrument investment. It helps the fund manager or Investor Performance. Investor and Fund Manager have investment to stock market to have expectation the fund increases sharply in the long term. Beside that Stock markets are getting more and more complicated until today. Investor still expect to have funds under management could achieve their target before they get retired in the future. A portfolio containing a variety of various assets will offer the investor a variety of returns while lowering risk (Galankashi, *et al.*, 2020). It means that investor always seek a good portfolio to achieve target return. The various characteristic stock was used to select stock to become member a portfolio which is Risk and return, excess return to beta, safety first, stochastic dominance and others. Numerous techniques have been created to investigate a portfolio performance that it could achieve their target. Academician did research to set up a good portfolio for investor needs. Markowitz (1952) introduce a good portfolio using risk and return and Quadratic Programming. Elton, et al. (1976, 1977 and 1978) introduced a portfolio that it selects from all stocks using excess return to beta. Then, safety first approach developed by some academician, which is Roy (1952), Kataoka (1963) and Telser (1955). This approach has a certain or special criteria to become member a portfolio. Jones (1992) used network analysis to set up a portfolio. Saaty (1980) developed a model hierarchy portfolio to set up a portfolio. Skewness as a tool to select stock to become a member portfolio discussed by Arditti (1967); Levy (1969), Kraus and Litzenberger (1976) and Manurung et.al (2023a). Porter (1973) discuss Empirical Comparison of Stochastic Dominance and Mean-Variance Portfolio Choice Criteria. McNamara (1998) studies Portfolio Selection Using Stochastic Dominance Criteria. Black and Litterman (1991) proposed an asset allocation based on combining investor view with market equilibrium. Research on the portfolio has been done mostly using Markowitz Model which is Hanif et.al (2021), Balqis (2021), Manurung and Berlian (2004), Manurung (1997a) Manurung (1997b) and Manurung (2002). Manurung et.al (2023a), Manullang et.al (2023) and Manurung et.al (2024a, 2024b) used Markowitz Model, Elton Grubel Model to construct a Portfolio for Indonesian stocks. Manurung et.al (2023a) used skewness methods to select stocks for member a portfolio. McNamara (1998), Alghalith (2011) and Dai et.al (2015) used stochastic dominance for construction portfolio. Bey and Howe (1984) used Gini's Mean Difference for Selection of Portfolios. Based on above explanation, this research wants to construct a portfolio using vary method which is Equal Weighted, Markowitz Method, Elton Gruber, and Market Capitalization. This Research also used Safety Criteria which is Roy Criteria (1952), Kataoka Criteria (1963) and Telser Criteria (1955). Roy, Kataoka and Telser Criteria has different from previous research. Roy, Kataoka and Telser Criteria should have certain return to achieve. Then portfolio return seek factor that affected it that it used macroeconomic variable.

The remainder of this paper is structured as follows. Section 1 goes over the relevant Theoretical background. Section 2 then outlines the methodology. The results are then presented and discussed in Section 3. Finally, in section 4, the conclusions are presented.

2. THEORETICAL REVIEW

Markowitz introduced the Theory of Portfolio in 1952 for the first time to scientific in Finance. The theory focused on risk and return as factors to select instrument of investments such as stock, bond and other to construct in the portfolio optimal. Markowitz (1952) assumed that most investors are cautious and seek to incur the least amount of risk in order to earn the maximum potential return, optimizing the return to risk ratio. Theory of Portfolio develops a framework in which any expected return is composed of various future outcomes and is thus risky, and this risk-return relationship can be optimized through diversification (Kierkegaard, *et al.*,

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2007). The portfolio should meet these two conditions is referred to as an efficient portfolio. Markowitz (1959) stated that No other portfolio will produce a higher return at the same degree of risk. Markowitz (1991) mentioned that If it is possible to increase expected return without increasing risk or decrease risk while maintaining the same level of expected return, a portfolio is inefficient. Markowitz (1952) stated that risk and return could be calculated using Quadratic Programming to estimate the efficient frontier. The efficient frontier is based on the straightforward line risk and return are connected from the smaller to the higher. Kierkegaard, *et al.*, (2007) stated that there may be a technique to calculate the level of risk needed to achieve different levels of return. (Markowitz (1959) stated that the efficient frontier is a trade-off graph with expected return on one axis and risk on the other. All portfolios that optimize expected return for a specific amount of risk are represented by Figure 1. The efficient frontier is just a line drawn from bottom to top, with each point representing the junction of a prospective reward and its matching amount of risk. The portfolio that offers the Optimum return for a specific level of portfolio risk is considered to be the most efficient. Based on Efficient Frontier, it found asset allocation through every combination risk and return.

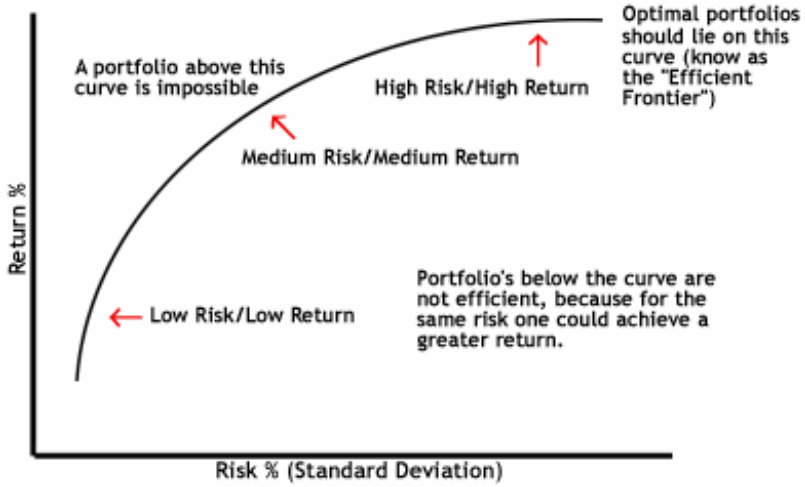


Figure 1: The Efficient Frontier ((Markowitz, 1959).

Figure 1 present that there are no portfolios above the efficient frontier, and all portfolios below the border are subpar compared to those on the frontier, as seen in the above graphic. A separate efficient portfolio is represented by each point on the frontier. The risk and return both rise as one moves from lower left to higher right. Each asset in the whole portfolio needs to be weighted in a specific way in order to produce a tangent portfolio on the efficient frontier. A portfolio with equally distributed fractions of each asset will not provide contact with the efficient frontier if only one asset is used. The weighting process is important for achieving a tangent portfolio on the efficient frontier. There is a portfolio that offers the lowest risk for every level of return and a portfolio that gives the highest return for every level of risk. Any portfolio in the line of the curve is efficient, meaning it provides the optimum expected return for a particular level of risk. Elton, et al. (1976, 1977 and 1978) introduced a construction of portfolio that it selects from all stocks using excess return to beta. Stock that has excess return to beta is higher than a criterion (cut off value), it will become a group portfolio. The Elton, Gruber, and Padberg model is based on stock performance using a reward-to-volatility (RV) approach, which entails dividing excess return by systematic risk. The Instruments are ranked according to their performance ranking, beginning with the highest and working down to the lowest to determine the Optimal Portfolio. Assets with an RV value greater than the cut-off point are included in the optimal portfolio; assets with a lower RV value are not included in the optimal portfolio. The Elton, Gruber, and Padberg model process is broken down into the following steps: a) calculating individual stock performance, or RV = (R - Rf) / β) defining the ranking of individual stock performance based on RV ratings; c) deciding the cut-off point; select the highest cut-off point (C*); d) deciding the assets that go into the portfolio; and e) comparing the individual RV with the highest cut-off point. Sometimes this model called single index model to select portfolio.

Cut-off point for each stock is calculated using equation as follows:

$$C_i^* = \frac{\sigma_m^2 \sum_{j=1}^{i} \frac{(R_i - R_f) * \beta_j}{\sigma_{ej}^2}}{1 + \sigma_m^2 \sum_{j=1}^{i} \left\{ \frac{\beta_j^2}{\sigma_{ej}^2} \right\}} \quad (1)$$

The asset allocation of each stock is calculated as follows:

$$w_i = \frac{Z_i}{\sum_{i=1}^{n} Z_i} \quad (2)$$

where

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2}\left(\frac{\bar{R}_i - R_f}{\beta_i} - C^*\right)$$

In Statistics, there is an indicator to measure normality of Bell curve that is called Skewness. Skewness is a measure of the asymmetry of a distribution. A distribution could be stated asymmetrical when its left and right side are not mirror images. A distribution can have right (or positive), left (or negative), or zero skewness. Skewness could be used to set up a portfolio by Fund Owner. Stocks will be selected to become a portfolio through return that has return in right skewness. When the portfolio return is negatively skewed, an extreme left-tail event is more likely than an extreme right-tail event (Kim, *et al.*, 2014). Therefore, the typical investor favours return distributions that are more positively biased. For instance, a portfolio that is more favourably skewed has a stronger Sortino ratio and less semi-deviation (Sortino & Van der Meer, 1991).

Then, there is a suggestion to select a portfolio using safety-first Criterion. This method is concerned only with risk of failing to achieve a certain minimum target return or secure prespecified safety margin. The risk is commonly expressed as

$$Prob(r_p \leq r_L) \leq \alpha \qquad (3)$$

where r_p is the return of portfolio p, r_L is a certain desired level return below which the investor does not wish to fall, which is often referred to as the disaster level or the safety threshold, and α is an acceptable limit on the probability of failing to earn the minimally acceptable level of return, r_L. There is 3 criterion that overcome to discuss for portfolio construction which is Roy (1952), Kataoka (1963) and Telser (1955). It will explain following this explanation.

Roy (1952) introduced and developed a safety-first criterion that seeks to minimize the probability of earning a disaster level of return, α in equation (3) which is:

$$\text{Minimize} \quad \text{Prob}\,(r_p < r_L) \qquad (4)$$

Roy's safety-first criterion implies that investors choose their portfolios by minimizing the loss probability for a fixed safety threshold called the floor return. Roy's criterion tries to control risk for a fixed return whereas Markowitz's mean variance criterion offers a menu of positively related pairs of points having both the maximum local return and minimum local risk. Roy's Safety first criterion is related to the Sharpe ratio (Francis and Kim, 2013, p 221). Minimizing Probability of equation (4) is equivalent to

$$\text{Minimize } Prob\left(\frac{(r_p - E(r_p)}{\sigma_p} < \frac{r_L - E(r_p)}{\sigma_p}\right) = Prob\left(z < \frac{r_L - E(r_p)}{\sigma_p}\right) = Minimize\left(\frac{r_L - E(r_p)}{\sigma_p}\right)$$

$$= \text{Maximize}\left\{\frac{E(r_p) - r_L}{\sigma_p}\right\}$$

Sharpe Ratio is as follows: $S_p = \frac{E(r_p) - r_L}{\sigma_p}$ --- $E(r_p) = r_L + S_p\,\sigma_p$ (5)

Equation (5) means that Expected return portfolio depend on r_L and risk tolerance. Roy criterion stated that risk tolerance is product of Sharpe ratio and portfolio risk. Based on equation (5), Roy criterion stated as follows:

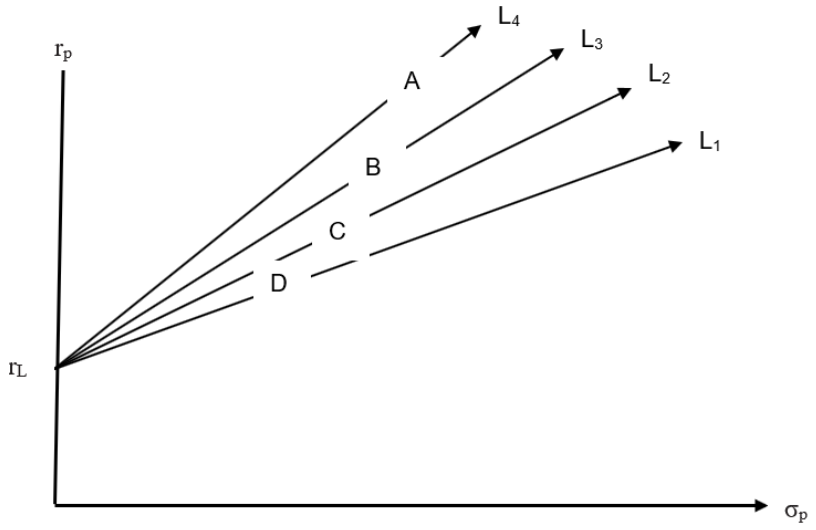


Figure 2: Portfolio Return in vary Risk and Slope.

Besides Roy, there is an others academician to suggest safety first. Kataoka (1963) also developed a safety-first criterion in which choose the portfolio with an insured return R_L, as high as possible subject to the constraint such as the probability that the portfolio return is no greater than insured return must not exceed a predetermined level, denoted α (alpha). Kataoka criterion stated in figure at below for $\alpha = 5\%$.

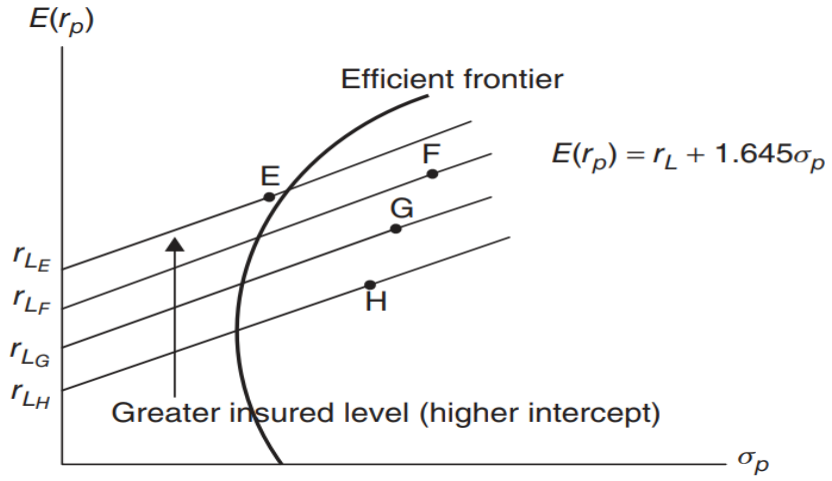


Figure 3: Kataoka's Safety-First Crietrion.

Kataoka stated as follows:

Maximize R_L

$$Prob\,(R_p < R_L) \leq \alpha \qquad (6)$$

$$E(R_p) = R_L + Z_\alpha * \sigma_p \qquad (7)$$

Equation (7) stated that Expected Return Portfolio $E(R_p)$ depend on insured return R_L and portfolio risk (σ_p) and level of tolerance error (α, alpha). If tolerance error is 5%, so the value of Z_α equal to 1.645 which is tolerance level always used by researcher and academician.

Then, Telser (1955) introduced another safety-first criterion three years after Roy's safety first. This criterion assumes that investors maximize expected return, subject to the constraint that the probability of a return less than or equal to a prespecified minimum disaster level (r_L) does not exceed a given probability. In Mathematic, Telser's criterion is expressed as follows:

$$\text{Maximize } E(r_p)$$

$$\text{subject to Prob}(r_p \leq r_L) \leq \alpha \qquad (8)$$

In the constraint of equation (8), the minimum disaster level, r_L, and the loss probability, α, are prespecified. The constraint used in Telser's criterion of equation (8) can be reformulated as follows:

$$E(r_p) \geq r_L + 1.645\,\sigma_p \qquad (9)$$

Among the portfolios satisfying this constraint, the optimum portfolio with respect to Telser's criterion is the one with the greatest expected return. Like the two previous safety-first criteria, Telser's criterion can also be related to the traditional mean-variance approach under one circumstance. If the returns are normally distributed and there exists no risk-free asset, then the constraint in Telser's criterion can be illustrated as in Figure 4 at below. Portfolios satisfying the constraint must lie in the shaded area, which is the intersection between the constraint and the opportunity set inside the mean-variance efficient frontier. Thus, the optimum portfolio is the one that has the greatest expected return among the portfolios located in the shaded region.

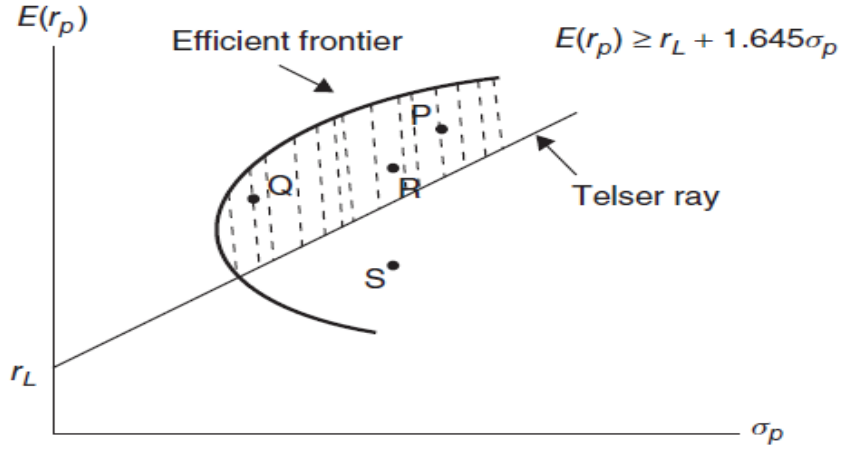


Figure 4: Telser's Safety-first Criterion.

Another approach to choose a portfolio among many portfolios could be used Stochastic Dominance. The usual stochastic dominance criterion was introduced by Lehmann (1955) and has been extensively applied in economics, finance and risk analysis. as it can be seen in the books by Müller and Stoyan (2002). Le Breton et.al

(2012) stated that A stochastic dominance approach to the measurement of discrimination. Stochastic Dominance could be comprised by 3 group which is first-degree stochastic dominance (FSD), Second-degree stochastic dominance (FSD) and Third-degree stochastic dominance (FSD). This research only used first-degree stochastic dominance (FSD). Quirk and Saposnik (1962) developed the concept and criteria for first-degree stochastic dominance (FSD), which considered the set of decision-makers whose utility functions are non-decreasing, thus including risk-loving agents.

First-Order Stochastic Dominance (FSD), Let X_1 and X_2 be two (continuous) random variables with the cumulative distribution functions (CDFs) given by F_1 and F_2, respectively. In economic applications, they typically correspond to incomes or financial returns of two different populations, which may vary regarding time, geographical regions or countries, or treatments. For $k = 1, 2$, let $Q_k(\tau) = \inf\{x : F_k(x) \geq \tau\}$ denote the quantile function of X_k, respectively, and let U_1 denote the class of all monotone increasing (utility or social welfare) functions. If the functions are assumed to be differentiable, then we may write $U_1 = \{u(\cdot) : u_ \geq 0\}$. Levy (2016), Whang (2019) dan Sriboonchitta et.al (2010), stated that *the random variable X_1 is said to first-order stochastically dominate the random variable X_2, denoted by $F1 \geq F2$ (or $X1$ FSD $X2$)*, if *any of the following equivalent conditions holds: (1) $F1(x) \leq F2(x)$ for all $x \in$ R; (2) $E[u(X1)] \geq E[u(X2)]$ for all $u \in U1$; and (3) $Q1(\tau) \geq Q2(\tau)$ for all $\tau \in [0, 1]$*. This statement stated any variable has cumulative distribution function greater than other, this variable has stochastic dominance in first-order stochastic dominance.

3. METHODOLOGY

This study uses monthly stock price information obtained from www.finance.yahoo.com. Data is available *January 2015 to December 2023*. This study employed an adjusted price that included dividends, rights issues, and all business activity to stock price into account. The stages are firstly calculating return of stock out of Kompas 100 Index, the standard of deviation, the skewness, the beta, the semi-variance. Then this research removed the stocks it has negative return and also negative skewness. Then stocks have the semi variance of above zero and less 0.1. The skewness has value above Zero and beta has value above 0.5 and less than 2.
Stock Return calculated as follows:

$$R_{i,t} = \frac{Adjusted\ Clossing\ Price_{i,t}}{Adjusted\ Clossing_{i,t-1}} x100\% \quad (8)$$

Risk calculated by standard of Deviation as follows:

$$\sigma_t = SQRT(250) * \sqrt{\frac{\sum_{i=1}^{252}(R_{i,t} - \bar{R})^2}{n-1}} \quad (9)$$

The return and risk will be used to choose stocks and calculate asset allocation using quadratic programming. In an operational research investigation, the weight of a group for reaching the target function can be solved using quadratic programming which is Risk minimization is the goal of portfolio management. Following is the quadratic programming equation:

$$\begin{aligned} &\text{Objective Function:} && \text{Min } \sigma = \sqrt{\sum_i^n \sum_j^m \left[w_i^2 \sigma_i^2 + 2 w_i w_j Cov(i,j)\right]} \\ &\text{Subject to} && w_1 + w_2 + \cdots + w_n = 1 \\ & && w_1 * R_1 + w_2 * R_2 + \cdots + w_n * R_n = R_p \\ & && w_1, w_2, \ldots, w_n > 0 \end{aligned} \quad (10)$$

This research uses the quadratic programming method to find weight of every stock in a portfolio (Markowitz, 1952; Manurung, 1997).
Weighted Stock could be calculated as follows as:

$$w_i = \frac{nilai\ stock\ i_{th}}{total\ Portfolio} \quad (11)$$

Weighted stock i_{th} will be calculated for portfolio using Markowitz Model, Elton Gruber Method, market capitalization and Equal Weighted in Portfolio.

The cumulative return is calculated as follows:

$$CR_t = (1 + r_t) * CR_{t-1} \quad (12)$$

Equation (12) will use based year on December 2014 that value of 100.

4. RESULTS AND DISCUSSION

This section will explain research result, that it will be divided into five parts in this section. It begins with descriptive statistics, then moves on to portfolio construction, Safety First Criterion, Stochastic Dominance and finally to causality analysis.

4.1. Statistics Descriptive

Based on Criteria of previous explanation in methodology, this research found 28 stocks out of 100 stocks in Kompas Index. The statistics descriptive of risk and return for 28 equities listed on the Indonesia Stock Exchange are explained in Table 1. The 28 stocks come form 100 stock member of Kompas 100 Index. Stock that has negative return and skewness negative was eliminated from 100 stocks, so the results is only 28 stocks to become member of a portfolio which it has positive return. Table 1 explain average return dan standard of deviation the stock for period Januari 2015 to December 2023 which is monthly return.

The highest return is 5.24% per month for BRPT stock, and the lowest stock return of KLBF Stock is 0.063% per month during January 2015 to June 2023. The highest of Standard of deviation is 25.148% for RAJA Stock and the lowest of standard of deviation is 6.04% for TLKM stock. This Standard of Deviation and Return has similar value at minimum value. The highest of semi-variance is 8.37% for TKIM Stock and the lowest of Semi-variance is 3.46% for TLKM Stoks. The highest of beta is 3.64 for RAJA Stocks and the lowest of Beta is 0.0896 for KLBF stocks. The highest of skewness of stock return is 1.97 for BRPT stocks and the lowest of skewness is 0.625 for LSIP stocks. There is a consistency result for TLKM stocks that the lowest for return, standard of deviation and semi-variance. It means, the TLKM Stock has less opportunity to get capital gain.

Table 1: Return, Standard of Deviation, Semi Variance, Skewness and Beta.

No.	Company	Return	STDV	Semi-Variance	Skewness	Beta
1	DSNG	0.001787	0.098953	0.056371	0.300435	0.641412
2	LSIP	0.007787	0.121711	0.05648	2.367183	0.625382
3	ACES	0.00358	0.096268	0.046031	0.970124	0.798458
4	EMTK	0.006698	0.141183	0.077326	1.123552	0.823727
5	ERAA	0.019483	0.169309	0.07966	0.855888	1.463743
6	MPMX	0.011594	0.136687	0.079886	0.670073	1.045689
7	UNTR	0.006558	0.091893	0.051046	0.4552	0.897478
8	ADRO	0.014893	0.121865	0.071671	0.418077	1.459153
9	ESAA	0.022354	0.190123	0.082898	1.287198	1.610492
10	HRUM	0.029349	0.200643	0.076121	2.033963	1.33997
11	INCO	0.011552	0.142408	0.076002	0.247175	1.53789
12	ITMG	0.016044	0.155234	0.079785	0.786498	1.748901
13	PTBA	0.006957	0.121725	0.065947	0.44659	1.327232
14	ELSA	0.002576	0.127981	0.070846	0.715795	1.49575
15	BRPT	0.052368	0.204765	0.065409	1.988723	1.974072
16	CPIN	0.0075	0.099964	0.058077	0.400055	0.771769
17	INKP	0.030826	0.160807	0.068764	1.302783	1.476341
18	JPFA	0.0114	0.140893	0.071512	0.701325	1.780815
19	BFIN	0.021628	0.119796	0.070454	0.588208	1.209475
20	PNLF	0.007146	0.134159	0.061943	1.116467	0.949299
21	RAJA	0.035363	0.251428	0.083558	3.636271	1.809927
22	ISAT	0.021149	0.186836	0.074242	3.358856	1.75303
23	TBIG	0.006434	0.112536	0.049216	1.453858	0.840405
24	TLKM	0.004806	0.060893	0.0346	0.134908	0.829967
25	TOWR	0.005494	0.091069	0.043016	1.226262	0.633156
26	PNBN	0.0081	0.126103	0.066643	0.397623	1.517321
27	KLBF	0.000627	0.06041	0.039712	0.089599	0.702654
28	TKIM	0.034261	0.17561	0.083738	0.752889	1.876491

Table 2: Statistics Descriptive of 28 Stoks.

	Return	STDV	Semi-Variance	Skewness	Beta
Minimum	0.06%	6.04%	3.46%	8.96%	62.54%
Maximum	5.24%	25.14%	8.37%	363.63%	197.41%
Average	1.46%	13.72%	6.57%	106.52%	124.79%
Standard of Deviation	1.24%	4.41%	1.41%	89.54%	43.76%
Skewness	1.370872	0.527543	-0.67412302	1.59341	0.001227
Kurtosis	1.728699	0.410491	-0.528437966	2.344851	-1.46307
Jarque Bera	10.65559	9.121892	16.64558217	12.34921	23.23882
Sources: Research Process					

4.2. Construction Portfolio

Then, this research construct portfolio using Markowitz Method that it shows at Figure Below. The dot line is called Efficient Frontier by Markowitz (1952). This line stated the equilibrium risk and return but it will also present the allocation asset for 28 stocks.

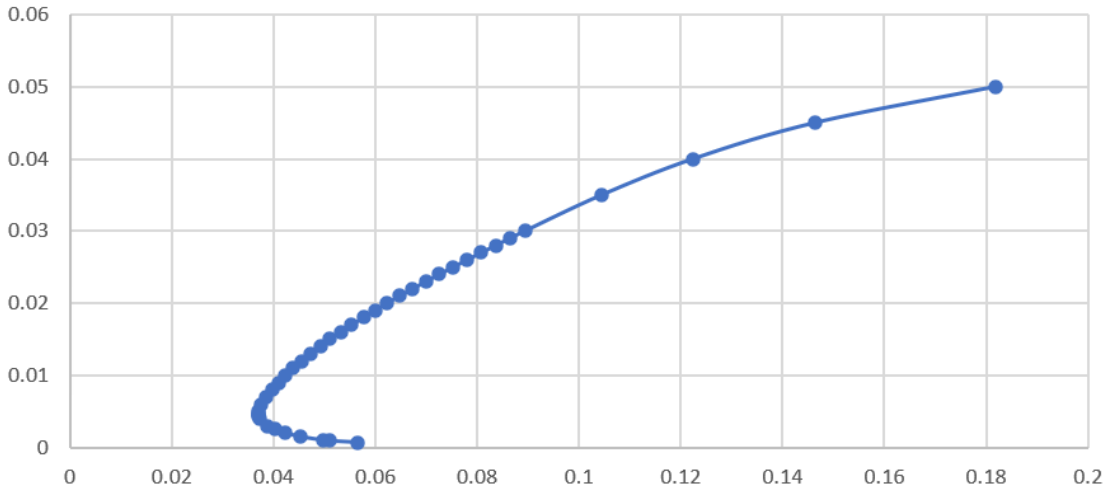


Figure 5: Efficient Frontier of Portfolio

Furthermore, this research constructed portfolio using Equal Weighted Asset Allocation and based on Market Capitalization and also using Elton Gruber Method stock for 28 stocks. When this research used Elton Gruber method, there is 24 stocks include to become a portfolio. It means, there are 4 portfolio that it has been constructed and add 1 portfolio which is Market Index. The Statistics descriptive of 5 Portfolios is as follows:

Table 3: Statistics descriptive of 5 Portfolios.

	EG	MC	EW	MKW	Market
Minimum	-23.59%	-14.39%	-18.31%	-11.95%	-16.76%
Maximum	27.79%	20.19%	18.64%	12.25%	9.44%
Average	2.30%	1.38%	1.46%	0.70%	0.38%
Stdev	7.97%	5.52%	6.20%	3.88%	3.71%
Skewness	0.3359363	0.33364	0.237882	-0.10285	-1.09639
Kurtosis	1.5226501	1.343657	1.211635	1.508989	3.541491
Jarque Bera	11.852889	14.3493	15.41071	10.19441	22.95661
Coefficient of Variation	3.47	4.01	4.25	5.54	9.87

Table 3 above shows that the highest average return is 2.3% for Elton Gruber Method and followed by Equal weighted average return of 1.46%, then Market Capitalization of 1.38%, Market of 0.38% and the last is Markowitz method of 0.7%. The maximum return got by Elton Gruber Method of 27.79% followed by Market Capitalization of 20.19% and the last is Market 9.44%.

Risk of portfolio showed by standard of deviation each portfolio. The highest risk is in Elton Gruber method by 7.97% and lowest is Market Risk which is value of 3.71%. Investor or Fund Manager choose portfolio using Coefficient of Variation that it come to select Elton Gruber Method. Then, the cumulative return for 6 portfolio shows in Figure 6 at.

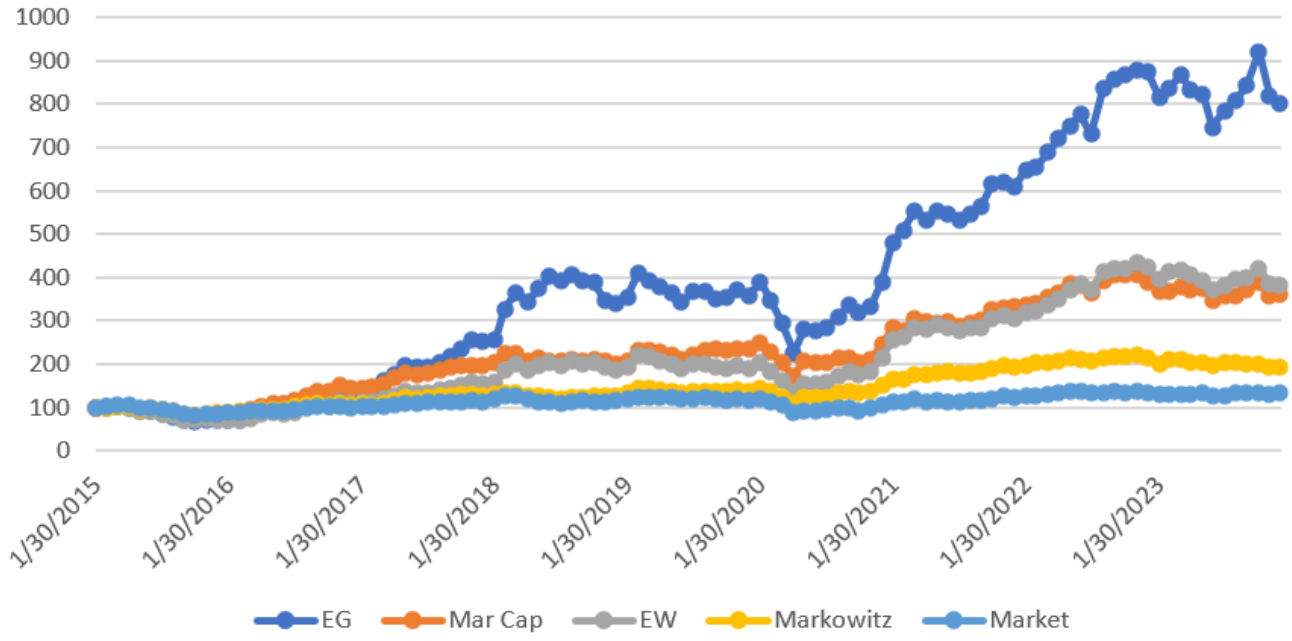


Figure 6: Cumulative Return of varying Portfolio.

Figure 6 shows that Elton Gruber Method that it has higher cumulative return since at the end of year 2014. Market Cap method and Equal Weighted are less than Elton Gruber Method. The lowest of cumulative return is market portfolio.

4.3. Construction Portfolio Using Safety Criterion

Then, this research also setup portfolio used Safety First Criteria as mentioned in previous explanation. It will use equation (5), the paper will firstly determine value of slope equation (5) then it got portfolio return. Value of S_p is determined 0.5 for portfolio D, 1 for Portfolio C, 1.5 for portfolio B and 2 for portfolio A. Then we determine value of R_L at least government bond of 10 years which is rate of 7.405% pa, then rate of government bond yield is rate of 0.617% per month. Risk premium is rate of 0.2% per month. So, R_L become sum of rate of Government Bond yield and risk premium (0.617% + 0.2%) that is equal to 0.817%. Rate of 0.2% per month is risk premium. Result portfolio return using Equation (5) appear in Table 4 and 5 at below. This portfolio return is calculated for equal weighted allocation for portfolio.

Table 4. Roy Model for Equal Weighted Portfolio.

Description	**S_p**			
	0.5	**1**	**1.5**	**2**
R_L	0.00817	0.00817	0.00817	0.00817
Risk	0.06202	0.06202	0.06202	0.06202
R_p	0.03918	0.07019	0.1012	0.13221

Based on Table 4, the portfolio return using equation (5) is vary from 3.918% to 13.221% that Sp is also vary from 0.5 to 2. Then, this research also calculated portfolio return using Roy Criterion (equation 5) for market capitalization weighted portfolio. The result is showed in Table 5 at below.

Table 5: Roy Model for Market Cap Weighted Portfolio

Description	**S_p**			
	0.5	**1**	**1.5**	**2**
R_L	0.00817	0.00817	0.00817	0.00817
Risk	0.0552	0.0552	0.0552	0.0552
R_p	0.03577	0.06337	0.09097	0.11857

Based on Table 5, the portfolio return using Roy Criterion is vary from 3.577% to 11.857% that S_p is also vary from 0.5 to 2.

Based on table 4 and table 5, it means that the return portfolio for Equal Weighted is higher than the return portfolio of market capitalization weighted portfolio. The difference Return is caused by risk market capitalization below than equal weighted portfolio.

Table 6. Kataoka Model for Equal Weighted Portfolio.

Description	Risk Tolerance		
	α=1% ($Z_{1\%}$=2,33)	**α=5% ($z_{5\%}$=1,645)**	**α=10% ($z_{10\%}$=1,28)**
R_L	0.00817	0.00817	0.00817
Risk	0.06202	0.06202	0.06202
R_P	0.15268	0.11019	0.08756

Based on Table 6, the portfolio return using equation (7) is vary from 8.756% to 15.268% that risk tolerance is also vary from 1% to 10%. If the risk tolerance become smaller, return become higher. It supported portfolio theory which is proposed by Markowitz (1952).

Table 7: Kataoka Model for Market Capitalization Weighted Portfolio.

Description	Risk Tolerance		
	α=1% ($Z_{1\%}$=2,33)	**α=5% ($z_{5\%}$=1,645)**	**α=10% ($z_{10\%}$=1,28)**
R_L	0.00817	0.00817	0.00817
Risk	0.0552	0.0552	0.0552
R_P	0.13679	0.09897	0.078883

Based on Table 7, the portfolio return using equation (7) is vary from 7.89% to 13.679% that risk tolerance vary from 1% to 10%.

Equation for Telser Criteria use Equation (9) which is RL = 0.00817 as follows:

$$E(R_p) \geq 0.00817 + 1.645\,\sigma_p \qquad (13)$$

Portfolio return (Rp) depend risk tolerance of Investor or Fund Manager to construct portfolio. This Model look likes Capital Market Line (CML) that return depend to risk tolerance by investor.

4.4. Stochastic Dominance

As mentioned above, this research wants to explore stochastic Dominance among portfolio that has been constructed which is Elton Gruber Methods, Markowitz Method, Equal Weighted Method, Market Capitalization Methods and Market Portfolio. Distribution Function of Portfolio shows at Table 3 in below.

Table 8: Probability Function of Varying Portfolio.

No.	Criteria of X	EG	MC	MW	EW	Market
1.	if X<-0.2	1/108				
2.	if -0.1<X<-0.2	5/108	2/108	3/108	1/108	1/108
3.	if -0.1<X<-0.05	9/108	9/108	10/108	5/108	9/108
4.	if -0.05<X<-0.01	23/108	31/108	31/108	16/108	16/108
5.	if-0.05<X<0	6/108	12/108	8/108	21/108	17/108
6.	if 0<X<0.05	28/108	29/108	33/108	15/108	18/108
7.	if 0.05<X<0.1	23/108	18/108	15/108	39/108	40/108
8.	if 0.1<X<0.2	10/108	6/108	8/108	9/109	7/108
9.	if X>0.2	3/108	1/108		2/108	

Table above shows distribution functions that put in one Table. At below, it writes down the distribution function as follows:

$$f(EG) = \begin{cases} 1/108 & \text{if } X \leq -0.2 \\ 5/108 & \text{if } -0.1 < X \leq -0.2 \\ 9/108 & \text{if } -0.1 < X \leq -0.05 \\ 23/108 & \text{if } -0.05 < X \leq -0.01 \\ 6/108 & \text{if } -0.01 < X \leq 0 \\ 28/108 & \text{if } 0 < X \leq 0.05 \\ 23/108 & \text{if } 0.05 < X \leq 0.1 \\ 10/108 & \text{if } 0.1 < X \leq 0.2 \\ 3/108 & \text{if } X > 0.2 \\ 0 & \text{otherwise} \end{cases}$$

Then, based on distribution function could comprise Cumulative of Distribution Function. The cumulative of Distribution Functions is as follows:

Table 9: Cumulative Distribution Function of Portfolio.

	EG	MC	EW	MKW	Market
if X<-0.2	0.009259	0	0	0	0
if -0.1<X<-0.2	0.055556	0.018519	0.027778	0.009259	0.009259
if -0.1<X<-0.05	0.138889	0.101852	0.12037	0.055556	0.092593
if -0.05<X<-0.01	0.351852	0.388889	0.407407	0.203704	0.240741
if-0.05<X<0	0.407407	0.5	0.481481	0.398148	0.398148
if 0<X<0.05	0.666667	0.768519	0.787037	0.537037	0.564815
if 0.05<X<0.1	0.87963	0.935185	0.925926	0.898148	0.935185
if 0.1<X<0.2	0.972222	0.990741	1	0.981481	1
if X>0.2	1	1		1	1

Furthermore, Stochastic dominance could be seen through the figure of cumulative distribution Function. Chakrabarty and Kanaujiya (2023) stated that the first-order stochastic dominance (FSD) is used when the cumulative distribution of return of a portfolio (or asset) *P*1 lies above the cumulative distribution of another portfolio (or asset) *P*2, in a certain range of return and vice-versa, i.e., *P*1 lies below *P*2, for certain other range of returns. This statement stated as follows:

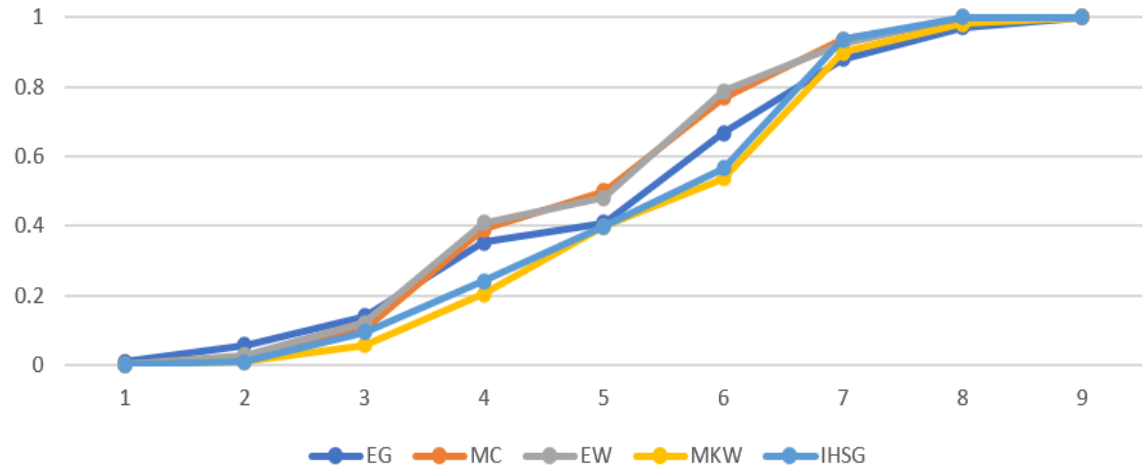


Figure 7: Cumulative Function of Vary Portfolio.

Based on Figure 2 above, The Portfolio of Market Capitalization and Equal Weighted seems lies in the same line. So, Portfolio of Market Capitalization and Equal Weighted dominated for all other portfolio. It means, the stochastic Dominance could be used to choose portfolio. This research also has conclusion that Investor's should not use knowledge of Fund Manager to manage their money.

Table 10: Multifactor Model for portfolio.

No.	Portfolio Description	Constant	Market	Exchange Rate	Oil Price	Interest Rate	Pandemic	R^2
1.	Equal Weighted	0.057238	1.164842	-0.1435	-0.00018	-0.10791	-0.00087	59.39%
			(9.14)	(-0.82)	(-0.43)	(-2.44)	(-0.07)	
	Market Capitalization							
2.		0.013495	1.135964	-0.05518	-0.0077	-0.00989	0.004226	61.15%
	Elton Gruber Method		(10.24)	(-0.362)	(-0.122)	(-0.256)	(-0.421)	
3.	Markowitz Method	0.085043	1.325231	-0.31488	-0.00054	-0.14885	-0.00994	51.17%
			(7.38)	(-1.28)	(-1.506)	(-2.39)	(-0.61)	
4.		0.00108	0.823366	-0.04444	-0.00047	0.002033	0.01223	67.86%
			(11.62)	(-0.46)	(-2.08)	(0.93)	(1.91)	

4.5. Causality

This section will describe how macroeconomics variable affected Portfolio Return. A multifactor model is used to investigate some portfolio return factors. The factors that affect portfolio return include market return, Exchange Rate, Oil price, and pandemic era. The Multifactor model's coefficients are shown in Table 10.

Based on Table 10, there four portfolio was affected by macroeconomics variables. In Equal Weighted

Portfolio, Market and Interest rate significantly affected at level significant of 1% to portfolio return. The other macroeconomic variable did not affect portfolio return. Interest rate negatively significant affect portfolio return at level of significant of 1%. This result follows the relationship of theory interest rate and return stock including portfolio return. Exchange Rate, Oil price and Pandemic variables did not significant affect portfolio return. Macroeconomic Variable and pandemic variable could explain fluctuation of Portfolio return by 59.39% and the rest by others variable.

On Market capitalization Weighted, the market return only Era significantly affect portfolio returns at level of significant of 1 %. Exchange rate, Oil price, and Interest rate and Pandemic Era variable did not significant affect portfolio return. Market Fluctuation, Macroeconomics Variable and Pandemic Era as together could explain fluctuation of portfolio return by 61.15% and the rest by others variable.

Then, the market return and interest rate significant affect portfolio return at level of significant of 1 % and Oil price significantly affect return portfolio at level significant at 6% for Elton Gruber weighted Method. Exchange Rate and Pandemic variables did not significant affect portfolio return. Fluctuation of Market Return, Macroeconomics Variable and Pandemic era as together could explain fluctuation of portfolio return by 51.17% and the rest by others variable.

On Markowitz Method constructing portfolio, only Market return affect portfolio return at level of significant of 1%. Pandemic Era significantly affect Portfolio return at level of significant of 10%. The other variable did not significant affect portfolio return. Macroeconomics Variable, fluctuation of market and Pandemic era as together could explain fluctuation of portfolio return by 67.86% and the rest by others variable

This results mostly support previously research Manurung et.al (2024), Manullang (2023), Manurung (2023a), Manurung (2023b), Manurung (2023c). Investor could have self-decision to hire fund manager to manage their fund. Investor also should consider his time if they want to manage their money.

5. CONCLUSION

Based on previous explanation, this has conclusion as follows:

1. This research selected stocks with criteria eliminate negative return and skewness, semi-variance below 0.1 and beta below 2 that it results 28 stocks to be member portfolio.
2. This research also construct portfolio using Markowitz Method that we choose return of 0.8 to get asset allocation for 28 stocks.
3. This research construct 4 portfolio which is Elton Gruber Method, Markowitz method, Equal Weighted and Market Capitalisation that Elton Gruber Method is the highest cumulative return from December 2014 until December 2023.
4. Using Safety First for portfolio, the return is varying range of 3.577% to 13.22% that Equal Weighted is the highest return using Roy Criteria.
5. Using First-Order Stochastic Dominance (FSD), Portfolio of Markowitz Method has stochastic dominance comparing to others portfolio.
6. Market Variable has impact for all portfolio return but interest has impact to Equal Weighted and Elton Gruber Method. Pandemic Era have only impact to Markowitz Method.

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