Journal of Finance and Investment Analysis, Vol. 12, No. 3, 2023, 27-42
ISSN: 2241-0988 (print version), 2241-0996(online)
https://doi.org/10.47260/jfia/1232
Scientific Press International Limited

Stock Selection Using Roy Criteria to Construct a Portfolio and the Effects of Variables on Portfolio Return

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Abstract

This research aims to explore for portfolio construction using Roy Criterion. Data was used monthly data of Kompas 100 Indec for period of 2015 to 2022. The result found that 66 stocks for using equal and market capitalization, 22 stocks using Elton Gruber Method. The research's findings are as follows Roy criterion could be used to construct portfolio with determining achievement of minimum return. Portfolio return using Roy criterion is vary from 0.631% to 0.638% per month. The market capitalization weighted Portfolio return is highest then equal weighted portfolio return. Elton Gruber method also used to construct portfolio, then this method has highest return compared to others methods. The Market shock affected all portfolio return and Interest rate has affected portfolio return for equal weighted and Elton Gruber Method.

JEL classification numbers: C13, C51, C61, G1, M21.
Keywords: Portfolio construction, Return portfolio, Risk portfolio, Skewness and quadratic programming, Market capitalization.

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Article Info: *Received:* August 16, 2023. *Revised*: August 31, 2023.
Published online: September 4, 2023.

1. Introduction

Investor invest 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. Galankashi, et al., (2020) stated that a portfolio containing a variety of various assets will offer the investor a variety of returns while lowering risk. 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 and others. Numerous techniques have been created to investigate a portfolio 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) and Elton et al., (2014) 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). Hunjra et al., (2020) proposed portfolio construction Using Different Risk Models.

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) and Manurung (1997b). Manurung et.al (2023a), Manullang et al., (2023) 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 Portfolio Selection.

Based on above explanation, this research wants to construct a portfolio using Roy Criteria that is different from previous research. Roy 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 background

In 1952, Markowitz introduced the Theory of Portfolio for the first time to scientific in Finance. This theory focused on risk and return as factors to select instrument of investments such as stock, bond and other to construct in the optimal portfolio.

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., 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) and Fahmy (2014) 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.

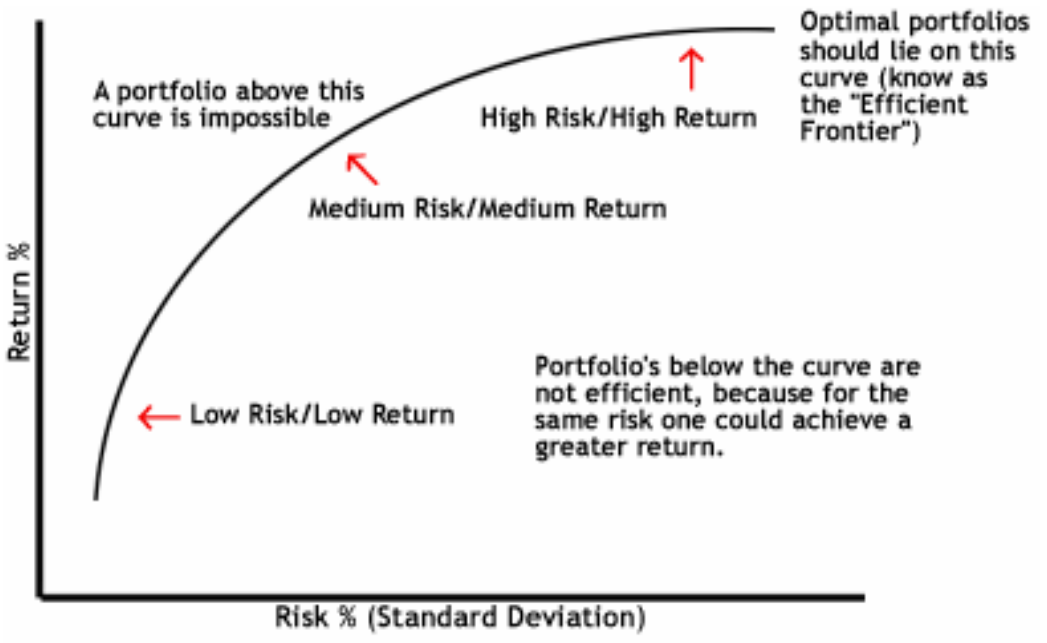


Figure 1: The Efficient Frontier (Markowitz, 1959)

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) and Elton and Martin (1997) 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. Assets 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.

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 favors return distributions that are more positively biased. For instance, a portfolio that is more favorably 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 follows:

$$Prob(r_p \leq r_L) \leq \alpha \quad (1)$$

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 (1) which is:

$$\text{Minimize Prob } (r_p < r_L) \quad (2)$$

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). Minimizing Probality of equation (2) is equivalent to:

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

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

Sharpe Ratio is as follows: $S_p = \frac{E(r_p) - r_L}{\sigma_p}$ --- $E(r_p) = r_L + S_p\, \sigma_p$ (3)

Equation (2) 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 (3), Roy criterion stated as follows:

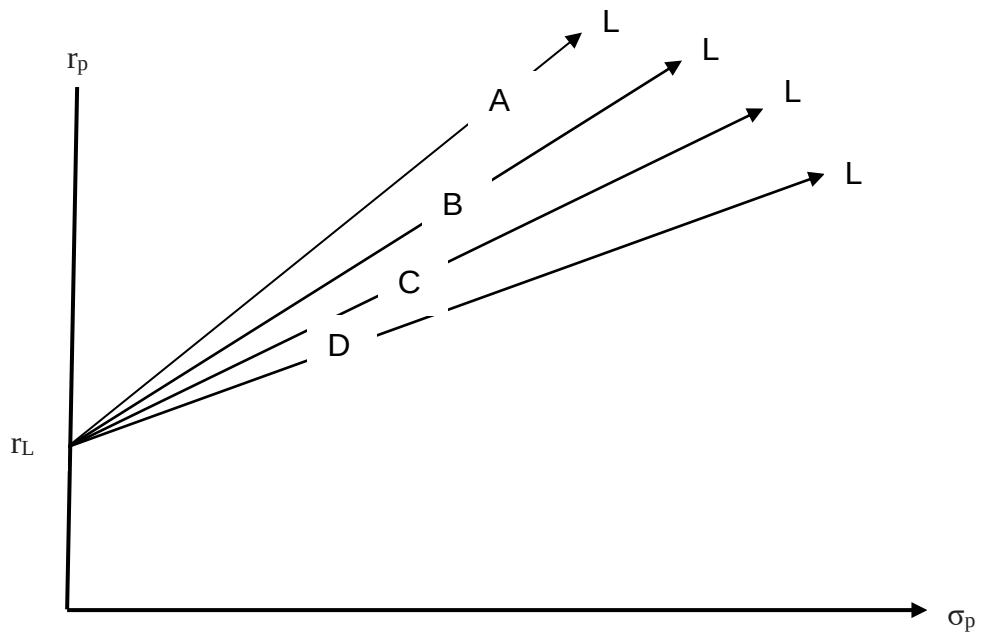


Figure 2: Portfolio Return in vary Risk and Slope

Based on Figure 2 above, Portfolio D is on L1 which is have return of R_D above R_L. Portfolio C is on L_2 which is have return of R_C above RD. Portfolio B is on L_3 which is have return of R_B above R_C. Portfolio A is on L_4 which is have return of R_A above R_B. It means that return of A higher than B, C and D (A > B > C > D). The slope of line L_1, L_2, L_3, L_4 are different. These two explanations also have meaning that portfolio return different has different slope for Roy Criterion.

3. Methodology

This study uses monthly stock price information obtained from www.finance.yahoo.com. Data is available *January 2015 to December 2022*. This study employed an adjusted price that included dividends, rights issues, and all business activity to stock price into account.
Stock Return calculated as follows:

$$R_{i,t} = \frac{Adjusted\ Clossing\ Price_{i,t}}{Adjusted\ Clossing_{i,t-1}} x100\% \quad (4)$$

Risk calculated by standard of Deviation as follows:

$$\sigma_t = SQRT(250) * \sqrt{\frac{\sum_{i=1}^{252}(R_{i,t}-\bar{R})^2}{n-1}} \quad (5)$$

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:

$$\begin{aligned} &\text{Objective Function:} && \text{Min } \sigma = \sqrt{\textstyle\sum_i^n \sum_j^m \left[w_i^2 \sigma_i^2 + 2 w_i w_j Cov(i,j)\right]} \\ &\text{Subject to} && w_1 + w_2 + \cdots + w_n = 1 \\ & && w_1 * R_1 + w_2 * R_2 + \cdots + w_n * R_n = R_p \\ & && w_1, w_2, \ldots, w_n > 0 \end{aligned} \quad (6)$$

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:

$$w_i = \frac{nilai\ stock\ i_{th}}{total\ Portfolio} \quad (7)$$

Weighted stock i_{th} could be calculated using market capitalization.

4. Results and discussion

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

4.1 Statistics descriptive

The statistics descriptive of risk and return for 61 equities listed on the Indonesia Stock Exchange are explained in Table 1. The 66 stocks come form 100 stock member of Kompas 100 Index. Stock that has negative return was eliminated from 100 stocks, so the results is only 66 stocks to become member of a portfolio. Table 1 explain average return dan standard of deviation the stock for period Januari 2015 to December 2022 which is monthly return.

Table 1: Return and Risk for 66 Firm

No.	Company Name	Tick Name	Average Return	Standard of Deviation	Equal Weighted	Market Cap Weighted	Contribute EW Return	Contribute MC Return
1	Dharma Satya Nusantara Tbk.	DSNG	0.00249	0.10177	0.01639	0.00141	0.00004	0.00000
2	PP london Sumatera Tbk.	LSIP	0.00016	0.11712	0.01639	0.00146	0.00000	0.00000
3	Ciputra Development Tbk.	CTRA	0.00531	0.12335	0.01639	0.00359	0.00009	0.00002
4	Pakuwon Jati Tbk.	PWON	0.00386	0.09965	0.01639	0.00440	0.00006	0.00002
5	AKR Corporindo Tbk.	AKRA	0.01053	0.10032	0.01639	0.00563	0.00017	0.00006
6	Sumber Alfaria Trijaya Tbk.	AMRT	0.02227	0.10165	0.01639	0.02338	0.00037	0.00052
7	Bumi Resources Minerals Tbk.	BMRS	0.00818	0.18634	0.01639	0.00480	0.00013	0.00004
8	Elang Mahkota Teknologi Tbk.	EMTK	0.01204	0.14029	0.01639	0.01264	0.00020	0.00015
9	Erajaya Swasembada Tbk.	ERAA	0.02043	0.17593	0.01639	0.00166	0.00033	0.00003
10	Matahari Departemen Store Tbk.	LPFF	0.00069	0.15501	0.01639	0.00225	0.00001	0.00000
11	Mitra Adiperkasa Tbk.	MAPI	0.01776	0.11562	0.01639	0.00522	0.00029	0.00009
12	Multipolar Tbk.	MLPL	0.00188	0.24047	0.01639	0.00032	0.00003	0.00000
13	Mitra Pinashtika Mustika Tbk.	MPMX	0.01351	0.14358	0.01639	0.00109	0.00022	0.00001
14	Saratoga Investama Sedaya Tbk.	SRTG	0.01461	0.11098	0.01639	0.00625	0.00024	0.00009
15	United Tractors Tbk.	UNTR	0.00814	0.09023	0.01639	0.01882	0.00013	0.00015
16	Adaro Karya (Persero) Tbk.	ADRO	0.02038	0.11943	0.01639	0.01961	0.00033	0.00040
17	Aneka Tambang Tbk.	ANTM	0.02101	0.16970	0.01639	0.00868	0.00034	0.00018
18	Delta Dunia Makmur Tbk.	DOID	0.03034	0.25464	0.01639	0.00053	0.00050	0.00002
19	Energi Mega Persada Tbk.	ENRG	0.01211	0.22434	0.01639	0.00146	0.00020	0.00002
20	Surya Esa Perkasa Tbk.	ESSA	0.02873	0.19067	0.01639	0.00290	0.00047	0.00008
21	Harum Energy Tbk.	HRUM	0.03431	0.20889	0.01639	0.00458	0.00056	0.00016
22	Vale Indonesia Tbk.	INCO	0.01777	0.14788	0.01639	0.01349	0.00029	0.00024
23	Indo Tambangraya Megah Tbk.	ITMG	0.02128	0.15826	0.01639	0.00818	0.00035	0.00017
24	Medco Energi Internasional Tbk.	MEDC	0.02146	0.19564	0.01639	0.00511	0.00035	0.00011
25	Buktim Asam Tbk.	PTBA	0.01139	0.12360	0.01639	0.00923	0.00019	0.00011
26	Timah Tbk.	TINS	0.01109	0.16050	0.01639	0.00147	0.00018	0.00002
27	Elnusa Tbk.	ELSA	0.00042	0.13420	0.01639	0.00046	0.00001	0.00000
28	Bario Pasific Tbk.	BRPT	0.05148	0.20999	0.01639	0.01418	0.00084	0.00073
29	Charoen Pokphand Indonesia Tbk.	CPIN	0.00942	0.10366	0.01639	0.01856	0.00015	0.00017
30	Indah Kiat Pulp & Paper Tbk.	INKP	0.03440	0.16538	0.01639	0.00866	0.00056	0.00030
31	Japfa Comfeed Indonesia Tbk.	JPFA	0.01339	0.14670	0.01639	0.00308	0.00022	0.00004
32	Candra Asri Petrochemical Tbk.	TPIA	0.03003	0.19077	0.01639	0.03935	0.00049	0.00118
33	Bank Raya Indonesia Tbk.	AGRO	0.04948	0.30563	0.01639	0.00200	0.00081	0.00010
34	Bank Central Asia tbk.	BBCA	0.01373	0.05228	0.01639	0.21580	0.00023	0.00296
35	Bank Negara Indonesia (persero) Tbk.	BBNI	0.00994	0.10230	0.01639	0.03403	0.00016	0.00034
36	Bank Rakyat Indonesia (Persero) Tbk.	BBRI	0.01092	0.07765	0.01639	0.14491	0.00018	0.00158
37	Bank Tabungan Negara (Persero) Tbk.	BBTN	0.01073	0.13840	0.01639	0.00349	0.00018	0.00004
38	BFI Finance Idonesi Tbk.	BFIN	0.02240	0.12263	0.01639	0.00410	0.00037	0.00009
39	Bank Mandiri (Persero) Tbk.	BMRI	0.00934	0.07464	0.01639	0.08979	0.00015	0.00084
40	Panin Financial Tbk.	PNLF	0.01033	0.13586	0.01639	0.00263	0.00017	0.00003
41	Baramulti Susessarana Tbk.	BSSR	0.01816	0.12690	0.01639	0.00228	0.00030	0.00004
42	Rukun Raharja Tbk.	RAJA	0.03537	0.26150	0.01639	0.00075	0.00058	0.00003
43	TBS Energy Utama Tbk.	TOBA	0.01897	0.14337	0.01639	0.00089	0.00031	0.00002
44	Astra Internasional Tbk.	ASII	0.00070	0.08253	0.01639	0.04705	0.00001	0.00003
45	ABM Investama Tbk.	ABMM	0.00777	0.12625	0.01639	0.00158	0.00013	0.00001
46	Adi Sarana Armada Tbk.	ASSA	0.03225	0.19088	0.01639	0.00063	0.00053	0.00002
47	Indika Energy Tbk.	INDY	0.04115	0.25734	0.01639	0.00245	0.00067	0.00010
48	Indosat Tbk.	ISAT	0.01916	0.19705	0.01639	0.01010	0.00031	0.00019
49	Samudera Indonesia Tbk.	SMDR	0.02570	0.19392	0.01639	0.00137	0.00042	0.00004
50	Tower Bersama Infrastructurss Tbk.	TBIG	0.00808	0.11808	0.01639	0.01012	0.00013	0.00008
51	Telkom Indonesia Tbk.	TLKM	0.00473	0.06251	0.01639	0.07801	0.00008	0.00037
52	Sarana Menara Nusantara Tbk.	TOWR	0.00695	0.09308	0.01639	0.01022	0.00011	0.00007
53	Pasific Strategic Financial Tbk.	APIC	0.02173	0.10365	0.01639	0.00266	0.00036	0.00006
54	Bank MNC Internasional Tbk.	BABP	0.01248	0.16441	0.01639	0.00064	0.00020	0.00001
55	Bank Pan Indonesia Tbk.	PNBN	0.01102	0.12926	0.01639	0.00695	0.00018	0.00008
56	Indofood CBP Sukses Makmur Tbk.	ICBP	0.00631	0.06186	0.01639	0.02272	0.00010	0.00014
57	Kalbe Farma Tbk.	KLBF	0.00335	0.06284	0.01639	0.01954	0.00005	0.00007
58	Industri Jamu dan Sido Muncul Tbk.	SIDO	0.01228	0.07536	0.01639	0.00478	0.00020	0.00006
59	Pabrik Kertas Tjiwi Kimia Tbk.	TKIM	0.03733	0.18149	0.01639	0.00482	0.00061	0.00018
60	Indofood Sukses Makmur Tbk.	INDF	0.00231	0.06932	0.01639	0.01113	0.00004	0.00003
61	Mayora Indah Tbk.	MYOR	0.01443	0.07923	0.01639	0.01210	0.00024	0.00017

Source: Researcher Process

Table 2 consist of descriptive statistics for 66 stocks about return, risk and weighted by equal and market capitalization.

Table 2: Statistics descriptive of the 61 stocks

	Return	Risk	Equal Weighted	Market Weighted	EW Return	MC Return
Minimum	0.00016	0.05228	0.01639	0.00032	0.00000	0.00000
Maximum	0.05148	0.30563	0.01639	0.21580	0.00084	0.00296
Average	0.01620	0.14257	0.01639	0.01639	0.00027	0.00021
Standard of Deviation	0.01197	0.05629456	1.05E-17	0.0352589	0.0001963	0.0004551
Skewness	1.02216	0.68905213	-1.02539	4.1786438	1.0221617	4.4876505
Kurtosis	0.77704	0.15814433	-2.06897	19.4891514	0.7770413	23.489131
Jarque Bera	23.182	25.3539257	75.99609	868.579939	23.182042	1271.7497

Sources: Researcher Process

The average return is 1.6% per month and risk of 1.2%. Market weighted is 1,64% using market capitalization. Based on Jarque berra, stock return has normal distribution. It means that using return to a model does not violate model assumption in normality distribution.

4.2 Portfolio Construction Roy Criterion

As mentioned previously, this paper wants to use Roy Criterion for construction portfolio. 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 RL at least average of time deposits rate for period of 2015 to 2022 which is rate of 5.145 pa, then rate of time deposits is rate of 0.42875% per month. Risk premium is rate of 0.2% per month. So, RL become sum of rate of time deposits and risk premium (0.42875% + 0.2%) that is equal to 0.62875%. Rate of 0.2% per month is risk premium. Result portfolio return using Equation (3) appear in Table 3 at below. This portfolio return is calculated for equal weighted allocation for portfolio.

Tabel 3: Roy Model for Equal Weighted Portfolio

Description	S_p			
	0.5	1	1.5	2
R_L	0,62875	0,62875	0,62875	0,62875
Risk	0,00196261	0,00196261	0,00196261	0,00196261
R_p	0,629731305	0,630712621	0,631693915	0,63267522

Sources: Researcher Process

Based on Table 3, the portfolio return using equation (3) is vary from 0.6297% to .6327% that Sp is also vary from 0.5 to 2.
Then, this research also calculated portfolio return using Roy Criterion (equation 3) for market capitalization weighted portfolio. The result is showed in Table 4 at below.

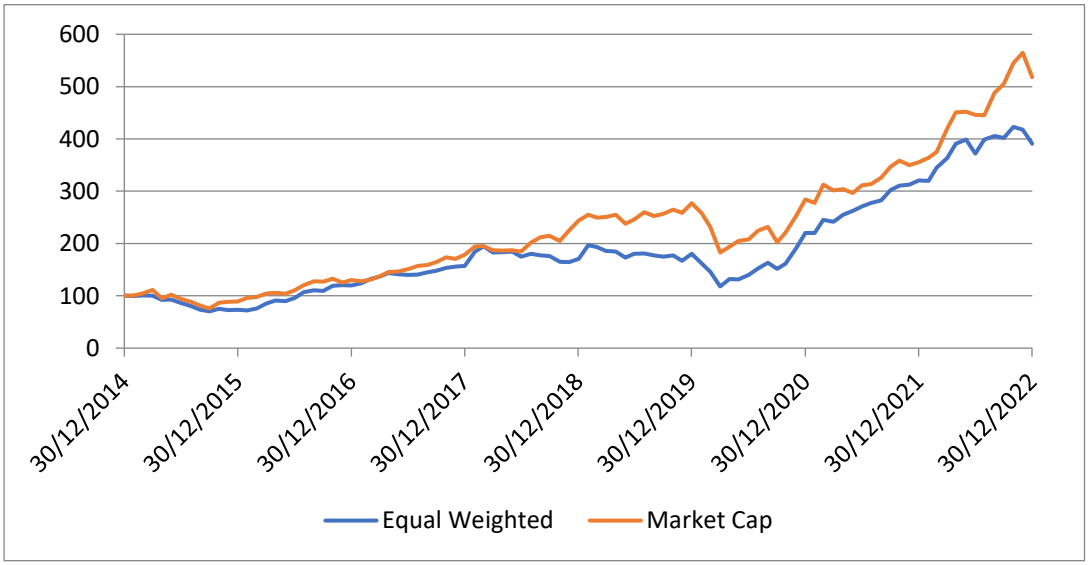
Table 4: Roy Model for Market Cap Weighted Portfolio

Description	S_p			
	0.5	1	1.5	2
R_L	0.62875	0.62875	0.62875	0.6288
Risk	0.0045507	0.0045507	0.0045507	0.0045507
R_p	0.63102535	0.6333007	0.63556705	0.6378514

Sources: Researcher Process

Based on Table 4, the portfolio return using Roy Criterion is vary from 0.631% to .638% that Sp is also vary from 0.5 to 2.
Based on table 3 and table 4, it means that the return portfolio for market capitalization weighted is higher than the return portfolio for equal weighted portfolio. It also could be explained by Figure 3.

Figure 3: Cumulative Return for Equal Weighted and Market Capitalization



On Figure 3 above, Portfolio return of market capitalization weighted is always higher than portfolio return of equal weighted portfolio over the period 2015 to 2022. This result stated that owner fund should put in his money in a market capitalization portfolio.

4.3 Portfolio Construction Elton Gruber and Roy Citerion

This research also set up a portfolio using Elton Gruber Model. The Elton Gruber overcome 22 stock to become a member portfolio which is the result appear Table 5. This table 5 show expected return and risk over period 2015 to 2022 and weighted stock in Portfolio.

Table 5: Return, Risk, Beta Stock and weighted 22 stock by Elton Gruber

No	Nama Perusahaan	Tick Name	Return	Risk	Beta	Weighted
1	Pasific Strategic Financial Tbk.	APIC	2.17%	10.37%	0.1394	8.32%
2	Saratoga Investama Sedaya Tbk.	SRTG	1.46%	11.10%	0.0983	4.31%
3	Sumber Alfaria Trijaya Tbk.	AMRT	2.23%	10.17%	0.3536	8.89%
4	Mayora Indah Tbk.	MYOR	1.44%	7.92%	0.2174	8.30%
5	TBS Energiy Utama Tbk.	TOBA	1.90%	14.34%	0.3186	3.64%
6	Baramulti Suksessarana Tbk.	BSSR	1.82%	12.69%	0.3624	4.39%
7	Bank MNC Internasional Tbk.	BABP	1.25%	16.44%	0.3243	1.55%
8	Candra Asri Petrochemical Tbk.	TPIA	3.00%	19.08%	1.0406	3.57%
9	Barito Pasific Tbk.	BRPT	5.15%	21.00%	1.9983	5.39%
10	Industri Jamu dan Sido Muncul Tbk.	SIDO	1.23%	7.54%	0.3474	7.21%
11	Harum Energy Tbk.	HRUM	3.43%	20.89%	1.3671	3.47%
12	ABM Investama Tbk.	ABMM	0.78%	12.63%	0.1786	1.14%
13	Indah Kiat Pulp & Paper Tbk.	INKP	3.44%	16.54%	1.5050	5.54%
14	Pabrik Kertas Tjiwi Kimia Tbk.	TKIM	3.73%	18.15%	1.8822	5.04%
15	Rukun Raharja Tbk.	RAJA	3.54%	26.15%	1.8910	2.28%
16	Indika Energy Tbk.	INDY	4.12%	25.73%	2.4039	2.79%
17	Surya Esa Perkasa Tbk.	ESSA	2.87%	19.07%	1.6075	3.37%
18	BFI Finance Indonesia Tbk.	BFIN	2.24%	12.26%	1.2074	6.06%
19	Bank Raya Indonesia Tbk.	AGRO	4.95%	30.56%	3.0279	2.42%
20	Adi Sarana Armada Tbk.	ASSA	3.22%	19.09%	2.1772	3.83%
21	Samudera Indonesia Tbk.	SMDR	2.57%	19.39%	1.7483	2.84%
22	Adarao Karya (Persero) Tbk.	ADRO	2.04%	11.94%	1.3842	5.65%
Sources: Researcher Prosess						

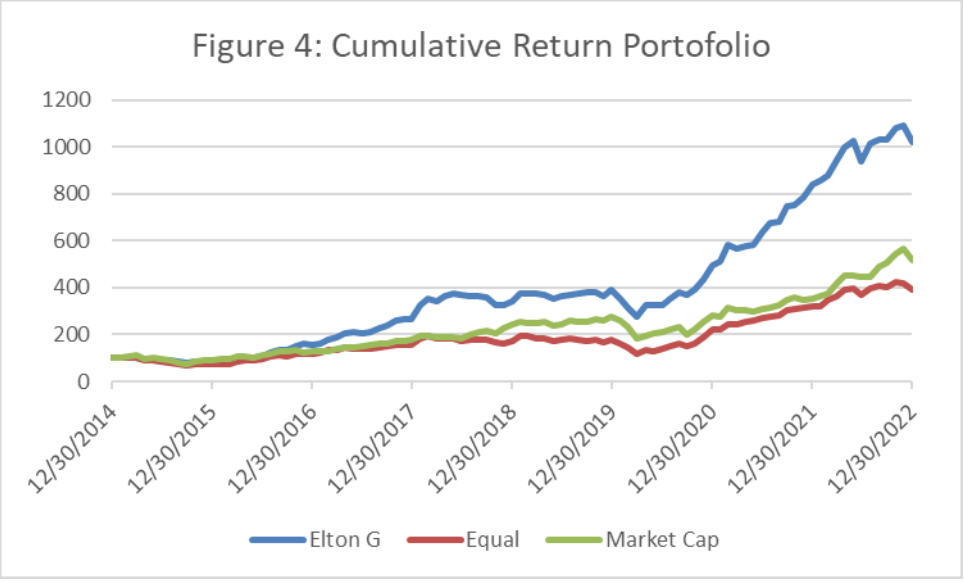
Based on Table 5, return of 22 stocks are vary form0.78% to 5.15% which is the lowest return of 0.78% for stock of ABM Investama Tbk and the highest return of 5.15% for stock of Barito Pacific Timber Tbk. Risk which is calculated by standard of deviation of return for 22 stocks are vary from 7.54% to 30.56%. Stock of PT Mayora Indah Tbk has the lowest return of 7.54% and the highest return of 30.56% for stock of Bank Raya Indonesia Tbk.

Then, Beta is risk of stock that has connected to market fluctuation. The beta stock is varying from 0.983 to 3.028. The beta also showed the riskier stock. The lowest

beta of 0.983 is for Saratoga Investama Sedaya Tbk dan the highest beta 3.028% is for Bank Raya Indonesia Tbk. Results of risk is similar for the highest to PT Bank Raya Indonesia Tbk even for return give similar results. This stock could help investor to get capital gain (profit) because the fluctuation price is very high.

Table 5 also shows the weighted stock in portfolio using Elton Gruber. The Weighted stock has range from 1.14% to 8.89%. The lowest of weighted stock is for ABM Investama Tbk and the highest for PT Sumber Alfaria Trijaya Tbk. This similar stated that lowest stock return will get lowest weighted stock in portfolio.

Furthermore, portfolio return for 3 portfolio which is Equal weighted, market capitalization and Elton Gruber compared it. The results by figure are showed in Figure 4 at below.



Sources: Compiled by the authors

Figure 4: Cumulative Return Portofolio

This research also compared portfolio return for each portfolio (Sartono and Setiawan, 2009). Figure 4 stated that portfolio using Elton Gruber has highest return compared to other method. This results also give argument that investor can use fund manager to manage fund. Using Elton Gruber for allocation stock need good knowledge in finance and quantitative analysis. This knowledge was owned by fund manager to sell it for investor.

4.4 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, Oil price, and pandemic era. The Multifactor model's coefficients are shown in Table 6.

Table 6: Multifactor Model for portfolio

No.	Portfolio Description	Constant	Market	Oil Price	Interest Rate	Pandemic	R^2
1	Equal Weighted	0.0448	1.26234 (12.8905)	0.0322 (1.2059)	-8.1094 (-1.8315)	0.00199 (0.1967)	70.07%
2	Market Capitalization	0.0191	1.4064 (17.9968)	0.0060 (0.2820)	-1.2067 (-0.3415)	0.00019 (0.0232)	80.05%
3	Elton Gruber Method	0.0902	0.9718 (7.4869)	0.0299 (0.8455)	-14.8952 (-2.5381)	-0.0136 (-1.0163)	46.69%

Sources: compiled by the authors

Based on Table 6, there three portfolio was affected by macroeconomics variables. In Equal Weighted Portfolio, Market 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 10%. This result follows the relationship of theory interest rate and return stock including portfolio return. Oil price and Pandemic variables did not significant affect portfolio return. Macroeconomic Variable and pandemic variable could explain fluctuation of Portfolio return by 70.07% and the rest by others variable.

On Market capitalization Weighted, the market return only significant affect portfolio returns at level of significant of 1 %. Oil price, Interest rate and Pandemic variable did not significant affect portfolio return. Macroeconomics Variable could explain fluctuation of portfolio return by 80.05% and the rest by others variable.

Then, the market return and interest rate significant affect portfolio return at level of significant of 1 % for Elton Gruber weighted Method. Oil price and Pandemic variables did not significant affect portfolio return. Macroeconomics Variable could explain fluctuation of portfolio return by 46.69% and the rest by others variable.

This results mostly support previously research Manullang (2023), Manurung (2023a), Manurung (2023b). 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. Conclusions

This study has some objective to investigate the effects of stock selection to construct portfolio return but mostly in Roy Criterion. The research's findings are as follows. First, Roy criterion could be used to construct a portfolio with determining achievement of minimum return. Second, portfolio return using Roy criterion is vary from 0.631% to 0.638% per month. Third, the market capitalization weighted Portfolio return is highest then equal weighted portfolio return. Fourth, Elton Gruber method also used to construct portfolio, then this method has highest return compared to others methods. Fifth, Market shock affected all portfolio return and Interest rate has affected portfolio return for equal weighted and Elton Gruber Method.

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