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Analysis of Capital Asset Pricing Models: Evidence from the Bank Sector on the Indonesia Stock Exchange (IDX)

Sermaye Varlıkları Fiyatlama Modellerinin Analizi: Endonezya Menkul Kıymetler Borsası (IDX) Bankacılık Sektöründen Kanıt

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ABSTRACT

In recent years, The development of the digital economy is increasingly advanced, creating new risks for banks because many banking branch offices have experienced a decline in their functionality which eventually had to be closed and had an impact on the rate of return that investors will receive. The objective of this research is to analyze the risk and return of the banking sector financial industry on the IDX, to find out efficient and inefficient stocks and to analyze stocks that can provide the greatest return on investment to investors. This type of research is quantitative research originating from secondary data, namely closing price data on stocks on the Indonesian Stock Exchange (IDX). The number of samples used was 43 banks which were taken using a non-probability sampling technique, especially purposive sampling which was listed on the Indonesia Stock Exchange for the period February 2019 to August 2022. The analytical tool used was the Capital Asset Pricing Model (CAPM). The results showed that of the 43 bank financial sector industries that were used as research samples, there were 18 stocks with a β_i value < 1 and 25 stocks with a β_i value > 1. Shares of the bank Woori Saudara Indonesia 1906 Tbk (SDRA) are stocks that have the smallest β_i value with The lowest $E(r_i)$ and shares of Bank Rakyat Indonesia Tbk (AGRO) are the shares that have the highest β_i value with the largest $E(r_i)$. Analysis of efficient and inefficient stocks shows that the number of efficient shares is 28 shares and the number of shares that are inefficient is as much as 15 shares. Of the 28 efficient stocks, Bank Jago Tbk (ARTO) shares are the ones that provide the most profit, namely 0.20280 or 20.28% when compared to other stocks.

Anahtar Kelimeler:

Risk,

Getiri,

Sermaye Varlıkları Fiyatlama Modeli

Jel Kodları:
G21, G24

ÖZET

Son yıllarda, Dijital ekonominin gelişimi giderek daha fazla ilerlemekte ve bankalar için yeni riskler yaratmaktadır. Bu nedenle birçok bankacılık şubesi nihayetinde kapanmak zorunda kalan işlevlerindeki bir azalış yaşadı ve ve yatırımcıların alacağı getiri oranını etkilenmiştir. Bu araştırmanın amacı, finans endüstride olan bankacılık sektörünün IDX üzerindeki risk ve getirisini analiz etmek, verimli ve verimsiz hisse senetlerini bulmak ve yatırımcılara en yüksek yatırım getirisini sağlayabilecek hisse senetlerini analiz etmektir. Bu araştırma türü, ikincil verilerden, yani Endonezya Menkul Kıymetler Borsası'ndaki (IDX) hisse senetlerine ilişkin kapanış fiyatı verilerinden kaynaklanan nicel araştırmadır. Özellikle amaçlı örneklem ile Şubat 2019 - Ağustos 2022 dönemi için Endonezya Borsasında işlem gören tesadüfi olmayan örneklem kullanarak 43 bankanın verileri kullanılmıştır. Kullanılan analitik araç, Sermaye Varlık Fiyatlandırma Modeli'dir (CAPM). Sonuçlar, araştırma örneklemi olarak kullanılan finans endüstride olan 43 banka β_i değeri < 1 olan 18 hisse senedi ve β_i değeri > 1 olan 25 hisse senedi olduğunu göstermiştir. Woori Saudara Indonesia 1906 Tbk (SDRA) bankasının hisseleri en düşük E(r_i) ile en küçük β_i değerine sahip hisse senetleridir ve Bank Rakyat Indonesia Tbk (AGRO) hisseleri en yüksek β_i değerine ve en büyük E(r_i) sahip hisselerdir. Etkin ve etkin olmayan hisse senetleri incelendiğinde, etkin hisse sayısının 28 adet, etkin olmayan hisse sayısının ise 15 adet hisse olduğu görülmektedir. 28 etkin hisse senedinden Bank Jago Tbk (ARTO) hissesi diğer hisse senetlerine göre en çok getiri sağlayan (%0,20280 veya %20,28) hissedir.

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1.INTRODUCTION

Investment is a business carried out by companies or individuals to gain profits and increase the wealth they have. One of the instruments used as a means of investment is stocks. If someone invests in a company or limited liability company (PT), then that person is referred to as an investor who has ownership shares of the company's assets. Stocks are usually traded on the capital market because the capital market is a place used to collect funds from the public to be channeled into productive sectors. which is long-term. In selecting investments, investors must be careful because every business contains risk, between risk and return has a linear (unidirectional) relationship, which means that the greater the expected return, the greater the risk (Sartono, 2005) or in other words, securities with a higher beta should have more expected return than security with a lower beta (Rui et al., 2018). The results of research conducted (Giva, 2015) on companies listed on the Nairobi Stock Exchange explain that there is a moderate correlation between risk and return.

In general, every individual is rational and does not like risk. This is reflected in the attitude that each individual will ask for an additional greater profit for each increase in the level of risk faced or in other words if individuals are faced with various choices, the individual prefers to obtain the same level of profit with less risk (Sartono, 2005). Therefore, both companies and individuals must find new ways of investing to minimize risk and maximize returns, especially investments in the financial sector (banking) which have a higher level of risk. Currently, the development of the digital economy is progressing which creates new risks for banks because many banking branch offices have experienced a decline in their functionality which eventually had to be closed because most customers switched to using online transactions. According to data from the Financial Services Authority (OJK, 2021), there has been a decrease in bank branch offices by 2,593 in the last 4-year period, namely from 2017-2021 and this has had an impact on banking stock prices.

The problems faced by banks today certainly have an impact on the rate of return that will be received by investors because risk and return are two inseparable things. One model that can assist investors in analyzing risk and return is the Capital Asset Pricing Model (CAPM). CAPM uses a theoretical basis that describes the relationship between systematic risk and returns in the market which can be used to measure the size of the return and risk on each stock (Nurhan et al., 2017; Markowski, 2020; Rammadhan, 2020; Tlemsani et al., 2020; Neill, 2021). This model defines risk performance and stock returns. To analyze the CAPM, there are several variables that must be known, namely individual stock returns (r_i), market returns (r_m), risk-free rates of return (r_f), systematic risk rates (β_i) and expected returns $E(r_i)$.

The research contribution is expected to be a reference for other researchers relevant to this research and provide information to investors in making investment decisions on stocks that provide maximum returns and minimum levels of risk. researchers are also motivated to research the capital asset pricing model because this model provides a solution to investors, especially in the banking industry which is currently experiencing many problems so that investors experience losses.

From the description of the background that has been stated previously, the problem in this study is how is the relationship between the risks and returns of the bank financial sector industry on the IDX, what stocks are efficient and inefficient and which stocks can provide the greatest level of profit to investors in investing? The objective of this research is to analyze the risk and return of the banking sector financial industry on the IDX, to find out efficient and inefficient stocks and to analyze stocks that can provide the greatest return on investment to investors.

2.LITERATURE REVIEW

2.1.Modern Portfolio Theory

Modern portfolio theory is a theory created by Harry Markowitz in the early fifties. The theory introduces the measurement of asset risk and develops methods for combining them into a risk-efficient portfolio, thereby creating an important basis for the further evolution of financial theory. The level of return and risk from investment activities are two basic things in an investment. Therefore, it is necessary to analyze the average calculation which describes the expected return of an asset while the standard deviation is a measure of the risk of each investment. To minimize risk, investors generally don't put their money in just one asset but combine many assets into one portfolio (Czekierda, 2007):

$$E(r_p) = \sum x_i E\,(r_i) \tag{1}$$

Where: $E(r_p)$ = Expected return on the portfolio. x_i = Weight of stock i in the portfolio, $E(r_i)$ = Expected return on asset i. Calculating the risk of each investor's portfolio is not easy because perfectly correlated portfolios are rare. According to Markowitz, if there is a merger of stocks into a portfolio, it will reduce portfolio risk so the term diversification is known as shown in the following figure (Brealey et al., 2009).

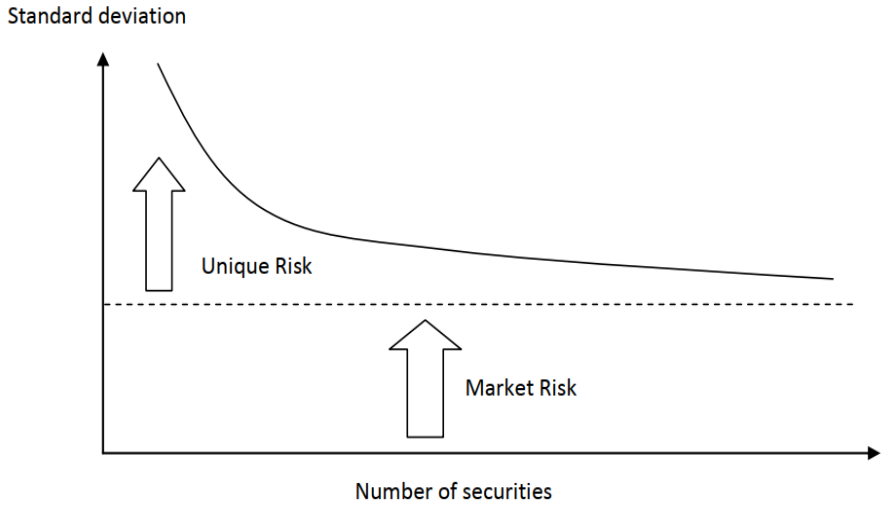

Figure 1. How Diversification Reduces Risk

The figure 1 shows that there are two risks that investors will face when making an investment, namely unique risk and market risk. Unique risk is a risk that can be diversified while the market risk is a risk that cannot be diversified. when an investor has an increasing number of shares in a portfolio, the unique risk will decrease. The following formula used is (Czekierda, 2007):

$$\sigma(p) = \sqrt{x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + 2(x_1x_2\sigma_{12}} \quad (2)$$

Where: $\sigma(p)$ = Portfolio standard deviation, ${\sigma_1}^2$ = Variance of stock 1, ${\sigma_2}^2$ = Variance of stock 2, x_2 = Weight of stock 2 in the portfolio, x_1 = Weight of stock 1 in the portfolio, and σ_{12} = Covariance between stocks 1 and 2. If the number of shares in the portfolio increases, the variables and covariance in the formula equation will increase. To minimize risk and maximize expected return, equations 1 and 2 are used to calculate it and the results are as shown in the following figure (Czekierda, 2007):

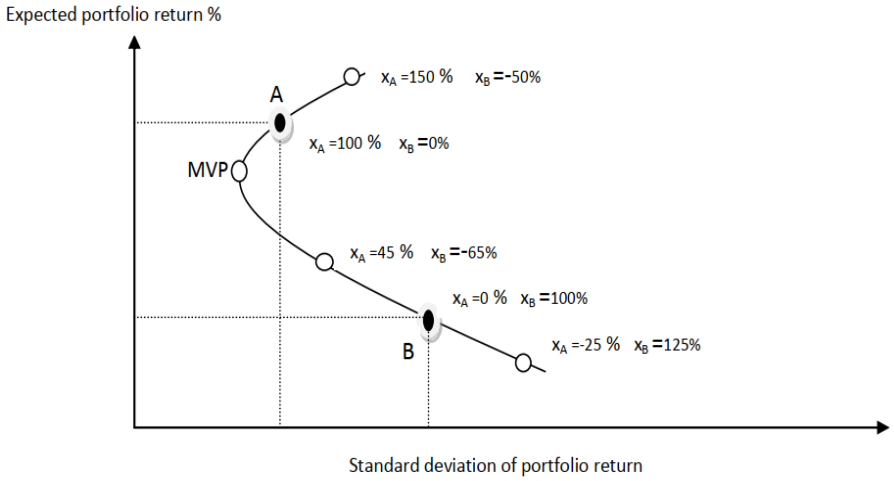

Figure 2. Combination Line for Securities A and B for the Case of Zero Correlation

The picture above explains that there are two points with different assets, namely points A and B. By using equations 1 and 2 then connecting the two points will produce a combination line. The shape of the combination line depends on the level of correlation between stocks. This bell-shaped curve is associated with the case when parts A and B have no correlation with each other. The following curve is a curve that describes if there are several stocks that are included in the portfolio (Czekierda, 2007):

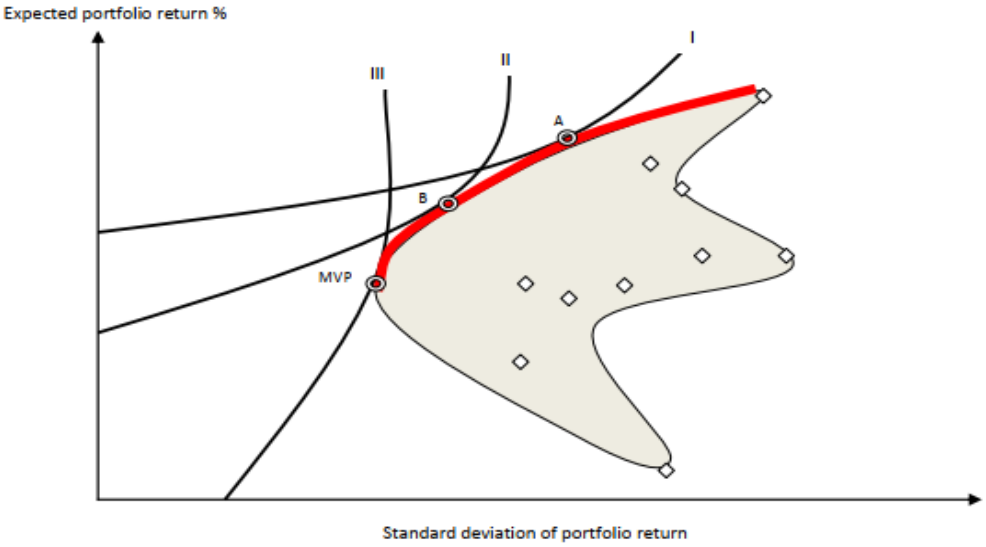

Figure 3. Optimal Choices of Investment Portfolio

The square dots in the shaded box are the stocks that provide the rate of return expected by each investor. When choosing a portfolio, investors want to achieve the highest possible expected return according to their risk preferences. However, no rational investor would invest in a portfolio below the minimum variance portfolio (MVP) because higher returns can be achieved with the same risk. The part of the feasible market set with a red curve is called the efficient frontier because it contains the portfolios defined by Markowitz as efficient portfolios. The main feature of these portfolios is that they offer the best possible expected return with a certain amount of risk. Now it is possible for us to see which portfolios will be chosen. According to common practice in microeconomics, the investors' preferences will be marked with utility functions represented by indifference curves I-III. An investor with indifference curve III is definitely a risk-loving one since he chooses portfolio A with high return and high risk. An investor with indifference curve II can tolerate some risk and thus chooses portfolio B while an investor with utility function I is most the risk-averse of them all and chooses minimum variance portfolio

2.2.Risk

Risk is the degree of uncertainty that exists in future events. Every investor does not like risk so they will try their best to avoid it, but investors always expect maximum profit. Usually, investors will secure investments that carry a low amount of risk because they have the opportunity to generate returns. Risk and investment are two things that cannot be separated, meaning that investors who decide to invest their funds in a number of assets or securities must be prepared to accept risk. The size of the risk to be borne by investors depends on the capital invested. The greater the investment capital, the greater the risk that will be borne by investors. Therefore, to minimize this risk, investors must know the performance of each share that will be occupied to make an investment. The stock performance of each industry or company can be seen from the annual report and the value of the company's shares.

The modern portfolio theory put forward by Markowitz explains that risk and return have a unidirectional relationship so that the greater the risk borne by investors, the greater the rate of return obtained (Alwi et al., 2022; Rasyad & Matoati, 2022; Suryanarayana, 2021; Giva, 2015; Akpo & Esuike, 2015). However, Markowitz further revealed that if the risk is considered a problem for investors who do not like risk, then risk can be minimized by investing in an optimal stock portfolio or diversification, even though not all risks can be eliminated by diversification. Diversified risk is divided into 2, namely systematic risk and unsystematic risk. Systematic risk is a risk that is always there and cannot be reduced by diversification, while unsystematic risk is a risk that can be reduced or eliminated by diversification, so it is also called market risk (r_m) (Husnan & Creativity, 2015). The main measure of investment industry risk is the standard deviation which tells how much an investment will fluctuate from its average return (Pacho, 2014). The equation used to calculate stock risk (β_i) is:

$$\beta_i = \frac{(Cov(r_i, r_m))}{Var(r_m)} \quad (3)$$

or

$$\beta_i = \frac{\sigma_i M}{\sigma^2 M} \quad (4)$$

Where: β_i = Systematic risk level of each stock, $\sigma_i M$ = Covariance between stock income and market income, $\sigma^2 M$ = Market Variance. The following is a risk assessment classification that refers to the β value of each stock.

Table 1. Classification of Beta Assessment

Measurement	Classification	Interpretation
$\boldsymbol{\beta = 1}$	Neutral shares	A 1% change in the Pm index causes a 1% change in $E(r_i)$.
$\boldsymbol{\beta < 1}$	Defensive shares	A change in the Pm index of 1% causes a change in $E(r_i)$ of less than 1%.
$\boldsymbol{\beta > 1}$	Aggressive shares	A change in the Pm index of 1% causes a change in $E(r_i)$ of greater than 1%.

Sources: Fabinu et al., (2017).

2.3.Returns

Return is a number of income or profits obtained by investors during a certain period from a number of investments that have been made. Each period the company will prepare financial reports as an accountability to various parties, both internal and external parties where the investor is one of the external parties who has the right to the financial reporting. The size of the return given to investors is usually influenced by the level of profit obtained by the company, which means that the greater the level of company profit, the greater the return distributed to investors (Nadyayani & Suarjaya, 2021). The rate of return obtained by investors will affect the company's stock price so that the share value is higher because more and more investors are interested in investing in the company (Hongkong, 2017; Ibrahim et al., 2022). The process of calculating the rate of return is (Nurhan et al., 2017):

Calculating Actual Return (r_i):

$$r_i = \frac{(P_t - P_{t-i})}{P_{t-1}} \quad (5)$$

Where: r_i = Stock return rate, P_t = Stock price period t (now), P_{t-i} = Stock Price Period t-1 (previous).

Calculating Risk-Free Return (r_f):

$$r_f = \frac{X_{SBI}}{N} \quad (6)$$

Where: r_f = Risk-Free Profit Rate, x = Average Risk-Free rate of return, N = Time (Month) in one year.

Calculating Return Market (r_m)

$$r_M = \frac{IHSG_t - IHSG_{t-1}}{IHSG_{t-1}} \quad (7)$$

Where: r_M = Market Profit Rate, $IHSG_t$ = Composite stock price index for the current period, $IHSG_{t-1}$ = Composite stock price index for the previous period.

2.4. Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) is used to determine the level of risk and expected return on a number of investments. The Capital Asset Pricing Model (CAPM) was first put forward by Markowitz (1952) and developed by Sharpe, Lintner, and Mossin in the 1960s. This model also acts as a key element of how the market can assess the return of each security along with different levels of risk (Rui et al., 2018). Several research results also show that CAPM analysis is a very useful item in investment management tools and investors trust it to evaluate project profitability (Pacho, 2014; Chiang & Zhang, 2018; Widianingsih, 2019; Wahyuny & Gunarsih, 2020; Pramono et al., 2022). Every investor is expected to be able to estimate the return of each investment made

in order to minimize risk. However, the results of research in England which tested the validity of the CAPM in analyzing the feasibility of investing in the London Stock Exchange for the 2012-2020 period found that the CAPM could not be used as an analytical tool in investing in stocks (Pham, 2021).

CAPM analysis consists of several variables that are related to one another. So, to find out the comparison between actual return and expected return, it must be based on the calculation results of the systematic value or beta (β), market return (r_m), and risk-free assets (r_f). Beta is a determining factor in the CAPM concept because the risk level of a security is measured by the beta coefficient β, and the relationship between risk and return on individual security is described in the security market line (SML) as shown in the following figure: security market line (Sartono, 2005):

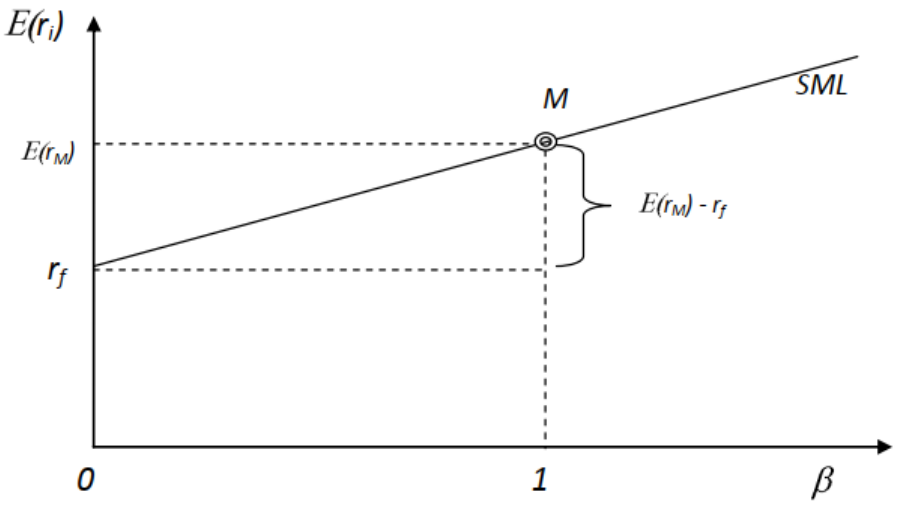

Figure 4. Securities Market Line (SML)

The figure 4 shows the relationship between the expected rate of return $E(r_i)$ and the level of systematic risk measured by Beta (β_i). β_i = 1 indicates that the expected rate of return is the same as the market rate of return $E(r_m) = E(r_i)$. If the beta in security is greater, the level of expected return will also be greater. Therefore, the SML equation can be written as follows:

$$E(r_i) = r_f + \beta_i[E(r_M) - r_f] \quad (8)$$

Where: $E(r_i)$ = Expected rate of return, r_f = Risk-free of return, β_i = Beta coefficient of an asset or a portfolio, and $E(r_M)$ = Expected return on the market portfolio.

3.METHODOLOGY

3.1. Data Types and Sources

This type of research used is quantitative research. This study uses secondary data sources derived from the closing prices of industrial financial sector banks on the IDX for the period February 2019 to August 2022 which are listed on the Indonesia Stock Exchange.

3.2.Population and Sample

The total population of the study was 47 industrial financial sector banks listed on the Indonesian stock exchange and a total sample of 43 industries was taken using non-probability sampling techniques, especially purposive sampling with the criteria of banks consistently trading shares and being listed on the Indonesia Stock Exchange for the period of February 2019 to August 2022.

Stock data from the banking sector financial industry is then inputted and processed using Microsoft Excel to calculate stock returns and systematic risk levels as benchmarks for the feasibility of investments to be made. If the actual return is greater than the expected return (Ri > E(Ri)) then the stock is efficient or in other words, the investor is eligible to invest, but if the actual return is smaller than the expected return (Ri < E(Ri)) then the stock it is not efficient or investors are not eligible to invest (Hasan et al., 2019).

3.3.Data analysis

The analysis technique used in this research is descriptive analysis with the Capital Asset Pricing Model (CAPM) model which links the level of risk and return so that investors know the right investment choices in the banking sector. The equation used in the CAPM analysis is:
Calculating Expected Return $E(r_i)$:

$$E(r_i) = r_f + \beta_i[E(r_M) - r_f] \quad (9)$$

4.RESULTS AND DISCUSSION

4.1.Research Results

The data for this study uses data on the closing price of shares in the financial sector industry for the period February 2019 to August 2022 on the Indonesia Stock Exchange, totaling 43 companies. The analytical tool used is the Capital Asset Pricing Model (CAPM) by carrying out several calculation stages to calculate the expected rate of return $[E(r_i)]$. The results of data analysis using the CAPM model for each variable in calculating the expected rate of return $[E(r_i)]$are presented in full in the following table 2:

Table 2. CAPM Calculation Results

No	Stock Code	r_i	r_m	r_f	β_i	$E(r_i)$
1	AGRO	0.0622	0.0036	0.0035	3.9988	0.0038
2	AGRS	-0.0045	0.0036	0.0035	0.7040	0.0036
3	ARTO	0.2065	0.0036	0.0035	2.6121	0.0037
4	BABP	0.0423	0.0036	0.0035	0.1381	0.0036
5	BACA	0.0003	0.0036	0.0035	0.1791	0.0036
6	BBCA	-0.0092	0.0036	0.0035	0.4493	0.0036
7	BBHI	0.1244	0.0036	0.0035	3.5942	0.0037
8	BBKP	0.0060	0.0036	0.0035	3.1174	0.0037
9	BBMD	0.0144	0.0036	0.0035	1.0703	0.0036
10	BBNI	0.0076	0.0036	0.0035	2.1720	0.0037
11	BBRI	0.0066	0.0036	0.0035	1.4374	0.0036
12	BBTN	0.0033	0.0036	0.0035	2.5614	0.0037
13	BBYB	0.0802	0.0036	0.0035	1.8287	0.0036
14	BCIC	-0.0089	0.0036	0.0035	-0.1465	0.0035
15	BDMN	-0.0176	0.0036	0.0035	2.1744	0.0037
16	BEKS	0.0109	0.0036	0.0035	0.9132	0.0036
17	BGTG	0.0448	0.0036	0.0035	2.2989	0.0037
18	BINA	0.0766	0.0036	0.0035	0.2039	0.0036
19	BJBR	-0.0031	0.0036	0.0035	1.2869	0.0036
20	BJTM	0.0047	0.0036	0.0035	1.5185	0.0036
21	BKSW	0.0125	0.0036	0.0035	0.5464	0.0036
22	BMAS	0.0546	0.0036	0.0035	1.4849	0.0036
23	BMRI	0.0096	0.0036	0.0035	1.4740	0.0036
24	BNBA	0.1050	0.0036	0.0035	2.4758	0.0037
25	BNGA	0.0028	0.0036	0.0035	1.5482	0.0036
26	BNII	0.0046	0.0036	0.0035	1.7160	0.0036
27	BNLI	0.0144	0.0036	0.0035	1.6234	0.0036
28	BRIS	0.0501	0.0036	0.0035	2.7497	0.0037
29	BSIM	0.0122	0.0036	0.0035	0.7089	0.0036
30	BSWD	-0.0051	0.0036	0.0035	-0.0733	0.0035
31	BTPN	0.0019	0.0036	0.0035	0.5142	0.0036

32	BTPS	0.0124	0.0036	0.0035	0.7740	0.0036
33	BVIC	0.0564	0.0036	0.0035	0.3389	0.0036
34	DNAR	0.0023	0.0036	0.0035	0.2090	0.0036
35	INPC	0.0320	0.0036	0.0035	1.9306	0.0036
36	MAYA	-0.0392	0.0036	0.0035	1.3275	0.0036
37	MCOR	-0.0068	0.0036	0.0035	1.4815	0.0036
38	MEGA	0.0088	0.0036	0.0035	0.2133	0.0036
39	NISP	-0.0053	0.0036	0.0035	0.2974	0.0036
40	NOBU	0.0009	0.0036	0.0035	0.2906	0.0036
41	PNBN	0.0135	0.0036	0.0035	1.6528	0.0036
42	PNBS	0.0168	0.0036	0.0035	1.0332	0.0036
43	SDRA	0.1667	0.0036	0.0035	-2.4484	0.0034

The results of calculating the actual return (r_i) of 43 industrial financial sector banks on the Indonesia Stock Exchange show that Bank Jago Tbk (ARTO) obtained the highest actual return value of 0.2065 or 20.65%. The lowest actual return is at Bank Mayapada International Tbk (MAYA) which is -0.0392 or 3.92% with an overall average value of 0.272 or 27.2%

The results of the calculations show that the market return rate (r_m) of the composite stock price index (IHSG) whose data was obtained from February 2019 to August 2022 shows that the market rate of return on industry financial sector bank stocks is on average 0.0036 or 0.36%, so Rm is considered not liquid because it is smaller than 1 (Jamil, 2018). For the risk-free return (r_f) of Indonesia's interest rate, it shows an average value of 0.0035 or 0.35%.

The average value of stock systematic risk (β_i) is 1.2554 greater than 1 (1.2554 > 1). This shows that overall 43 stocks from the banking sector financial industry are active in responding to any changes in market prices. Shares of bank Woori Saudara Indonesia 1906 Tbk (SDRA) have the smallest βi value of -2.4484 and shares of Bank Rakyat Indonesia Tbk (AGRO) have the highest (β_i) value. The expected rate of return [$E(r_i)$] indicates that the lowest expected rate of return [$E(r_i)$]in the banking financial sector industry occurs at the Woori Saudara Indonesia Tbk (SDRA) bank, which is equal to 0.0034 while the highest rate of return [$E(r_i)$] occurs) at Bank Rakyat Indonesia Tbk (AGRO) which is equal to 0.0038.

4.2. Security Market Line (SML)

The security market line (SML) image is used to relate the systematic risk value (β_i) to the expected rate of return [$E(r_i)$]. The SML line will connect the points of βi values and [$E(r_i)$]values starting from the smallest Beta (β_i) value. Complete (β_i) and [$E(r_i)$]data are presented in the following table:

Table 3. Systematic Risk (βi) and Expected Return E(Ri)

No	Stock Code	Company Name	(β_i)	$E(r_i)$
1	SDRA	Bank Woori Saudara Indonesia 1906 Tbk	-2.4484	0.00342
2	BCIC	Bank Jtrust Indonesia Tbk	-0.1465	0.00354
3	BSWD	Bank Of India Indonesia Tbk	-0.0733	0.00354
4	NOBU	Bank Nasionalnobu Tbk	0.2906	0.00356
5	NISP	Bank OCBC NISP Tbk	0.2974	0.00356
6	BABP	Bank MNC International Tbk	0.1381	0.00356
7	BACA	Bank Capital Indonesian Tbk	0.1791	0.00363
8	BINA	Bank Ina Perdana Tbk	0.2039	0.00362
9	DNAR	Bank Oke Indonesia Tbk	0.2090	0.00365
10	MEGA	Bank Mega Tbk	0.2133	0.00356
11	BVIC	Bank Victoria Indonesia Tbk	0.3389	0.00356
12	BBCA	Bank Central Asia Tbk	0.4493	0.00359
13	BTPN	Bank BTPN Tbk	0.5142	0.00357

14	BKSW	Bank QNB Indonesia Tbk	0.5464	0.00358
15	AGRS	Bank IBK Indonesia Tbk	0.7040	0.00358
16	BSIM	Bank Sinarmas Tbk	0.7089	0.00358
17	BTPS	Bank BTPN Syariah Tbk (S)	0.7740	0.00363
18	BEKS	Bank Pembangunan Daerah Banten Tbk	0.9132	0.00364
19	PNBS	Bank Panin Dubai Syariah Tbk (S)	1.0332	0.00363
20	BBMD	Bank Mestika Darma Tbk	1.0703	0.00360
21	BJBR	Bank Pembangunan Jawa barat & banten Tbk	1.2869	0.00363
22	MAYA	Bank Mayapada Internasional Tbk	1.3275	0.00363
23	BBRI	Bank Rakyat Indonesia (Persero) Tbk	1.4374	0.00358
24	BMRI	Bank Mandiri (Persero) Tbk	1.4740	0.00363
25	MCOR	Bank China Konstruktion Bank Indonesia Tbk	1.4815	0.00362
26	BMAS	Bank Maspion Indonesia Tbk	1.4849	0.00356
27	BJTM	Bank Pembangunan Jawa Timur Tbk	1.5185	0.00363
28	BNGA	Bank CIMB Niaga Tbk	1.5482	0.00360
29	BNLI	Bank Permata Tbk	1.6234	0.00363
30	PNBN	Bank Pan Indonesia Tbk	1.6528	0.00363
31	BNII	Bank Maybank Indonesia Tbk	1.7160	0.00364
32	BBYB	Bank Neo Commerce Tbk	1.8287	0.00364
33	INPC	Bank Arta Graha Internasional Tbk	1.9306	0.00362
34	BDMN	Bank Danamon Indonesia Tbk	2.1744	0.00366
35	BBNI	Bank Negara Indonesia (Persero) Tbk	2.1720	0.00366
36	BGTG	Bank Ganesha Tbk	2.2989	0.00371
37	BNBA	Bank Bumi Arta Tbk	2.4758	0.00374
38	BBTN	Bank Tabungan Negara (Persero) Tbk	2.5614	0.00368
39	ARTO	Bank Jago Tbk	2.6121	0.00369
40	BRIS	Bank Syariah Indonesia Tbk (S)	2.7497	0.00371
41	BBKP	Bank KB Bukopin Tbk	3.1174	0.00369
42	BBHI	Allo Bank Indonesia Tbk	3.5942	0.00374
43	AGRO	Bank raya Indonesia Tbk	3.9988	0.0038

The values of (β_i) and $[E(r_i)]$ in table 8 are then made into SML images to see the relationship between the two. The following is an image of the research SML:

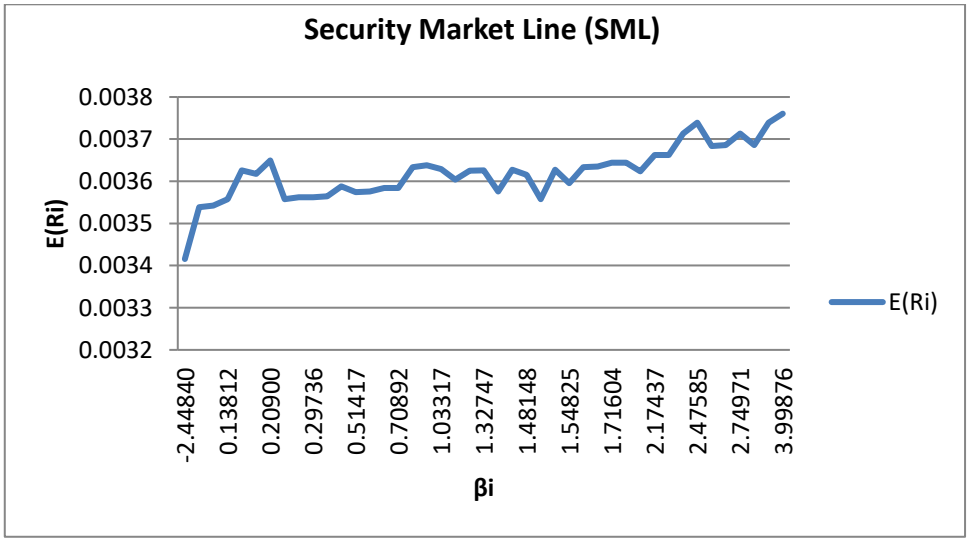

Figure 5. Security Market Line (SML)

The image of the Security Market line (SML) in the financial industry in the banking sector for the period February 2019 to August 2022 shows that (β_i) has a negative correlation with $[E(r_i)]$, so this research contradicts several previous studies which argue that (β_i) has a positive correlation with $[E(r_i)]$. The calculation results also show that of the 43 stocks used as research samples, there are 18 stocks with a (β_i) value < 1 and 25 stocks with a (β_i) value > 1.

4.3. Grouping of Shares and Stock Investment Decisions

Stock investment is carried out in order to obtain maximum profit, therefore investors must know which stocks are efficient and which stocks are not efficient. Efficient stocks are stocks that provide an actual rate of return greater than the expected rate of return ($r_i > E(r_i)$ (Hasan et al., 2019; Maharani et al., 2021). The following is a grouping of 43 efficient stocks and inefficient stocks in the banking sector financial industry for the period February 2019 to August 2022 so that investors can make the right decisions in investing.

Table 4. Efficient Stock and Inefficient Stock

No	Stock Code	r_i	$E(r_i)$	Stock Evaluation	Decision
1	AGRO	0.0622	0.0038	Efficient	Buy
2	AGRS	-0.0045	0.0036	Inefficient	Sell
3	ARTO	0.2065	0.0037	Efficient	Buy
4	BABP	0.0423	0.0036	Efficient	Buy
5	BACA	0.0003	0.0036	Inefficient	Sell
6	BBCA	-0.0092	0.0036	Inefficient	Sell
7	BBHI	0.1244	0.0037	Efficient	Buy
8	BBKP	0.0060	0.0037	Efficient	Buy
9	BBMD	0.0144	0.0036	Efficient	Buy
10	BBNI	0.0076	0.0037	Efficient	Buy
11	BBRI	0.0066	0.0036	Efficient	Buy
12	BBTN	0.0033	0.0037	Inefficient	Sell
13	BBYB	0.0802	0.0036	Efficient	Buy
14	BCIC	-0.0089	0.0035	Inefficient	sell
15	BDMN	-0.0176	0.0037	Inefficient	Sell
16	BEKS	0.0109	0.0036	Efficient	Buy
17	BGTG	0.0448	0.0037	Efficient	Buy
18	BINA	0.0766	0.0036	Efficient	Buy
19	BJBR	-0.0031	0.0036	Inefficient	Sell
20	BJTM	0.0047	0.0036	Efficient	Buy
21	BKSW	0.0125	0.0036	Efficient	Buy
22	BMAS	0.0546	0.0036	Efficient	Buy
23	BMRI	0.0096	0.0036	Efficient	Buy
24	BNBA	0.1050	0.0037	Efficient	Buy
25	BNGA	0.0028	0.0036	Inefficient	Sell
26	BNII	0.0046	0.0036	Efficient	Buy
27	BNLI	0.0144	0.0036	Efficient	Buy
28	BRIS	0.0501	0.0037	Efficient	Buy
29	BSIM	0.0122	0.0036	Efficient	Buy
30	BSWD	-0.0051	0.0035	Inefficient	Sell
31	BTPN	0.0019	0.0036	Inefficient	Buy
32	BTPS	0.0124	0.0036	Efficient	Buy
33	BVIC	0.0564	0.0036	Efficient	Buy
34	DNAR	0.0023	0.0036	Inefficient	Sell
35	INPC	0.0320	0.0036	Efficient	Buy
36	MAYA	-0.0392	0.0036	Inefficient	Sell

37	MCOR	-0.0068	0.0036	Inefficient	Sell
38	MEGA	0.0088	0.0036	Efficient	Buy
39	NISP	-0.0053	0.0036	Inefficient	Sell
40	NOBU	0.0009	0.0036	Inefficient	Sell
41	PNBN	0.0135	0.0036	Efficient	Buy
42	PNBS	0.0168	0.0036	Efficient	Buy
43	SDRA	0.1667	0.0034	Efficient	Buy

The following is a picture of efficient shares and inefficient shares:

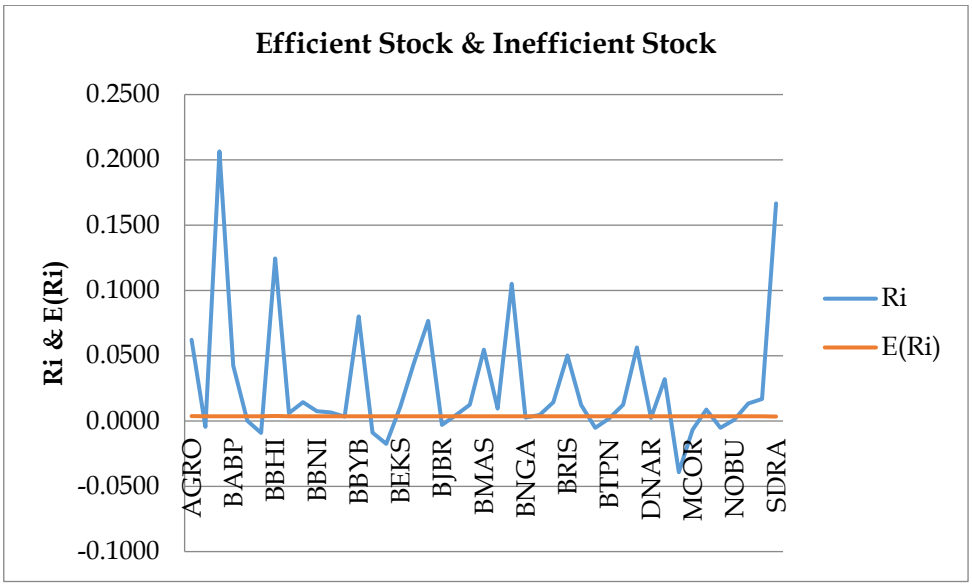

Figure 6. Efficient Stocks and Inefficient Stocks

Figure 6 shows efficient shares and inefficient shares. The blue line is the actual return (r_i) line and the red line is the expected return ($E(r_i)$) line. Stocks are efficient if the actual return value is greater than the expected return value [$r_i > E(r_i)$] so that it can be seen that the number of efficient shares is 28 shares and the number of inefficient shares is 15 shares.

4.4.Discussion

The results of data analysis using the capital asset pricing model (CAPM) show that the Actual return (r_i) value of the 43 banking sector financial industries, there are 34 industries that have a positive (r_i) value ($r_i > 0$) while the other 9 companies have a negative (r_i) value ($r_i < 0$). Actual return (r_i) with a positive value indicates that the investment in these stocks is able to provide actual profits, while (r_i), which has a negative value, indicates that these stocks cannot provide actual returns to investors in the time period studied. The shares with the highest (r_i) value were Bank Woori Saudara Indonesia 1906 Tbk (SDRA) shares, namely 0.1667 or 16.67%, while the lowest (r_i) values were obtained in Bank Mayapada International Tbk (MAYA) shares, namely -0.0392 or -3.92%. In calculating the market rate of return (r_m) for the period February 2019 - August 2022 it experienced fluctuations due to stock prices that were also uncertain and sometimes even decreased, but overall the market rate of return (r_m) had a positive annual average of 0.0036 or 0.36% which means that the JCI on the IDX is able to provide benefits to investors. While the value of the risk-free rate of return (r_f) during the study period decreased, this was because the value of the BI rate which was used as the basis for calculations continued to decrease, namely the (r_f) from February 2019 of 0.06 or 6%, down to 0.035 or 3.5% in the month of July 2022. This can reduce investor confidence in banks so that investors will withdraw their investments or deposits and transfer them to other stocks that are more profitable.

In calculating the level of systematic risk (β_i), it shows that of the 43 bank financial sector industries that were used as research samples, there were 18 shares with a (β_i) value < 1 and 25 shares with a (β_i) value > 1. The shares of the bank Woori Saudara Indonesia 1906 Tbk (SDRA) are the stock that has the lowest (β_i) value is -2.4484 which means that SDRA shares are not sensitive and do not follow the movement of market returns while the shares of Bank Rakyat Indonesia Tbk (AGRO) are stocks that have the highest (β_i)value of 3.9988 which

means that AGRO shares are active stocks and sensitive to movements in the market. The final stage in the CAPM analysis is to calculate the expected rate of return ($E(r_i)$), which is calculated from the sum of the risk-free rate of return (r_f) with the systematic risk level for each share (βi) which has previously been multiplied by the difference between the market rate of return (r_m) with a risk-free rate of return (r_f). The highest expected rate of return ($E(r_i)$) is in shares of Bank Raya Indonesia Tbk (AGRO) which is 0.0038 or 0.38% while the lowest ($E(r_i)$) is in shares of Bank Woori Saudara Indonesia 1906 Tbk (SDRA) which is equal to 0.0034 or 0.34% These results explain that the bank financial sector industry stocks that have the largest βi values get the highest $E(r_i)$ and stocks that have the smallest βi values get the lowest $E(r_i)$ values.

Based on the results of the CAPM analysis, it is known that of the 43 shares in the banking sector financial industry, there are 28 efficient shares and 15 inefficient shares. Investors should be able to choose stocks that provide the maximum level of profit among the 28 efficient stocks in making investments. Stocks with the greatest profit are obtained from the difference between the actual return (r_i) value and the expected return [$E(r_i)$] value, the results of which can be seen in the following table:

Table 5. Efficient Stock Rating

No	Stock Code	Company Name	r_i	$E(r_i)$	r_i - $E(r_i)$
1	ARTO	Bank Jago Tbk	0.2065	0.0037	0.20280
2	SDRA	Bank Woori Saudara Indonesia 1906 Tbk	0.1667	0.0034	0.16327
3	BBHI	Allo Bank Indonesia Tbk	0.1244	0.0037	0.12062
4	BNBA	Bank Bumi Arta Tbk	0.1050	0.0037	0.10136
5	BBYB	Bank Neo Commerce Tbk	0.0802	0.0036	0.07652
6	BINA	Bank Ina Perdana Tbk	0.0766	0.0036	0.07305
7	AGRO	Bank raya Indonesia Tbk	0.0622	0.0038	0.05841
8	BVIC	Bank Victoria Indonesia Tbk	0.0564	0.0036	0.05281
9	BMAS	Bank Maspion Indonesia Tbk	0.0546	0.0036	0.05101
10	BRIS	Bank Syariah Indonesia Tbk (S)	0.0501	0.0037	0.04641
11	BGTG	Bank Ganesha Tbk	0.0448	0.0037	0.04111
12	BABP	Bank MNC International Tbk	0.0423	0.0036	0.03872
13	INPC	Bank Arta Graha Internasional Tbk	0.0320	0.0036	0.02836
14	PNBS	Bank Panin Dubai Syariah Tbk (S)	0.0168	0.0036	0.01315
15	BNLI	Bank Permata Tbk	0.0144	0.0036	0.01077
16	BBMD	Bank Mestika Darma Tbk	0.0144	0.0036	0.01076
17	PNBN	Bank Pan Indonesia Tbk	0.0135	0.0036	0.00983
18	BKSW	Bank QNB Indonesia Tbk	0.0125	0.0036	0.00890
19	BTPS	Bank BTPN Syariah Tbk (S)	0.0124	0.0036	0.00882
20	BSIM	Bank Sinarmas Tbk	0.0122	0.0036	0.00857
21	BEKS	Bank Pembangunan Daerah Banten Tbk	0.0109	0.0036	0.00733
22	BMRI	Bank Mandiri (Persero) Tbk	0.0096	0.0036	0.00599
23	MEGA	Bank Mega Tbk	0.0088	0.0036	0.00527
24	BBNI	Bank Negara Indonesia (Persero) Tbk	0.0076	0.0037	0.00392
25	BBRI	Bank Rakyat Indonesia (Persero) Tbk	0.0066	0.0036	0.00298
26	BBKP	Bank KB Bukopin Tbk	0.0060	0.0037	0.00225
27	BJTM	Bank Pembangunan Jawa Timur Tbk	0.0047	0.0036	0.00102
28	BNII	Bank Maybank Indonesia Tbk	0.0046	0.0036	0.00100

After classifying efficient stocks that have a value of $r_i > E(r_i)$ (abnormal return), it can be seen that Jago Tbk (ARTO) shares are the most efficient stocks because they can provide the greatest difference between r_i and $E(r_i)$ which is 0.2161 or 21.6% which means that ARTO shares can provide a profit of 20.28% greater than the expected return of investors and shares of Bank Maybank Indonesia Tbk (BNII) are stocks that provide the smallest difference between r_i and $E(r_i)$, namely 0.00100 or 0.1% which means that BNII shares are only able to provide a profit of 0.1%. The results of this study can provide information to investors who wish to invest in industrial

bank financial sector stocks on the Indonesian Stock Exchange that there are 28 efficient stocks and of the 28 efficient stocks, ARTO shares are stocks that provide the greatest profit when compared to other stocks.

The results of this study are in line with the theory put forward by Markowich and the results of research conducted by (Giva, 2015) at the Nairobi Securities Exchange (NSE), explaining that there is a significant relationship between risk and return. Because that βi has a unidirectional (linear) relationship with $[E(r_i)]$, which means that the greater the βi, the greater the $[E(r_i)]$ and Meanwhile, several other studies have found the opposite, such as research conducted by Alwi et al., 2022, explaining that of the 24 stocks studied, there were 23 stocks that provided actual returns that were smaller than expected returns, so the returns obtained by PT Jiwasraya were not as expected. Hasan et al. (2019) found that there is a non-linear relationship between systematic risk and expected stock returns. The research results of Z. (Hasan et al., 2012) who explained that the Capital Asset Pricing Model (CAPM), is a valid indicator of systematic risk, but the CAPM analysis in their research was inconsistent and could not find complete support from the CAPM model. (Husein & Hasanah, 2017), and Rui et al., (2018) cannot prove Markowitz's portfolio theory. This is explained by the number of beta market (β_m) beta value below 1 indicating that fluctuations in stock returns do not follow the movement of market fluctuations.

5.CONCLUSION

The results of the analysis using the capital asset pricing model (CAPM) in the banking sector financial industry for the period February 2019 – August 2022 or for 45 months, it can be concluded that the stocks that obtained the highest actual return (r_i) values were Bank Woori Saudara Indonesia 1906 Tbk (SDRA) shares. namely 0.1667 or 16.7% while the lowest actual return (r_i) value was obtained on Bank Mayapada International Tbk (MAYA) shares which amounted to -0.0392 or -3.92%. In calculating the level of systematic risk (β_i), it shows that of the 43 bank financial sector industries that were used as research samples, there were 18 shares with a (β_i) value < 1 and 25 shares with a (β_i) value > 1. The shares of the bank Woori Saudara Indonesia 1906 Tbk (SDRA) are stocks that have the lowest (β_i) value of -2.4484 and an Expected return $E(r_i)$ value of 0.0034 or 3.4%, while Bank Rakyat Indonesia Tbk (AGRO) shares are stocks that have the highest βi value of 3.9988 with a return rate of 0.0038 or 3.8% which means meaning that stocks that have the smallest systematic risk provide the lowest rate of return and conversely stocks that have the largest systematic risk provide the highest returns so that the relationship between systematic risk (β_i) and Expected return $E(r_i)$ is linear. Analysis of efficient and inefficient stocks shows that the efficient number of shares is 28 shares, and the number of inefficient shares is 15 shares. Of the 28 efficient stocks, ARTO shares are the ones that provide the most profit, namely 0.20280 or 20.28% when compared to other stocks.

The researcher recommends that investors pay attention to efficient stocks for investing because efficient stocks will provide a greater rate of return compared to inefficient stocks such as ARTO shares. The limitation of this research is that this study only uses the financial sector in the banking industry, totaling 43 shares for the period February 2019 - August 2022. the banking industry as a sample but can take other sectors on the Indonesian Stock Exchange (IDX). The research obstacle is data that is spread in various places so it takes a long time to collect and process research data. This paper suggests a different assets pricing model and takes into consideration of some related variables in predicting future stock returns. This research provides important implications to investors, analysts, stock brokers, speculators, fund managers, practitioners, relevant authorities, and the government.

AUTHORS' DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

All sections are written by the author.

REFERENCES

Akpo, E. S., Hassan, S., & Esuike, B. U. (2015). Reconciling the arbitrage pricing theory (APT) and the capital asset pricing model (CAPM) institutional and theoretical framework. *International Journal of Development and Economic Sustainability*, *3*(6), 17-23.

Alwi, M., Ali, M., & Rahim, F. R. (2022). Analysis of investment risk and return. *Hasanuddin Journal of Business Strategy*, *4*(1), 73-84.

Brealey, R., Myers, S. C., & Allen, F. (2009). Principles of corporate finance. Moscow: Olimp-Bisnes.

Chiang, T. C., & Zhang, Y. (2018). An empirical investigation of risk-return relations in Chinese equity markets: Evidence from aggregate and sectoral data. *International Journal of Financial Studies*, *6*(2), 35.

Czekierda, B. (2007). The Capital asset pricing model: Test of the model on the Warsaw Stock Exchange.

Fabinu, I. B., Makinde, K. O., & Folorunso, A. O. (2017). Empirical analysis of capital assets pricing model (CAPM) as a tool for valuation of a company's returns. *Net Journal of Business Management*, *5*(2), 30-40.

Giva, S. I. (2015). *The relationship between risk and return for firms listed at the Nairobi securities exchange* (Doctoral dissertation, University of Nairobi).

Hasan, M. Z., Kamil, A. A., Mustafa, A., & Baten, M. A. (2012). Relationship between risk and expected returns: Evidence from the dhaka stock exchange. *Procedia Economics and Finance*, *2*, 1-8.

Hasan, N., Pelleng, F. A., & Mangindaan, J. V. (2019). Analisis capital asset pricing model (CAPM) sebagai dasar pengambilan keputusan berinvestasi saham (Studi pada Indeks Bisnis-27 di Bursa Efek Indonesia). *Jurnal Administrasi Bisnis (JAB)*, *8*(1), 36-43.

Hongkong, H. (2017). The effect of earning per share and return on equity on stock price (study on listed banks). *Accountability*, *6*(2), 20-25.

Husein, F., & Hasanah, S. M. (2017). Determining the optimum portfolio of Sharia stocks using an approach of Shariah compliant asset pricing model (SCAPM). *Journal of Economics, Business & Accountancy Ventura*, *19*(3), 349.

Husnan, F., & Creativity, J. (2015). *Buku pintar bisnis online*. Elex Media Komputindo.

Ibrahim, M. I., Titaley, J., & Manurung, T. (2017). Analisis keakuratan capital asset pricing model (CAPM) dan arbitrage pricing theory (APT) dalam memprediksi expected saham pada LQ45. *d'CARTESIAN: Jurnal Matematika dan Aplikasi*, *6*(1), 30-44.

Jamil, P. C. (2018). Analisis Market Return di Indonesia. *Jurnal Ekonomi KIAT*, *29*(1), 61-65.

Maharani, N. D. (2021). *Analisis capital asset pricing model (CAPM) terhadap keputusan investasi (Studi pada perusahaan yang tergabung Di Idx30 Periode 1 Februari 2017-31 Januari 2020)* (Doctoral dissertation, Universitas Brawijaya).

Markowitz, H. (1952). The utility of wealth. *Journal of political Economy*, *60*(2), 151-158.

Markowski, L. (2020). Further evidence on the validity of CAPM: The Warsaw Stock Exchange application. *Journal of Economics and Management*, *39*(1), 82-104.

Nadyayani, D. A. D., & Suarjaya, A. A. G. (2021). The effect of profitability on stock return. *American Journal of Humanities and Social Sciences Research (AJHSSR)*, *5*(1), 695-703.

Nurhan, Y. P., Hutabarat, F. M., & Nadine, V. (2017). Capital asset pricing model analysis in determining risk and return of companies listed at Jakarta Islamic Index (JII) of Indonesia Stock Exchange. *IMC 2016 Proceedings*, *1*(1).

O'Neill, M. (2021). *The validity of the capital asset pricing model, in the Modern Irish Market* (Doctoral dissertation, Dublin, National College of Ireland).

Pacho, F. (2014). Capital Asset Pricing Model (CAPM) testability and its validity in stock market: Evidence from previous literatures. *Research Journal of Finance and Accounting*, *5*(21), 2222-1697.

Pham, T. (2021). Testing the validity of the capital asset pricing model with empirical evidence from the London Stock Exchange, in the period of 2012-2020: an examination of the validity of the capital asset pricing model in the UK financial market and the potential impact of size, value and momentum risk factors.

Pramono, E. S., Rudianto, D., Siboro, F., Baqi, M. P. A., & Julianingsih, D. (2022). Analysis investor index Indonesia with capital asset pricing model (CAPM). *Aptisi Transactions on Technopreneurship (ATT)*, *4*(1), 35-46.

Rammadhan, M. R. (2020). Analisis keakuratan dari capital asset pricing model (CAPM) dan arbitrage pricing theory (APT) dalam memprediksi return saham pada perusahaan sektor perbankan di Bursa Efek Indonesia Tahun 2015-2018.

Rasyad, M. I. (2022). Analysis of capital asset pricing model (CAPM) on health sector stocks as a growing sector during the pandemic. *Jurnal Ilmiah Econosains*, *20*(1), 13-22.

Rui, K. X., Rasiah, D., Yen, Y. Y., Ramasamy, S., & Pillay, S. D. (2018). An analysis of the relationship between risk and expected return in Malaysia stock market: Test of the CAPM. *International Journal of Engineering & Technology*, *3*(21), 161-170.

Sartono, R. A. (2005). Trading behavior and asset pricing under heterogeneous expectations. *Gadjah Mada International Journal of Business*, *7*(1).

Suryanarayana, P. S. (2021). China–India rivalry: The Saga of game changers. *East Asian Policy*, *13*(02), 5-18.

Tlemsani, I., Alkhaldi, A., Aljeshi, B., Alluwaimi, I., & Alrayes, J. (2020). Analysis of the capital asset pricing model: Application to general electric performance. *Theoretical Economics Letters*, *10*(05), 1103.

Wahyuny, T., & Gunarsih, T. (2020). Comparative analysis of accuracy between capital asset pricing model (CAPM) and arbitrage pricing theory (APT) in predicting stock return (case study: manufacturing companies listed on the Indonesia stock exchange for the 2015-2018 period). *Journal of Applied Economics in Developing Countries*, *5*(1), 23-30.

Widianingsih, Y. P. N. (2019). Analysis of capital asset pricing model according to Shariah principle: Indonesian evidence. *International Journal of Economics, Business and Accounting Research (IJEBAR)*, *3*(03).