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Which one is Effective in Setting Asset Pricing in Indonesia's Capital Market, the CAPM or APT?

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Abstract

Capital Asset Pricing Model (CAPM) Theory and Arbitrage Pricing Theory (APT) had been known as two theories that most well-known in asset pricing in the capital market until now besides the Fama and French Factor Model Theories. By using monthly data return from Indonesia stock exchange composite index (IDX Composite) and sectoral stock exchange index (IDX Sectoral) for 5 years from 2013-2017 for APT model, it is known that no one of the economic risk factor in the model that could explain the stock return movement in Indonesia's capital market. By using the same data for the APT model limited for four sectoral stock price index for the same years, however, the CAPM model could explain the stock return movement in Indonesia's capital market. Accordingly, the business people in Indonesia's capital market considered more on the stock price than the sistemic risk of the macroeconomic risks.

Keywords: Capital market, capital asset pricing model, arbitrage pricing theory.

INTRODUCTION

Debates on effectivity and prediction power of the Capital Asset Pricing Model (CAPM) still to be classical problem occurred until today. Fama and French [1] ever done empirical test on CAPM theory in some countries and the results show inconcistency within. According to the two scholars, however, the CAPM theory was still used by investors as a footstep in choosing and forming an optional portfolio.

CAPM theory was firstly developed by Sharpe [2], Lintner [3], dan Mossin [4] is a the basic and fundamental of the asset pricing theory model. The theory determines the asset pricing based on the market price risk. In an efficient market, the price of an asset will be identic to the market price. Market price in an efficient market will absorp all information so that the price effective in the market has reflected the factual price. In empirical test, the CAPM theory almost never been proven though the rational argumentation had been declared by Sharpe, Lintner, and Mossin. This condition then became the fundamental weakness of the CAPM theory, in which it firms in theoretical aspect but weaks in empirical testing.

Though the CAPM theory has some weaknesses and unable to draw out the factual reality [5-9], the theory itself can be modified and this modified theory can be expected to be more suitable in the actual capital market condition. Modification and development of CAPM concept ever been done by some researchers like Merton [10, 11] by inserting continues-time model into the original CAPM model and from which the new model is created, it is *Intertemporal Capital Asset Pricing Model* (ICAPM). Breeden [12] did the same modification by inserting consumption level as the base to calculate utility maximization into the CAPM basic model and from which Consumption CAPM model (CCAPM) come out.

Though the development on CAPM basic model has been done more, the empirical tests still represent unconsistent outcome. Moreover, some of theoritical models are unapplicable due to there were no empirical variable that fit to be used. Based on these facts, Ross [13] tried to develop alternate model of the CAPM model. According to Ross, if the market could not be used to set the asset price, the investors then could do arbitrage option by using other

variable that identic to the market characteristic and has a relation to the asset price itself.. By then, this theory called as factor theory. The Ross' approach then more known as Arbitrage Pricing Theory (APT).

Macroeconomy application as arbitrage risk in price setting on assets in the capital market keep experiencing good deeds. It is based on firm assumption in which macroeconomy variable is the systematic risk that affect the market entirely and the risk size can not be eliminated though by both forming portfolio and increasing asset in the portfolio. This condition is differ with the unsystemtic risk where its size can be elimineted by forming a new portfolio and increasing asset value in that portfolio [13].

This research is an empirical test on both CAPM and APT theories in Indonesia's capital market. This research searched and compared the affect of macroeconomy risk variable and the affect of market price on assets price movement. The affects of economy risk variable in this research is diveded into the affect on all Indonesia's capital market and its affect on sectoral stock. The purpose of this study was intended to see the affect of macroeconomy risk variable and market price comprehensively and thoroughly.

The results of this study can have an empirical impact on asset pricing in the Indonesian capital market. Investors can choose assets by considering the variables that influence the movement of stock returns in the Indonesian capital market. The results of this study can be the basis of investors in choosing assets so they can obtain optimal profits.

LITERATURE REVIEW

Until today, the CAPM theory is the most applied theory in the financial sector and became the basic theory in developing asset pricing theory. CAPM theory has an advantage that has become an attractive source to apply in financial sector. CAPM theory is a logical theory and easy to apply in asset pricing in the financial sector. Though the CAPM theory believed as a powerfull theory in financial sector, however, in contrast it has a great weakness in empirical affairs. Empirically, the CAPM theory is unproven [14].

Indeed,there were some weaknesses in CAPM theory that has been so far criticise by researhers. The theory is always terminate the market price as main variable in the modelling though in fact the business entities operating in the capital market have different characteristic such as financial entities and non-financial entities [15]. The different characteristic of business and industry can not justified by a single market price. Therefore, the market price itself usually can not be set as a good instrument to fix asset price [13]. Moreover, CAPM theory is only to test a single period for multy-period observation. That is why the CAPM model is a time – bias [16].

When the market price could not be set as an instrument in setting a price asset, investor could do arbitrage action by using other variable that has identical characteristic with the market and has a relation to the asset price. Various variables for the arbitrage process called by Ross ased factor. Over time, the theory developed by Ross more known as Arbitrage Pricing Theory (APT). The APT theory should be able to resolve some weaknesses occurred in the classical CAPM theory [16].

The factors that influences the asset price in APT theory are the systematic risks that affect the asset price entirely [17]. A systematic risk is the risk that affect business condition entirely such as high fluctuation of interest rate, inflation rate, world crude oil price, econonmic growth and some other macroeconomy variables [18, 19]. Accordingly, in APT theory there are many betas, while in CAPM theory, it has single beta [20].

The use of macroeconomy variable as risk factor to replace market price variable commenced by Chen *et al*., [18]. The macroeconomy variables used by Chen *et al*., [18] are Industrial Production Index (IPI), inflation rate, unpredictable inflation rate, the difference between corporate bond and government bond interest and the difference between government bond and central bank's reference interest rate. From all of the five factors, there are only two that have a significant affect i.e. Industrial Production Index (IPI) and the difference between government bond and central bank's interest rate reference.

Empirical test on macroeconomy variable by using APT model keep done by researchers in many countries and with so many efforts to improve method and calculation technique. Darrat dan Mukherjee [21] try to find out the impact of macroecnomy factor on stock return in India's stock exchange by using Vector Auto Regression (VAR) model. They found out the causal-effect relation between macroeconomy factor and stock return.

Chan *et al*., [22] found out that classical CAPM theory can not identify sistemic risk factor that should be able to explain stock yield movements on Japan capital market. Poon and Taylor [23] studied United Kingdom's capital market by using monthly macroeconomy variable data and the result explained that the macroeconomy variable has no impact on the United Kingdom's stock exchange. Mukherjee and Naka [24] tried to test the relation between six

macroeconomy variables with stock return in Japan's stock exchange by using Vector Error Correction Model (VECM) and they found out there is a relation between the six variables with the stock return.

The research in the ASEAN capital market ever done by Wongbangpo and Sharma [25]. By using the APT model and VECM, they found out there is a the long run relationship between economic growth and stock return. However,they also found out varied relationship between other macroeconomy variable and stock return in the five countries (Indonesia, Malaysia, Philippine, Singapore and Thailand).

The studies and tests on APT model using different macroeconomy variable and calculation method is continuously done by reserachers in many countries. Those research ever done by Endri [26], Srivastava [27], Basu and Chawla [28], Zang and Li [20], Wen-Jen [29], Shiva and Sheti [30], Srivastava *et al*., [31], Herawati *et al.*, [32], Sumarto and Saluy [33]. The researches' result, however, still vary both on using variable aspect and the country where the research was conducted. The difference of the factor that has a significant influence on the various researches done shows that macroeconomy variable based on the APT model is inconsistent. For next time, it needs to prove again and the specific studies are needed to conduct for every country with a diferent time horizon.

METHODOLOGY

Data

The data used in this research are the banking companies stock price monthly data traded actively in the Indonesia Stock exchange (IDX) from January 2017 to December 2018. Stock returns used are the average stock returns of all banks actively traded and it used as a proxy of banking stock portfolio. Meanwhile, banking companies specific firm data got from monthly banks financial report publication published by Indonesia's Financial Services Authority (OJK - Otoritas Jasa Keuangan) from January 2017 to December 2018.

Model

There are two models used in this research namely CAPM and APT models. The CAPM model is used in this research refers to the theory developed by Sharpe [2], Lintner [3], and Mossin [4] which until now is still the main theory used in asset pricing model. Theorically, the CAPM model used here is:

$$E(R_i) = R_f + \beta_i\left(E(R_M) - R_f\right) \quad \text{..... (1)}$$

Where R_i is asset return rate i and R_M is market return. While, Rf is risk free interest rate. Risk free interest rate in this research is the central bank interest rate (Bank Indonesia / BI).

β_i Variable termed as market risk derived from the formula 2 below:

$$\beta_i = \frac{Cov(R_i,R_M)}{\sigma^2(R_M)} \quad \text{..... (2)}$$

For the APT model, the Roll and Ross' [16] model is used in this research and we choose multivariate analysis. According to the APT model developed by Ross, the profit from each security traded in the stock market consists of two components. The first, the normal or expected profit rate and it became the part of actual profit rate expected by shareholders. This profit is affected by the information kept by investors.

The second is the uncertain or risky profit rate. The part of this profit generated from the unpredictable information. Formally, the stock profit rate can be written down as follows:

$$R = \bar{R} + U \quad \text{.....(3)}$$

Where:

R : Stock actual profit rate.
$\bar{R}$: Expected stock profit rate
U : Part of unpredictable profit

From the equation, expected profit $\bar{R}$ is the profit rate that has been predicted by the investors based on various informations kept by them in the stock market and thus no surprise factor. The unpredicted profit U is the profit generated from the new information exist in the stock market that unknown before (surprise factor).

The unpredicted profit portion obtained from unpredicted information (surprise factor) is the risk that faced by investors. The risk source could be come from factors that influencing all or many companies (systematic risk),

however, there is a specific case in this case just for a certain companies (unsystematic risk). By dividing the risk factor in two sections, the profit rate equations gained by investors can be written down as [16]:

$R = \bar{R} + U$, and ……..…... (4)

U = m + $\mathcal{E}$, so ……..…... (5)

$R = \bar{R} + m + \mathcal{E}$ ……... (6)

Based on the equations, R is actual profit rate, $\bar{R}$ is an expected profit rate, m is the systematic risk that is also called as market risk that affect all listing companies in the stock exchange. While $\mathcal{E}$ is an unsystematic risk or specific risk for a certain compnany. Usually, the spesific risk can be eliminated by forming a new optimal portfolio and thus in the APT model, the spesific risk is assumed as null.

Based on the APT model developed by Ross and Ross [16] concerning about the macroeconomy affect on stock yield,thus, in this research we used the model that based on APT model in which the yield of each sectoral stock index was used as the dependent variable and the independent variables are agriculture, property and real estate, financial sectors, LQ45 and composite index (IHSG). The independent variable consists of four factors, namely Industrial Production Index (IPI), inflation rate, Rupiah versus dollar exchange rate, and reference interest rate. The APT model equation adopted is:

$$R_i = \bar{R}_i + \beta_{IPI}F_{IPI} + \beta_{INF}F_{INF} + \beta_{KURS}F_{KURS} + \beta_{SBI}F_{SBI} \text{ ……..…. (7)}$$

Where:

R_i = Actual profit rate stock i
$\bar{R}_i$ = Expected profit rate stock i
β_i = Coefficient of variable.
F_{IPI} = Surprise factor of IPI (actual IPI – expected IPI)
F_{INF} = Surprise factor of inflation (actual inflation – expected inflation)
F_{KURS} = Exchange rate surprise factor of Rupiah versus Dollars (actual exchange rate – expected exchange rate)
F_{SBI} = SBI's interest rate Surprise factor (actual – expected interest rate)
(SBI is Sertificate of Bank of Indonesia)

Expected value of each variable is drawn from using an approach developed by Markowitz [34]. According to Markowitz, expected vale of a variable is the average value of that variable itself.

RESULTS AND DISCUSSION

The main purpose of CAPM model is to measure the market risk on an asset's return or portfolio.The market risk in the CAPM model is measured by beta variable. Beta variable derived from equation 2. For more details, the beta variable result in four sectors in the Indonesia's capital market can be seen in the next table.

Table-1: Beta Coefficient Test output

Sector	Coefficient of beta	Sig.	Adj. R-Square
Agriculture	0.557873	0.0317	0.063353
Finance	1.312572	0.0000	0.78822
Property	1.140835	0.0000	0.95341
LQ-45	1.343806	0.0000	0.498977

Table-1 shows that beta coefficient in all sector is significantat real stage five percent. The agriculture has the slightest coefficient of beta as 0.5578 with significance at 0,0317. The CAPM model in agriculture sector has the slightest Adjusted R-Square value at 0,063353. These output shows that the CAPM model in agriculture sector is not too significant. The output of CAPM model simply explained 6.3 percent stock return changes in agriculture sector .The biggest in sequence of beta coefficients in CAPM model are in LQ-45 (1,3438), Finance (1,312), and Property sector (1,14).

By using multivariate analysis in the APT model, it is known that both all the model has a small R square and even a negative adjusted R square. The output shows that, entirely, there is no macroeconomy variable factors that could

explain the changes in stock return in capital market. For more details, the R square and adjusted R square values can be seen in Table-2.

Model 1 is the model that its dependent variable is composite index return. Model 2 using the most liquid stock in Indonesia's capital market (LQ45) as dependent variable. Model 3,4 and 5 sequentially are the stock returns in the agriculture,the property and real setate, and the financial sectors. Meanwhile, the independent variable for all the models are identical namely Industrial Production Index (IPI), inflation rate, the Rupiah's excange rate against US' Dollar and the reference stock rate. The output based on multivariate analysis shows that no one model that could explain the stock return change both on composite index and the sectoral stocks.

Table-2: Goodness of Fit Model Table

Model	Sectors	R	R Square	Adjusted R Square
1	Composite Index return (IHSG) (Y1)	0.174	0.030	-0.043
2	LQ45 stock return (Y2)	0.161	0.026	-0.047
3	Agriculture stock return (Y3)	0.201	0.040	-0.032
4	Property and Real Estate stock return (Y4)	0.116	0.014	-0.061
5	Financial stock return (Y5)	0.203	0.041	-0.031

Besides the low in goodness of fit, all the model also insignificant. All the models has a significant value more then 0.05 or there is no models that has significant value less than 0.05. Thus, entirely model tests are insignificant. Based on the Model Tests Table, it is known that no one models that entirely could predict stock return movement in Indonesia's capital market.

Table-3: Simultaneous model test

Model	Sectors	F	Sig.
1	Composite index return (Y1)	0.412	0.799
2	LQ45 stock return (Y2)	0.355	0.840
3	Agriculture stock return (Y3)	0.559	0.694
4	Property and Real Estate stock return (Y4)	0.181	0.947
5	Financial stock return (Y5)	0.568	0.687

Knowing whether there is one factor or more that has affect on stock return movement in Indonesia's capital market,it needs to perform partial tests for all the model. The partial tests' output of all the models shows the same result with all the model tests that there is no variable that aff ects on stock return movement in Indonesia's capital market. The partial test output can be seen more clearly on Partial Test Table. All the factors within all the models has no significant value less than 0.05. It shows that there is no macroeconomy variable risk factor that affect on stock return movement in Indonesia's capital market.

Table-4: Partial Test Model

Model	Dependent Variable	Factor	Coef. B	t	Sig.
Model 1	IHSG / Composite index Return (Y1)	IPI factor	0.000	0.076	0.940
		Inflation factor	-0.008	-1.170	0.247
		Exchange rate factor	-0.006	-0.348	0.729
		Interest rate factor	-0.002	-0.168	0.867
Model 2	LQ45 stock return (Y2)	IPI factor	0.001	0.429	0.669
		Inflation factor	-0.008	-1.064	0.292
		Exchange rate factor	-0.006	-0.132	0.895
		Interest rate factor	-0.001	-0.055	0.956
Model 3	Agriculture sector stock return (Y3)	IPI factor	0.004	1.134	0.262
		Inflation factor	-0.011	-0.839	0.405
		Exchange rate factor	-0.006	-0.109	0.914
		Interest rate factor	0.006	0.241	0.810
Model 4	Property and Real Estate sector stock return (Y4)	IPI factor	0.001	0.344	0.732
		Inflation factor	-0.009	-0.693	0.491
		Exchange rate factor	-0.006	0.082	0.935
		Interest rate factor	-0.005	-0.213	0.832
Model 5	Financial sector stock return (Y5)	IPI factor	-0.005	0.026	0.979
		Inflation factor	-0.013	-1.307	0.197
		Exchange rate factor	-0.006	0.480	0.634
		Interest rate factor	-0.009	-0.475	0.637

Indonesia's macroeconomy variable risk is not an influencing variable on stock return movement in Indonesia's capital market. Inother words, the investors will not too worry about the macroeconmy variable as a risk where it can affect on the portfolio they holds. The investors are more concern on other variables beyond the model in making their investment decisions.

There are two things to be considered by investors in choosing and making stock portfolio in Indonesia's capital market. Firm specific. Investors, certainly will consider more on individual company performance than systematic potential risk that enable to influence the market entirely. Secondly, the option that is random in nature and irrational. When the systematic risk abadoned in investors' decision in Indonesia's capital market, the investors were said not rational any more in choosing their securities or portfolios. The investors' decision is more speculative and then th environtment condition be abandoned in their important consideration. Therefore, in doing a research,in order to predict stock return in Indonesia's capital market,other models are needed in way includes other variable besides macroeconomy variable or using other model besides APT model by using macroeconomy variable factor such as Fama and French Five Factors Models.

CONCLUSION AND MANAGERIAL IMPLICATION

In fact, coefficient of beta of CAPM model can explain all four sectors in Indonesia's capital market. Coefficient of beta factor in each sector, however, has a different value. For Goodness of Fit, each of the sector has a different value as well. Entirely, however, the CAPM model in all four sectors in Indonesia's capital market has been proven and can be used as a tool for asset pricing.

On the other hand, the APT model that using the macroeconomy variable can not explain the stock return movement in Indonesia's capital market both in composite index and sectoral return index. This condition could show two possibilities to be consideration for investors in selecting their portfolios. The first, investros choose randomly or speculatively and by which they do not consider the rational variables. The second option, investors who invested in Indonesia's capital market more considering the individual company performance than condition and systematic risk impacted on entirely market condition. Therefore, risky environtment condition has no impact on investors' investment decision in Indonesia's capital market.

The results of this research have a managerial implications especially for investors in the capital market in choosing and determining their portfolios. In making a stock portfolio in the Indonesian capital market, investors should consider the movement of market return rather than the movement of macroeconomic risk, especially economic growth, inflation, exchange rates, and interest rates. It is because market returns have a significant influence on portfolio return movements, especially in four sectors, are LQ45, Agricultural Sector, Property and Real Estate Sector, and Financial Sector. While the macroeconomic variable risk movements have no effect on the movement of the portfolio return in the four sectors.

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