Value at Risk, Market Risk and Trading Activity: CAPM Alternative Model

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Abstract

The purpose of this research is try to create Capital Asset Pricing Model (CAPM) alternative model at Indonesia Stock Exchange (IDX) that analyze the effect of the investment risk, trading activity and market multiple on stock return on low (IDR5 and IDR10), medium (IDR25), high (IDR50) and all tick size. This analysis focuses in (1) the relationship between return, VaR and market risk (2) the relationship between return, size and liquidity and (3) the relationship between return and PBV. We employ panel data model for data analysis. The research samples are active stocks of 12 sectors and members of LQ45 in 2004-2006 periods. The results of this research that VaR, beta, size, and liquidity positively related to stock return except the PBV. These findings indicate that VaR, market risk and trading activity are positively correlated to stock's return; however the fundamental performance is not relevant with trading activity at lower price, especially. These results support the previous

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researches which are done by many scholars, and give opportunities to VaR build alternative CAPM model.

1 Introduction

One of the reasons of high risk investment in Indonesia Stock Exchange (IDX) is frequent trading that is not based on stock's fair value or known as fad trading. Fad trading sometimes occurs by reason of limited capability of fundamental analysis, asymmetric information and weak capital market regulation [26]. All those three factors make the stock trading activity rife with speculative action of traders which creates noise trading. These conditions cause inefficient price forming.

Fad based equity trading activities tend to make overreaction behavior from market players not only when the market is up trend but also in down trend condition. Overreaction often occurs slightly after the market received the information, even more when the information is negative [24]. Due to this behavior, stock prices tend to be overvalued or undervalued which means asset price is mispricing and do not represent all relevant information in the market. Overreacted stock price then will be corrected by the market. Those repeated price corrections will create multiple price reversal before the price reaches its efficient price [26].

Kofman and Mosser [21] and Santosa [24] argued that the more frequent price reversal occurred will result in greater risk of investment because the direction of price trends change often does not match the expectations of traders. Furthermore, it was found that consistent pattern of price reversal indicates that

IDX is less efficient in reflecting the information content in stock prices. Theoretically, the risk of stock investments and expected rate of return refers to the traditional approach, namely the Capital Asset Pricing Model (CAPM) that relies on beta. Nevertheless, the accuracy and reliability of CAPM in measuring asset pricing is being questioned. Is there an alternative measure of market risk than beta?

According to [12] and [13] in the formation of the CAPM theory, there are several other important factors which are not involved in explaining the relationship between the expected return with market risk (beta). Even during the last two decades, finance and investment researchers found significant evidence that variables such as market capitalization (stock size), price-to-book value (PBV), price-earnings ratio (PER) and earnings to price ratio (EPS) has a significant influence (explanatory power) on the average stock returns [9, 6, 20].

As an alternative to complete the CAPM theory, some market players use VaR as a measure of investment risk in the stock market. The use of VaR is initiated by J.P. Morgan in the early 1990s, and it is being increasingly popular used in management of financial risk. VaR is widely known by world-class investment and hedge fund managers. In addition, some of the world's financial markets regulator has been applied VaR consistently and continuously. Application of VaR is an efficient and effective way to monitor and control market risk, especially risk of financial loss due to fluctuated exchange rate, stocks and commodities [17].

As have been discussed in various classic literatures, it is generally accepted that there is a tradeoff between risk and return. But this opinion is inconclusive. In fact, it is often empirically proved that the correlation of risk and return is not significant and sometimes even negative in certain specific situations.

A regression model to predict the market return over the size of individual stock variance and market variance. They concluded that market variance does not always have the forecasting power to explain market returns. But from the results

of their analysis, they found a significant positive relationship between average stock variance with the yield on the market. Therefore, differ from most financial economic models which say that only systematic risk influences return. It is concluded that the average risk of stock is determined by the idiosyncratic risk. This opinion is also supported by discuss risks and returns that include idiosyncratic risk factors into the model analysis.

Bali and Cakici [2] considered that the inter-temporary relation between risk and returns has long been an important topic in asset pricing literature. Almost all postulates of the asset pricing model states a significant positive relationship between yields on portfolio returns with risk, which is often modeled in the form of variance or standard deviation of portfolio returns. However, so far the argument is still categorized "there is no agreement about the existence of such a tradeoff for stock market Indices". This corresponds to a size that is used as variance, standard deviation or variance of the log-yield stocks that are intuitively understood as risks arising from the volatility of stock returns or market index.

Furthermore Bali and Cakici [2] improved that model by incorporating microstructure elements that form market liquidity, namely bid-ask spread. According to Jacoby et al.[20], when the market loses liquidity over time due to the momentum so that the expected market excess return has a positive relation with expected market illiquidity. Chan and Pfaff [6] supports earlier findings which confirmed that liquidity (turnover rate) has negative relationship with the return on stocks, and it considered to be consistent in the long run. So when liquidity is low (dry up), bid-ask spread is higher although trading activity tends to decrease. Those conditions were considered as the cause of the increased volatility spurious components [2]. So, the positive relationships between the weighted average volatility with the excess of yield on stock illustrate the premium liquidity.

Formally, VaR measure the worst expected loss over a given horizon under normal market conditions at a given confidence level Jorion [18]. VaR began to

use after financial disaster at the beginning of the 1990s, such as Orange County, Gibson Gretings, Barrings Securities, Metallgesellschaft, Proter and Gamble, Daiwa and some more cases. The effects of these cases motivate the more intensive use of risk management [18]. Another valuable example is the increasing of substantially losses due to the failure of risk management in detecting errors in derivatives pricing (NatWest, UBS), excessive risk-taking in the case of Procter and Gamble, and also the fraud behavior on Barrings and Sumitomo scandal.

The issue of this study associates to alternative solution of the asset pricing method that exists today. Identification of problem is done through measuring the level of risk associated with the stock investment risk and the market risks itself to the return. The calculation of investment risk with VaR method gives a probability level of investment risk of total loss at a certain period with the value of certain investments in certain capital markets as well. This study aims to measure how significant the relationship between Value at Risk (VAR) with the returns on stocks as an alternative asset pricing method. Market risk is often used in obtaining the yield expectations in capital markets through a significant correlation between market risk and average stock returns. CAPM model explains that the market portfolio and expected return has a positive linear function to the market risk (β).

This study aims to find alternative solutions to complement the CAPM theory by using the Value at Risk (VaR) as one of variables to estimate the correlation of risk and returns. VaR is widely recognized by investment and hedge funds managers as well as the regulator of financial markets so as not to complicate the implementation. In addition, VaR has been implemented by most reputable financial institutions as instruments of risk management. Implementation of VaR is an efficient and effective way to monitor and control market risk, which is the emergence of losses from movements in interest rates, exchange rates, stock prices and commodities [17]. This study is also to determine whether the market capitalization, liquidity and fundamentals ratio can be used as

an alternative measure of investment risk beside market risk (beta) in determining the asset pricing in capital markets, especially in the IDX.

2 Literature Review and Hypoyhesis

Risk and Asset Pricing. One fundamental method in analyzing stock risk and return is a correlative relationship between risk and return in an asset pricing framework that involves a variety of market factors, especially market risk (β) and trading activity. This study uses several known theories as well as several new researches in determining those trading activity variables. The approach of Downs & Ingram [10] which measured the risks associated with market returns through the market indices variances and the variance of stock market partially. They found that market variance has no forecasting power for market returns. Instead found a significant positive relationship between the average variance of stocks with a market return. Measurement of risk through portfolio variance performed with the model:

$$V_{p,t} = \sum_{d=1}^{Dt} r_{pd}^{t} + 2\sum_{d=2}^{Dt} r_{pd} r_{pd-1}$$

(1)

As for individual stocks it uses the monthly average variance shares:

$$V_t = \frac{1}{N} \sum_{i=1}^{Nt} \left[\sum_{d=1}^{D_t} r_{id}^2 + s \sum_{d=2}^{D_t} r_{id} r_{id-1} \right]$$

(2)

Where V_t is the risk of the portfolio in a given month; D_t is the number of days in a given month; t and r_{pd} the portfolio return on day d. Second term in equation (2) is a daily autocorrelation return adjustment due to liquidity effects [10]. $d_{i,d}$ is the return on stock i on day d and N_t is the number of stocks in month t. The previous study of Goyal and Santa-Clara which explained idiosyncratic risk beyond the CAPM method that has a significant influence on stock returns gives valuable input for this paper. In addition, they provide an alternative by using the average

risk in the time series based predictive regression for the aggregate of capital markets.

Return. The rate of returns method related to the stock trading in IDX is a random variable of financial asset. The entire range of possible payoffs of securities can be explained by its probability distribution function. Suppose that in one month, the yield is measured from the end of the previous month, which is denoted by *t-1* until the end of the current month with the notation *t*. In discrete, rate of returns can be formulated as a capital gain plus the interim payment such as dividend:

$$r_t = \frac{P_t + D_t - P_{t-1}}{P_{t-1}}$$

(3)

Where R is the return in period t; P is the capital gain in period t, while D_t is the dividend in period t. Equation (3) also called as arithmetic return. Geometric rate of return is defined via the natural logarithm of the ratio of current price to previous price:

$$R_t = Ln \frac{P_t + D_t}{P_{t-1}}$$

(4)

Equation (4) forms a continuous yield value. For simplifying reason, the value of D_t is assumed as zero in subsequent studies. The advantages of using a continuous yield include two things: first, more economically meaningful than the arithmetic return (discrete). If the yield is normally distributed, then the distribution is not ever lead to a negative price. This is possible because the left tails of the distribution are:

$$\ln \left(P_t / P_{t-1} \right) \to -\infty$$
$$\ln \left(P_t / P_{t-1} \right) \to 0$$
$$P_t \to 0$$

So the current price P_t at least zero and cannot be negative, while for discrete returns (arithmetic's returns) left tail is:

$$r_t = (P_t - P_{t-1})/P_{t-1} \to -\infty$$
$$(P_t/P_{t-1}) - 1 < -1$$
$$P_t < 0$$

As a consequence, discrete returns might result negative price and of course it damages the actual situation so that it will be economically meaningless.

The second advantage of using continuous yield is the ease in a continuous series of multiple periods. For example for two periods return can be formulated as follows:

$$R_{t,2} = \ln\left(P_t/P_{t-2}\right) + \ln\left(P_{t-1}/P_{t-2}\right) = R_{t-1} + R_t \tag{5}$$

From the above formula, to get the two periods yields simply add their respective returns in the period. One will find that problems in the discrete yield are more complex than in the continuous yield because there is no rebalancing process in the continuous yield, where each capital gain is followed by the withdrawn and the added back if capital loss is occurred. However, the difference between these two results is very small so its use is quite flexible.

Market Risk. The method of total risk measurement involves systematic risk and idiosyncratic risk. Based on the CAPM, a single formula factor is:

$$R_{i,t} - r_{f,t} = \beta_i(R_{m,t} - r_{f,t}) + \varepsilon_{i,t} \tag{6}$$

Where R is the return on stock i, R_{mt} is the market return, r_{ft} is risk free rate and ε_{it} is the idiosyncratic returns. The total variance $\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{\varepsilon i}^2$ can be divided into two parts, firstly $\beta_i^2 \sigma_m^2$ as systematic risk component which represents the share variance associated with the attributes of overall market volatility. Secondly, $\sigma_{\varepsilon i}^2$ is the firm's unsystematic risk which describes the variance of shares that is not related at all with the market volatility attribute.

CAPM explains that investors would get r_f if you invest in risk free assets and $\beta_i\left[E(R_m) - r_f\right]$ is a risk premium to be paid to investment in risky asset i. While $E(R_m) - r_f$ is applicable to all risky assets but β_i only a factor which applicable to

particular *i* risky asset in determining the return rate associated with that risk premium. So far, the CAPM model does not account the idiosyncratic returns variance component is $\sigma_{\varepsilon i}^2$, which will consequently implicate that idiosyncratic risk is irrelevant because it will be eliminated through well-diversified portfolio formed by investors.

Value at Risk. Capital markets associated with the risk of loss and the frequency of risk assessed more frequently occurs even at the level of daily trading activity. These conditions are influenced by its relevant capital market microstructure position and characteristics (Ho et al. 2000). In the investment situation of less conducive and fluctuated capital markets due to macroeconomic indicators, the level of inherent risk in any stock or portfolio will be increased. This increasing of financial risk is caused by the uncertainty in the investment climate and the company's performance which are increasingly difficult to predict, especially in the long run [26].

The correlation of risk and return is a fundamental basis on investment decisions. Risk is a measure of volatility or uncertainty of returns, while return is something that is expected to be obtained or anticipated cash flows from each investment made. Generally, the investors tend to select lower risk investments. Risk may also be a degree of uncertainty associated with investments [19].

This study uses the Benchmark for Managing Financial Risk, which is the Value at Risk (VaR). VaR began to use after financial disaster at the beginning of the 1990s, such as Orange County, Gibson Gretings, Barrings Securities, Metallgesellschaft, Proter and Gamble, Daiwa and some more cases. Another valuable example is the increasing of substantially losses due to the failure of risk management in detecting errors in derivatives pricing (NatWest, UBS), excessive risk-taking in the case of Procter and Gamble, and also the fraud behavior on Barrings and Sumitomo scandal.

The amount of loss that must be borne by investors and management is very large so as it often nearly bankrupted them. This phenomenon is caused by poor

existing financial risks management, so that since then many financial institutions and regulators the world started to switch to VaR. Other considerations for implementing VaR are the ease of calculation methods and as quantitative method in assessing investment risks in the financial market and credit risk.

In recent years, the use of VaR techniques in banking sector and capital market regulators is increasing rapidly. The aim of using VaR is to estimate losses primarily related to financial markets assets trading, as a method to design the size and predict the market risk [15]. VaR technique had previously been intensively developed by [15]. But according to Ho et al. [17], the broader types of managed assets, types of held currency and entered market can create difficulties in implementing VaR. Furthermore, the readiness of the necessary financial data is also very important. Through VaR, the maximum risk loss at a certain period and at a certain degree of confidence of certain portfolios may be calculated so that risk is become more controllable. There are two reason in selecting VaR in this study: (1) its controllable and countable factor (2) its measurable quantitative methods in assessing investment risk.

The study of Ammihud and Mendelson [1], Datar et al. [9] and Grossman and Miller [16] explain the relationship between Beta, stock return, VaR, liquidity, Price-to-Book Value and Stock size in the capital markets. Bali and Cakici [2] specifically found that VaR has a significant influence on the expectations of stock returns.

Formally, VaR measure the worst expected loss over a given horizon under normal market conditions at a given confidence level [19]. So according to this concept, VaR provides the worst level of market risk in certain investment period and specified level of confidence. VaR is highly effective in normal market which makes it less applicable in measuring risk when the market crashes or overconfidence. The level of confidence corresponds to the probability of total financial losses. The confidence level of X% indicates the maximum loss rate in normal market conditions by X% in a certain period.

Financial risks that arise in connection with stock investments can be measured by the dispersion value of possible outcomes of these investments based on historical data. The more flat distribution then the risk will also increase and vice versa if the distribution become tighter and the risk will be smaller too. The determination of risk value can be measured by the quintiles of distribution. Quintiles (also called Percentiles) can be defined as the cut-off value of q which is the right (or left) area of the probability distribution that represents the level of c:

$$c = prob(X \geq q) = \int_{q}^{+\infty} f(x)dx = 1 - F(q)$$
(7)

In the normal distribution, its quantiles can be determined through statistical tables, which is written as follows:

$$c = prob(\in \geq -\alpha) = \int_{-\alpha}^{+\infty} \Phi(\in)d \in$$
(8)

To implement the value of standard deviation distance from the average (mean) at the confidence level c, choose a value in the first row in Table 1 below:

Tabel 1: Lower Quantiles of Normal Distribution

	Confidence Level (%)								
	99,99	99,9	99	97,72	97,5	95	90	84,13	50
Quantiles (-α)	-3,71	-3,09	-2,32	-2,00	-1,96	-1,64	-1,28	-1,00	-0,00
E(εε<-α)	-4,01	-3,37	-2,66	-2,36	-2,33	-2,06	-1,75	-1,52	-0,79

The complement measurement is the expected value of quantiles excess:

$$E(X|X < q) = \frac{\int_{-\infty}^{q} xf(x)dx}{\int_{-\infty}^{q} f(x)dx}$$
(9)

In other words, we will be able to find the cutoff loss value that will occur in the c % in that time as well as the average size of losses when exceeding the cutoff value. This scale is also called the expected shortfall, tail conditional expectation,

conditional loss or tail loss. It also means the amount of loss if the value exceeds the VaR.

In a normal standard variable, the equation 3 yields the following equation, which is often used in some applications:

$$E(\varepsilon|\varepsilon < -\alpha) = \frac{-\Phi(\alpha)}{F(-\alpha)}$$

(10)

and on average ε below zero are:

$$E(\varepsilon|\varepsilon < 0) = -\frac{\left(\frac{1}{\sqrt{2\pi}}e^0\right)}{0.5} = -\sqrt{2/\pi}$$

(11)

Measurement of VaR

Measurement of certain stock's VaR requires all the conditions and specific steps. Generally, VaR summarize the expected maximum loss (or worst loss) over a target horizon within a given confidence level on [18]. So the calculation of the quantitative factor is required in the establishment and construction of VaR on the time horizon and predetermined confidence level.

The construction steps of VaR values that are needed to determine the value of the investment risk are as follows:

- Mark-to-Market of the current portfolio in accordance with the market value at the given times. Suppose the portfolio investment is USD100 million.

- Measure the Variability of the risk factors in units of percent (%) per unit time such as annual, monthly, daily or hourly. For example, the variability value is 15%, annually.

- Set the Time Horizon or referred to as holding period. At this step one must determine the level of investment risk in accordance with the period of risk measurement to be assessed. Suppose it is 10-days trading.

- Set the desired confidence level according to business research plan that the risk will be measured, e.g. at 99% confidence level (or 95% and 90%).

- Report the worst loss that is the result of the investment risk measurement and the analytical results that are easily understood and practically implementable as an investing solution in IDX. Suppose the obtained VaR is IDR7 million.
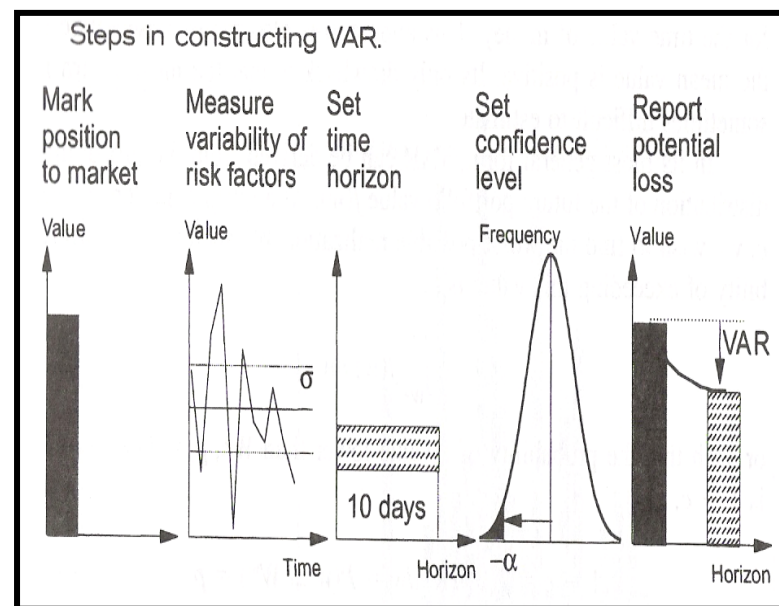
Source: Jorion (2006)

Figure 1: Investment Portfolio VaR Construction Steps

Sampling calculation (for daily data):

USD100 million   x   15%   x $\sqrt{(10/252)}$ x   2.33   =   USD7 million

Research Paradigm

The analysis in this framework will be explained by adding some explanatory variables that are generally accepted as independent variables. Some previous studies described fundamental factors such as size; liquidity and the ratio of price-to-book value (PBV) have significant relationship in determining return. From the analysis of these additional variables, return can be explained

comprehensively in the assessment of portfolio risk (VaR), market risk (β), size (LnME), liquidity and PBV of stock prices. The basic framework of correlation between returns and its independent variables can be seen in Figure 2.
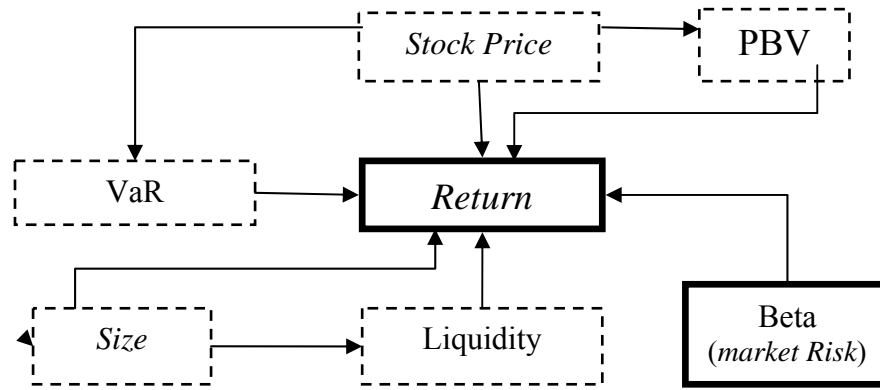

Figure 2: Framework of Research Paradigm

Analysis Model

The formula of data panel in this study is formed as multiple regression data panel as follows:

$$R_{i,t} = \delta_t + \gamma_{1,t}VAR(\alpha)_{i,t} + \gamma_{2,t}\beta_i + \gamma_{3,t}Size_{i,t} + \gamma_{4,t}Liq_{i,t} + \gamma_{5,t}(PBV)_{i,t} + \varepsilon_{i,t} \quad (1)$$

with

$R_{i,t}$:   The level of return of shares i at period t

$VAR(\alpha)$:   The maximum loss on certain investment period (target horizon) with a certain confidence level of shares i at period t

$\beta_{i,t}$:   Market risk shares i at period t

$\ln(ME)_{i,t}$: Size or stock market capitalization of i at period t

$Liq_{i,t}$:   Liquidity of shares i at period t

$(PBV)_{i,t}$:   The ratio of price to book value of shares i at period t

Hypothesis Development

The hypothesis in this study had a close relationship with the identification of problems and will be explained through the theory and empirical evidence, that would specifically associated with the panel analysis of stock price at all tick size sample of IDR 5, 10, 25 and 50. The formulations of hypotheses are scientifically designed based on some rationale and supporting literature as shown in Table 2. The supporting literature is the result of studies related to all research variables.

Table 2: Literature Review for Research Hypothesis

No	Variable	Hypothesis	Literature Review
1	VaR	VaR (Value-at-Risk) affect stock return positively	Bali & Cakici (2004); Erb&Viskanta (1998); Giot (2001; 2005); Giot & Laurent (2001); Giot & Sebastian (2001); Jorion (2002) Rogachev (2002) dan Ho et al. (2000).
2.	Beta	Beta has positive effects on stock return	Sharpe (1964); Merton (1973; 1976); Lewellen (1999); Banz (1981); Clarkson & Saterly (1997).
3	Size	Stock size negatively affects return	Banz (1981); Subrahmanyam (2006); Fama& French (1992; 1995).
4.	Liquidity	Liquidity has negative impact to stock return.	Amihud (2002); Chang et al (1995); Chordia et al (2001); Datar et al. (1998); French et al. (1987);
5	Price-to-Book Value	Price-to-Book Value positively impact on stock return	Subrahmanyam (2006); Downs & Ingram (2000); Fama& French (1995; 1992) danBanz (1981).
6	All Research Variable	VaR, Stock Beta, Liquidity and PBV has an impact to stock return	Bali & Cakici (2004); Giot (2001; 2005); Banz (1981); Subrahmanyam (2006); Fama& French (1992; 1995); Datar et al. (1998); Chordia et al. (2001);

Based on above listed researches it can be developed several hypotheses on the study include:

1. **Hypothesis 1:** Value-at-Risk (VaR) has positive effect on Return on low, medium, high and all tick size

2. **Hypothesis 2:** Market risk (beta) has positive effect on Return on low, medium, high and all tick size

3. **Hypothesis 3:** Market capitalization has negative effect on Return on low, medium, high and all tick size

4. **Hypothesis 4:** Liquidity has negative effect on Return on low, medium, high and all tick size

5. **Hypothesis 5:** PBV has positive effect on return on low, medium, high and all tick size

3 Method

This study uses quarterly data of stocks that are listed in the LQ45 index. Thus, the analysis does not meet the liquidity constraints and the impact of non-traded period from stocks samples. The existence of non-traded period and illiquid sample could potentially cause nonsynchronous trading problems that lead to mispricing. There are 30 samples of issuer listed in the LQ-45 index. Other reasons in the selection of the shares of the LQ-45 index, including:

1. Represent the entire tick size in the share price segmentation set by the IDX.

2. Samples are active and have adequate liquidity which always included in the top 20 most active stocks in the last 30 trading days or active stock in the last 3 years.

3. Has a quite large market capitalization at over IDR1 trillion, so it can represent the value of daily market trading, even able to become index movers for the formation of Composite Stock Price Index (CSPI).

4. Having a good reputation of fundamental and technical analysis so that it can reliably predict the short-term performance and long-term expectations.

5. Samples are leading sector so that it is a benchmark for its industry group.

These above stock character criteria is highly relevant and supports this study in using quarterly active trading stock through a stock whose price

represents the information and news coming into the capital markets both historical and public information.

3.1 Descriptive and Panel Data Analysis

Of the 30 companies that were selected at random from the LQ-45 there are several blue-chip stocks, the AALI, ASII, BBRI, BMRI, INDF, EARTH, MEDC, PGAS, PTBA, TINS, UNVR and UNTR. The analyses were performed for all samples and as comparison they have analyzed in accordance with the three fractions of each price based on tick size at IDX, such as low price (IDR5-10), medium price (IDR25) and the high price (IDR50).

Descriptive Analysis

Descriptive analysis on all tick size which includes 30 stocks of companies (as listed in Table 4) shows the results that describe variation on research variables. Research variables are divided in the dependent variable and independent (explanatory) variables.

Table 4: Descriptive Analysis of Research Variables

	Return	VaR	Beta	Size	Liquidity	PBV
Mean	0.144275	16.09153	0.353691	22.40412	0.000480	3.143427
Median	0.080000	15.98200	0.171500	22.54400	0.000000	1.843000
Maximum	9.000000	18.88600	10.40300	26.41300	0.025000	23.15800
Minimum	-0.500000	12.62600	-1.15300	15.82000	0.000000	-0.44900
Std. Dev.	0.593725	1.200814	0.798999	1.949940	0.001851	3.714452
Skewness	10.79448	0.029269	5.974055	-0.61803	8.282657	2.436150
Kurtosis	150.1504	2.460974	72.10509	3.358802	95.63470	8.873812
Jarque-Bera	328103.2	4.360638	72954.36	24.57284	131358.0	863.9077
Probability	0.000000	0.113005	0.000000	0.000005	0.000000	0.000000
Observations	356	356	356	356	356	356

Table 4 shows data distribution of each variable. The maximum value for each variable ranged from 0.025000 to 26.41300. Minimum value is up to 15.82000 -1.153000. The biggest average value is in Size with an average of 22.40412, while the smallest contained in the Liquidity variable with an average of 0.000480.

Return has a mean of 0.14 with a minimum value of -0.5 and a maximum of 9.0. The mean VaR at the level of significant 5% is 16.1 with a minimum value at 12.6 and maximum value at 18.9. Size has a mean of 22.5 with a minimum value of 15.8 and a maximum of 26.4. Liquidity has a mean of 0 with minimum 0 and maximum value of 0.025. PBV has a mean of 3.1-0.4 with minimum and maximum value of 23.2.

Standard deviation is a measure of diversity that shows the relative position of each observation on the mean. High standard deviation values indicate a greater diversity and more varied, whereas if the value of standard deviation is small, it indicates values close to its mean value. Liquidity, which has the smallest standard deviation (0.001851), means that it relatively more uniform than the other variables, and PBV has the highest standard deviation of 3.714452.

Slope coefficient or skewness shows the distribution of panhandle data. Positive coefficient occurs if the curve has a tail that extends to the right. This means that the indicator has greater middle value than median value. On the contrary, if middle values larger than median, then it will stick to the left with a negative skewness. Most of the results of the analysis of Table 4 have a positive skewness value such as Return, VaR5, Beta, Liquidity and PBV.

Only Size that have negative skewness. Data is in normal distribution if it has kurtosis values between -3 to 3. Table 4 shows VaR5 as the variables that are included in the normal distribution, while return, beta, size, liquidity and PBV are out of normal distribution.

Analysis of Common Effect Model with Pooled Least Squared (PLS) Method

Common effect model analysis (PLS) for the VaR from the White Heteroskedasticity test results for all levels of tick size for the random 30 samples. The hypothesis being tested is the influence of independent variables on the returns on 30 companies. The results of the analysis are listed in Table 5.

Table 5: Results of Common Effect Model with PLS Method

Variable	Coefficient	SE	t-Statistic	Prob.	Result
C	-0.943934	0.289147	-3.26455	0.001	significant
VaR	-0.038265	0.046623	-0.82073	0.412	insignificant
Beta	0.083433	0.073262	1.138831	0.256	insignificant
Liquidity	0.06783	0.033819	2.005679	0.046	significant
Size	35.01647	14.95142	2.342016	0.02	significant
PBV	0.040795	0.017811	2.290454	0.023	significant

Table 5 illustrates the influence test results of VaR, Beta, Size, Liquidity and PBV to Return. Based on the analysis it can be seen that the probability of Size, Liquidity and PBV<0.05 indicating a significant influence on Return. While the VAR and Beta do not have a significant effect.

Analysis of Fixed Effect Model with PLS and GLS Methods

Analysis of fixed effects models for VaR from White Heteroskedasticity test results used in this study is pooled least square method (PLS) and generalized least square (GLS). In this analysis, PLS and GLS are used for the category level of stock prices taken from the entire price of the shares in all the tick size prevailing in IDX. For comparison, an analysis is done based on share prices in accordance with its tick size in three categories: all tick size, low price, medium price, and high price.

Analysis of Fixed Effect Model with PLS Method

Analysis of fixed effects models for   White Heteroskedasticity test results for all tick size uses pooled least square method (PLS), the results are in Table 6.

The hypothesis is that there is an influence of independent variables on the returns of 30 companies based on all tick size. The influences of all independent variables to all tick size are as follows:

Table 6: Results of Fixed Effect Model with PLS Method

Variable	Coefficient	SE	t-Statistic	Prob.	Result
VaR	-0.018985	0.066371	-0.28604	0.775	insignificant
Beta	0.079108	0.069204	1.143125	0.254	insignificant
Liquidity	0.069887	0.032228	2.168505	0.031	significant
Size	51.43152	21.29161	2.415578	0.016	significant
PBV	0.002874	0.023755	0.120991	0.904	insignificant

Table 6 depicts the results of the influence test of VaR, Beta, Size, Liquidity and PBV on Return to the entire sample. It shows that the probability of Size and Liquidity are 0.05 smaller. It specifies the Size and Liquidity has a significant influence on Return, while VaR, Beta and PBV has no effect on the return.

Summary of Fixed Effect Model with PLS Method

Regression analysis for fixed effect model with the PLS to return of 30 (thirty) samples based on the total price and the three level of stock prices has not produced favorable results, because there are still not significant independent variables.

Table 6 depicts the results of the influence test of VaR, Beta, Size, Liquidity and PBV on Return to the entire sample. It shows that the probability of Size and Liquidity are 0.05 smaller. It specifies the Size and Liquidity has a significant influence on Return, while VaR, Beta and PBV have no effect on the return.

The summary shows only samples of companies with a share price level in medium tick size and high size that show favorable results, but on all tick size and low prices indicate unfavorable outcome.

Table 7: Summary of Fixed Effect Model with Pool Least Square

Variable	All Tick Size	Low Price	Medium Price	High Price
VaR	x	x	x	x
Beta	x	x	x	√
Liquidity	√	√	√	x
Size	√	√	√	√
PBV	x	x	√	√

√ =significant; X = insignificant at α = 5%.

Analysis of Fixed Effect Model GLS Method

Fixed effects models analysis for VaR from White Heteroskedasticity test results used in this study is generalized least square (GLS) which is done after a pooled least square (PLS). GLS data panel analysis is expected to give better results than the previous analysis. Data Panel is all tick size and all three predetermined grouping prices (low, medium, and high prices). Fixed effects models analysis for VaR from White Heteroskedasticity test results for all tick size used in this study is using the method of generalized least squares (GLS) as shown in Table 8. This study also analyzed three levels of stock prices.

Table 8: Results of Fixed Effect Model with GLS Method

Variable	Coefficient	SE	t-Statistic	Prob.	Result
VaR	0.023793	0.009809	2.425653	0.0157	significant
Beta	0.029162	0.004947	5.894391	0.0000	significant
Liquidity	0.034763	0.001511	23.00795	0.0000	significant
Size	42.33291	5.031865	8.412966	0.0000	significant
PBV	0.013015	0.004467	2.913311	0.0038	significant

Table 8 shows that the values of VaR, Beta, Size, Liquidity and PBV is smaller than 0.05 indicate that for all independent variables VaR, Beta, Size, Liquidity and PBV has a significant influence on Return.

Summary of Fixed Effect Model with GLS Method

Regression analysis for fixed effect model with the GLS method for the return of 30 (thirty) samples based on stock price level has provided excellent results shown by significant results for almost all independent variables.

Table 9: Summary of Fixed Effect Model with GLS Method

Variable	All Tick Size	Low Price	Medium Price	High Price
VaR	√	√	√	√
Beta	√	√	√	√
Liquidity	√	√	√	√
Size	√	√	x	x
PBV	√	x	√	x

√ =significant;   X: insignificant at α = 5%.

Table 9 shows significant results for all tick size, low price, medium price, and high price samples. It also shows that the regression results of 30 samples and all level of stock prices are significant. The influences of independent variables on return are significant for VaR, Beta, Liquidity and PBV of all samples. While the Size on medium and high prices are still not significant. PBV at low and high prices are not significant. So that, based on the result of this data panel, fixed effect model with the GLS can be selected.

Analysis of Random Effect Model with Pooled Least Square Method

Random effect models analysis for VaR from White Heteroskedasticity test results in this study is the pooled least square (PLS) method, for the 30 companies' level of stock prices with the tick size based on all tick size, low price, medium price, and high price.

Table 10 illustrates the results of the influence test of VaR, Beta, Size, Liquidity and PBV on Return at all tick size price level. Table 10 shows that the probability of Beta, Size, Liquidity and PBV is less than 0.05. It indicates that the

Beta, Size, Liquidity and PBV have a significant influence on Return. While VaR just do not have a significant effect on the return.

Table 10: The Results of Effect Model Random Analysis with PLS method on Return

Variable	Coefficient	SE	t-Statistic	Prob.	Result
C	-0.945271	0.466621	-2.025777	0.0435	significant
VaR	-0.038227	0.030597	-1.249386	0.2124	insignificant
Beta	0.082220	0.037462	2.194746	0.0288	significant
Liquidity	0.068020	0.017430	3.902391	0.0001	significant
Size	35.82064	16.31244	2.195910	0.0288	significant
PBV	0.039684	0.008999	4.409768	0.0000	significant

Summary of Random Effect Model with PLS Method

Regression analysis of random effects models with PLS on the return gives fairly good results, although not all results are significant independent variables. It shows that the sample with all tick size price level, medium price, and high price are significant, whereas the low price is less significant.

Table 11: Summary of White Random Effect Model with PLS

Variable	All Tick Size	Low Price	Medium Price	High Price
C	√	x	√	√
VaR	x	x	√	√
Beta	√	x	√	√
Liquidity	√	x	√	√
Size	√	√	√	x
PBV	x	√	√	x

√ = significant :   x= insignificant at α = 5%.

Table 11 shows that the regression results of the sample at four all tick size price level, medium price and high price showed significant results, except for the low price. The white regression results for PLS models with random effects

cannot be selected as the analysis of data panel because the results of the regression cannot be categorized as BLUE.

Analysis of Random Effect Model with GLS Method

Regression analysis of random effects model for the VaR from the test results using White Heteroskedasticity method used in this study is the generalized least squares (GLS). In this analysis GLS method is used only for shares of 30 companies based on all tick size.

The hypothesis is that independent variables affect return on all tick size. The effect of all independent variables to return for all tick size companies are listed in Table 12.

VaR still has a significant effect on return. While the Size and PBV did not have a significant influence on return, this can be seen from the probability value above 0.05.

Tabel 12: Results of Random Effect Model with GLS Method

Variable	Coefficient	SE	t-Statistic	Prob.	Result
C	1.4474	0.618161	2.341511	0.0214	significant
VaR	-0.0673	0.037467	-1.798609	0.0755	significant*
Beta	0.0956	0.033512	2.853992	0.0054	significant
Liquidity	-0.0090	0.013466	-0.668359	0.5056	insignificant
Size	192.42	15.79982	12.17913	0.0000	significant
PBV	0.0068	0.007676	0.893012	0.3743	insignificant

Note: *) significant at α=10%.

Table 12 describes the values for Beta and Liquidity which less than 0.05. It indicates that Beta and Liquidity has a significant influence on Return.

Hausman Test

Hausman test used in this study is aim to prove that the *Fixed Effects Model* is more appropriate for the estimation of data panel models. The result is as follows:

$$m = \hat{q}^1 \, \mathrm{var}(\hat{q})^{-1} \hat{q} = 506$$

Based on this Hausman test, the value is = 506, while the critical value of chi square with df is 5 on $\alpha = 5\%$ is equal to 9.91. By using the test criteria, if the value of Hausman test is higher than the critical value then the chosen model is the fixed effect model with GLS (*generalized least square*) method.

3.2 Discussion of CAPM Alternative Model

From the results of data panel analysis of fixed effects model on GLS method for all stock, it was acquired several important findings, include the existence of a significant relationship between VaR, beta (market risk), Size, Liquidity Proxy and PBV to Return. The effect of all independent variables of Return is positive. These results show that the foundation of theory and hypothesis is favorable and proven. Most of these findings support some previous research such as [2, 11, 17, 18].

VaR of individual stock has a positive impact on Return, so the level of maximum risk of loss can be considered an alternative in estimating the expected return for stocks particularly in LQ45 index. This finding supports at least three studies [2, 17, and 19]. Bali and Cakici [2] showed that VaR has explanatory power to return as well as can also be served as tools of investment risk management. Other key variables that have a positive influence is beta (market risk) in accordance with the classical theory of CAPM which is often being questionable [3, 27]. This study found that the effect of Beta is greater than the VaR. It is not in accordance with the argument of Jorion [18] and Bali and Cakici [2], that the VaR provides more powerful influence than the stock beta.

In accordance with previous research findings that the increasing of price and the outstanding shares have a positive effect on the level of return Banz [3] and Subrahmanyam [28] so that the market capitalization (size) are potentially

triggering a negative correlation of returns. But the findings of this research indicate otherwise, due to low stocks tick size is also influenced by liquidity risk. Liquidity risk becomes a major consideration for these stock group traders. Liquidity becomes main variable factor in these low-priced stocks trading as investors strongly consider liquidity risk or market risk than VaR [26]. Therefore, the findings of this research show liquidity have positive impact on return, contrary to the argument of Datar et al.[9] and Ammihud and Mendelson [1]. Liquidity at each tick size can provide a different effect on stock returns because at each tick size will create different market behavior. Individual investors with limited budgets can take advantage (benefit) from this lowest tick size liquidity mainly due to transaction costs are very low (costless).
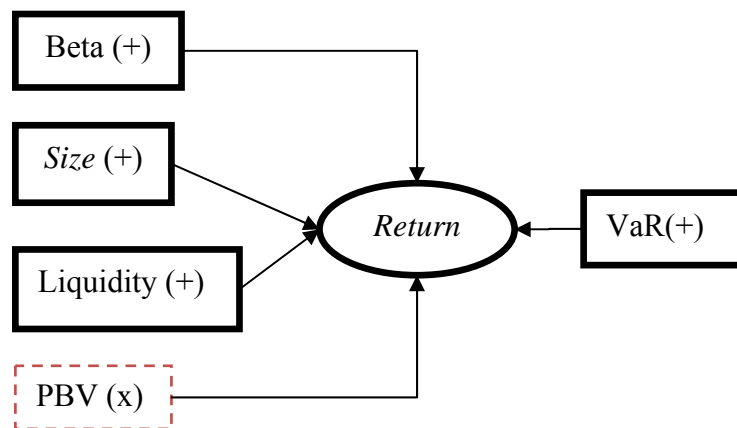

Figure 4: Alternative Empirical CAPM Model for IDX

Meanwhile, other findings are, PBV not significant to the return indicating that the fundamental factors less considered by the investors in the transaction of low stock price. Particularly for the uninformed traders who are tend to consider liquidity factor than fundamental performance because of short-term capital gains concerned. Another factor is the analysis ability and limited information access on the intrinsic value of shares to be a problem for the uninformed traders.

These findings are different from the study of Downs & Ingram [10] and Subrahmanyam [28] because they did the research in a relatively strong efficient market at all price levels such as the NYSE. Thus, in designing the expected return related-alternative CAPM model for the low stock price one must consider VaR, Beta, Size, Liquidity and PBV.

4 Conclusions

Panel Data analysis on fixed effects model for all tick size at IDX found that the independent Variables VaR, Beta, Size, and Liquidity providing significant effect on stock returns. Liquidity risks, VaR and Beta are the most concerned variables to the investors of low prices stocks. Otherwise, PBV as the fundamental performance is the only ignored variables in the process. PBV ratio variable has no effect to the strategic traders and liquidity traders in the short-run trading.

Investment Risky Variables such as VaR and beta were found having relatively equal positive influence on return according to CAPM. VaR can be used as an asset pricing alternative solutions in addition to stock market risk. But the explanatory power of beta is better than VaR, so that it only serves as a complementary variable. However, the use of VaR can be enhanced through the establishment of the stock portfolio risk level on a shorter period.

Furthermore, empirical evidence suggests that when the share price is smaller than the number of independent variables that influence the return is increase, especially in the increasing of market capitalization (size). The increased size could potentially lower the risk of liquidity so that low price stocks trading activity will increase, particularly when there are shocks that create liquidity pressures.

For the strategic traders, low price stocks are being more traded when volatility increases during the appearance of momentum or shock. It triggers liquidity pressure so that its liquidity risk is lower compare to it in low volatility. Participation of strategic traders has the potential to create efficient trading activity because the order flow that received by the market creating more rational bid-ask spread so that uninformed traders can take a moment advantage.

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