



## RISK ANALYSIS AND INVESTMENT RETURN ON BOOK IV BANKING SHARES AT INDONESIA STOCK EXCHANGE

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**Abstract:** This research aims to get the optimum models as a basis for calculating Value-at-Risk which is to measure those maximum risks of each book IV banking shares. Data from this research was secondary time-series data in monthly returns of BCA, BRI, Mandiri, BNI, CIMB-Niaga, and Pan Indonesia Bank. Research data ranges from June 2004 to September 2019, which obtained from [www.investing.com](http://www.investing.com) without added those share dividend factor. ARCH/GARCH model used to estimate these values of VaR as maximum loss over a certain period of in certain confidence level. The results from this research were useful for policymakers as a basic consideration in making a decision regarding macroeconomic risk mitigation policies due to disturbance which occurs in Book IV's banking shares. Besides that, it also used as basic consideration of risk mitigation that occurs in this sector due to shocks on macroeconomic indicators.

**Index Terms – Risk Mitigation, Shares, Value at Risk (VaR), Yields.**

### I. INTRODUCTION

#### 1.1. The Background of Problem

Today there are many alternatives that investors can do to develop his/her wealth. Starting from this conventional ones, such as property, precious metals, business, to non-conventional ones, such as shares, bonds and so on. Each form of investment chosen will provide different returns excluded risk free investment (risk-free assets), investment are not always positive but also could be negative. Because investment is greatly influenced by economic conditions of a country.

Besides there so many choice of investment forms with various risk, there are also various types of investors. In general, types of investors could be classified into three (Asianto, 2019): Aggressive (Risk Taker), Moderate (Risk Moderate), and Conservative (Risk Averse). Risk Taker is a type of investor who expects high returns and does not mind the high risk that it faces. Risk Moderate is a type of investor who expects optimal returns and willing to face moderate risk (balance between risk and return). Risk Averse is a type of investor who avoids risk and willing to accept low in returns. Investment decisions really depend on the type of investor. Thus, the choice of investment will be in according to the risk-appetite of investors.

This research focused on investing in shares at Indonesia Stock Exchange (IDX/BEI). At IDX the shares from companies were traded. Based on IDX data in 2018 (Indonesia Stock Exchange, 2018) there are 600 companies that registered on IDX. The company's shares are grouped into 9 sectors, including: agriculture, mining, basic and chemical industries, various industries, consumer goods industry, property and real estate, transportation, utilities and infrastructure, finance, trade, service and investment.

From this nine industrial sectors at IDX, the capitalization were continue to grow, in line with improving economic conditions. In 2018, the capitalization of Indonesia Stock Exchange amounted to IDR 6,737 trillion. One of industrial sectors that quite dominant at IDX is from financial sector. Shares from this sector was 29.6% or IDR 1,991.7 trillion. Meanwhile, 91.1% or IDR 1,814.4 trillion in financial sector came from banking sub-sector. The data above were wrote detailed in Table 1 below.

**Table 1. IDX Capitalized and Financial Sector alongside Banking sub-sector**

No.	Capitalization	IDR(trillion)	% to BEI	% to Fin.Sec
1	BEI Capitalization - 2018	6,737.0	100.0	n/a
2	Capitalization of Financial Sector	1,991.7	29.6	100.0
3	Capitalization of Banking sub-Sector	1,814.4	26.9	91.1
4	Capitalization of Banking Book IV	1,467.8	21.8	73.7
4.1	Bank Central Asia (BBCA)	589.5	8.8	29.6
4.2	Bank Rakyat Indonesia (BBRI)	384.6	5.7	19.3
4.3	Bank Mandiri (BMRI)	310.7	4.6	15.6
4.4	Bank Negara Indonesia 1946 (BBNI)	136.6	2.0	6.9
4.5	Bank CIMB-Niaga (BNGA)	23.1	0.3	1.2
4.6	Pan Indonesia Bank (PNBN)	23.3	0.3	1.2
5	Others (39 Banks)	346.0	5.1	19.1

Source: *IDX Fact Book 2018*

The number of banks which its shares were traded at IDX are 45 banks. Banking Industry, is a strategic industry for Indonesia Economy. This because, the intermediation function which took and core business of this industry, the systemic risk inherent in it and its ability to increase the money supply (M2) through the creation of demand deposits.

From this 45 banks in Banking sub-sector, six of them are the largest banks in Indonesia (based on total capital more than IDR 30 trillion). The six banks are: PT. Bank Central Asia, Tbk (BBCA), PT. Bank Rakyat Indonesia, Tbk (BBRI), PT. Bank Mandiri, Tbk (BMRI), PT. Bank Negara Indonesia 1946, Tbk (BBNI), PT. Bank CIMB-Niaga, Tbk (BNGA), and PT. Pan Indonesia Bank, Tbk (PNBN). These banks are included in category of Banking Book IV (Financial Service Authority (OJK), 2016). The Banking Book IV had significant impact on those activities and performance at IDX. Thus it could affects the Indonesian economy as well.

The research will be an interesting topic that could be discuss on financial economic forums at Domestic, Regional and International levels, remind of systemic impact that this six banks could create to national and global economy. This research data were focused on the risk analysis which faced by investors, manage/measuring the risk from Banking Book IV shares assets at Indonesia Stock Exchange.

## 1.2. Research Purpose

1. Get informed from the risk and returns due to price volatility of Banking Book IV's shares that could impact to investor's funds decision.
2. Analysis and measure the market risk using VaR (Value at Risk). Especially with Variance-Covariance model and Historical Simulation.
3. Ensuring those validity methods by risk measurement in form of back-testing.

## II. LITERATURE REVIEW

### 2.1. Financial Theory

Financial Theory was divided into two major groups, which is the Capital Market (Equity Market) and Company Finance or Corporate Finance. These two large groups are further divided into seven parts, such as: (1). Stock/Shares (2). Bond (3). Derivatives (4). Market Micro Structure (5). Corporate Finance (6). Financial Intermediation and (7). Corporate Governance. Each of section were includes other matters, could be a small section that discuss specifically with aspects of financial theory (Krahn, 1998).

### 2.2. Income Return (Return)

The investment return was simple concept in case of investing in certain period. To calculate that expected return  $E(R)$  from single asset, it is done by calculating the expected return on that asset. Basically, Expected Return is an average return value. If the probability distribution value of an asset's return well known, so the value of expected return could be calculated by discovering the weighted average that could distribution to returns.

### 2.3. Risk

Risk is the possible difference between the actual return received and the expected return. The bigger the difference, the bigger the investment risk. Risk could defined as volatility of unexpected results, which was reflected from value of assets, equity or income (Jorion, Financial Risk Manager Handbook, 2009)

### 2.4. Value at Risk (VaR)

VaR is statistical measure in numbers that tells the maximum potential loss which may occur on ownership from security or exposure to financial instruments. VaR summarizes all the biggest losses that were expected to occur within a certain timeframe and predetermined confident level (Jorion, Value at Risk - The New Benchmark For Managing Financial Risk., 2007).

#### 2.4.1. Variance-Covariance Method (Delta Normal Method)

This method was introduced by JP. Morgan in 1990. The assumptions used in this method such as (Jorion, Value at Risk - The New Benchmark For Managing Financial Risk., 2007):

1. Portfolio were based on change in value of a portfolio which are linearly dependent on changes in assets value. Therefore, the portfolio return also linearly dependent on the return on its assets.
2. Portfolio returns are normally distributed, this method (Variance-Covariance) was calculated those VaR value based on value from volatility of return on assets. The asset value and for portfolio was calculated by correlation occurs between those single asset. This method will provide an accurate VaR value.

#### 2.4.2. Historical Simulation Method

Historical Simulation Method is the simplest and most transparent method for estimation including its portfolio's value. The weakness of this method was not including normal distribution for return on its assets. These historical simulation method is a method which calculated VaR value that was determined on the past (historical) on returns of an assets value. The more historical value data bases you have, the better the VaR estimation results will be (Abbot, 2013). Historical Simulation is a method that could be directly implemented to calculate of VaR.

#### 2.4.3. Monte Carlo Simulation Method

Monte Carlo Simulation Method is VaR method that's also relatively simpler than the Variance-Covariance Method. This method has good result in accuracy, but weak in computation. Because this method requires relatively large number of risk factors simulation.

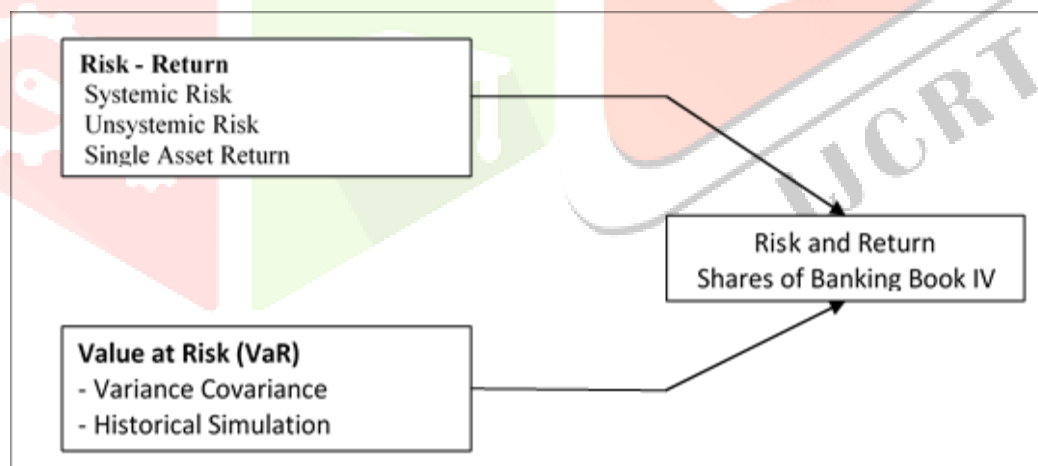
#### 2.5. Previous Research

Previous research on investment return period 2013-2017 with expected return method, they found that there are positive correlation on price growing and investment returns (Kurniawan, Sihombing, & Pramudena, 2019). Study of selected banks in Bombay Stock Exchange, using Variance-Covariance and CAPM, banking sector have low risk (Al-gamal & Siddig, 2018).

GARCH and EVT model was used by (Li, 2017) as comparative study in modelling Value at Risk. The result is EGARCH giving the best in VaR forecasting.

Using Delta Normal Method and Historical Simulation from Saudi Stock Exchange Data, (Arabi & Abdelmageed, 2018) founded that ARCH effect at IGARCH (1,1) cannot be removed.

#### 2.6. Conceptual Framework



Guided by Conceptual Framework above, Furthermore to analyzed the risk of Banking Book IV shares, therefore needs to be carried out by these following steps such as:

1. Doing analysis of unsystemic risk on (single) asset from Banking Book IV shares
2. Counting those yield of each bank share in Banking Book IV
3. Estimating those possible maximum risk occurs by Value at Risk using Variance-Covariance method and Historical Simulation.

### III. RESEARCH METHOD

This research includes descriptive research, which means to analyze the risks and returns on an asset (shares). Each share which is the research object needs to undergo with analysis of its risks and returns. The estimation of risk was carried out by Value at Risk approach with help of Variance-Covariance method and Historical Simulation. As for operational variables definition in this research that could be seen in table below.

**Table 2: Operational Definition of Research Variables**

No.	Variables	Concepts	Formulas	Scale
1	Yields	Yields	$Yield = \frac{Pt+1 - Pt}{Pt}$	Ratio
2	Risk	Variance	$V = p1 (y1 - E)^2 + p2 (y2 - E)^2 + \dots + pN (yN - E)^2$	Ratio
3	Value at Risk	VaR Single Assets	$VaR = a . \sigma . P$	Ratio
4	VaR-Variance-Covariance	Holding Period	$VaR = Pa . \sigma . \sqrt{t}$	Ratio
5	VaR-Historical Simulation	Historical Method	$VaR = Vo \times Percentile\ 5\% \times \sqrt{t}$	Ratio

These research population were all banks which included in six banks that had largest capitalization with capital for more than IDR.30 trillion, and was categorized as Banking Book IV, such as shares of BBKA, BBRI, BMRI, BBNI, BNGA and PNBK in period of June 2004 till September 2019. Thus this research does not used the sample, but instead it used those entire population of banking shares from Banking Book IV category.

Research data used was secondary data from time monthly returns earned by special sample. Sources of data were downloaded from [www.investing.com](http://www.investing.com) data from shares prices, yields, was processed by Value at Risk Statistical Methods (VaR). This analysis used Eviews 10, Microsoft Excel and Microsoft Word software.

## IV. RESULT AND DISCUSSION

### 4.1. Calculation and Analysis of Return

Statistical Description of Return on Shares in Banking Book IV as table below:

**Table 3: Statistical Description**

Shares	Return on Banking Book IV shares (Jun'04 - Sep'19)					Standar Deviasi	Skewness	Jarque-Bera (prob)
	Average	Maximum	Period	Minimum	Period			
BBKA	0.021654	0.319149	Mar'09	(0.153846)	Jan'09	0.071773	0.482840	0.000004
BBRI	0.017297	0.380952	Apr'09	(0.765152)	Oct'08	0.113960	(1.583869)	0.000000
BMRI	0.015663	0.358799	Dec'08	(0.538950)	Oct'08	0.103393	(0.623396)	0.000000
BBNI	0.018470	0.812909	Apr'09	(0.473913)	Oct'08	0.128964	1.883506	0.000000
BNGA	0.013642	0.733333	Apr'09	(0.346535)	Oct'08	0.123206	1.514086	0.000000
PNBK	0.016031	0.354839	Apr'09	(0.309211)	Oct'08	0.118185	0.194490	0.522810
Total	0.102757	2.959981		(2.587607)	Oct'08	0.659481	1.867657	

source: investing.com

This monthly average total returns over the six shares from Banking Book IV were analyzed during period of June 2004 until September 2019, were in range of 10.27%. The shares with the lowest yield were Bank CIMB-Niaga (BNGA) shares at 1.36% and the highest average yield was achieved by Bank Central Asia (BBKA) on 2.16%. The highest yield in monthly period was achieved by Bank Negara Indonesia 1946 (BBNI) shares that reached 81.29% in April 2009 and the lowest maximum yield was achieved by Bank Central Asia (BBKA) shares of 31.91% in March 2009. Meanwhile, the largest loss was achieved by Bank Rakyat Indonesia (BBRI) around of -76.51% in October 2008 and the lowest loss was achieved by Bank Central Asia (BBKA) shares of -15.38% in January 2009.

The yield from six banking shares of Banking Book IV, BBKA topped the other five shares (BBRI, BMRI, BBNI, BNGA, and PNBK). This shows that the longer the holding period of investment in BBKA shares, the more distant returns will get compared to the other five shares

**Table 4: Comparison of Investment Returns, Between Average Annual and 15 years Period**

Shares	Return for 15 years	Average Annual Returns	Average Risk Free Rate
BBKA	3095.63%	206.38%	7.17%
BBNI	816.33%	54.42%	7.17%
BMRI	594.81%	39.65%	7.17%
BBRI	420.29%	28.02%	7.17%
PNBK	417.93%	27.86%	7.17%
BNGA	277.97%	18.53%	7.17%

Source: IDIC, Investing.com,

Even though during these research period (June 2004 – September 2019), the Indonesia capital market (IDX) had experienced shocks from economic crisis in 2008 and 2018. However, if the investment strategy was carried out with a long holding period, Banking Book IV shares still produced an convincing advantage. Meaning that, investing in capital market on “outstanding stock” will bring an excellent “oustanding” results as well as far above of Risk Free Rate (IDIC, 2020) and conquering the “specter” of inflation in Indonesia which is and average of 6.14% annually (Bank Indonesia, 2020).

#### 4.2. Stationarity Test

Stationarity test was related to consistency of time series data movements. A time series data was said to be non-stationary if the mean and variance values were vary over time. From the results of these stationery test, it shows that the t-statistical value aon ADF, all of them had value above its Critical Value. The data would declared stationery if t-statistic from ADF values was greater than critical value.

**Table 5: ADF Stationery Test**

Shares	ADF (t-statistik)	Critical Value 5%	Notes
BBCA	(12.070410)	(2.877363)	Stasioner
BBRI	(14.408360)	(2.877274)	Stasioner
BMRI	(13.904400)	(2.877274)	Stasioner
BBNI	(11.461410)	(2.877274)	Stasioner
BNGA	(12.920650)	(2.877274)	Stasioner
PNBN	(13.985660)	(2.877274)	Stasioner

#### 4.3. Data Normality Test

Normality test aims to discovered whether distribution of yield data on six shares of Banking Book IV was normally distributed or not (Skewed). Base on normality test result it could be concluded base on yield of five shares from Banking Book IV, such as BBCA, BBRI, BMRI, BBNI, and BNGA, shares that data was not normally/skewed distribution. Meanwhile, PNBN shares are normally distributed. In the Variance-Covariance Method, data which normally distributed and not normally (Skewed) requires different formula. For yield data that is not normally distributed,  $\alpha'$  used to calculations use of Cornish Fisher Expansion formula to determine the Z-correction value.

**Table 6: Normality Test (Jarque-Bera)**

Shares	Jarque-Bera(prob)	Critical Value 5%	Notes
BBCA	0.000004	0.050000	Not Normal
BBRI	0.000000	0.050000	Not Normal
BMRI	0.000000	0.050000	Not Normal
BBNI	0.000000	0.050000	Not Normal
BNGA	0.000000	0.050000	Not Normal
PNBN	0.522810	0.050000	Normal

#### 4.4. Data Heteroskedasitcity Test

After stationarity test and normality test were carried out, next step was heteroskedasticity test. This test was intended to ensure that no data was extremely fluctuating. From these heteroskedasticity test result, it turns out that BBCA, BBRI, BMRI, BBNI, BNGA and PNBN shares all of them had probability F-statistic values lower than critical value 0.05 (5%). Thus, data from all shares in Banking Book IV contained heteroskedasticity. Which is, it has variance that is not constant with time.

**Table 7: Heteroskedasticity Test (White)**

Shares	Prob F-Statistic (White)	Critical Value 5%	Notes
BBCA	0.000625	0.050000	Heteroskedastisitas
BBRI	0.000000	0.050000	Heteroskedastisitas
BMRI	0.000025	0.050000	Heteroskedastisitas
BBNI	0.000017	0.050000	Heteroskedastisitas
BNGA	0.000000	0.050000	Heteroskedastisitas
PNBN	0.004254	0.050000	Heteroskedastisitas

#### 4.5. Calculation of $\alpha'$ Adjustment to Cornish Fisher Expansion

After validity test (normality test) of yield data for each share, it is known that data was not normally distributed. Thus, as adjustment should be made to  $\alpha$  value. It appears that skewness value consists of positive values and negative values. Negative Skewness value, meaning that data distribution curve was skewed to the left. Meanwhile, if the skewness value was positive, the curve will go to the right. If data is not normally distributed, the skewness value is zero. With confident level 95%, a Z-score was obtained on 1.644854.

**Table 8:** Calculation from Z-correction, Skewness and  $\alpha'$

Shares	Z-Score ( $\alpha$ )	Skewness	Z-Corection ( $\alpha'$ )
BBCA	1.644854	0.482840	1.507603134
BBRI	1.644854	(1.583869)	2.095080558
BMRI	1.644854	(0.623396)	1.822058955
BBNI	1.644854	1.883506	1.109453393
BNGA	1.644854	1.514086	1.214463779
PNBN	1.644854	0.194490	1.589568769

#### 4.6. Calculating Standard Deviation and Optimum ARCH/GARCH Model

Referring to prior Table 7, the yield data has heteroskedasticity, it is important to estimation those yield volatility by ARCH/GARCH optimum model approach. The determination of ARCH/GARCH model in Table 9 was carried out by estimating the mean process equation with the ARCH/GARCH method. After Estimate Equation process in Eviews, constants will be obtained for the variance process equation alongside with Z-statistics and probability, the Akaike Info Criterion (AIC) value as well as Schwarz Info Criterion (SIC) value.

To discovered the best/optimum ARCH/GARCH model, various of variations of variance process were carried out. With loglikelihood criteria, AIC, and SIC. If AIC and SIC values had an conflict, the highest loglikelihood value would taken as optimum model.

**Table 9:** Estimation of Volatility Shares from Banking Book IV

Shares	ARCH/GARCH Model	Mean Coefficient	Variance Coefficient			Conditional Variance ( $\sigma^2$ )	Std Dev (Volatilitas) ( $\sigma$ )
		C	$\omega$	$\alpha\varepsilon^2$	$\beta\sigma^2$		
BBCA	ARCH(1)	0.021179	0.003958	0.217787	0.000000	0.005183	0.071993
BBRI	GARCH(1)	0.017440	0.006201	0.521310	0.000000	0.013128	0.114577
BMRI	GARCH(2)	0.016377	0.002960	0.038712	0.686610	0.010893	0.104370
BBNI	ARCH(2)	0.012482	0.012116	0.345308	0.023294	0.014189	0.119118
BNGA	ARCH(1)	0.009655	0.012815	0.203436	0.000000	0.015941	0.126258
PNBN	GARCH(1)	0.016494	0.004236	0.696893	0.000000	0.014150	0.118954

#### 4.7. Estimation VaR Value – Variance Covariance Method

After knowing the Z-correction value (alpha prime), then the maximum risk value (VaR) from six shares of Banking Book IV could be calculated. Base on VaR calculation from Banking Book IV share with time horizon of 1 month, the maximum amount of loss which faced by investors of each share was obtained. From Table 10, it is known that the biggest risk for those shares comes from BBRI's shares which amounting to IDR 238,755,380.- Meanwhile, the lowest maximum risk was obtained from BBCA shares. Which amounted of IDR 108,536,872.-

**Table 10:** Value of VaR (Variance-Covariance Method) of 1 month

Shares	Standar Deviation (Volatilitas - $\sigma$ )	Z-Koreksi ( $\alpha'$ )	$\sqrt{t}$ (1month)	Value at Risk* (Undiversified)
BBCA	0.071993	1.507603	1.000000	(108,536,872)
BBRI	0.113960	2.095081	1.000000	(238,755,380)
BMRI	0.104370	1.822059	1.000000	(190,168,293)
BBNI	0.119118	1.109453	1.000000	(132,155,869)
BNGA	0.126258	1.214464	1.000000	(153,335,768)
PNBN	0.118954	1.589569	1.000000	(189,085,591)

\*asumption, initial Investment for each Bank's Shares =IDR.1.000.000.000,-

VaR estimation from Banking Book IV shares with time horizon of 3 months produces the maximum amount of loss faced by investors for each share. In Table 11, it is known that the biggest risk for six shares were comes from BBRI shares amounting to IDR 413,536,495 and the lowest maximum risk on PNBN shares was IDR 107,716,842.-

**Table 11:** Value of VaR (Variance-Covariance Method) of 3 Month

Shares	Standar Deviation (Volatilitas - $\sigma$ )	Z-Koreksi ( $\alpha'$ )	$\sqrt{t}$ (3months)	Value at Risk* (Undiversified)
BBCA	0.071993	1.507603	1.732051	(187,991,398)
BBRI	0.071993	2.095081	1.732051	(261,247,218)
BMRI	0.113960	1.822059	1.732051	(359,646,254)
BBNI	0.104370	1.109453	1.732051	(200,560,508)
BNGA	0.119118	1.214464	1.732051	(250,566,286)
PNBN	0.126258	0.522810	1.732051	(114,330,859)

\*asumtion, initial Investment for each Bank's Shares =IDR.1.000.000.000,-

#### 4.8. VaR Historical Simulation Method

One method that could be used to calculated VaR is historical data on shares returns using Historical Simulation method. The steps in calculating the VaR value with Historical Simulation were first carried out by sorting the shares yield data. The ordering starts from largest loss value to largest profit. After that, a percentile list was created with specified confidence level. In this research, the number of shares return data used 183 time series with 95% confidence level. So 5% of data was 9.15. Rounded up to 10. With return data sequence of 10 which is used as a percentile, the VaR Historical Simulation value could be calculated. The maximum loss estimation for six bank of Banking Book IV shares was carried out by same yield data used in calculation of Variance-Covariance VaR. Completing the previous percentile value explanation, the next explanation was regarding the calculation of Value at Risk value for 1 month time horizon, the largest value comes from BBNI shares amounted to IDR 157,960,000.- and the lowest was from BBCA shares, amounted to IDR 91,660,000.-

**Table 12:** Value of VaR (Historical Simulation Method) – for 1 month

Shares	Exposure *	Percentile	$\sqrt{t}$	Value at Risk
BBCA	1,000,000,000	(0.091660)	1.000000	(91,660,000)
BBRI	1,000,000,000	(0.129210)	1.000000	(129,210,000)
BMRI	1,000,000,000	(0.110470)	1.000000	(110,470,000)
BBNI	1,000,000,000	(0.157960)	1.000000	(157,960,000)
BNGA	1,000,000,000	(0.144800)	1.000000	(144,800,000)
PNBN	1,000,000,000	(0.176740)	1.000000	(176,740,000)

\* asumtion

The calculating is in Table 13 which distinguishes that calculation was the root of t value (time horizon). For 3 month time horizon, the value was 1.732051. Thus, the largest VaR value was IDR 306,122,694.- which comes from PNBN shares. While the lowest VaR value was BBCA's shares amounted to IDR 158.759,795.-

**Table 13:** Value of VaR (Historical Simulation Method) – for 3 month

Shares	Exposure *	Percentile	$\sqrt{t}$	Value at Risk
BBCA	1,000,000,000	(0.091660)	1.732051	(158,759,795)
BBRI	1,000,000,000	(0.129210)	1.732051	(223,798,310)
BMRI	1,000,000,000	(0.110470)	1.732051	(191,339,674)
BBNI	1,000,000,000	(0.157960)	1.732051	(273,594,776)
BNGA	1,000,000,000	(0.144800)	1.732051	(250,800,985)
PNBN	1,000,000,000	(0.176740)	1.732051	(306,122,694)

\* asumtion

#### 4.9. VaR Model Testing (Back Testing)

To examined whether VaR calculation model carried out was accurate / valid or not, the backtesting examined was required (Jorion, Value at Risk - The New Benchmark For Managing Financial Risk., 2007). One of backtesting models was done by Kupiec Test, which by comparing test results between the actual return data and VaR predicted value (Kupiec, 1995). Backtesting from Variance-Covariance method and Historical Simulation method aims to find out the validity of potential loss on six shares that been studied. The method used was Kupiec Test, its common that the failure rate is in the range of  $6 < N < 21$  for  $T = 256$ , then VaR model could be said to be valid enough to measure those maximum potential loss (Jorion, Value at Risk - The New Benchmark For Managing Financial Risk., 2007).

The test results, both Variance-Covariance method and Historical method, shows that both models were declared valid in measuring the maximum potential loss of six shares from Banking Book IV individually stock as presented in Table 14 below.

**Table 14:** Validity Test of VaR Model (Kupiec Test)

Shares	Failure level		6 < N < 21	Notes
	Var-Covar	Historical		
BBCA	7	9	< 21	Valid
BBRI	2	10	< 21	Valid
BMRI	3	9	< 21	Valid
BBNI	13	6	< 21	Valid
BNGA	7	9	< 21	Valid
PNBN	4	9	< 21	Valid

Base on validity of VaR model above, it turns out that the failure rate generated by Historical Simulation method was generally greater than Variance Covariance method. The failure rate of these two methods mentioned above were still within the required tolerance limits (<21). Thus, the VaR model, both Historical Simulation method and Variance-Covariance method, could be declared valid.

## V. CONCLUSION AND SUGGESTION

### 5.1. Conclusion

From these results that has been carried out on Banking Book IV shares in Indonesia Stock Exchange, it could be concluded that:

1. Changes in value of shares at stock market are Random-Walk. Thus, changes in share prices were difficult to predict because they were influenced by various risk factors that come from external companies. Such as government policies and changes in national and international macro economic variables. Beside that, changes in share prices were also influenced by company policies and activities. Such as dividend policy, company performance and other corporate actions.
2. The longer investment value were made, the greater returns will gets.
3. The measurement of market risk on individual shares investment by the VaR, Variance Covariance method generally produces a greater value, compared to Historical Simulation method.

### 5.2. Suggestion

1. For prospective investors in six shares from Banking Book IV stocks, it is advisable to apply the Value at Risk (VaR) model in sizing the market risk, because the results from risk measurement with existing models could be recognize by certainty within certain time horizon. So it would get easy to understand for taking investment decisions.
2. For next researchers, it is recommended that they capable to carry out further research regarding the returns and risk analysis by Value at Risk approach, the Variance-Covariance method, the Historical Simulation method and Monte Carlo method. Not only to banking sector shares, but also to other industrial sectors. Whether it's on Indonesia Stock Exchange or Stock Exchange in other countries. Because this research only covers Banking Book IV stock investment and limited as an individual asset. Further research was suggested to capable to carry out research for both single assets and portfolios.
3. In examing stock price movements, it is basically known as fundamental analysis and technical analysis. Fundamental analysis used to determine what stocks to buy. While technical analysis used when is the right time to buy. This research discusses stock price movements in terms of fundamental analysis such as an attempt to determine what stocks were recommended to be purchased from several other shares at Banking Book IV. In this case, the recommended investment / purchase was BBKA shares. For further research, the researcher could explore this fundamental analysis from various aspects. For example, for this macro economic aspect (GNP, GDP, Inflation, interest rate and others). Another aspect was the Company's Financial Statements (Balance Sheet, Income Statement and Cash Flow Report).
4. For regulators and also top management of banks, these implemented of maximum risk calculation (VaR Model) in banking sector could be used by existing VaR calculation models (Variance Covariance, Historical Simulation and Monte Carlo method). In order to enrich this testing over maximum risk exposure that face by a bank as well as its use as an implementation of the Stress Test policy.



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