The Volatility of Industrial Stock Returns and An Empirical Test of Arbitrage Pricing Theory

Review of Integrative Business & Economics Research

Bahri
Accounting Department of Politeknik Negeri Ujung Pandang

ABSTRACT

This study focused on the investigation of the sensitivity of industrial stock returns and empirical test of the model of arbitrage pricing theory (APT). Three issues were the basis of this study. The first issue was the difference in industrial stock returns volatility. The second issue was concerning the validity and robustness of CAPM as well as APT models. And, the third issue was the time-varying volatility with the phenomenon of structural breaks. This study used a nested model approach with the second-pass regression. Method of estimation using ordinary least squares method, ARCH/GARCH method, and the dummy variable method. This study used secondary data for the observation period January 2003 to December 2010 in the Indonesian stock market. This investigation produced three empirical findings. First, there was no difference in sensitivity of industrial stock returns among sectors, based on systematic risk factors. Second, the testing of CAPM and APT multifactor models revealed inconsistent results in testing industrial stocks. But the model of CAPM seemed more valid and robust than APT multifactor was. Finally, there were differences in the risk premium for systematic risks caused by the structural break during the financial crisis in 2008.

Keywords: Arbitrage pricing theory, industrial stock return volatility, systematic risk factors, structural-breaks

1. INTRODUCTION

Investments are current expenditures of investors to expect a return in the future. There is a variety of investment options for investors; one of them is an investment in common stock. This investment is classified long-term investments that provide a return with an uncertain magnitude for investors. The investment indicates that an investment in common stock is a kind of risky investment, not a risk-free one. In connection with an investment in common stock, investors will be exposed to a wide selection of industrial stocks, meaning that investors require making analysis of various industries.

The focus of this research was investigating the volatility and the sensitivity return of industrial stocks and their implications for the empirical test of arbitrage pricing theory (APT) in the Indonesian capital market. This study was based on two assumptions, that is, constant beta and changeable beta. The main purpose of this study was to test APT model empirically. This study was based on three main issues. The first issue was the phenomenon of the return sensitivity difference of industrial stocks over the changes of systematic risk factors (Yao et al., 2005; Azeez and Yonezawa, 2006; Jones, 2007; Brown and Reilly, 2009). The second one was the phenomenon of the validity and

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

robustness of unconditional model of APT multifactor, as compared with the unconditional model of capital asset pricing model (CAPM) in explaining empirically the relationship between the returns of sectoral stocks and systematic risks.

Empirical testing of these two models has brought about pros and cons. The examination of CAPM (Black et al., 1972; Fama and MacBeth, 1973; Chen, 2003; and Sudarsono, 2010) concluded that the unconditional CAPM was a parsimony model. All assumptions tested could be proven empirically and were relatively able to outperform competitor models. Meanwhile, testing results showed that the APT was better than CAPM (Roll and Ross, 1980; Chen, 1983; Bower et al., 1984; Cagnetti, 2002; Azeez and Yonezawa, 2006). The third issue was the phenomenon of time-varying volatility. This phenomenon was basing on the assumption that the beta is not constant. Time-varying volatility is associated with available new information that leads investors to revise their assessments on the intrinsic values of a planned investment opportunity (Bodie et al., 2009). In this issue, the phenomenon investigated was associated with a structural break. One of the interesting conditions investigated in connection with the matter of time-varying volatility was the occurrence of the financial crisis in 2008. During this period, the volatility of monthly return of sectoral stocks in the Indonesian capital market increased drastically.

Based on the above three phenomena as major issues, this study addressed three issues. The first issue was whether or not there was a difference in the return sensitivity of industrial stock, both among sectors and systematic risk factors. The second issue was whether or nor systematic risk factors could explain the return variation of industrial stocks. And, finally, whether or not there was a difference in the risk premium of systematic factors at industrial stocks as a result of a structural break. The aim of this study was to investigate the three issues formulated above.

2. REVIEW OF LITERATURE

2.1 Capital Asset Pricing Model (CAPM)

CAPM is a theory that was developed by William F. Sharpe in 1964. This theory explains the correlation between risk and return of securities based on one factor (single factor), i.e. market factor. Martin et al., (1988) suggested that the CAPM was constructed based on the mean-variance mechanism developed by Markowitz in 1952. The CAPM is described by a security market line (SML) which shows the relationship between the expected return and the risk for individual securities on market equilibrium condition (Martin et al., 1988). CAPM is a theory that describes how an asset is valued in accordance with its risk (Haugen, 1997). CAPM is the result of the development of modern financial economics theory to predict the relationship between the risk of an asset and return (profit) expected (Bodie et al. (2009).

The CAPM developed by Sharpe, Lintner, and Mossin above is the standard model of CAPM or unconditional CAPM. The standard model is based on the view that beta does not change (static) during the period of observation. The standard CAPM is formulated in the security market line (SML) equation which shows the trade-off between risk and expected return for individual securities (Sharpe et al., 1999). In equilibrium condition, each asset is located on an SML because an expected return is

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

required to compensate for systematic risk borne by an investor (Jones, 2007). SML shape is shown in Equation 1.

$$E(R_i) = R_f + \beta_i \lfloor E(R_M) - R_f \rfloor \quad (1)$$

One interesting issue in the development model of CAPM is the model of time-varying volatility. This model is a development of intertemporal CAPM (Merton, 1973). The model is based on the view that the beta can change (dynamic) all the time during the period of observation. Bodie et al. (2009) stated that the variance of return of a stock was related to the rate of arrival of new information. Therefore, with the new information, investors revised their assessment on the intrinsic value of an investment.The issue of time-varying volatility will catch (capturing) the phenomenon of a structural break. The phenomenon of structural breaks (structural change) reveals the existence of differences in required rate of return and risk premium as a result of the economic cycle or cycles of business and industry. Theoretically it is stated that required rate of return and risk premium will be greater when the economy is in a recession or downturn.

Earlier testing on CAPM was performed by Black et al. (1972) and Fama and MacBeth (1973). Both the testings were conducted to test the standard model of CAPM with an emphasis on the testing of security market line (SML). They used a two-pass regression approach; the first-pass regression was to estimate the value of beta (sensitivity of an asset return against a market return) while the second-pass regression tested the significance of beta.

Both of the tests above, in principle, had the same conclusion, the test results were consistent with the empirical CAPM theory. Specifically, the two tests are shown as follows:

1. Testing of Black et al. (1972)
   As explained in their article, Black et al. (1972) tested the slop and intercept of SML. As noted by Sharpe, the general form of SML is shown in Equation 2.

$$E(r_J) = r_F + [E(r_M) - r_F]\beta_J \quad (2)$$

   If investors can not borrow at the rate of a risk-free, then the form of SML turns to be Equation 3.

$$E(r_J) = E(r_Z) + [E(r_M) - E(r_Z)]\beta_J \quad (3)$$

   On the basis of the above findings, there was a positive and linear correlation between risk and stock return.
2. Testing of Fama and MacBeth (1973)
   In their article, Fama and MacBeth (1973) stated that they tested several hypotheses that served to be the conclusion of CAPM model. The research model proposed is shown in Equation 4.

$$E(R_i) = E(R_0) + [E(R_m) - E(R_0)]\beta_i \quad (4)$$

In addition to the testing on the CAPM performed by Black et al. (1972) and Fama and MacBeth (1973), Chen (2003) and Sudarsono (2010) conducted several subsequent testings. The results of these tests are as follows.

1. Testing of Chen (2003)
   Chen (2003) used the traditional CAPM model to perform the test, shown in Equation 5.

$$E(R_i) = R^f + \beta_i \{E(R^m) - R^f\} \quad (5)$$

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

He concluded that the relationship between stock returns and beta were statistically significant, and the coefficient of determination of the regression was high across all sectors.

2. Testing of Sudarsono (2010)
   In his study, Sudarsono (2010) examined the CAPM model testing in Indonesian capital market. His testings covered the unconditional CAPM and conditional CAPM. Based on the results of his research, he drew the following conclusions:
   1) The testing on the unconditional CAPM revealed a result which was not fully rejected. Two empirical results were the basis of the result. First, the relationship between return and risk was linear and positive, both in single period and multiperiod. However, idiosyncratic risk factors, together with systematic risk factors, are determinants of return if investors could not hold an optimally diversified portfolio. Second, CAPM was a parsimony model, consistent with the theory, coherent with the data, had predictive strength, and was relatively able to outperform competitor models.
   2) The testing on the conditional CAPM that took market timing (dual beta) into account also resulted in a conclusion that was consistent with the theory. Four empirical results showed this. First, an upmarket condition the slope of SML had a positive sign. Meanwhile in a down market condition, the slope of SML had a negative sign. However, the magnitude of market risk premium turned out differently during down market and upmarket. Second, the testing on the CAPM by considering structural changes provided empirical supports that market conditions with higher volatility brought about a risk premium or return rate required by market condition with lower volatility. Third, the use of time-varying beta with dual beta turns resulted in a more consistent explanation about the relationship between return and risk than the time-varying beta with a single beta. Finally, market residual volatility had a positive effect on the return and beta magnitude, so if the market conditions were getting more volatile, the magnitude of Beta was increasingly unstable.

2.2 Arbitrage Pricing Theory (APT)

Arbitrage pricing theory (APT) is a theory that was developed by Stephen A. Ross in 1977. The APT model is also called a risk factor model. APT states that the expected return of certain assets is based on the sensitivity of the assets against one or more systematic factors (Megginson, 1997).

The forerunner to the emergence of this theory came from the criticism presented by Roll (1977) on the CAPM test performed by Black et al. (1972) and Fama and MacBeth (1973). In his article Ross (1976) suggested arbitrage models be an alternative to the mean variance of capital asset pricing model introduced by Treynor, Sharpe and Lintner. APT is based on the view that the expected return of a security will be affected by several risk factors (Ross, 1976).

APT is a model based on the law of one price which states that two assets that have the same characteristics can not be sold at different prices (Jones, 2007). Model arbitrage pricing theory (APT) is in the form of multi-factor model or multi-index model that are based on the correlations between risk and return. Factor model or index model assumes that the return of an asset is sensitive to the movement of various factors or indices (Sharpe et al., 1999).

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

As stated above, APT is a model of risk factors so that the risk factors assessed at APT model have the following characteristics (Jones, 2007; Tandelilin, 2010):

1. Each of risk factors should have a broad effect on stock returns in the stock market.
2. Risk factors should affect the expected returns. Accordingly, it is necessary to perform an empirical test with statistical analyzes.
3. At the beginning of a period, the risk factors can not be predicted by the market because they contain unexpected or shocking information for markets.

Several literature and articles have proposed APT common model as described as follows:

1. Brown and Reilly (2009) described the relationship between expected return and risk factors, shown in Equation 6.
   $$E(R_i) = \lambda_0 + \lambda_1 b_{i1} + \lambda_2 b_{i2} + \ldots\ldots + \lambda_k b_{ik} \quad (6)$$
2. Elton et al. (2011) suggested an APT model that describes the relationship between return and risk as shown in Equation 7.
   $$R_i = a_i + b_{i1}I_1 + b_{i2}I_2 + \ldots\ldots + b_{ij}I_j + e_i \quad (7)$$
3. Roll and Ross (1980) suggested general models of APT in the form of excess return model as presented in Equation 8 to 10.
   $$E_i - E_0 = \lambda_1 b_{i1} + \ldots\ldots\ldots\ldots\ldots + \lambda_k b_{ik} \quad (8)$$
   $$\lambda_j = E^j - E_0 \quad (9)$$
   $$E_i - E_0 = (E^1 - E_0)b_{i1} + \ldots\ldots\ldots\ldots + (E^k - E_0)b_{ik} \quad (10)$$
4. Azeez and Yonezawa (2006) proposed general models of APT as shown in equation 11 to 13.
   $$R_{it} = E(R_{it}) + b_{i1}\delta_{1t} + b_{i2}\delta_{2t} + \ldots\ldots + b_{ik}\delta_{kt} + u_{it} \quad (11)$$
   $$E(R_{it}) = \lambda_0 + \lambda_1 b_{i1} + \lambda_2 b_{i2} + \ldots\ldots + \lambda_k b_{ik} \quad (12)$$
   $$E(R_{it}) - R_f = \lambda_1 b_{i1} + \lambda_2 b_{i2} + \ldots\ldots\ldots\ldots + \lambda_k b_{ik} \quad (13)$$

The excellence of APT is allowing pricing or stock returns to be based on several risk factors that are referred to as the return generating process. Thus, the estimates of pricing will be more valid and accurate. However, APT also has weaknesses in accordance with the criticism presented by Shanken (1982). The APT fundamental weakness raised by Shanken is that it does not determine the number and type of risk factors that are considered determinants of stock return variation. The underlying theory of the multifactor model does not specify the required number of factors (Campbell et al., 1997).

Various studies were conducted to test the APT model, among others, by Roll and Ross (1980), Chen (1983), Antoniou et al. (1998), Cagnetti (2002), and Azeez and Yonezawa (2006). In their article Roll and Ross (1980) empirically examined the APT model. They proposed a model as shown in Equation 14.

$$E_i - E_0 = (E^1 - E_0)b_{i1} + \ldots\ldots\ldots\ldots\ldots + (E^k - E_0)b_{ik} \quad (14)$$

As $\lambda_j = E^j - E_0$, the model of equation 14 is converted into equation model 15.

$$E_i - E_0 = \lambda_1 b_{i1} + \ldots\ldots\ldots\ldots + \lambda_k b_{ik} \quad (15)$$

The conclusion of their study was that the estimated expected return depended on the estimation of factor loadings. Chen (1983) in his article examined the comparison between APT and CAPM models in estimating the return. He used APT and CAPM models respectively shown in Equations 16 and 17.

$$r_i = \lambda_0 + \lambda_1 \hat{b}_{i1} + \ldots\ldots + \lambda_k \hat{b}_{ik} + \varepsilon_i \text{ (APT)} \quad (16)$$

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

$$r_i = \lambda_0 + \lambda_1 \hat{\beta}_i + \eta_i \text{ (CAPM)} \quad (17)$$

The conclusion of their study was that the APT model was better than the CAPM model in estimating the return. In their article Antoniou et al. (1998) examined the performance of APT for securities traded on London Stock Exchange. They studied ten economic factors. The factors were unexpected inflation, changes in expected inflation, real industrial production, real retail sales, real money supply, commodity prices, term structure, default risk, exchange rate, and excess returns on the market portfolio. They concluded that there were three factors that could be used to assess securities, that is, unexpected inflation, money supply, and the excess return on the market portfolio. In his article, Cagnetti (2002) examined the comparisons between CAPM and APT models in explaining empirically the relationship between risk and return in Italian capital market. He concluded as follows:

1) The relationship between β and returns in Italian capital market during the period January 1990 to June 2001 was weak, and overall CAPM was poor as explanatory power.
2) Arbitrage pricing theory (APT) which allow the use of various sources of systematic risks was better than the CAPM from the various tests considered.
3) Stocks and portfolios in Italian capital markets seemed to be significantly affected by a number of systematic risks, and their behaviors could be explained only through a combination of explanatory powers of several factors or macroeconomic variables.

In their article, Azeez and Yonezawa (2006) empirically examined the APT model in Japanese capital market. They aimed to analyze the asset pricing mechanism in Japanese capital markets during the bubble economy period empirically, using APT-based macroeconomic variables. Economic factors that were examined included: industrial production, money supply, inflation, long-term bond rate, call rate, exchange rate, and land price. The APT model are shown in Equations 18 and 19.

$$R_{it} = E(R_{it}) + b_{i1}\delta_{1t} + b_{i2}\delta_{2t} + \ldots\ldots + b_{ik}\delta_{kt} + u_{it}, \quad i = 1,\ldots\ldots, N \quad (18)$$

$$E(R_{it}) = \lambda_0 + \lambda_1 b_{i1} + \lambda_2 b_{i2} + \ldots\ldots + \lambda_k b_{ik} \quad (19)$$

If there is a risk-free asset (riskless asset) with return R_f, and assuming that $R_f = \lambda 0$, APT turns into Equation 20.

$$E(R_{it}) - R_f = \lambda_1 b_{i1} + \lambda_2 b_{i2} + \ldots\ldots + \lambda_k b_{ik} \quad (20)$$

Based on the results of their research, they concluded that:

1) All the tests conducted seemed to provide support to the APT as an asset pricing model.
2) There were four different risk factors that significantly affected the expected return on each sample period. The four factors were money supply, inflation, exchange rate, and industrial production.

The testing of the two models was performed in two stages (Haugen, 1997), that is, estimating factor beta (β) and estimating factor price (λ).

Therefore, Fama and MacBeth (1973); and Roll and Ross (1980) using a two-pass regression method to test the model. The first-pass regression was to estimate the beta factor by making regressions of individual stock returns with risk factors that were assessed using time-series regression. Meanwhile, the second-pass regression was to estimate the factor price by making regressions of portfolio return with a beta portfolio resulting from the first-pass regression using cross-sectional regression.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Furthermore, testing the reliability (robustness) of the models was aimed to test the ability of the two models above in explaining the volatility or variation of sectoral stock return. The test applied the approach of goodness of fit that was measured using the adjusted R^2 coefficient based on the relationship between sectoral stock returns and market factors, as well as economic factors. The larger the adjusted R^2 coefficients were, the more robust the models were. In addition, the robustness of the models was also measured using the Akaike's information criterion (AIC) and Schwarz information criterion (SIC). The smaller the AIC and SIC were, the more robust the models were.

In line with the development of research that examines the particular asset pricing in stock markets, a number of special characteristics have been found. One special characteristic in question was the phenomenon of volatility clustering which was the period that showed extensive changes for a long period followed by a quiet period (Gujarati and Porter, 2009). In connection with the phenomenon of volatility clustering, the residual variance of stock returns will change over time so that the residual variance is not constant (heteroscedastic). This phenomenon can be caused by the presence of a structural break in the economy as a business cycle form that affects the return volatility of securities in capital markets.

3. METHODOLOGY

This study used two models of asset pricing, namely capital asset pricing models (CAPM) as a single factor model and arbitrage pricing theory (APT) as a multifactor model. Both models were encompassed in the form of nested models to investigate the return sensitivity of industrial stocks against systematic risk factors, and were tested empirically for further comparisons. Both models were constructed based on trade-off risk and return. This study completely used secondary data published by several sources such as the Indonesia Stock Exchange (IDX) and Bank Indonesia. This study used monthly time-series data for the period from January 2003 to December 2010 and cross-section data of some individual stocks from nine sectors. The period of observation consisted of four categories; first, the whole period (January 2003 - December 2010) and three sub-periods. The first sub-period was the period before the financial crisis (January 2003 - December 2007). The second sub-period was the period during the financial crisis (January 2008 - April 2009). The third sub-period was the period after the financial crisis (May 2009 - December 2010). The sampling technique employed was purposive sampling under criteria that the stocks were consistent or continuously listed in Indonesia Stock Exchange (IDX) during the observation period. Figure 1 depicts the flow of the study.

Three hypotheses were constructed with following test designs to address the three issues.

Hypothesis 1

H1. There was a difference in the sensitivity of returns of the sectoral stocks among industries.

The estimation model is shown in Equation 21.

$$ER_t = \beta_0 + \beta_{iDMR}DMR_t + b_{iDInfR}DInfR_t + b_{iDIntR}DIntR_t + b_{iDExcR}DExcR_t + b_{iGMR}GMR_t + b_{iGExcR}GExcR_t + \varepsilon_t \quad (21)$$

Hypothesis 2

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

H2. The Beta of the risk premium of systematic factors might influence the variation of returns of industrial stocks.

The estimation model is shown in Equation 22 to 24.

$$\overline{ER_i} = \lambda_0 + \lambda_1 \beta_{i\,DMR} + \varepsilon_i \quad (22)$$

$$\overline{ER_i} = \lambda_0 + \lambda_1 \beta_{iDMR} + \lambda_2 b_{iDInfR} + \lambda_3 b_{iDIntR} + \lambda_4 b_{iDEchR} + \lambda_5 b_{iGMR} + \lambda_6 b_{iGEchR} + \varepsilon_i \quad (23)$$

$$\overline{ER_i} = \lambda_0 + \lambda_2 b_{iDInfR} + \lambda_3 b_{iDIntR} + \lambda_4 b_{iDExcR} + \lambda_5 b_{iGMR} + \lambda_6 b_{iGExcR} + \varepsilon_i \quad (24)$$

Hypothesis 3

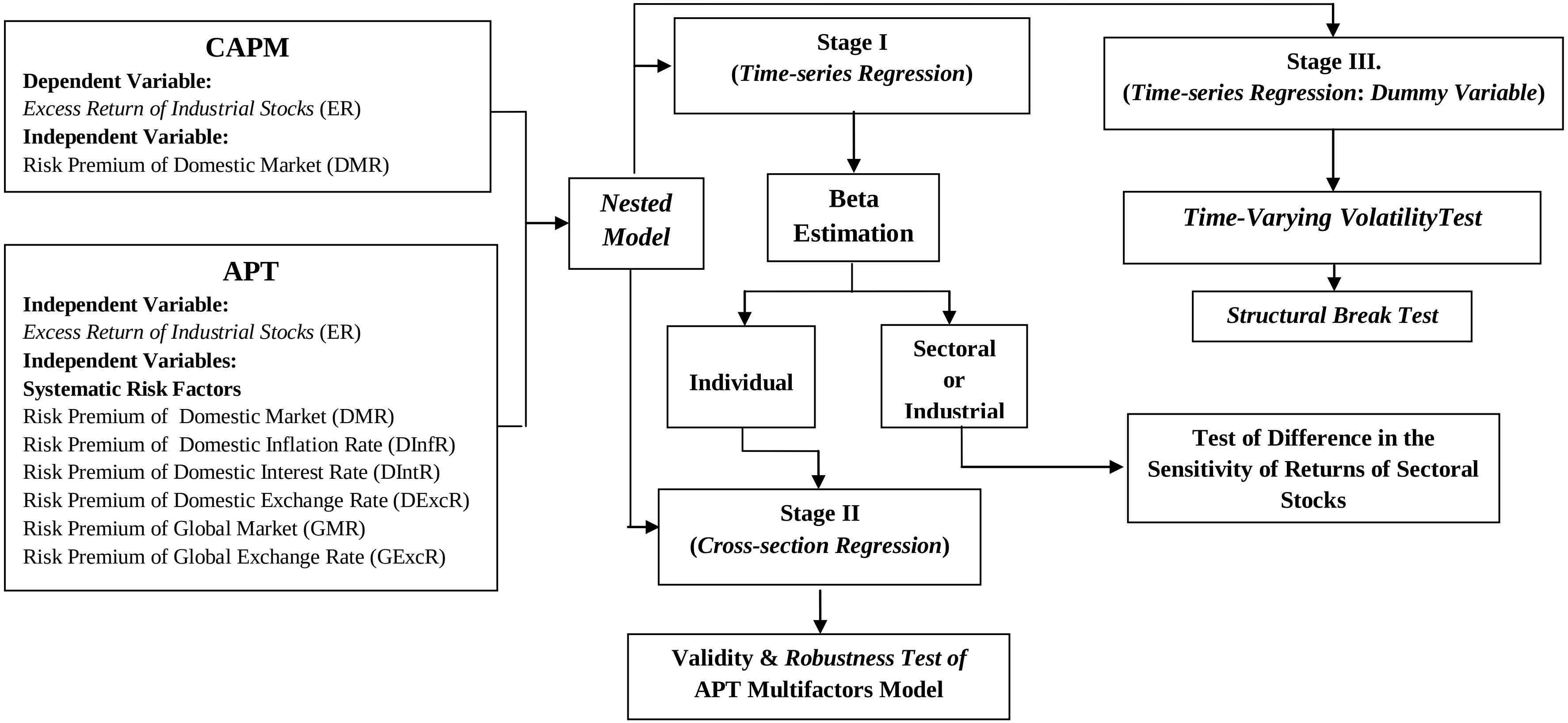
H3. The risk premium of systematic factors of industrial stocks was greater during the financial crisis in 2008 than that of the period before and after the financial crisis in 2008.

The estimation model is shown in Equation 25.

$$ER_t = \delta_0 + \beta_{iDMR}DMR_t + b_{iDInfR}DInfR_t + b_{iDIntR}DIntR_t + b_{iDExcR}DExcR_t + b_{iGMR}GMR_t + b_{iGExcR}GExcR_t + \beta_{iD1DMR}D_1DMR_t + b_{iD1DInfR}D_1DInfR_t + b_{iD1DIntR}D_1DIntR_t + b_{iD1DExcR}D_1DExcR_t + b_{iD1GMR}D_1GMR_t + b_{iD1GExcR}D_1GExcR_t + \beta_{iD2DMR}D_2DMR_t + b_{iD2DInfR}D_2DInfR_t + b_{iD2DIntR}D_2DIntR_t + b_{iD2DExcR}D_2DExcR_t + b_{iD2GMR}D_2GMR_t + b_{iD2GExcR}D_2GExcR_t + \varepsilon_t \quad (25)$$

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Figure 1
The Flow of Research



ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

4. RESULTS AND DISCUSSION

4.1 Differences in Return Sensitivity of Industrial Stocks

The results of testing of hypothesis 1 in terms of return sensitivity differences among sectors are shown in Table 1 (Panels a, b, c, and d). Along the period of January 2003 - December 2010, the t-test values on industrial stocks of the industries for the period of before, during, and after the financial crisis in 2008 showed that the differences in return sensitivity of stocks of the nine sectors were not significant. They were both at the level of 1% and 5%. That means that H_0 can not be rejected. The fact indicated that at certain systematic risk factors, there was no difference in return sensitivity among the nine sectors. Although the return volatility of stocks tended to differ among the sectors, this volatility apparently was not entirely influenced by systematic risk factors. The results of this investigation confirm that the same systematic risk factors have a spillover effect similar to the return volatility of industrial stocks.

4.2 Effects of the Beta of Systematic Risk Premium in Affecting Industrial Stocks Return Variation

The testing results on the validity and robustness of the APT model for industrial stocks which were encompassing between the unconditional CAPM and unconditional multifactor APT for the period January 2003 - December 2010 are shown in Table 2. The results showed that the validity testing of stocks of mining, basic industry and chemical, miscellaneous industry, consumer goods industry, infrastructure, utilities, transportation, trade, services, and investment had λ_1 coefficient (Panels a and b), significant at level 5%. This means that H_0 was rejected. Meanwhile, coefficient λ_2 to λ_6 (Panels b and c) were not significant, both at the levels of 1% and 5%. The coefficients mean that H_0 can not be rejected. This indicates that there is only one systematic risk factor that significantly explains the return variation of the six industrial stocks. The risk factor that can explain the return variation of the six sectors is the risk premium of domestic market return.

Furthermore, based on the testing results on the robustness of APT model for the six industrial stocks, the three indicators *goodness of fit* (adj.R^2, AIC, and SIC) had better values for the model of one factor, that is, market risk factor, when compared with multifactor model. This is indicated by the bigger value of adj.R^2 and smaller values of AIC and SIC on one-factor model (Panel a), when compared with multifactor model (Panels b and c). The values indicate that one-factor model is more robust when compared with the multifactor model to be used to explain the return variation the six industrial stocks.

The testing of the validity of property, real estate and building stocks, and financial stocks resulted in λ_1 coefficient and λ_3 (Panel b), significant at level 5%. This means that H_0 was rejected whereas the coefficients λ_2, λ_4, λ_5, and λ_6 (Panel b) are not significant, either at the level of 1% or 5%. This means that H_0 could not be rejected. It shows that there were two systematic risk factors that significantly determined the return variation of property, real estate, and building stocks, as well as financial stocks. The factors were the domestic market return and the domestic interest rate. Similarly, testing the models simultaneously was significant at the level of 1%. This indicates that the return variation of the property sector stocks, real

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

estate and building, and financial sector could be explained by two factors, namely market risk and national interest risk factors. Therefore, market risk and national interest risk factors were variables that could be priced as risk factors for the property sector stocks, real estate, and buildings, as well as the financial sector.

4.3 Differences in Risk Premium of Systematic Factors of Industrial Stocks between the Period Before, During, and After the Financial Crisis in 2008

The testing results of hypothesis 3 are shown in Table 3. The risk premium is indicated by the regression slope of a dummy variable of industrial stock returns. The test results of the slope difference between the period before and during the financial crisis in 2008 showed that the industrial stock had different coefficients among the various systematic risk factors (Table 3). The coefficients imply that the structural changes during the financial crisis affected the slope (risk premium) of APT model for a particular sector. The test results also showed that structural changes after the 2008 financial crisis had an impact on the slope (a risk premium) of APT model for a particular sector.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Table 1
Testing Results of Difference of Sensitivity of Returns of Industrial Stocks among Sectors

Sectors		Panel a All Periods (Jan. 2003-Dec. 2010)		Panel b Sub Period I (Before Crisis)		Panel c Sub Period II (During Crisis)		Panel d Sub Period III (After Crisis)	
		t-stat	Prob.	t-stat	Prob.	t-stat.	Prob.	t-stat.	Prob.
Agriculture	Mining	1.053	0.317	0.061	0.952	-1.059	0.315	0.603	0.560
Agriculture	Basic Industry and Chemical	0.819	0.432	0.794	0.446	-0.934	0.392	1.153	0.300
Agriculture	Miscellaneous Industry	-0.163	0.874	0.351	0.733	0.035	0.973	0.550	0.594
Agriculture	Consumer Goods Industry	1.644	0.131	0.825	0.429	-0.911	0.404	1.129	0.309
Agriculture	Property, Real Estate, and Building	0.074	0.942	0.053	0.959	-0.576	0.577	0.718	0.489
Agriculture	Infrastructure, Utilities and Transportation	0.345	0.738	0.415	0.687	-0.578	0.576	0.226	0.825
Agriculture	Finance	0.551	0.594	1.066	0.311	-0.507	0.623	0.218	0.832
Agriculture	Trade, Services, and Investment	1.206	0.256	0.333	0.746	-0.897	0.391	1.037	0.346
Mining	Basic Industry and Chemical	-0.358	0.728	0.676	0.515	0.234	0.819	1.294	0.245
Mining	Miscellaneous Industry	-0.701	0.499	0.274	0.790	1.037	0.324	0.015	0.988
Mining	Consumer Goods Industry	1.051	0.330	0.706	0.496	-0.242	0.813	1.237	0.265
Mining	Property, Real Estate, and Building	-0.768	0.460	-0.010	0.992	0.691	0.506	0.214	0.835
Mining	Infrastructure, Utilities and Transportation	-0.478	0.643	0.331	0.747	0.409	0.691	-0.333	0.746
Mining	Finance	-0.349	0.734	0.928	0.375	0.529	0.609	-0.446	0.665
Mining	Trade, Services, and Investment	0.187	0.855	0.254	0.805	-0.068	0.947	0.990	0.359
Basic Industry and Chemical	Miscellaneous Industry	-0.589	0.569	-0.410	0.691	0.905	0.387	-0.762	0.463
Basic Industry and Chemical	Consumer Goods Industry	1.420	0.203	0.073	0.944	-0.415	0.687	-0.166	0.871
Basic Industry and Chemical	Property, Real Estate, and Building	-0.582	0.573	-0.729	0.483	0.494	0.632	-1.280	0.246
Basic Industry and Chemical	Infrastructure, Utilities and Transportation	-0.287	0.780	-0.394	0.702	0.204	0.842	-0.907	0.405
Basic Industry and Chemical	Finance	-0.125	0.903	0.563	0.586	0.327	0.750	-1.180	0.289

Source: Results of Data Analysis

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Table 1
Testing Results of Difference of Sensitivity of Returns of Industrial Stocks among Sectors (continued)

Sectors		Panel a All Periods (Jan. 2003-Dec. 2010)		Panel b Sub Period I (Before Crisis)		Panel c Sub Period II (During Crisis)		Panel d Sub Period III (After Crisis)	
		t-stat	Prob.	t-stat	Prob.	t-stat.	Prob.	t-stat.	Prob.
Basic Industry and Chemical	Trade, Services, and Investment	0.589	0.569	-0.481	0.641	-0.269	0.793	-0.667	0.520
Miscellaneous Industry	Consumer Goods Industry	0.952	0.384	0.448	0.664	-0.907	0.386	0.726	0.484
Miscellaneous Industry	Property, Real Estate, and Building	0.203	0.843	-0.296	0.773	-0.535	0.604	0.129	0.900
Miscellaneous Industry	Infrastructure, Utilities and Transportation	0.375	0.715	0.048	0.962	-0.568	0.583	-0.306	0.766
Miscellaneous Industry	Finance	0.490	0.634	0.708	0.495	-0.496	0.631	-0.389	0.705
Miscellaneous Industry	Trade, Services, and Investment	0.757	0.467	-0.032	0.975	-0.889	0.395	0.587	0.571
Consumer Goods Industry	Property, Real Estate, and Building	-1.208	0.255	-0.761	0.464	0.708	0.495	-1.211	0.270
Consumer Goods Industry	Infrastructure, Utilities and Transportation	-0.927	0.376	-0.436	0.672	0.536	0.604	-0.881	0.418
Consumer Goods Industry	Finance	-0.888	0.395	0.451	0.661	0.616	0.552	-1.148	0.301
Consumer Goods Industry	Trade, Services, and Investment	-1.176	0.267	-0.521	0.614	0.170	0.869	-0.535	0.604
Property, Real Estate, and Building	Infrastructure, Utilities and Transportation	0.240	0.816	0.358	0.728	-0.220	0.830	-0.449	0.663
Property, Real Estate, and Building	Finance	0.407	0.693	1.002	0.340	-0.112	0.913	-0.594	0.566
Property, Real Estate, and Building	Trade, Service, and Investment	0.872	0.404	0.276	0.788	-0.632	0.542	0.901	0.398
Infrastructure, Utilities and Transportation	Finance	0.151	0.883	0.737	0.478	0.103	0.920	-0.031	0.976
Infrastructure, Utilities and Transportation	Trade, Services, and Investment	0.578	0.576	-0.085	0.934	-0.417	0.685	0.783	0.452
Finance	Trade, Services, and Investment	0.466	0.651	-0.809	0.437	-0.514	0.618	1.024	0.350

Source: Results of Data Analysis

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Table 2
Testing Results of the Validity and Robustness of APT Model for Industrial Stocks

Parameters	Mining	Basic Industry and Chemical	Miscellaneous Industry	Consumer Goods Industry	Property, Real Estate, and Building	Infrastructure, Utilities, and Transportation	Finance	Trade, Services, and Investment
Panel a. Single Factor Model (CAPM) $\overline{ER_i} = \lambda_0 + \lambda_1 \beta_{i\,DMR} + \varepsilon_i$								
λ_0	**-0.0183****	**-0.0065*****	**-0.0126*****	**-0.0082*****	**-0.0148*****	**-0.0153*****	**-0.0057*****	**-0.0100*****
λ_1	**0.0192****	**0.0038****	**0.0080****	**0.0078*****	**0.0103*****	**0.0079****	**0.0140*****	**0.0079*****
F-stat.	**3.2409****	**4.8447****	**3.0435****	**10.9661*****	**14.4926*****	**3.4704****	**20.1193*****	**7.7818*****
R^2	0.2648	0.0934	0.0780	0.2552	0.3411	0.2398	0.3138	0.1663
Adj.R^2	0.1831	0.0742	0.0523	0.2320	0.3175	0.1707	0.2982	0.1450
AIC	-5.1593	-6.1135	-5.9306	-6.0858	-6.2020	-6.1908	-5.7140	-5.5613
SIC	-5.0869	-6.0363	-5.8444	-5.9960	-6.1086	-6.1038	-5.6345	-5.4778
Panel b. APT Multifactors Model (include market risk) $\overline{ER_i} = \lambda_0 + \lambda_1 \beta_{i\,DMR} + \lambda_2 b_{iDInfR} + \lambda_3 b_{iDIntR} + \lambda_4 b_{iDExcR} + \lambda_5 b_{iGMR} + \lambda_6 b_{iGExcR} + \varepsilon_i$								
λ_0	**-0.0276***	**-0.0061*****	**-0.0139*****	**-0.0073*****	**-0.0130*****	**-0.0172*****	**-0.0060*****	**-0.0097*****
λ_1	**0.0235****	**0.0037****	**0.0119****	**0.0087*****	**0.0064****	0.0026	**0.0113*****	**0.0087****
λ_2	0.0035	-0.0009	0.0011	0.0005	0.0009	-0.0031	-0.0013	-0.0004
λ_3	0.0004	-0.0002	0.0001	-0.0003	**-0.0009****	-0.0001	**-0.0005****	-0.0002
λ_4	-0.0818	-0.0017	0.0242	0.0356	-0.0144	-0.0445	0.0118	-0.0075
λ_5	0.0030	-0.0035	0.0029	-0.0039	-0.0058	0.0138	0.0024	0.0030
λ_6	0.0175	0.0010	-0.0047	-0.0017	-0.0052	-0.0037	-0.0064	-0.0003
F-stat.	0.7496	1.1788	0.9950	**2.1026***	**4.0330*****	1.1450	**5.7203*****	1.2844
R^2	0.5293	0.1441	0.1615	0.3184	0.5127	0.5338	0.4680	0.1848
Adj.R^2	0.1768	0.0219	0.0008	0.1670	0.3856	0.0676	0.3863	0.0409
AIC	-4.6961	-5.9670	-5.7624	-5.8804	-6.1704	-5.9105	-5.7513	-5.3398
SIC	-4.4429	-5.6970	-5.4607	-5.5662	-5.8435	-5.6063	-5.4730	-5.0472

***) Indicates significant at 1% level; **) Indicates significant at 5% level; *) Indicates significant at 10% level
β_iDMR is the beta of domestic market return; b_iDInfR is the beta of domestic inflation rate; b_iDIntR is the beta of domestic interest rate; b_iDExcR is the beta of domestic currency exchange rate; b_iGMR is the global market return; b_iGExcR is the beta of global currency exchange rate.
The validity of APT model for agricultural sector (sector 1) can not be tested due to insufficient data sample.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Table 2
Testing Results of the Validity and Robustness of APT Model for Industrial Stocks (continued)

Parameters	Mining	Basic Industry and Chemical	Miscellaneous Industry	Consumer Goods Industry	Property, Real Estate, and Building	Infrastructure, Utilities, and Transportation	Finance	Trade, Services, and Investment
Panel c. APT Multifactors Model (exclude market risk) $\overline{ER_i} = \lambda_0 + \lambda_2 b_{iDInfR} + \lambda_3 b_{iDIntR} + \lambda_4 b_{iDExcR} + \lambda_5 b_{iGMR} + \lambda_6 b_{iGEchR} + \varepsilon_i$								
λ_0	-0.0014	**-0.0050***	**-0.0094***	**-0.0076***	-0.0083	**-0.0179***	**-0.0045**	**-0.0091***
λ_2	-0.0040	-0.0015	0.0015	0.0014	0.0011	-0.0034*	-0.0016	0.0014
λ_3	0.0013	-0.0002	0.0001	-0.0001	**-0.0010***	-0.0001	**-0.0007***	-0.0001
λ_4	-0.2520	-0.0063	0.0239	0.0254	-0.0353	-0.0709	0.0267	-0.0292
λ_5	-0.0065	-0.0016	-0.0008	-0.0006	**-0.0089***	0.0153*	0.0030	0.0018
λ_6	-0.0101	0.0004	0.0002	-0.0020	**-0.0077***	-0.0027	-0.0075	-0.0018
F-stat.	1.0293	1.2940	1.0816	2.7162	**3.5428**	1.5444	**3.1080**	2.9552
R^2	0.2362	0.0646	0.0563	0.0421	0.4247	0.5245	0.2708	0.0483
Adj.R^2	0.1776	0.0442	0.0412	0.0289	0.3048	0.1649	0.1898	0.0377
AIC	-4.3939	-5.9189	-5.6968	-5.5989	-6.0710	-6.0446	-5.4917	-5.2338
SIC	-4.1769	-5.6873	-5.4382	-5.3295	-5.7907	-5.7839	-5.2532	-4.9830

***) Indicates significant at 1% level; **) Indicates significant at 5% level; *) Indicates significant at 10% level
β_iDMR is the beta of domestic market return; b_iDInfR is the beta of domestic inflation rate; b_iDIntR is the beta of domestic interest rate; b_iDExcR is the beta of domestic currency exchange rate; b_iGMR is the global market return; b_iGExcR is the beta of global currency exchange rate
The validity of the APT model for the agricultural sector (sector 1) can not be tested due to insufficient data sample.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Table 3
Testing Results of Structural Break of Industrial Stock

$$ER_t = \delta_0 + \beta_{iDMR}DMR_t + b_{iDInfR}DInfR_t + b_{iDIntR}DIntR_t + b_{iDExcR}DExcR_t + b_{iGMR}GMR_t + b_{iGExcR}GExcR_t + \beta_{iD1DMR}D_1DMR_t + b_{iD1DInfR}D_1DInfR_t + b_{iD1DIntR}D_1DIntR_t + b_{iD1DExcR}D_1DExcR_t + b_{iD1GMR}D_1GMR_t + b_{iD1GExcR}D_1GExcR_t + \beta_{iD2DMR}D_2DMR_t + b_{iD2DInfR}D_2DInfR_t + b_{iD2DIntR}D_2DIntR_t + b_{iD2DExcR}D_2DExcR_t + b_{iD2GMR}D_2GMR_t + b_{iD2GExcR}D_2GExcR_t + \varepsilon_t$$

Parameters	Agriculture	Mining	Basic Industry and Chemical	Miscellaneous Industry	Consumer Goods Industry	Property, Real Estate, and Building	Infrastructure, Utilities, and Transportation	Finance	Trade, Services, and Investment
δ_0	0.117358	**0.222462****	-0.360957	**0.139823****	**0.078074****	**0.217268*****	**0.119712*****	0.048786	**0.144515****
β_{iDMR}	**0.436843****	0.397773	**0.699590*****	**0.444733*****	**0.420045*****	**0.503588*****	**0.593735*****	**0.491500*****	**0.423147*****
b_{iDInfR}	0.410010	0.022510	-0.273547	0.005419	-0.055924	0.173350	0.189760	-0.131456	-0.131915
b_{iDIntR}	3.231967	**9.126135****	3.283064	**7.296103*****	**3.488993****	**12.87370*****	**6.378354*****	1.954779	**6.854899****
b_{iDExcR}	**-0.837147****	**-1.345099***	**-0.700285***	-0.256211	**-0.823574*****	**-1.271521*****	-0.127646	-0.203733	**-0.683870****
b_{iGMR}	0.148501	-0.388562	0.003722	-0.121264	-0.056839	**-0.583181*****	0.102871	**0.382089****	-0.026141
b_{iGExcR}	**1.197651*****	-0.167912	0.305527	0.228746	0.038802	**-0.560916****	-0.449579	0.024220	**0.521970****
β_{iD1DMR}	**0.797608****	0.445313	0.027401	-0.186486	**0.177710***	**0.353383***	-0.288210	-0.111519	0.094451
$b_{iD1DInfR}$	-2.918610	-4.077665	5.011030	**4.395551*****	**3.118791*****	-0.872397	-0.553860	0.789177	**4.073711*****
$b_{iD1DIntR}$	3.573133	-25.20459	-14.54869	-8.399563	**-29.66521*****	**-21.78001*****	**-19.71284****	**-13.74330****	**-27.22447*****
$b_{iD1DExcR}$	0.361293	0.919099	0.378798	**0.445870***	**0.579282****	0.706732	-0.452667	0.005492	**0.645832***
b_{iD1GMR}	-1.374987	-0.008751	-0.129962	**0.636260*****	-0.070628	-0.065387	-0.202019	**-0.437950****	-0.010782
$b_{iD1GExcR}$	-0.612595	**1.489619****	-0.150065	-0.010990	0.193338	**0.899269*****	0.444526	-0.020715	-0.412024
β_{iD2DMR}	0.089478	0.199371	-0.325125	-0.140972	0.152090	**0.359458****	0.193661	-0.241376	0.127592
$b_{iD2DInfR}$	-6.092949	2.425282	0.130282	0.287311	-0.317857	**-3.371823*****	-0.487173	**-3.333833****	-0.918364
$b_{iD2DIntR}$	17.16143	-14.20525	-6.709970	0.598254	-5.087618	-1.105287	5.302028	7.161179	-4.845469
$b_{iD2DExcR}$	**0.790521****	**1.344526***	**0.694532***	0.234703	**0.812473*****	**1.263083*****	0.110938	0.211675	**0.685509****
b_{iD2GMR}	-0.314128	1.021160	0.590478	0.133018	0.338399	**0.507407****	-0.287146	-0.069791	0.353213
$b_{iD2GExcR}$	-1.175866	-0.172700	-0.308635	-0.377240	-0.319298	-0.006221	0.670190	-0.161705	-0.165531
R^2	0.427063	0.549384	0.691376	0.576549	0.731641	0.441545	0.526211	0.657068	0.622412
Adj.R^2	0.233395	0.429220	0.581153	0.463628	0.660079	0.242097	0.399868	0.565619	0.521722
F-stat.	**2.205123*****	**4.571940*****	**6.272519*****	**5.105799*****	**10.22383*****	**2.213835*****	**4.164922*****	**7.185098*****	**6.181470*****

***) Indicates significant at the 1% level; **) Indicates significant at the 5% level; *) Indicates significant at 10% level
D1=1 for the period January 2008 - April 2009 (during the financial crisis), another period=0; D2=1 for the period May 2009 - December 2010 (after the financial crisis), another period= 0

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

4.4 Discussion

The results of the investigation of the return sensitivity of industrial stocks showed that the systematic risk factors were determinant factors for the return sensitivity of industrial stocks. It means that the systematic risk factors have a spillover effect on return volatility of industrial stocks. Besides market risk factors, macroeconomic factors affected the return volatility of industrial stocks. The results of the investigation also revealed that the risk premium for domestic inflation was one of the factors that might affect the return volatility of industrial stocks. Inflation could have adversely affected the purchasing power of society that in turn affected the cash flow of companies. Such results were relevant and supported previous research conducted by Chen et al., (1986); Elton et al., (1995); Priestley (1997); Flannery and Protopapadakis (2002); Rapach et al., (2005); Al-Zubi and Salameh (2007); Kandir (2008); Kryzanowski and Rahman (2009); Henao (2009; Schmeling and Schrimpf (2010); and Tsai et al., (2011). Furthermore, the results of the investigation revealed that domestic inflation had positive impacts on stock returns. They, however, appear to contradict the theory stating that the stock return negatively relate to inflation (Fama and Schwert, 1977); Geske and Roll, 1983); Ammer, 1994); Adrangi et al., 1999); Ewing, 2002). Several reasons underlie these results. One of them was that during the period January 2003 - December 2010 there was a negative domestic inflation that caused the risk premium of domestic inflation to be also negative. Accordingly, investors tended to respond positively to the capital markets. The research findings of Boudoukh and Richardson (1993); Boudoukh et al. (1994); Kryzanowski and Rahman (2009) were relevant and supported the results of this study. They stated that there was a positive correlation between stock returns and inflation factors.

The results of the investigation indicated that domestic inflation was one of the factors that might affect the return volatility of sectoral stocks. Inflation could adversely affect the purchasing power of society that had an impact on the cash flow of companies. The results of this study were relevant and supported previous research conducted by Chen et al., (1986), Elton et al. (1995), Priestley (1997), Flannery and Protopapadakis (2002), Rapach et al. (2005), Al - Zubi and Salameh (2007), Kandir (2008), Kryzanowski and Rahman (2009), Henao (2009), Schmeling and Schrimpf (2010), and Tsai et al., (2011). Additionally, the results of the investigation unveiled that domestic inflation had positive effects on stock returns. But, they appear to contradict the theory claiming that stock return negatively relates to an inflation (Fama and Schwert, 1977), Geske and Roll, 1983), Ammer, 1994), Adrangi et al., 1999), and Ewing, 2002). The results of this study are based on several reasons. One of them was that during the period January 2003 - December 2010 there was a negative domestic inflation that caused the risk premium of domestic inflation to be also negative. That is why investors tended to respond positively to the capital markets. The results of this study were relevant and supported the research carried out by Boudoukh and Richardson (1993); Boudoukh et al. (1994); Kryzanowski and Rahman (2009).

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

The results of the investigation also showed that the risk premium of domestic interest rate was one of the factors that could affect the return volatility of industrial stocks. The interest rate might adversely affect cash flows and net incomes, as well as the discount rate of company's investments. In this case, if the domestic interest rate is high, the purchasing power will decrease, which causes declining public demand for goods and services. The decline would decrease the cash flows of companies; companies' non-operating costs would decline, which caused a decrease in net income. Also, the discount rate of investment would increase so that the level of investment feasibility decreased. The interest rate applicable in the country was highly dependent on government's monetary policy. Previous research conducted by Pearce and Roley (1985); Darrat (1990); Patelis (1997); Ewing (2002); Rapach et al., (2005); Yao et al., (2005); and Chang (2009) were relevant and supported the results of this study. What is more, based on the results of the investigation, the risk premium of domestic interest rate negatively and positively affected the returns of industrial stocks. Some reasons underly the negative relationship between stock returns and the risk premium of domestic interest-rate. Some of the reasons were the interest-rate increase that could reduce purchasing power, and the increase in company costs. The other reasons were the decline in net profit of companies, the increase in a discount rate or required rate of return on investment, and the decrease in attractiveness of stock investment. Furthermore, the results of the investigation indicated that the excess returns of stocks positively correlated to interest rates for several reasons. One of them is that during the period January 2003 - December 2010 there was a surprising value of negative domestic interest rates that caused risk premium of domestic interest rate to be also negative. Therefore, investors tended to respond positively to the capital markets. The results of this study are relevant and support the research conducted by Endri (2009).

The results of the investigation also showed that the risk premium of domestic currency exchange rate was one of the factors that might contribute to the return volatility of industrial stocks. This was caused by the exchange rate that could affect the purchasing power of society, as well as company's cash flows. This situation was subject to economic exposure, either transaction exposure or operating exposure. Transaction exposure is associated with gains or losses from foreign exchange. If the rupiah value is depreciated against the US dollar, a profit is earned from foreign exchange from rupiah investment, and a loss of US dollar investment. Meanwhile, operating exposure is related to export and import activities. If the rupiah is depreciated against the US dollar, it could encourage exports but reduce imports. The results of this study were relevant and supported previous research held by Pearce and Roley (1985); Darrat (1990); Bartov and Bodmar (1994); Bailey and Chung (1995); Kandir (2008); Kolari et al., (2008); Fedorova and Vaihekoski (2008); and Endri (2009).

The study found that, according to the results of the investigation, the risk premium of domestic currency exchange rates negatively affected the returns of industrial stocks. There were some reasons underlying the negative correlation between stock returns and a risk premium of domestic currency exchange rate. The depreciation of the domestic currency encouraged exports, and it could reduce imports because the price of imported goods became more expensive than it was before the depreciation. As Indonesia is a developing country that needs relatively large imports to meet domestic consumption and production, the volume of imports

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

is relatively large. Therefore, the depreciation of domestic currency causes a greater impact on imports. In addition, the depreciation of domestic currency can increase the burden of foreign debt of both public and private parties. Furthermore, the results of the investigation in the period January 2003 - December 2010 revealed a surprising value of the domestic currency exchange rate that made the risk premium of domestic currency exchange rate positive. The surprising value was that the actual value was greater than the expected value. These various conditions tended to be responded negatively by investors. The results of this study were relevant and supported the research carried out by Boyer and Filion (2004).

Still, the results of the investigation showed that the risk premium of global capital markets return was one of the factors that could also affect the return volatility of industrial stocks. This is simply possible as the information about the development of global capital market return could affect the investment climate in the country, especially in the domestic stock market. The increase in global stock market indices illustrated better prospects for investing in stock markets overseas. Investors who would diversify international investments would use this condition by diverting their investment abroad so that capital flights would occur from domestic to abroad. Conversely, a decrease in global stock market indices indicates an unfavorable outlook to invest in overseas stock markets. This condition would be responded by investors by diverting investment from abroad, so capital flights can take place from abroad into the country. The results of this study were relevant and supported previous research conducted by Clare and Priestley (1998). They, however, do not seem relevant to the theoretical expectation stating that the returns among stock markets positively correlate to one another. This implies that a capital flight happens, from domestic capital markets to foreign capital markets.

The results of the investigation also showed that the risk premium of currency exchange rate was one of the factors that might affect the return volatility of industrial stocks. The currency exchange rate could affect the domestic government policies and investment climate in the domestic money market. Global currency exchange rates depended on the government's monetary policy overseas. Furthermore, the investigation revealed that the exchange rate of a risk premium of global currencies positively affected the returns of industrial stocks.

The investigation of sensitivity difference of the industrial stocks returns due to the financial crisis in 2008 indicated that domestic interest and domestic inflation factors contributed a dominant influence to the volatility return of industrial stocks. The investigation results confirmed that the factors that had implications for the purchasing power had a significant effect on stock returns. The results of this investigation also verified that the Indonesian capital market is still an emerging market because the market is still exposed by domestic factors rather than global factors (Bilson et al., 2001).

Investigation of the difference of return sensitivity of industrial stocks generated empirical findings indicating that there was no difference in return sensitivity level of industrial stocks among the sectors. However, there was a difference of return sensitivity of industrial stocks among systematic risk factors. The disparity implied that the fluctuations occurring in certain systematic risk factors tended to cause the same effect on return volatility of industrial stocks. Conversely, the return volatility of certain sectors tended to get a different effect on the fluctuations of systematic risk factors. The results of this investigation were based on

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

several reasons. One of them was that investors tended to give the same response to stocks by sectors due to changes in systematic risk factors.

The investigation of the validity and robustness of APT model that was tested using cross-sectional regression brought about empirical findings. From the eight industrial stocks tested only two sectors accorded with the use of a multifactor APT model (two-factor APT model) while the other six sectors suited a one-factor APT model (CAPM). This indicates that, in general, the one-factor APT model or CAPM was more valid and more robust to be used to explain the correlation between the returns of industrial stocks and systematic risk factors. In this case, the stock return can only be explained by a single factor. The factor was the risk premium of domestic capital market except for the property, real estate, and buildings sector as well as the financial sector. In both these sectors, the stock return was not only explained by the market risk premium but also by the risk premium of domestic interest rate. The investigation results of the conflict on the results of empirical tests of CAPM and APT multifactor models above provided empirical evidences. Both CAPM and multifactor APT models could not consistently be used in explaining the correlation of risk and return of industrial stocks. Nevertheless, it seems that the CAPM model was more valid and robust than the multifactor APT model was. The results of this study were relevant and supported the research held by Fama and MacBeth (1973) and Sudarsono (2010). Moreover, the results of investigations for both sectors (real estate and buildings sector and financial sector) seemed relevant and supported previous research that suggested the use of multifactor APT model (Roll and Ross, 1980; Chen, 1983; Antoniou et al., 1998; Cagnetti, 2002; Azeez and Yonezawa, 2006).

The investigation of the structural break of industrial stock return indicated that there were differences in the risk premium of industrial stocks in connection with the structural break as a result of the financial crisis in 2008. The results of this study unveiled that, in general, the risk premium of systematic factors during the financial crisis in 2008 seemed to be higher than that before the financial crisis happened. This indicates that there was a time-varying volatility in the sectoral stocks concerning the structural break phenomenon caused by the financial crisis in 2008. One of the factors that led to a higher risk premium during the financial crisis was the high volatility that indicates a high risk. This was supported by the positive correlation patterns between risks and return expectations. The results of this study were relevant and supported the research carried out by Yao et al. (2005); Beltratti and Morana (2006); Hartmann et al., (2008); Sudarsono (2010); and Babikir et al. (2012).

5. CONCLUSIONS AND RECOMMENDATIONS

Firstly, the investigation of the return sensitivity differences of industrial stocks resulted in two empirical findings. First, the return volatility of industrial stocks was positively influenced by the factors of market risk premium, domestic inflation risk premium, domestic interest rate risk premium, and global currency exchange-rate risk premium. But, the factors of a risk premium of domestic currency-exchange-rate and global capital-market-return risk premium negatively affected the return sensitivity of industrial stocks. Second, there was no difference in the level of return sensitivity of industrial stocks among sectors in certain systematic risk factors.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

However, there were differences in the level of return sensitivity of industrial stocks among systematic risk factors in particular sectors.

Secondly, the investigation of validity and robustness of the eight sectors of the APT model produces three empirical findings. First, there were six sectors whose return variation can only be explained by a single factor, that is, the risk premium of domestic capital market. And, there were two sectors that could be explained by two risk factors, namely, the risk premium of domestic capital market and domestic interest rate. Second, the risk premium of domestic capital market and domestic interest rates could be risk factors for industrial stocks. But, the risk premium of domestic inflation, the domestic currency exchange rate, global capital market return, and global currency exchange rate partially could not be considered risk factors for industrial stocks. Finally, the global macroeconomic factors were not a risk factor that can be appreciated to explain the return variation of industrial stocks in the Indonesian capital market.

Thirdly, the investigation of time-varying volatility on the phenomenon of a structural break generated an empirical finding. The risk premium of systematic risks of industrial stocks investment during the financial crisis tended to be bigger than that before and after the financial crisis.

Based on the conclusion, as a follow-up for the results of this study, the writer would propose academic and practical recommendations. Academically, it is suggested that any researchers who will conduct research relevant to this study accommodate unsystematic risk factors such as fundamental factors of companies or industries. Besides, they should split share category into two, that is, manufacturing and non-manufacturing sectors. Practically, in making investment decisions, investors are advised to take market risk and domestic interest rate risk into consideration as factors that can explain the return variation of shares. And, in providing advices to the public and investors, investment analysts should use fundamental analysis in addition to technical analysis.

REFERENCES

[1] Adrangi, Bahram, Chatrath, Arjun, Shank, Todd M (1999), "Inflation, Output and Stock Prices: Evidence from Latin America", *Managerial and Decision Economics*, 20, 63-74.

[2] Al-Zubi, Khaled A, Salameh, Hussain (2007), "Explaining the Stock Return via a Macroeconomic Multifactor Model", *Jordan Journal of Business Administration*, 3.

[3] Ammer, John (1994), "Inflation, Inflation Risk, and Stock Returns", *Working Paper: Board of Governors of the Federal Reserve System International Finance Discussion Papers*.

[4] Antoniou, Antonios, Garrett, Ian, Priestley, Richard (1998), "Macroeconomic Variables as Common Pervasive Risk Factors and the Empirical Content of the Arbitrage Pricing Theory,", *Journal of Empirical Finance*, 5, 221-240.

[5] Azeez, A.A., Yonezawa, Yasuhiro (2006), "Macroeconomic Factors and the Empirical Content of the Arbitrage Pricing Theory in the Japanese Stock Market", *Japan and World Economy*, 18, 568-591.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

[6] Babikir, Ali, Gupta, Rangan, Mwabutwa, Chance, Owusu-Sekyere, Emmanuel (2012), "Structural Breaks and GARCH Models of Stock Return Volatility: The Case of South Africa", *Economic Modelling*, 29, 2435-2443.

[7] Bailey, Warren, Chung, Y. Peter (1995), "Exchange Rate Fluctuations, Political Risk and Stock Returns: Some Evidence from an Emerging Market", *The Journal of Financial and Quantitative Analysis*, 30, 541-561.

[8] Bartov, Eli, Bodmar, Gordon M. (1994), "Firm Valuation, Earnings Expectations, and the Exchange-Rate Exposure Effect", *Journal of Finance*, 44, 1755-1785.

[9] Beltratti, A, Morana, C. (2006), "Breaks and Persistency: Macroeconomic Causes of Stock Market Volatility". *Journal of Econometrics*, 131, 151-177.

[10] Bilson, Christopher M,, Brailsford,Timothy J, Hooper, Vincent J. (2001), "Selecting Macroeconomic Variables as Explanatory Factors of Emerging Stock Market Returns", *Pacific-Basin Finance Journal*, 9, 401-426.

[11] Black, F, Jensen, M.C., Scholes, M. (1972), "The Capital Asset Pricing Model: Some Empirical Tests", *in Jensen (ed). Studies in Theory of Capital Markets* (*New York: Praeger, 1972*).

[12] Bodie, Zvi, Kane, Alex, Marcus, Alan J. (2009), "Investments", *Eighth Edition, New York: McGraw-Hill Companies, Inc*.

[13] Boudoukh, Jacob, Richardson, Matthew (1993), "Stock Returns and Inflation: A Long-Horizon Perspective", *American Economic Review*, 83, 1346-1355.

[14] Boudoukh, Jacob, Richardson, Matthew, Whitelaw, Robert F. (1994), "Industry Returns and the Fisher Effect". *Journal of Finance*, 49, 1595-1615.

[15] Bower, Dorothy H, Bower, Richard S, Logue, Dennis E. (1984), "Arbitrage Pricing Theory and Utility Stock Returns". *The Journal of Finance*, 39, 1041-1054.

[16] Boyer, M. Martin, Filion, Didier (2004), "Common and Fundamental Factors in Stock Returns of Canadian Oil and Gas Companies". *Working Paper: Cirano*.

[17] Brown, Keith C, Reilly, Frank K. (2009), "Analysis of Investment and Management of Portfolio", *Ninth Edition. Canada: South-Western – Cengage Learning*.

[18] Cagnetti, Arduino (2002), "Capital Asset Pricing Model and Arbitrage Pricing Theory in the Italian Stock Market: An Empirical Study". *Unpublished working paper*.

[19] Campbell, John Y, Lo, Andrew, and MacKinlay, A. Craig (1997), "The Econometrics of Financial Markets", New Jersey: Princeton University Press.

[20] Chang, Kuang-Liang (2009), "Do Macroeconomic Variables Have Regime-Dependent Effects on Stock Return Dynamics? Evidence from the Markov Regime Switching Model", *Economic Modelling*, 26, 1283-1299.

[21] Chen, Ming-Hsiang (2003), "Risk and Return: CAPM and CCAPM", *The Quarterly Review of Economics and Finance*, 43, 369-393.

[22] Chen, Nai-Fu (1983), "Some Empirical Tests of the Theory of Arbitrage Pricing", *The Journal of Finance*, 38, 1393-1414.

[23] Chen, Nai-Fu, Roll, Richard, Ross, Stephen A. (1986), "Economic Forces and the Stock Market". *The Journal of Business*, 59, 383 – 403.

[24] Clare, A and Priestley, R. (1998), "*Risk Factors in the Malaysian Stock Market*". Pacific-Basin Finance Journal 6 pp. 103-114.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

[25] Darrat, Ali F. (1990), "Stock Returns, Money, and Fiscal Deficits", *The Journal of Financial and Quantitative Analysis*, 25, 387-398.
[26] Elton, Edwin J, Gruber, Martin J., Blake, Christopher R. (1995). "Fundamental Economic Variables, Expected Returns, and Bond Fund Performance", *The Journal of Finance*, 50, 1129-1256.
[27] Elton, Edwin J, Gruber, Martin J, Brown, Stephen J, and Goetzmann, William N. (2011), "Modern Portfolio Theory and Investment Analysis", Eighth Edition, Rosewood: John Wiley & Sons, Inc.
[28] Endri (2009), "Keterkaitan Dinamis Faktor Fundamental Makroekonomi dan Imbal Hasil Saham", *Jurnal Bisnis dan Akuntansi*, 11, 79-95.
[29] Ewing, Bradley T. (2002), "Macroeconomic News and the Returns of Financial Companies", *Managerial and Decision Economics*, 23, 439-446.
[30] Fama, Eugene F., Schwert, G. William (1977), "Asset Returns and Inflation". *Journal of Financial Economics*, 5, 115-146.
[31] Fama, Eugene F., MacBeth, James D. (1973), "Risk, Return, and Equilibrium: Empirical Tests", *The Journal of Political Economy*, 81, 607-636.
[32] Fedorova, Elena, Vaihekoski, Mika. (2008). "Global and Local Sources of Risk in Eastern European Emerging Stock Markets". *Working Paper: Bank of Finland, BOFIT Institute for Economies in Transition*.
[33] Flannery, Mark J., Protopapadakis, Aris A. (2002). "Macroeconomic Factors Do Influence Aggregate Stock Returns", *The Review of Financial Studies*, 15, 751 – 782.
[34] Geske, Robert, Roll, Richard (1983). "The Fiscal and Monetary Linkage Between Stock Returns and Inflation", *Journal of Finance*, 38, 1-33.
[35] Gujarati, Damodar N, Porter, Dawn C. (2009), "Basic Econometrics", *Fifth Edition. New York: McGraw-Hill Companies, Inc*.
[36] Hartmann, Daniel, Kempa, Bernd, Pierdzioch, Christian (2008), "Economic and Financial Crises and the Predictability of U.S. Stock Returns", *Journal of Empirical Finance*, 15, 468-480.
[37] Haugen, Robert A. (1997), "Modern Investment Theory", *Fourth Edition. New Jersey: Prentice-Hall, Inc*.
[38] Henao, Wilmer (2009), "Can Macroeconomic Factors Predict Stock Returns?". *Investment Management*.
[39] Jones, Charles P. (2007), "Investments: Analysis and Management", *Tenth Edition. New York: John Wiley & Sons*.
[40] Kandir, Serkan Yilmaz (2008), "Macroeconomic Variables, Firm Characteristics and Stock Returns: Evidence from Turkey", *International Research Journal of Finance and Economics*, 16, 35-45.
[41] Kolari, James W, Moorman, Ted C., Sorescu, Sorin M. (2008). "Foreign Exchange Risk and the Cross-Section of Stock Returns", *Journal of International Money and Finance*, 27, 1074-1097.
[42] Kryzanowski, Lawrence, Rahman, Abdul H. (2009), "Generalized Fama Proxy Hypothesis: Impact of Shocks on Phillips Curve and Relation of Stock Returns with Inflation", *Economic Letters*, 103, 135-137.
[43] Martin, John D, Cox, Samuel H, and MacMinn, Richard D. (1988), "The Theory of Finance: Evidence and Applications", *New York: The Dryden Press*.
[44] Megginson, William L. (1997), "Corporate Finance Theory", Massachusetts: Addison-WesleyEducational Publishers Inc.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

[45] Merton, Robert C. (1973), "An Intertemporal Asset Pricing Model", *Econometrica*, 41, 867-887.
[46] Patelis, Alex D. (1997), "Stock Return Predictability and The Role of Monetary Policy", *The Journal of Finance*, 55, 1951 – 1972.
[47] Pearce, Douglas K, Roley, V. Vance (1985), "Stock Prices and Economic News", *Journal of Business*, 58, 49-68.
[48] Priestley, Richard (1997), "Seasonality, Stock Returns, and the Macroeconomy", *The Economic Journal*, 107, 1742-1750.
[49] Rapach, David E, Wohar, Mark E. Rangvid, Jesper (2005), "Macro Variables and International Stock Return Predictability", *International Journal of Forecasting*, 21, 137-166.
[50] Roll, Richard (1977), "A Critique of the Asset Pricing Theory's Tests: Part I: On the Past and Potential Testability of the Theory", *Journal of Financial Economics*.
[51] Roll, Richard, Ross, Stephen A (1980), "An Empirical Investigation of the Arbitrage Pricing Theory", *The Journal of Finance*, 35, 1073-1103.
[52] Ross, Stephen A. (1976), "The Arbitrage Theory of Capital Asset Pricing", *Journal of Economic Theory*, 13, 341-360.
[53] Schmeling, Maik, Schrimpf, Andreas (2010), "Expected Inflation, Expected Stock Returns, and Money Illusion: What Can We Learn from Survey Expectations?", *European Economic Review.*
[54] Shanken, Jay (1982), "The Arbitrage Pricing Theory: Is it Testable?", *The Journal of Finance*, 37, 1129-1140.
[55] Sharpe, William F, Alexander, Gordon J, Bailey, Jeffery V. (1999), "Investments", *Sixth Edition. New Jersey: Prentice-Hall, Inc*.
[56] Sudarsono, Rachmat (2010), "Pemodelan Penetapan Harga Aset di Pasar Modal Indonesia", *Disertasi: Program Doktor Ilmu Manajemen Fakultas Ekonomika dan Bisnis Universitas Gadjah Mada Yogyakarta*.
[57] Tandelilin, Eduardus (2010), "Portofolio dan Investasi: Teori dan Aplikasi", Edisi Pertama. Yogyakarta: Penerbit Kanisius.
[58] Tsai, Chih-Fong, Lin, Yuah-Chiao, Yen, David C, Chen, Yan-Min (2011), "Predicting Stock Returns by Classifier Ensembles", *Applied Soft Computing*,11, 2452-2459.
[59] Yao, Juan, Gao, Jiti, Alles, Lakshman (2005), "Dynamic Investigation into the Predictability of Australian Industrial Stock Returns: Using Financial and Economic Information", *Pacific-Basin Finance Journal*, 13, 225-245.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)