

# The Effect of Macroeconomic Variables on Stock Price Volatility: Evidence from Jakarta Composite Index, Agriculture, and Basic Industry Sector

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**Abstract.** The aim of this paper is to construct a model and examine the effect of macroeconomic variables on the stock price movement in Indonesia Stock Exchange. Three variables of macroeconomics (inflation, interest rate, and exchange rate) are used as independent variables. Jakarta Composite Index, agriculture sector, and basic industry sector stock price are indicated as dependent variable. The monthly time series data are gathered from Bank Indonesia and Yahoo Finance over the period of January 2007- December 2011. Multiple regression analysis is applied in this paper to construct a quantitative model showing the relationship between macroeconomics and stock price. The result of this paper indicate that significant relationship is occurred between macroeconomics variable (inflation, interest rate, and exchange rate) and stock price in JCI, agriculture sector (AALI.JK), and basic industry sector (JPFA.JK). The change in inflation is giving positive impact, while change in interest rate and inflation giving negative impact to the stock price in JCI, agriculture sector, and basic industry sector.

**Keywords:** Inflation, Interest Rate, Exchange Rate, Stock Price

## 1. Introduction

Nowadays, people tend to invest in the instrument which generate higher rate of return than inflation rate. Capital market investment is growing rapidly in Indonesia as one of promising investment. The Aggregate performance of capital market can be easily seen by its index (Jakarta Composite Index). Many factor influencing the price movement of the stock. Factor influencing stock price might be appeared from internal which could be controlled by the company. Otherwise, it might come from external, like economic stability. Economic stability in a country could be measured by macroeconomics variables. Inflation, interest rate, and exchange rate are some macroeconomics variable that shows economic condition in Indonesia.

Global crisis happened in 2008 which started in United States also affecting Indonesia's economic condition. Before the crisis happened, the JCI average gain could reach 50% annually. During 2008 until 2011, JCI only gained 11%. Depreciating value of Indonesia currency to USD currency and lower demand on Indonesian export are some of the impact of the crisis in 2008.

Indonesia economic condition will affect the industry condition which ultimately will affect the company activity. Agriculture sector mainly related with export policy which directly lead to exchange rate, while basic industry sector have to aware with the economic situation in Indonesia due to its focus in expanding the companies as the business strategy. Macroeconomic variables are factors that could not be controlled by the the companies which might be affecting the volatility of the stock price. Based on monthly statistical data published by Indonesia Stock Exchange, the author using top gainer stock in agriculture and basic industry sector during 2007-2011; PT Astra Agro Lestari Tbk (AALI.JK) and PT JAPFA Comfeed Indonesia Tbk (JPFA.JK) as a sample in this research.

## 2. Literature Review

Seeing the importance of macroeconomics variables to stock price, many researchers have analyzed its impact which directly lead to the stock return analysis. Examining the long-term equilibrium relationship between macroeconomics variables and the Singapore stock market index (STI), also with the various

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Singapore Exchange Sector indices (finance index, property index, and hotel index) are the main purpose of Maysami, Howe, and Hamzah (2004) research. Methodology used in this research is Johansen's (1990) VECM as an estimation model. By using natural logarithm of monthly time-series data, they prove that there is cointegrating relationship between macroeconomics variables and stock price. It is shows that the Singapore stock market index (STI) and the SES All-S Equities Property Index have significant relationships with all macroeconomic variables (consumer price index, industrial production, proxies for long and short-run interest rates, money supply (M2), and exchange rates) identified, while the SES All-S Equities Finance Index and SES All-S Equities Hotel Index meet significant relationships only with selected variables.

Similar research also has been done in New Zealand. Gan, Lee, Yon, and Zhang (2006) conduct a research to analyze the effect of seven macroeconomics variables (inflation rate, long term interest rate, short term interest rate, the real trade weighted exchange rate index, real gross domestic product, money supply, and domestic retail oil prices) to the New Zealand Stock Index (NZSE40) return for the period of January 1990 until January 2003. They are using cointegration test, with specifically employ Johansen Multivariate, Granger-causality Test, and innovation accounting in processing the data. In general, the result shows that the NZSE40 is consistently determined by the interest rate, money supply, and real GDP.

Ahmad, Rehman, Raof (2010) observed the impact of interest rate and exchange rate to the Stock Return in Pakistan. The dependent variable used in their research is the stock return of KSE-100, where the independent variables used are interest rate and exchange rate (Rs/USD). The data is collected from the State Bank of Pakistan and Karachi Stock Exchange over period of 1998 – 2009 on yearly basis. As a result of multiple regression model analysis, it shows that the change in interest rate and exchange rate has a significant impact on stock returns. The change in interest rate giving negative impact, while change in exchange rate giving positive to the stock returns. Ahmet Büyüksalvarcı (2010) analyze the effect of seven variables of macroeconomics in the Turkish Stock Exchange Market using the Arbitrage Pricing Theory framework. The method used in processing the data is Multiple Regression with seven variables macroeconomic (variables consumer price index, money market interest rate, gold price, industrial production index, oil price, foreign exchange rate and money supply) as independent variables and Turkish stock market Index (Istanbul Stock Exchange Index-100) as dependent variable. The data used are monthly basis over the period of January 2003 to March 2010. As a result, interest rate, industrial production index, oil price, foreign exchange rate have a negative effect while money supply has positive impact on ISE-100 Index returns. Moreover, inflation rate and gold price do not have any significant effect on ISE-100 Index returns.

Moreover, in China, Xiufang Wang (2011) try to find some evidence on the relationship between stock price and macroeconomic variables (Real GDP, CPI, short term interest rate) in China Stock Market. The research is aim to estimate the volatility of each variable using Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) and determine the causal relationship between the stock price volatility and macroeconomic variables by using Lag-Augmented VAR (LA-VAR) models. The first finding of these research is there is no causal relationship between stock price and real GDP volatility. Bilateral causal relationship is found between inflation and stock price volatility. Xiufang Wang (2010) also found that there is a unidirectional causal relationship between stock market volatility and interest rate volatility, with the direction from stock prices to the interest rate.

### 3. Methodology and Variable Construction

$$Y_R = \alpha + \beta_1 X_{INF} + \beta_2 X_{IR} + \beta_3 X_{ER} + \varepsilon$$

The multiple regression method is required in showing the effect of independent variables to the dependent variables. In the model above, stock price is the dependent variable ( $Y_R$ ), while inflation ( $X_{INF}$ ), interest rate ( $X_{IR}$ ), and exchange rate ( $X_{ER}$ ) are the independent variable in this research. The data processing will include regression statistic, F-Test (Anova), and T-Test.

### 4. Result and Discussion

- JCI Statistical Analysis

Table 1 Regression Statistic

R	R. Square	Adjusted R Square	Standard Error
0.964	0.929	0.925	0.08803

The R value of 0,964 indicate the high correlation between JCI with three macroeconomic variables. Adjusted R square value of 0,925 shows that 92,5% of JCI price movement could be explained by macroeconomics variable, while the 7,5% is explained by other factors.

Table 2 Anova

	Sum of Square	Df	Mean Square	F	P-Value
Regression	5.637	3	1.879	242.493	0.000
Residual	0.434	56	0.008		
Total	6.071	59			

From the Anova or F test, the value of F is 242.493 with significance of 0.000. Because of the probability (level of significant) of 0.000 is less than 0.05, it proves that inflation, interest rate, and exchange rate are simultaneously affecting the JCI price.

Table 3 Coefficient of Regression

	Coefficient	Std. Error	T stat	P-Value
Constanta	25.277	1.418	17.831	0.000
Inflation (INF)	0.207	0.040	5.205	0.000
Interest Rate (IR)	-1.682	0.121	-13.858	0.000
Exchange Rate (ER)	-2.336	0.145	-16.085	0.000

As for the sectoral-based analysis in agriculture and basic industry stock price, statistical inference comes up with the following result.

- Agriculture Sector Statistical Analysis

Table 4 Regression Statistic

R	R. Square	Adjusted R Square	Standard Error
0.797	0.635	0.616	0.57612

The R value of 0,797 indicates correlation between AALI.JK as agriculture sector with macroeconomic variables. Adjusted R square value of 0,616 shows that 61,6% of AALI.JK price volatility could be explained by macroeconomics variable, while the 38,4% is explained by other factors.

Table 5 Anova

	Sum of Square	Df	Mean Square	F	P-Value
Regression	32.373	3	10.791	32.511	0.000
Residual	18.587	56	0.332		
Total	50.960	59			

From the Anova or F test, the value of F is 32.511 with significance of 0.000. Because of the probability (level of significant) of 0.000 is less than 0.05, it proves that inflation, interest rate, and exchange rate are simultaneously affecting the AALI.JK as agriculture sector's stock price.

Table 6 Coefficient of Regression

	Coefficient	Std. Error	T stat	P-Value
Constanta	36.714	9.342	3.930	0.000
Inflation (INF)	0.934	0.251	3.724	0.000
Interest Rate (IR)	-5.911	0.864	-6.841	0.000
Exchange Rate (ER)	-4.501	0.950	-4.741	0.000

- Basic Industry Sector Statistical Analysis

Table 7 Regression Statistic

R	R. Square	Adjusted R Square	Standard Error
0.888	0.789	0.778	0.41605

The R value of 0,888 indicates quite high correlation between JPFA.JK with inflation, interest rate, and exchange rate. Adjusted R square value of 0,778 implies that 77,8% of JPFA.JK price movement could be explained by three macroeconomics variable, while the 22,2% is another factor.

Table 8 Anova

	Sum of Square	Df	Mean Square	F	P-Value
Regression	36.298	3	12.099	69.899	0.000
Residual	9.694	56	0.173		
Total	45.992	59			

From the Anova or F test, the value of F is 69.899 with significance of 0.000. Because of the probability (level of significant) of 0.000 is less than 0.05, it proves that those three macroeconomic variables are simultaneously affecting the JPFA.JK as basic industry sector's stock price.

Table 9 Coefficient of Regression

	Coefficient	Std. Error	T stat	P-Value
Constanta	33.351	6.747	4.943	0.000
Inflation (INF)	0.599	0.181	3.305	0.002
Interest Rate (IR)	-5.935	0.624	-9.511	0.000
Exchange Rate (ER)	-4.392	0.686	-6.405	0.000

## 5. Conclusion

Table 10 Estimated Multiple Regression Model

Jakarta Composite Index	$Y = 25.277 + 0.207INF - 1.682 IR - 2.336ER$
Agriculture Sector	$Y = 36.714 + 0.934INF - 5.911IR - 4.501ER$
Basic Industry Sector	$Y = 33.351 + 0.599INF - 5.935IR - 4.392ER$

Macroeconomics is considered as important factor for investing in Indonesia. It is proved that macroeconomics bring significant impact to the stock price. From the JCI, agriculture sector, and basic industry stock price, it is indicate that increase in inflation lead to higher stock price which is higher rate of return. In contrast, increase in interest rate and exchange rate causing lower price of stock which result in lower return. In general, the author implies that agriculture sector and basic industry sector stock

performance are having the same pattern of impact with Jakarta Composite Index as the response of changing in macroeconomic variables.

Referring to the statistical result that there is a probability of other factor influencing stock price volatility, further research using other independent variables is necessary. This paper is one of the evidence of how macroeconomic variables affecting the stock price in Indonesia Stock Exchange. The model above are expected to be practical and used as a consideration for investor, company, and government in the future.

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