RELATIONSHIP BETWEEN MACROECONOMIC VARIABLES AND THE INDONESIAN STOCK MARKET

Oleh: Suyanto
(A Lecturer at Economics Faculty, University of Surabaya)

Abstrak

Kajian ini menelaah hubungan antara beberapa variabel makroekonomi dan "stock return" Indonesia. Uji-uji akar unit mendeteksi bahwa ekspor sebagai ukuran aktivitas ekonomi riil tidak dapat berkointegrasi dengan "stock market return" karena ekspor terintegrasi dalam urutan yang berbeda. "stock market return" Indonesia mempunyai hubungan kointegrasi dengan perubahan penawaran uang, tingkat suku bunga, inflasi dan krisis ekonomi. Baik model Engle-Granger maupun model Error-correction Wilkens-Breusch menunjukkan bahwa perubahan penawaran uang dan tingkat suku bunga berkontribusi secara signifikan terhadap hubungan kointegrasi, sedangkan inflasi dan krisis ekonomi tidak. Temuan ini mengimplikasikan bahwa "stock market" Indonesia sensitif terhadap faktor-faktor moneter.

Kata Kunci: *Pasar modal Indonesia, Kointegrasi, Error-correction Models*

A. Introduction

The Jakarta Stock Exchange (JSX) was established in 1976. However, during the period 1976 to 1987 it was mostly inactive. There were only 11 companies listed on the market and the volume of transactions was minimal during that period. In late 1987, the Indonesian government tried to reactivate the market by introducing some deregulation related to private and foreign roles in the market (the Central Bank of Indonesia, 2003).

In addition to reactive the Indonesian stock market, the secondary market was opened in 1989 (Bapepam, 2003). In the beginning of the secondary market, the JSX was dominated by small brokerage firms. The price of stocks is in many cases overvalued in relation to the underlying assets of the company because they have been overstated. In early 1990, there was a market crash, the market value fell to below 200 points. The market started recovery in 1993.

From 1993 to 1997, the JSX experienced tremendous growth in both trading volume and market value. The Jakarta Composite Stock Price Index (JCSPI) increased sharply and reached a peak to above 700 points in early 1997. However, during the economic crisis the trading volume decreased rapidly due to the collapse of some emitens and the high rate of interest in the money market in relation to the effort of the government to recover economic activity. The market started to grow again in the end of 1998 when the effect of economic crisis diminished.

Even though the stock market plays a significant role in the Indonesia's economy, this market has been almost ignored by financial researchers until recently. Based on the facts that the Indonesian stock market is one of the emerging markets in the ASEAN (the Association of South East Asian Nations) region that will play an important role in the capital market of the ASEAN countries and Indonesia has been open to foreign direct investment since 1967, research on the Indonesia stock market is both meaningful and valuable for a global financial market.

Compared to developed stock markets, such as that of the United States (U.S.), the market capitalization in Indonesia's stock market is much smaller. The price movements in Indonesia's stock market are relatively more subject to speculative activities and government intervention. Therefore, there may be different responses of Indonesian stock market return to economic variables compared to the U.S. market.

The main purpose of this study is to test whether current economic activities in Indonesia can explain stock returns. In particularly, this paper proposes to test the short run and long run relationship between selected macroeconomic variables and stock market returns. Section 2 presents the related literature review. Section 3 provides hypothesized relations between stock market returns and selected macroeconomic variables. Section 4 explains the methodology. Section 5 analyzes the results of empirical tests. Section 6 presents the concluding remarks.

B. Literature Review

Numerous studies have been done to capture the effects of fundamental economic activities to the movement of stock prices. Most of the studies focused on the well-developed stock markets, i.e. the New York Stock Exchange (Bulmash and Trivoli, 1991; Chen, 1991; Chen, Roll, and Ross, 1986; Fama, 1970, 1990, 1991, Huang and Kracaw, 1984; Pearce and Roley, 1988; Wei and Wong, 1992) and the Tokyo Stock Exchange (Elton and Gruber, 1988; Hamao, 1988; Mukherjee and Naka, 1995). Only a few of them evaluated less-developed Asian stock markets (Maysami and Koh (2000)

for study in the Singapore Stock Market; Kwon and Shin (1999) for study in the Korea Stock Exchange). All these studies showed there is a systematic effect of economic variables on stock market returns.

The most widely used framework to analyze the effect of macroeconomic variables on stock returns was the Arbitrage Pricing Theory (APT) model developed by Ross (1976). Using the APT model, Chen, Roll, and Ross (1986) provide the fundamentals for the belief that long run equilibrium exists between relevant macroeconomic variables and stock returns. They showed that the economic variables do indeed have a significant effect on stock market returns through the effect on discount rates, the ability of firms to generate cash flows, and future dividend payouts.

Another approach to examine the relationship between macroeconomic variables and stock returns is cointegration analysis. Granger (1986) suggests that the validity of the belief that there is a long run relation between macroeconomic variables and stock market returns can be verified by applying a cointegration analysis. A set of non-stationary time-series variables are said to be cointegrated if they are integrated of the same order and a linear combination of them is stationary (Enders, 1995). The existence of this linear combination points to a long-term equilibrium relation (Johansen and Juselius, 1990).

An advantage of cointegration analysis is that it builds an Error Correction Model (ECM) to explore the dynamic co-movement among variables and the adjustment process toward long-term equilibrium relation (Maysami and Koh, 2000; Mukherjee and Naka, 1995). In this study, the Engle and Granger (1987) Error Correction Model (EGECM) and Wilkens-Breusch Error Correction Model (WBECM) are used to examine whether the selected macroeconomic variables and Jakarta Composite Stock Price Index (JCSPI) are cointegrated.

C. The Model and Hypothesized Equilibrium Relation between Macroeconomic Variables and the Jakarta Stock Exchange

Based on "simple and intuitive financial theory" (Chen, Roll, and Ross, 1986; Mukherjee and Naka, 1995; Maysami and Koh, 2000), four macroeconomic variables are selected to examine the relationship between the Indonesian stock market and economic variables. These variables are inflation (CPI), money supply (M1), export (EXP), and interest rate (INT). Since there is an economic crisis from August 1997 to the end of 1998, which is captured in the period of the sample, the dummy variable for crisis is also included in the model.

The simple model for this study can be formulated as follows:

JCSPI = f (CPI, M1, EXP, INT, Dummy)

The definition of the variables used to proxy the Indonesia stock market and the four selected macroeconomic variables are presented in Table 1.

Table 1. Definition of Variables and Time Series Transformations

Variables	**Definition[a] of Variables**
Jakarta Composite Stock Price Index (JCSPI)	Index of market-value-weighted average of closing prices for all shares listed on the Jakarta Stock Exchange
Money Supply (M1)	End-of-month narrowly defined money supply
Export (EXP)	End-of-month Total Domestic Export from Indonesia
Interest Rate (INT)	Monthly average time deposit interest rate in Indonesian state bank
Inflation (CPI)	End-of-month consumer price index
Transformation	**Definition of Transformations[b]**
$\Delta JCSPI = \log[JCSPI_t/JCSPI_{t-1}]$	Monthly return on the Jakarta Stock Exchange (ex-dividend)
$\Delta M1 = \log[M1_t/M1_{t-1}]$	Monthly growth rate of money supply
$\Delta EXP = \log[EXP_t/EXP_{t-1}]$	Monthly change in Indonesia's total domestic export
$\Delta INT = \log[INT_t/INT_{t-1}]$	Monthly return on money market
$\Delta CPI = \log[CPI_t/CPI_{t-1}]$	Monthly realized inflation rate

[a] This definition is based on the definition by the Central Bank of Indonesia

[b] All variables are converted into natural logarithm. Δ denotes the first differences

An interest rate is likely to have a negative effect on stock returns. An increase in interest rate raises the opportunity cost of holding cash, and hence, leads to a substitution effect between stocks and other interest bearing security (Maysami and Koh, 2000).

The effect of money supply on stock returns is an empirical question. Fama (1981) argued that since the rate of inflation is positively related to money growth rate, an increase in money supply may led to an increase in the discount rate and lower stock prices. On the contrary, Mukherjee and Naka (1995) argue that money growth would likely increase cash flows and stock price. However, studies in less developed stock markets (Kwon and Shin, 1999; Maysami and Koh, 2000) showed that money growth has no significant effect on stock returns.

The level of real economic activity, as proxied here by domestic export is likely to have a positive relation to stock returns through its effects on expected

Table 2. Descriptive Statistics of All Variables: January 1993 to December 2002

	Summary Statistics				
	Observation	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Panel A. Variable in Levels					
JCSPI	120	486.7298	99.06323	276	724.55
M1	120	92600.82	49552.55	28761	196537
EXP	120	2945280	642729.2	1029753	4245856
INT	120	17.94108	11.90574	8.24	60.97
CPI	120	290.6925	129.238	139.03	521.0702
Panel B. Variable in First Differences					
ΔJCSPI	119	0.001521	0.0423762	-0.1643709	0.1080208
ΔM1	119	0.0069274	0.0159267	-0.0476133	0.0735478
ΔEXP	119	0.0007553	0.0799669	-0.2905544	0.3761857
ΔINT	119	-0.0003597	0.0466325	-0.1376452	0.2749154
ΔCPI	119	0.0048217	0.0079094	-0.0070821	0.0157922

future cash flow (Fama, 1990; Geske and Roll, 1983; Maysami and Koh, 2000; Mukerjee and Naka, 1995).

There is a negative relation between inflation and stock returns. The rise in the rate of inflation increases the nominal risk-free rate and raises the discount rate in the valuation model. If cash flow is also increased at the same rate, the inflation effect will be neutralized. However, cash flows do not rise at the same rate as inflation (DeFina, 1991). As a result, an increase in discount rate leads to a decrease in stock returns.

Since the economic crisis, which started from the second half of 1997, had a negative impact to economic activities in Indonesia, it can be suspected that the stock market returns would also be affected negatively.

D. Methodology

1. Data Description

The monthly time-series data used in this study were taken from an online service by the Central Bank of Indonesia (2003). The period of the sample is from January 1993 to December 2002. The year of 1993 is chosen as the starting year because the continuous time series for the JCPSI are only available from 1993. Because of the market crash in early 1990 and the low level of transactions in secondary markets, the monthly time series from 1989 to 1992 is not available. Figures 1 and 2 in the end of this paper show the movement of each variable in the level forms and the first difference respectively during the period of the sample.

Table 2 provides the summary statistics for the variables in levels and in

first differences. Panel B reveals that over the period studied the JCSPI grew at the rate of 0.15% per month; money supply and inflation grew at relatively high rates, 0.69% and 0.48% per month respectively; export increased at the low rate 0.08%; and interest rate decreased on average 0.04% per month.

2. Testing for Cointegration

The cointegration analysis involves two steps. The unit-root test is used to determine whether all variables in a model are stationary or non-stationary. If the result from step one shows that the first-differenced series of each variable are stationary, then estimation test for cointegration can be performed.

This study employs both the augmented Dickey-Fuller (1981) and the Philips-Perron (1988) tests to determine the presence of unit-root in the selected series. Since Figure 1 (at the end of this paper) for variables in the level forms shows that the series of M1 and CPI are suspected to have time trend in the data generating process while the other series are not suspected to have time trend, this study performs two models for both unit root tests, one with time trend and the other without time trend.

The model for Augmented Dickey-Fuller (ADF) test can be formulated as follows:

Model with linear time trend

$$\Delta y_t = a_0 + \gamma y_{t-1} + a_2 t + \Sigma\beta_i \Delta y_{t-i+1} + \varepsilon_t \quad ..(1)$$

Model without time trend

$$\Delta y_t = a_0 + \gamma y_{t-1} + \Sigma\beta_i \Delta y_{t-i+1} + \varepsilon_t \quad .....(2)$$

I = 1,2,…,n

yt is the variable in period t

Δy_t is the first differences of the variable (i.e. $\Delta y_t = y_t - y_{t-1}$)

a_0 is a constant

t is time trend

ε_t is i.i.d. disturbance with mean 0 and variance σ^2

The relevant critical values to reject H0:γ=0 are τ_τ-statistics and τ_μ-statistics for ADF with linear time trend and ADF without time trend respectively. These critical values can be seen in Fuller (1976).

The Philips-Perron (PP) test allows for fairly mild assumptions concerning the distribution of the disturbance. While Dickey-Fuller procedure assumed the disturbances to be independent and homogenous, the PP test allows the disturbance to be weakly dependent and heterogeneously distributed (Enders, 1995). The critical values for the PP-statistics are those given for the ADF test.

After the unit root test, the cointegration analysis can be performed. The Granger representation theorem (Granger and Weiss, 1983; Engle and Granger, 1987) states that if a set of variables is cointegrated, then there exists a valid error-correction representation of the data. This study uses two error-correction models: Engle-Granger (1987) two-step error-correction model (EGECM) and Wilkens-Breusch one-step error-correction model

(WBECM) to examine the dynamic relation between stock market returns and selected macroeconomic variables. If the result shows that there is a systematic effect from the selected macroeconomic variables to Indonesian stock price return, then the movement of stock prices reflects the movement in economic activities.

The estimation procedure in EGECM requires two steps. In the first step, the OLS is used to run the original model:

$JCSPI_t = \gamma_1 + \gamma_2 CPI_t + \gamma_3 M1_t + \gamma_4 EXP_t + \gamma_5 INT_t + \gamma_6 Dummy_t + e_t$.....(3)

and then tests whether the residuals, e_t, from the regression are stationary or not. If the residuals are stationary, there exists a long-term equilibrium relation in the model and then the second step is followed. The second step estimates the error-correction form:

$\Delta JCSPI_t = \beta_0 + \Sigma\beta_1(i)\Delta JCSPI_{t-i} + \Sigma\beta_2(i)\Delta CPI_{t-i} + \Sigma\beta_3(i)\Delta M1_{t-i} + \Sigma\beta_4(i)\Delta EXP_{t-i} + \Sigma\beta_5(i)\Delta INT_{t-i} + \beta_6 Dummy_t + \beta_7 e_t + \varepsilon_t$ .... (4)

For i=1,2,…,n. If the β_7 is a fraction, the residual converges to long run equilibrium and equation (3) is the right representation model.

Table 3. Unit Root Test: Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) Tests

	ADF		PP	
	With Trend	**Without Trend**	**With Trend**	**Without Trend**
Variable in Levels				
JCSPI	-2.527	-2.400	-3.214	-3.197
M1	-1.773	1.534	-2.011	1.378
EXP	-1.545	-1.837	-5.434***	-3.789**
INT	--2.305	-2.395	-1.803	-1.834
CPI	-2.261	0.459	-1.840	-0.794
Variable in First Differences				
ΔJCSPI	-3.062	-3.128**	-9.308***	-9.295***
ΔM1	-3.355*	-3.329**	-12.713***	-12.716***
ΔEXP	-3.714**	-3.541***	-15.082***	-15.062***
ΔINT	-3.014	-2.904**	-6.798***	-6.821***
ΔCPI	-2.894	-2.903**	-4.672***	-4.684***

Note:
* denotes significant at the 10% level
** denotes significant at the 5% level
*** denotes significant at the 1% level
- The Augmented Dickey-Fuller test uses the lag of 12 and Phillips-Perron test uses a truncated Newey-West lag of 4

The error-correction form for WBECM can be formulated as follows:

$$\Delta JCSPI_t=\alpha_1+\Sigma\Phi i\Delta JCSPI_{t-i}+\Sigma\psi i\Delta CPI_{t-i}+\Sigma\omega i\Delta M1_{t-i}+\Sigma\Pi i\Delta EXP_{t-i}+\Sigma\rho i\Delta INT_{t-i}+\alpha_2CPI_{t-1}+\alpha_3M1_{t-1}+\alpha_4EXP_{t-1}+\alpha_5INT_{t-1}+\alpha_6Dummy_t+\alpha_7JCSPI_{t-1}+\varepsilon_t \quad (5)$$

If the α_7 from equation (5) is a fraction, then the short run disequilibrium will converge to long run equilibrium and equation (3) is the right representation model. The long run coefficient for equation (3) can be calculated from coefficient α's in equation (5), as follows:

$$\gamma_1=\alpha_1/\alpha_7 \; ; \; \gamma_2=\alpha_2/\alpha_7 \; ; \; \gamma_3=\alpha_3/\alpha_7 \; ; \; \gamma_4=\alpha_4/\alpha_7 \; ; \gamma_5=\alpha_5/\alpha_7 \; ; \; \gamma_6=\alpha_6/\alpha_7 \quad (6)$$

There are two advantages of WBECM compared to EGECM. First, WBECM can estimate the long run coefficient using the short run coefficient as can be seen in equation (6). Second, it only uses one-step estimation rather than two-step estimation as used by EGECM.

E. Empirical Results

1. Unit Root Test

To find the right lags for the selected series, the ADF procedure in this study started by applying high order lags and reduced the lags one by one until the right lags were found. Since the data is in monthly periods, 12 lags are used as a starting point.

Table 3 reports the results (the value of Z(t)) of the ADF test with a lag of 12 and the PP test with a truncated Newey-West of 4 for both with and without time trend. Model with time trend is presented to accommodate the series of M1 and CPI in the level forms, which are suspected to have a (deterministic) time trend. The results, which are robust to different lag lengths, indicate that all time-series variables except EXP are integrated of order one, I(1). Since EXP is integrated of order zero, it can not be cointegrated with stock returns. Hence, this variable is dropped from the model.

2. The Impact of Economic Forces on Stock Returns

The first step of EGECM is regression of the long run model. The long-run model for this study is:

$$JCSPI=\alpha_0+\alpha_1CPI+\alpha_2M1+\alpha_3INT+\alpha_4Dummy+\xi \quad (7)$$

In order to perform EGECM, the ADF test is performed to test whether the residuals (ξ) from equation (7) are stationary. The table 4 reports the results of the ADF test and other related tests for the residual.

As in the ADF test for the time-series variables, the 12 lag lengths are chosen as the starting point to find the robust lags for the residual. The 9 lag lengths to the zero lag length are the appropriate lags. Some statistical criteria: the Adjusted-R^2, the Breusch-Godfrey Lagrange Multiplier (BG-LM) tests for serial correlation, and the Akaike's Information Criterion (AIC) and the Schwarz-Bayesian Criterion (SBC) are used to evaluate which lag length is the most appropriate. For the Adjusted-R^2,

the higher the value the better a model. For AIC and SBC, the lower the value the better a model.

The BG-LM test shows that there is no serial correlation for all models (the |p| values against null hypothesis no serial correlation are larger than 5%). The Adjusted-R^2 shows that the shorter the lag length the better the model while the AIC and the SBC show the reverse. In this case, the AIC and the SBC are preferred because they give 'fit' and 'parsimony' measures for the models (Verbeek, 2001). Hence, the 9 lags length is used as a starting point to find the right lag length for ECM.

The EGECM is started using the 9 lag lengths for all the time-series variables. The lag lengths are reduced one by one until we find the right and the most appropriate model. After the process of selection, the most appropriate lags are four lags for ΔM1, three lags for ΔINT, four lags for ΔCPI, and one lag for ΔJCSPI. Table 5 presents the results for EGECM and WBECM.

Since the Error Correction Term (ECT_{t-1}) for both the EG model and the WB model are negative and fractional, the short run disequilibrium between Indonesian stock market returns and selected macroeconomic variables converge to long run equilibrium. This means that the long-run model in equation (7) is the right representation model for the stock market relationship.

The Jakarta Stock Exchange's relationship with money supply is positive. This finding is consistent with Bulmash and Trivoli's (1991) findings for

Table 4. A Cointegration Test: Testing for Residual

Model	ADF	Adj. R^2	BG-LM Test	AIC	SBC	PP
9 lags	-2.671***	0.0483	7.368 [0.5989]	1163.298	1190.303	-3.283***
8 lags	-2.922***	0.0627	4.910 [0.7171]	1171.042	1195.427	-3.298***
7 lags	-2.739***	0.0585	7.340 [0.3944]	1180.094	1201.842	-3.318***
6 lags	-3.259***	0.0657	6.408 [0.3791]	1189.341	1208.433	-3.358***
5 lags	-3.098***	0.0649	1.459 [0.9177]	1197.964	1214.381	-3.379***
4 lags	-3.321***	0.0697	2.595 [0.6277]	1206.026	1219.75	-3.415***
3 lags	-3.390***	0.0794	0.796 [0.8505]	1213.643	1224.657	-3.429***
2 lags	-3.452***	0.0837	0.530 [0.7070]	1221.563	1229.85	-3.449***
1 lag	-3.568***	0.0883	0.004 [0.9515]	1229.426	1234.968	-3.438***
0 lag	-3.332***	0.0782	2.260 [0.1328]	1239.336	1242.116	-3.332***

Values in brackets are |p|>chi-squared.
*** denotes significant at the 1% level

the U.S., Mukherjee and Naka's (1995) findings for Japan, and Maysami and Koh's (2000) findings for Singapore. There are two possible explanations for this finding. First is the injection of money supply increases cash flow and boosts corporate earnings (Mukherjee and Naka, 1995), Another explanation is an increase in money supply has a direct positive liquidity effect on the stock market (Maysami and Koh, 2000).

As hypothesized, the relationship between Indonesian stock returns and interest rates is negative. A similar relation is found in the U. S. (Fama and Schwert, 1977; Geske and Roll, 1983; Chen, Roll, and Ross, 1986), Japan (Brown and Otsuki, 1990; Mukherjee and Naka, 1995), Korea (Kwon and Shin, 1999), and Singapore (Maysami and Koh, 2000). This negative relation is because interest rate and discount rate are substitutes. When interest rate increases, investments in money markets become more interesting compared to investment in stock markets. Economic agents will substitute their investment in stock market to investment in money market.

Price levels and stock returns in Indonesia are negatively related, and this is also consistent with findings for the U.S. (Fama and Schwert, 1977; Chen, Rall, and Ross, 1986), Japan (Mukherjee and Naka, 1995), and Singapore (Maysami and Koh, 2000). The negative sign of inflation is because cash flow does not rise at the same rate as inflation (DeFina, 1991) and hence inflation increases the nominal risk-free rate and raises the discount rate in the valuation model. The increase in discount rate implies the decrease in price of stock.

The relation between economic crisis and Indonesia's stock returns is negative. This negative relation is because economic crisis reduces corporate earnings and hence decreases stock returns. The decrease in corporate performance encourages economic agents to sell stocks and invest in other sectors.

The individually significant test (t-test) shows that the coefficients of M1 and INT are significant related to stock returns in JSX, while the coefficients of CPI and Dummy have no significant relation. This suggests that the Indonesian stock market (in this case JSX) is money supply and interest sensitive. In short, the Indonesian stock market is sensitive to monetary factors. The monetary policy will significantly affect the Indonesian stock markets.

The Classical diagnosis tests shows that the models in Table 5 do not violate any Gauss-Markov assumptions. The Durbin-Watson (DW) test and the BG-LM test report that there is no serial correlation in the models (the DW-stat is near two, which indicates there is no autocorrelation (Ender, 2001), and |p|-value of BG-LM, which is larger than α=5%, shows that the null hypothesis of no serial correlation can not be rejected).

The normality Jarque-Bera (JB) test shows the models are asymptotically distributed as a Chi-squared with two degrees of freedom (i.e. The null hypothesis can not be rejected). The RESET Ramsey test for model specification shows that the models are correctly specified at α=5%. Given these Classical test results, the ECM estimations in Table 5 are unbiased, linear, consistent, and asymptotically efficient. In other words, the estimations are reliable.

To decide which model is better between EGECM and WBECM, some criteria for model selection are used. The criteria are the Adjusted-R2, the AIC, and the SBC (see Table 5). The adjusted-R2 for the WBECM is larger than the EGECM. The AIC and the SBC are lower for the WBECM model. This means that the WBECM is a better representative model for the Indonesian stock market.

From the coefficients of WBECM model, we can calculate the long-run equilibrium coefficient using equation (6). The long run equilibrium model for the relationship between Indonesian stock market returns and the selected macroeconomic variables is as follows:

JCSPI=462.08+0.0037M1+7.0165INT–
1.1123CPI–186.6703Dummy .....(8)

The long run relation shows that the money supply and stock price is positively related as in the short-term. The long run relationship between inflation and the stock market, which is negative, is also consistent with the short run relationship. However, the long run relationship between interest rate and stock market is positive, which contradicts the short run relationship. The possible explanation for this finding is that this study uses short-term (monthly) interest rate. The short-term interest rate is not a good proxy for the nominal risk free component of the discount rate in the stock valuation model. The long-term interest rate, such as government bonds, is a better proxy for interest rate (Mukherjee and Naka, 1995). Unfortunately, government bonds have not been popular in Indonesia during the period of sample. The Indonesian government began to sell bonds to the public at the end of 1999 when the government tried to decrease budget deficits from non-tax sources. Finally, the long run relationship between stock returns and economic crisis is negative, and consistent with the short run results.

F. Conclusion

Testing for unit root using both the ADF and PP test shows that all selected variables, except export (EXP), are integrated of degree one, I(1). The EXP is dropped from the model. By applying the EG and WB error-correction model, this study found that the Error-Correction Term (ECT) is a fraction, which means that the short run disequilibrium will converge to long run equilibrium.

Table 5. Error Correction Model: Engle-Granger (EG) Two-step and Wilkens-Breusch (WB) One-Step

Variable	EG Model		WB Model	
	Coefficient	Standard Error	Coefficient	Standard Error
Constant	0.0014807	0.0073518	0.0756888*	0.0397235
ΔM1	0.5562503**	0.2484094	0.6856702**	0.2634366
ΔINT	-0.2610003**	0.1097205	-0.2011332*	0.125706
ΔCPI	-0.6412429	0.72832	-0.8547165	0.8187179
LΔM1	0.2353049	0.2721769	0.275731	0.3279996
L2ΔM1	0.3220169	0.3075922	0.3986807	0.3271707
L3ΔM1	-0.0103457	0.3057789	0.1003435	0.3210524
L4ΔM1	-0.447858*	0.2880246	-0.3439609*	0.2945199
LΔINT	0.1990308*	0.1151627	0.1862192	0.1191607
L2ΔINT	0.0414451	0.1124426	0.0403367	0.1198607
L3ΔINT	-0.2918994***	0.1024843	-0.2807481**	0.1173697
LΔCPI	0.217351	0.8206026	-0.0557035	0.8558911
L2ΔCPI	-0.263363	0.808596	-0.7337159	0.8611041
L3ΔCPI	-0.3885701	0.8036049	-0.8261511	0.8505769
L4ΔCPI	1.373938*	0.7166856	0.6627132	0.8670499
LΔJCSPI	0.1659974**	0.0952016	0.1638988**	0.0990425
Dummy	-0.0101574	0.0080412	-0.0305766	0.0210032
Lres (ECT_{t-1} for EG model)	-0.0001544***	0.0000438	---	---
LJCSPI (ECT_{t-1} for WB model)	---	---	-0.0001638***	0.0000455
LM1	---	---	6.04e-07	6.70e-07
LINT	---	---	0.0011493	0.0007881
LCPI	---	---	-0.0001822	0.0002938
Adj. R^2	0.1949		0.1995	
DW-stat	1.984879		1.968854	
Normality-JB	0.3124	[0.85540]	0.3223	[0.85116]
BG-LM Test	2.444	[0.6548]	4.711	[0.3183]
Ramsey Test	1.50	[0.2195]	2.02	[0.1160]
AIC	-3.5348638		-3.5198562	
SBC	-3.1052223		-3.0186077	

Note:
* denotes significant at the 10% level
** denotes significant at the 5% level
*** denotes significant at the 1% level
- Values in brackets are |P| > Chi-squared for the Normality JB test and the BG-LM test, and |P| > F for the RESET Ramsey test.
- The ECT_{t-1} is an Error Correction Term.

In the short-term the money supply (M1) has a positive relation with stock returns in JSX while the interest rate (INT), inflation (CPI), and economic crisis (Dummy) have a negative relationship. The long-term relationships, which are calculated from short-term coefficients of the WB model, show consistent findings with the short-term relationships for all selected macroeconomic variables, except INT.

References

Bapepam (2003). www.bapepam.go.id. downloaded on April 11th, 2003.

Brown, S. J. and T. Otsuki (1990). "Macroeconomic factors and the Japanese equity markets: the CAPMD project". In E. J. Elton and M. Gruber, Eds.: *Japanese Capital Markets*, New York: Harper and Row

Bulmash, S. B. and G. W. Trivoli. (1991). "Time-lagged interaction between stock prices and selected economic variables". *Journal of Portfolio Management*. summer, 61-67

Central Bank of Indonesia. (2003). www.bi.go.id. downloaded on April 05th, 2003

Chen, N. F. (1991). "Financial investment opportunities and the macroeconomy". *Journal of Finance* 46, 529-554

Chen, N. F., R. Roll, and S. A. Ross. (1989). "Economic forces and the stock market". *Journal of Business* 59, 383-403

DeFina, R. H. (1991). "Does inflation depress the stock market?". *Federal Reserve Bank of Philadelphia Business Review*, 3-12

Dickey, D. A. and W. A. Fuller (1981). "Likelihood ratio statistics for autoregressive time series with unit root". *Econometrica* 49, 1057-1072

Enders, W. (1995). *Applied Econometric Time Series*. New York: John Wiley

Elton, E. J. and M. Gruber (1988). "A multi-index risk model of the Japanese stock market". *Japan and the World Economy* 1, 21-44

Engle, R. E. and C. W. J. Granger (1987). "Cointegration and error correction: representation, estimation, and testing". *Econometrica* 55, 251-276

Fama, E. F. (1970). "Efficient capital markets: a review of theory and empirical work". *Journal of Finance.* 25, 383-417

_____ (1981). "Stock returns, real activity, inflation and money*". The American Economic Review.* 71, 545-565

_____ (1990). "Stock returns, expected return, and real activity". *Journal of Finance* 45, 1089-1108

_____ (1991). "Efficient capital markets: II". *Journal of Finance* 46, 1575-1617

Fama, E. F. and G. W. Schwert (1977). "Asset returns and inflation". *Journal of Financial Economics* 5, 115-146.

Fuller, W. A. (1976). *Introduction to Statistical Time Series.* New York: John Wiley

Geske, R. and R. Roll (1983). "The Fiscal and monetary linkage between stock returns and inflation". *Journal of Finance* 38, 7-33

Granger, C. W. J. (1986). "Developments in the study of cointegrated economic variables". *Oxford Bulletin of Economics and Statistics* 48, 213-228

Granger, C. W. J. and A. A. Weiss (1983). "Time series analysis of error-correction models". *Studies in Econometrics, Time Series, and Multivariate Statistics*, pp. 255-278, New York: Academic Press

Hamao, Y. (1988). "An empirical investigation of the arbitrage pricing theory". *Japan and the World Economy* 1, 45-61

Huang, R. D. and W. A. Kracaw (1984). "Stock market returns and real activity: a note". *Journal of Finance* 39, 131-140

Johansen, S. and K. Juselius (1990). "Maximum likelihood estimation and inference on cointegration with application to the demand for money*". Oxford Bulletin of Economics and Statictics* 52, 169-210

Kwon, C. S. and T. S. Shin (1999). "Cointegration and causality between macroeconomic variables and stock market returns". *Global Finance Journal* 10(1), 71-81

Maysami, R.C. and T.S. Koh (2000). "A vector error correction model of the Singapore stock market". *International Review of Economics and Finance* 9, 79-96

Mukherjee, T. K. and A. Naka (1995). "Dynamic relation between macroeconomic variables and the Japanese stock market: an application of a vector error-correction model". *The Journal of Financial Research* 18(2), summer, 223-237

Pearce, D. K. and V. V. Roley (1988). "Firm characteristics, unanticipated inflation, and stock returns". *Journal of Finance* 43, 965-981

Philips, P. C. and P. Perron (1988). "Testing for a unit root in time series regression". *Biometrika* 75, 335-346

Ross, S. A. (1976). "The arbitrage theory of capital asset pricing". *Journal of Economic Theory* 13, 341-360

Verbeek, M. (2001). *A Guide to Modern Econometrics.* New York: John Wiley

Wei, K. C. J. and K. M. Wong (1992). "Test of inflation and industry portfolio stock returns". *Journal of Economics and Business* 44, 77-94