THE EFFECT OF MONETARY GROWTH VARIABILITY ON THE INDONESIAN CAPITAL MARKET

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Abstract

Over the years studies to ascertain the relationship between money supply growth and stock prices have been carried out in abundant. However, very few researchers have paid attention to the impact of uncertainty in monetary growth on stock prices. The element of uncertainty on monetary growth, is noted by scholars to increase perceived riskiness of the financial assets, and this in a way will have a detrimental effect on stock prices. By adopting commonly used econometric tools, this study is designed to determine the relationship between these two variables in a developing market (i.e. Indonesia). Contrary to the proposed hypothesis, uncertainty in monetary growth is found to have no influence on stock prices. However uncertainty in monetary growth seems to have a significant long-run dynamic relationship with the uncertainty in stock prices. Such relationship discovery on the Indonesian Stock Market has several implications. First, with respect to stock market investors since past information of monetary growth uncertainty does not seem to influence the contemporary stock prices, it nonetheless is consistent with the concept of efficient market. Therefore no trading strategy can be developed based on money growth uncertainty information. On the other hand, because money growth uncertainty does influence the stock market that proxies the economy in the long run, attention of the policy makers should be focused on how the monetary policy is conducted. Friedman (1983, 1984) did mention about the detrimental effect of monetary growth uncertainty. For the policy makers of the country, unless something is done to remedy the situation, the disaster of 1979-1982 brought upon by a monetary experiment could occur in this country as well.

Key words: monetary growth, money supply growth, stock prices.

1. Introduction

Over the years empirical studies that examine the relationship between money supply and stock prices are abundant and with particular references to advanced market. As a matter of fact, documented evidence suggests that the issue has been investigated as early as the sixties (Brunner, 1961; Friedman, 1961; Friedman and Schwartz, 1963; and Sprinkel, 1964). From seventies era through out the nineties, the studies continue to be expanded in the covering various markets worldwide (Ghazali & Yakob, 1997).

Based on the existing theoretical frameworks, the propose relationship between the two variables is a uni-directionally causation relationship running from money supply to stock prices (Rozeff, 1974). However despite the extensiveness of the studies on these two variables, empirical findings fail to reach a conclusive agreement (Rogalski & Vinso, 1977 and Hashemzadeh & Taylor, 1988). Hence, the issue continues to receive attention from both finance scholars and researchers.

Theoretically, the value of a common stock is determined by the present value of the discounted expected cash inflows to be received by investors who owned the stock – in this case from dividend payments (Ross et al., 1995).

$$P_0 = \frac{[D_0(1+gt)]}{[1+rt+p]}, \tag{1}$$

where: P_0 is the current price of the common stock, D_0 is the current level of dividend, gt is the dividend growth rate, rt is the riskless rate of interest, p is the risk premium and t is the tim-

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ing running from one to infinite. Therefore we may suggest that the ability of a company to pay dividends will influence the price of its stock.

Monetary economics framework has provided an argument that links money supply with stock prices. The monetarists propose that money supply affects the economy via its transmission effect on interest rate, which is a crucial determinant of economic stimulus. Thorbecke (1995) for instance, argues that monetary policy has real and quantitatively important effects on the economy. He proves in his model that expansionary monetary policy will exert positive real effects by increasing future cash flows or by decreasing the discount factors at which those cash flows are capitalized. Since the value of a stock is a function of its cash flows and the discounting factors, the model may indicate that positive monetary shocks shall increase industry stock returns.

The focus of this study is not on the impact of money supply on stock prices per se, but instead the impact of money supply uncertainty on stock prices, which in our opinion is still unclear. According to Friedman (1983, 1984) because money supply has a real effect on the economy, therefore monetary growth variability should increase the degree of perceived uncertainty in the market. Given this argument and the fact that financial asset (i.e. common stock) prices are dependent on investor expectations (Rozeff 1974), an argument was put forward by Boyle (1990) who argues that changes in uncertainty regarding money stock will affect prices of common stock. Theoretically, he claims that monetary uncertainty alters the equity risk premium to reflect the additional expected return investors require for bearing the risk of holding stocks during the period of economy uncertainty.

Given the stock valuation model presented in equation (1), an increase in risk premium will result in decline in stock price. Thus, monetary uncertainty is implied to have an adverse relationship with stock prices. Since we believe this proposition has never been tested in developing market, this paper intends to ascertain the relationship between monetary uncertainty and stock prices, with a special reference to the Indonesian stock market. Hence, the objectives of this paper are: First, to test for the existence of a relationship between the uncertainty associated with the past variability (uncertainty) of the money growth and the stock prices. Second, to determine if there are any long-run dynamic relationships between uncertainty in monetary aggregate and stock prices in Indonesia.

The next section of the paper will discuss the background of the study followed by the presentation of data, methodology and findings. A brief discussion of the findings and its conclusion will end the paper.

2. Literature Review

In the context of Indonesian financial market, Parikh and Sundram (1994) have performed one of the comprehensive studies to determine the relationship between money supply and stock prices. They employ the Vector Autoregression (VAR) methodology in order to identify the relationship between money supply and stock prices while controlling for two other variables namely income and interest rate. The result of the Granger causality test shows the presence of a significant uni-directional relationship running from money supply to stock prices. Using the Impulse Response Function (IRF) it was shown that stock prices response positively following monetary expansion and the impact peaks after seven month from the initial shock. Motivated with the belief that stock prices reflect real economic performance (Roseff, 1974), the authors conclude that their finding is consistent with the long-run effect of money on the real sector.

Hicks (1996) conducts a similar study for the Indonesian market and found an almost identical result. Using the co-integration and Error-Correction Model (ECM), he discovers that the two variables – stock prices and money – are non-stationary in their level form but are co-integrated in the long-run with the presence of error correction representation. More significantly, he found from the error-correction model that money supply, represented by M3, causes stock prices but not otherwise. He concludes that his finding is inconsistent with the Efficient Market Hypothesis (EMH) since market participants will be able to predict stock prices in the market using information on broad money supply, M3, as a trading rule to earn excess returns.

The empirical results that suggest the importance of monetary policy in influencing stock prices in Indonesia are not surprising since the government has long been known to pursue monetary policy in attaining economic goals, one of which is price stability in the country. The Central Bank of Indonesia is entrusted with the responsibility of formulating and implementing the country's monetary policy. One of the earlier strategies has been targeting the monetary aggregate, which shows the emphasis given more on Ml and eventually M3 to ensure sufficient liquidity in the system to meet the demand of the economy (Boyle, 1990; and Friedman, 1983). The success of the monetary targeting strategy is evident in its ability to spur economic growth until mid-1990's. The Indonesian's economy continues to record unprecedented growth rates from 1988 until then.

However, the large capital influx into the country since early 1990's has caused considerable instability in the relationship between monetary aggregates and nominal GDP (Central Bank of Indonesia, 2001). Output growth is seen to cause monetary growth and not vice versa, forcing the Central Bank to shift its strategy from monetary aggregate targeting to interest rate targeting. Nevertheless, the Central Bank still monitors the monetary aggregates closely despite suggestions that they become unreliable indicators of economic activity. During this period, monetary velocities – the ratios of nominal GDP to various monetary aggregates, are reported to frequently depart from the historical patters. This departure from the historical pattern implies variation in money growth (Central Bank of Indonesia, 2001).

Following the Thorbecke's (1995) argument of monetary policy real and quantitative effect on the economy, we suspect that this phenomenon – instability of monetary aggregates over those periods should have an effect on the level of economic activity. In addition, since stock prices reflect real economic performance, the impact of the monetary uncertainty should transpire in the common stock prices. Considering this development, it is deemed appropriate to pursue empirical evidence to establish the relationship between monetary uncertainty and stock price behaviors.

With this in mind, this paper is designed to test two hypotheses, namely (i) monetary uncertainty is negatively related to stock prices, and (ii) stock price uncertainty to monetary uncertainty ratio. The major contribution of this paper is in its attempt to clarify the issue of monetary uncertainty and its effect on the Thai stock market. The findings will be of use for market participants and regulators alike.

3. Data and Methodology

This study employs monthly data running from 1989:01 to 2001:03. Using M1 (suggested by Friedman (1984)) to represent monetary aggregate and Indonesian Index as a proxy of stock prices, the month to month (i.e. January to January) rate of changes is computed to generate new series that represent changes in M1 and Indonesian Index. The monetary variability is measured by calculating the standard deviation of changes in the M1 series over one-year period (Rungsun, 1997).

To measure the past history of monetary instability, following Boyle (1990) a series of one-year moving average of the standard deviation is constructed. Similar process is also performed on the Indonesian Index series to accomplish the second objective of the study. Overall, three series are generated – namely moving average of standard deviation of monetary growth, stock price growth and moving average of standard deviation for stock price growth.

In order to examine whether there is a long run equilibrium relationship among the variables, we employ the method of co-integration developed by Johansen and Juselius (1990). Prior to testing for co-integration, the time series properties of the variable should be investigated. If the variables are stationary, conventional regression procedures are appropriate. However, if the variable is stationary, with time-dependent means and variances, then test of co-integration is necessary to establish long run relationship. The Augmented Dickey-Fuller test for unit roots as suggested by Dickey and Fuller (1979) and Phillip and Peror (1988) respectively is employed.

If both variables are non-stationary and integrated of the same order, then the relationship of these variables is estimated by employing the co-integration methodology suggested by Johansen (1991) and Johansen and Juselius (1990). The co-integration (see Engle and Granger,

1987) is a long run relationship and it implies that deviations from equilibrium are stationary, with finite variance, even though the series themselves are non-stationary and have infinite variance.

If a common trend among a set of variables that move together in the long run equilibrium exists, the Granger causality tests should be constructed within a Vector Error-Correction Model (VECM) to avoid misspecification. The Granger Causality Test is implemented by calculating the F-statistic based on the null hypothesis that the set of coefficients on the lagged values of independent variables is not statistically different from zero. If the null hypothesis is not rejected, then it can be concluded that the independent variable does not cause dependent variable. If the coefficient of error correction term from the co-integrating regression is significant based on the t-statistic, then both independent and dependent variables have a stable relationship in the long-run.

In order to examine the dynamic properties of the system beyond the sample period we use the Variance Decomposition (VDCs) technique. Accordingly, the VECM may be interpreted as within sample causality test (Masih and Masih, 1996). It indicates only the Granger-exogeneity or endogeneity of the dependent variable within the sample period. It does not provide an indicator of the dynamic properties of the system, neither do they allow us to gauge the relative strength of the Granger-causal chain nor degree of exogeneity amongst the variable beyond the sample period (Masih and Masih, 1995). VDCs which may be termed as out-of-sample causality test, by partitioning the variance of the forecast error of a certain variable (money supply) into proportions attributable to the innovations (or shocks) in each variable in the system including its own, can provide an indication of these relativities. A variable that is optimally forecast from its own lagged values will have all its forecast error variance accounted for by its own disturbances (Sims, 1982).

4. Discussion of Results

The results of the ADF tests, are presented in Table 1. They indicate that only two series are non-stationary at level form but integrated of first order, I(1). The two series are moving average of standard deviation for monetary growth (MADVM1) and moving average of standard deviation for stock price growth (MADVSTK). Since these two series are integrated at the same level, it suggests the presence of co-integration relationships and that validates the use of co-integration analysis to ascertain the long-run dynamic between the two series.

Table 1

ADF Tests for the presence of Unit Root

Variable	Statistic for level	Statistic for first difference
MADVM1	-0.969376	-5.39449***
MADVSTK	-1.930111	-4.127270***
MAGSTK	-2.315937***	-5.061604

Note:
MADVM1= moving average std. dev. of money growth
MADVSTK= moving average std. dev. of stock price growth;
MAGSTK = stock price growth;
* significant at 10%;
** significant at 5%;
*** significant at 1%.

The results of co-integration analysis are presented in Table 2. Based on the results presented in panel A of Table 2, it is found that the two series – moving average of standard deviation for monetary growth (MADVM1) and stock price growth (MAGSTK) – are not co-integrated in the long-run. This is consistent with the ADF test, which shows that these two series reach their stationarity at different level. However panel B shows that the series of moving average of standard deviation for monetary growth (MADVM1) and moving average of standard deviation for stock price growth (MADVSTK) do indeed possess a long-run equilibrium between them. Figure 1 shows the movement of the two series over the period under study.

Table 2

Results from Johansen's Co-integration analysis

Panel A. Series: MADVM1 MAGSTK				
	Likelihood	5 Percent	1 Percent	Hypothesized
Eigenvalue	Ratio	Critical Value	Critical Value	No. of CE(s)
0.090943	8.511996	15.41	20.04	None
0.017982	1.360948	3.76	6.65	At most 1
Note: L.R. rejects any co-integration at 5% significance level				
Panel B. Series: MADVM1 MADVSTK				
	Likelihood	5 Percent	1 Percent	Hypothesized
Eigenvalue	Ratio	Critical Value	Critical Value	No. of CE(s)
0.105565	14.45866	15.41	20.04	None
0.078008	6.091394	3.76	6.65	At most 1 *

Note: LR test indicates 2 co-integration equations at 5% level.

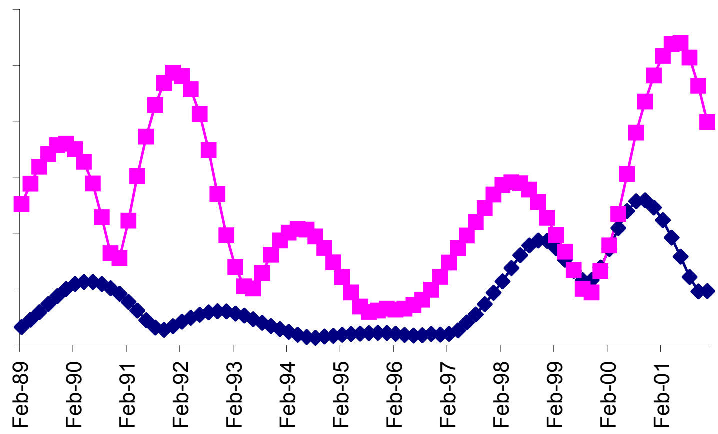

Fig. 1. The moving average of standard deviation of monetary growth (MADVM1) and moving average of standard deviation of stock price growth (MADVSTK)

Table 3 presents the results of VECM. Coefficients for the Error Correction terms (ECM), which are represented by the speed of adjustment are found to be significantly different from zero. This indicates the two series (MADVM1 and MADVSTK) simultaneously correcting for the dis-equilibria resulting from monetary deviation from their long-run equilibrium path, thus explaining the co-integration relationship between the series. The fact that the two series are adjusted at different rates and different significance level, gives raise to the matter of which series is the leader and which variable is the follower, thus establishing the causal relationship between the series. Because MADVSTK adjusting is more significant in comparison with MADVM1 based on the coefficient of the ECM term and its significance level, this may indicate that MADVSTK is the follower while MADVM1 is the leader. In other words, changes in MADVM1 may lead to changes in MADVSTK. Additional evidence that provides support for this causation relationship lies in their lagged coefficient. The lagged coefficients for MADVM1 are found to be relatively significant in lagged 1, 3 and 4. On one hand, none of the coefficients for MADVSTK is significant. With evidence from the

ECM coefficient and the lagged coefficient, this may indicate that the uncertainty in money growth has more prevalent effect on the uncertainty in stock prices than vice versa.

Table 3

VECM estimates of the adjustment coefficient

Dependent Variable	MADVM1	MADVSTK
ECM_{t-1}	0.002363 (0.00775) (0.30477)	0.062807 (0.02207) (2.84554)
D(MADVM1(-1))	1.760011 (0.12029) (14.6310)	-0.584146 (0.34249) (-1.70557)
D(MADVM1(-2))	-1.156787 (0.24401) (-4.74073)	0.861206 (0.69473) (1.23962)
D(MADVM1(-3))	0.248748 (0.25180) (0.98788)	-0.070872 (0.71691) (-0.09886)
D(MADVM1(-4))	-0.077378 (0.13221) (-0.58527)	-0.460943 (0.37642) (-1.22455)
D(MADVSTK(-1))	0.010182 (0.03778) (0.26952)	1.699876 (0.10756) (15.8044)
D(MADVSTK(-2))	-0.037370 (0.07664) (-0.48764)	-1.430714 (0.21819) (-6.55713)
D(MADVSTK(-3))	0.054669 (0.07879) (0.69390)	0.958079 (0.22431) (4.27117)
D(MADVSTK(-4))	-0.021889 (0.04245) (-0.51563)	-0.441669 (0.12087) (-3.65415)

Note: Standard errors and t-statistics are in parentheses.

The results for the variance decomposition (see Table 4) are found to be consistent with that of the VECM causality test. For example, in terms of own shock, MADVM1 shows its relative exogeneity with 99.1934% of its own innovations in 20-quarter. This result tends to confirm our initial findings from the VECM formulation that the MADVM1 is more exogenous of the two series in the system developed. In 20-quarter about 36.841% of the MADVSTK shock is explained by innovation in MADVM1 variable. This result is consistent with the earlier results provided by our VECM model, where MADVSTK may be affected by MADVM1 and not the other way around. Again this finding tends to highlight the roles played by monetary uncertainty in influencing the variability in the stock market.

Table 4

Variance Decomposition

A. Variance Decomposition of MADVSTK Due to Innovation in MADVM1			
Period	S.E.	MADVM1	MADVSTK
1	0.004776	0.051472	99.94853
2	0.013598	0.192007	99.80799
3	0.023365	0.720430	99.27957
4	0.032158	0.739984	99.26002
5	0.039631	0.487959	99.51204
6	0.045521	0.872891	99.12711
7	0.049435	2.416313	97.58369
8	0.051707	5.422035	94.57797
9	0.053229	9.751578	90.24842
10	0.054666	14.41906	85.58094
11	0.056264	18.23415	81.76585
12	0.057962	20.74079	79.25921
13	0.059505	22.27474	77.72526
14	0.060668	23.41313	76.58687
15	0.061454	24.59558	75.40442
16	0.062104	26.08231	73.91769
17	0.062975	28.01890	71.98110
18	0.064362	30.46710	69.53290
19	0.066337	33.39121	66.60879
20	0.068716	36.64119	63.35881
B. Variance Decomposition of MADVM1 Due to Innovation in MADVSTK			
Period	S.E.	MADVM1	MADVSTK
1	0.001677	100.0000	0.000000
2	0.004929	99.99270	0.007297
3	0.009311	99.99795	0.002047
4	0.014171	99.99224	0.007757
5	0.018860	99.98755	0.012447
6	0.022853	99.98927	0.010730
7	0.025871	99.99158	0.008416
8	0.027918	99.99260	0.007402
9	0.029197	99.99309	0.006906
10	0.029979	99.99313	0.006869
11	0.030510	99.98602	0.013977
12	0.030975	99.95172	0.048282
13	0.031519	99.86500	0.134997
14	0.032263	99.71717	0.282829
15	0.033282	99.53079	0.469213
16	0.034572	99.35276	0.647243
17	0.036039	99.22697	0.773027
18	0.037536	99.16934	0.830657
19	0.038928	99.16666	0.833340
20	0.040136	99.19314	0.806862

5. Conclusion

The paper is written to accomplish two objectives: First, to test for the existence of a relationship between the uncertainty associated with the past variability (uncertainty) of the money growth and the stock prices. Second, to determine if there are any long-run dynamic relationships between uncertainty in monetary aggregate and stock prices in Indonesia. Through the analysis that has been conducted, it is found that the variability of the past values of money growth has no significant long-run relationship with stock prices, as evident by the lack of co-integration between the moving average of standard deviation for monetary growth and stock prices. This finding rejects the proposition made by Boyle (1990) who argues that changes in uncertainty regarding money stock will affect stock prices thus implying a negative relationship.

However, using Johansen (1991) co-integration analysis, the long-run relationship between the uncertainty of the two variables is detected. This finding conforms to the suggestion that monetary policy has real and quantitatively important effects specifically on the Indonesian economy since uncertainty in the monetary aggregate, is reflected in the uncertainty in stock prices which proxy the economic. The extent of the relationship is further substantiated from the VECM testing. It was shown in the testing, that monetary uncertainty indeed granger cause stock prices variability. In addition our variance decomposition procedures are also pointed in the same direction.

Such relationship discovery on the Indonesian Stock Market has several implications. First, with respect to stock market investors since past information of monetary growth uncertainty does not seem to influence the contemporary stock prices, it nonetheless is consistent with the concept of efficient market. Therefore no trading strategy can be developed based on money growth uncertainty information. On the other hand, because money growth uncertainty does influence the stock market that proxy the economy in the long run, attention of policy makers should be focused on how the monetary policy is conducted. Friedman (1983, 1984) did mentioned about the detrimental effect of monetary growth uncertainty. For the policy makers of the country, unless something is done to remedy the situation, the disaster of 1979-1982 brought upon by a monetary experiment could be repeated in this country as well.

References

1. Boyle, G.W. Money Demand and The Stock Market in The General Equilibrium Model and Variable Velocity. *Journal of Political Economy*, 1990. No. 98. pp.1039-53.
2. Brunner, K. Some Major Problems in Monetary Theory. *American Economic Review Proceedings*, 1961. pp. 47-56.
3. Dickey, D.A. and Fuller. "Distribution of the Estimator for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, 1979. No. 74. pp. 427-31
4. Engle, R.F. and Granger, C.W.J. Co-integration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 1987. No. 55. pp. 251-76.
5. *Eviews 3: User's Guide*, Irvine, California: Quantitative Micro Software. 1994-1998. 2nd Edition
6. Friedman, M. The Lag Effect of Monetary Policy. *Journal of Political Economy*, 1961. pp. 447-66.
7. Friedman, M. and Schwartz, A. Money and Business Cycle. *Review of Economics and Statistic Supplement*, 1963. pp. 32-64.
8. Friedman, M. Monetary Variability: United States and Japan. *Journal of Money Credit and Banking*, 1983. No 15. pp. 339-43.
9. Friedman, M. Lessons From 1979-1982 Monetary Experiment. AEA Papers and Proceedings, May 1984, pp. 397-400.
10. Ghazali, N.A. and Yakob, N.A. Money Supply and Stock Prices: The Case of Malaysia. Proceedings Seminar Antarabangsa Managing Growth and Changes, Bengkulu, Indonesia, 1997. pp. 605-617.
11. Hashemzadeh, N. and Taylor, P. Stock Prices, Money Supply and Interest Rates: The Question of Causality. *Applied Economics*, 1988. No 20. pp. 1603-11.

12. Hicks, G. The Indonesian Inflation and Stock Market. *Philippine Economic Journal*, 1996. No 6. pp. 210-24.
13. Johansen, S. and K. Juselius. The Full Information Maximum Likelihood Procedure for Inference on Co-integration – With Application to The Demand of Money. *Oxford Bulletin of Economics and Statistics*, 1990. No 55. pp. 169-210.
14. Johansen, S. Estimation and Hypothesis Testing of Co-integration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, 1991. No 59. pp. 1551-80.
15. Masih, A.M.M and Masih, R. Investigating the Robustness of Tests of The Market Efficiency Hypothesis: Contributions From Co-integration Techniques on the Canadian Floating Dollar. *Applied Financial Economics*, 1995. No 5. pp. 139-50.
16. Masih, A.M.M and Masih, R. Macroeconomic Activity Dynamics and Granger Causality: New Evidence From a Small Developing Economy Based on a Vector Error-Correction Modeling Analysis. *Economic Modeling*, 1996. No 13. pp. 407-26.
17. Mak, B.S.C. and Cheung, D.W.W. Causality Test of the United States Weekly Money Supply and Asian Pacific Stock Market. *Asia Pacific Journal of Management*, 1991. No 9. pp. 252-60.
18. Parikh, A., Booth, A. and Sundram, R.M. An Econometric Model of Monetary Sector of the Indonesian Economy. *Journal of Development Studies*, 1994. No 21. pp. 406-19.
19. Phillips, P.C.B. and Perror, P. Testing for Unit Root in Time Series Regression. *Biometrika*, 1988. No 75. pp. 335-46.
20. Rogalski, R.J. and Vinso J.D. Stock Returns, Money Supply and The Direction of Causality. *The Journal Of Finance*, 1977. No 32. pp. 1017-30.
21. Ross, S.A., Westerfield, R.W. and Jordan, B.D. *Fundamentals of Corporate Finance*, 1995. 3rd Edition. Chicago, Illinois: Rirchard Irwin Inc.
22. Rozeff, M.S. Money and Stock Prices: Market Efficiency and The Lagged Effect of Monetary Policy. *Journal of Financial Economics*, 1974. pp. 245-302.
23. Sprinkel, B.W. *Money and Stock Prices*. 1964. Chicago, Illinois: Homewood, Richard Irwin Inc.
24. Sims, C. Policy Analysis With Econometric Models. Brookings Paper on Economic Activity, 1982. No. 1. pp. 107-52.
25. The Central Bank of Indonesia. *Indonesia Annual Economic Report 2001*.
26. Thorbecke, W. On Stock Market Returns and Monetary Policy. Working Paper, 1995. No. 139, April 1995, The Jerome Levy Economics Institute of Bard College.