Economic Forces and the Thai Stock Market, 1993-2007

Jiranyakul, Komain

National Institute of Development Administration

December 2009

NIDA Economic Review, Vol. 4, No. 2 (December 2009)

Economic Forces and the Thai Stock Market, 1993-2007

Komain Jiranyakul
School of Development Economics
National Institute of Development Administration
Bangkok 10240,Thailand
Email: komain_j@hotmail.com

Abstract: This study examines the relationship between stock market index and macroeconomic variables in Thailand. The results from Johansen cointegration test shows that the variables are cointegrated. Thus there exists a long-run relationship between the stock market index and a set of four macroeconomic variables. Real GDP, money supply, and nominal effective exchange rate significantly impose a positive impact on the stock market index while the price level insignificantly imposes a negative impact. The financial crisis in 1997 has no influence on stock prices. The causality test results from an error correction model show bidirectional causal relations between stock market return and the growth rate in the long run and the short run.

Keywords: Stock market returns, macro variables, unit root, cointegration, causality
JEL Classification: G19, C22

1. Introduction

Earlier study by Fama (1981) indicates that most economic factors, except inflation, exhibit a positive correlation with the stock market index. Chen, Roll and Ross (1986) employ a multivariate arbitrage pricing theory (APT) to analyze the relationship between the market returns and macroeconomic factors, which include industrial production, money supply, inflation, and interest rate and exchange rate variables. The results show a strong relationship between the market returns and these variables. Hamao (1988) finds that inflationary expectations cause a change in the risk premium in the stock market and these variables have a significant impact on stock returns in the Japanese market. On the contrary, Fung and Lie (1990) find that the response of the stock market index to changes in domestic production and money supply was weak in Korea. Dhakal, Kandil, and Sharma (1993) use a vector autoregression (VAR) model to test the impact of a change in the money supply on a change in the stock market index under a money market equilibrium condition. They observe a significant relationship between these two variables in the United States. Abdullah and Haywarth (1993) also find that a change in the market index was caused by the rate of inflation and by the change in the money supply. Rapach (2001) examines the effects of money supply, aggregate spending, and aggregate supply shocks on real U.S. stock prices by employing a structural VAR model. The main finding is that real stock returns are negatively correlated with inflation.

Recently, many researchers employ multivariate cointegration tests to examine the long-run relationships between the stock market index and various macroeconomic variables. Gallinger

(1994) indicates the existence of the linkage between stock returns and economic activity for the U.S. stock market. Mookerjee and Naka (1995) find the existence of long-run relationships between stock prices and various macroeconomic variables in the Japanese stock market. Choi, Hauser, and Kopecky (1999) find the same relationship in the G-7 stock markets. Mookerjee and Yu (1997) further find that not all macroeconomic variables are cointegrated with stock prices in Singapore, which is a small open economy. Cheung and Ng (1998) show evidence of cointegration between stock market indices and various macroeconomic variables, including oil prices. The long-run relationship between stock market returns and several macroeconomic variables also exists in South Korea as indicated by Kwon and Shin (1999). However, the stock market indices are not leading indicators of macroeconomic variables, such as the production index, money supply, exchange rate, and the trade balance. In the case of Malaysia, Ibrahim (1999) finds that stock prices are related with consumer prices, credit aggregates, and official reserves in the long-run.

Emerging stock markets are partially segmented from global capital markets. Therefore, local factors rather than global factors should be the primary source of the movement in stock returns in these markets. Bilson, Brailsfor, and Hooper (2001) find moderate evidence that supports the notion that local macroeconomic variables have explanatory power over stock returns in emerging stock markets. Also, there is evidence that similar factors affect stock market returns in the same region. The results of Wongbangpo and Sharma (2002) show that there exists bidirectional causality between stock prices and macroeconomic variables in the ASEAN-5 countries (Indonesia, Malaysia, the Philippines, and Thailand). Hooker (2004) finds that financial factors rather than macro factors are significant preditors of excess returns in emerging markets. There can be disparity in the advanced stock markets. For example, Humpe and Macmillan (2007) find that stock prices are positively related to industrial production and negatively related to the consumer price index and interest rate in the US. However, stock prices are influenced positively by industrial production and negatively by money supply in Japan. They suspect that the slump in the Japanese economy during 1990s might be the cause of the contrating results.

The Thai stock market (the Stock Exchange of Thailand) is one of emerging stock markets in Asia. Since the financial liberalization in 1992, capital flows to the market in terms of portfolio investment has been in a rising trend under the fixed exchange rate regime. However, the large current account deficits due mainly to trade deficits have been observed. The financial crisis in July 1997 caused the adoption of flexible exchange rate regime. This regime caused huge exchange rate fluctuations, and the fluctuations subsided after one or two years. This could distort the portfolio investment by foreign investors, which accounted for a large percentage in stock trading.

The main purpose of this study is to examine the impact of macroeconomic variables on the Thai stock market index using quarterly data from 1993 to 2007. In particular, this study tests for cointegration between economic forces and stock index. Section 2 presents the data and methodology. Section 3 presents empirical results. Section 4 presents concluding remarks.

2. Data and Methodology

The stationary property of time series data is crucial in using cointegration tests. In what follows, the data, the model and estimation methods are described.

2.1 Data

The Bank of Thailand Economic Bulletin provides quarterly data on real GDP, the consumer price index (price level), narrow money supply (M1), and nominal effective exchange rate (NEER) from the first quarter of 1993 to the fourth quarter of 2007. The price level series are adjusted to the base period of 1998. Data used for the stock market index are obtained from Stock Exchange of Thailand.

2.2 Empirical Model

Stock market index can be affected by various macroeconomic variables, i.e., real GDP, price level, nominal effective exchange rate, money supply, and oil prices. The functional form of multiple regression that is widely used in empirical studies is:

$$LP_t = a_0 + a_1 LY_t + a_2 LCPI_t + a_3 LM1_t + a_4 LEX_t + e_t \tag{1}$$

where LP_t denotes the logarithim of stock prices measured by the stock market index of overall market value of listed stocks in the Stock Exchange of Thailand. This is the sum of market value (share outstanding multiplied by market price) of all stocks being traded. A change in the index represents capital gains/losses. Rate of return (ΔLP) is measured as the sum of capital gains/losses for each period. Dividends are not included in computing the one-period rate of return. LY_t is the logarithm of real GDP, a measure of real economic activity. $LCPI_t$ is the logarithm of the consumer price index, a measure of price level. $LM1_t$ is the logarithm of the narrow definition of money supply. LEX_t is the logarithm of the nominal effective exchange rate, and e_t is a disturbance term.[1]

Some economic forces (macroeconomic variables) in the economy may play a major role in affecting the stock market index. In particular, a different period of time can capture different responses of stock prices to varying levels of macroeconomic activity. Real GDP should impose a positive impact on stock prices while price level may impose a positive or a negative impact on stock prices as this issue is still controversial. Nominal effective exchange rate should have a negative relation to stock prices since a depreciation of domestic currency (Thai baht) can deter portfolio investment of foreign investors, which will cause stock prices to fall. However, this relationship is unclear because it can also improve a country's trade balance and thus stimulate growth that can cause stock prices to rise. The relationship depends on the relative strength of the two effects. Money supply is expected to have a positive impact on stock prices since an increase in money supply will lower the borrowing rate and cause investors to borrow more to invest in

[1] The international oil prices variable is not included in the model since the OLS estimate shows that it is insignificant.

stocks and thus cause stock prices to increase.

When Thailand experienced financial crisis, the policy makers shifted from a fixed foreign exchange rate regime prior to the crisis to a flexible rate regime after the crisis. Policy makers became more prudent in exercising monetary policy tools. The cointegration test indicates the presence or absence of long-run equilibrium relationships among variables. Cointegration among variables may or may not exist due to changes in their orders of integration when the regime shifts. Therefore, the dummy variable that captures the impact of financial crisis may deem necessary.[2]

2.3 Estimation Procedure

In practice, the most widely used method of estimation is based on the condition that many economic variables are known to be integrated of order one or I(1), with or without cointegration. The PP unit root test (Phillips and Perron, 1988) for time series is performed to determine the order of integration of each variable. Furthermore, cointegration test is conducted to determine whether the stock market index and a set of macroeconomic factors are cointegrated. If cointegration exists, there exist a long-run relationship among the variables in question.

The relationship between the stock prices and crucial macroeconomic variables in equation (1) can be applied if all variables are stationary in level. If they are not stationary in level, but stationary in first differences, they may or may not be cointegrated. If they are cointegrated, the error correction mechanism (ECM) can be used to determine the short- run deviation from the long-run equilibrium. If they are not cointegrated, the Granger causality can be employed to investigate the direction of causation.

The two-step Engle and Granger (EG) cointegration test is discussed in details by Engle and Granger (1987). In brief, cointegration determines if the linear combination of two variables is stationary. The series are cointegrated or have a long-run relationship if there exists a linear combination of these series. The test can also apply to multivariate cases. In this study, there are more than two variables in the equation, as specified in equation (1). If all variables are I(1), there may be long-run relationship between these variables. Therefore, the first step of cointegration test is to use OLS in equation (1).

From the first step, the residual series is obtained from the estimate of equation (1) to test for unit root using both Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests specified by the equations (2) and (3) below.

$$\Delta e_t = \rho e_{t-1} + \varepsilon_t \quad (2)$$

$$\Delta e_t = \rho e_{t-1} + \beta \Delta e_{t-1} + \varepsilon_t \quad (3)$$

[2] The financial dummy takes the value of one after the financial crisis, and zero before the financial crisis.

In case cointegration exists, there will not be a unit root in the residual series, i.e., the residual series are stationary. Therefore, equation (1) will show the long-run relationship between stock prices (market index) and macroeconomic variables.

The short run relationship can be expressed as

$$\Delta y_t = A + B(L)\Delta y_{t-1} + \lambda^{/} e_{t-1} + \nu_t \tag{4}$$

where Δy_t = k × 1 vectors of variables,
A = k × 1 vectors of constants,
B(L) = k × k matrix of the polynomial expression in the lag operator (L),
e_{t-1} = k × 1 vectors of error correction terms,
ν_t = k × 1 vectors of residuals.

The hypothesis to be tested is Ho : B(L) = 0, and $\lambda^{/} = 0$. This is a vector error correction model (VECM) provided by Engle and Granger (1987). The error correction terms (ECTs) in equation (4) is e_{t-1}. The estimated coefficients from these terms can tell whether any deviation from long-run equilibrium will be corrected.

The Johansen (1988, 1991) cointegration test employs the maximum likelihood procedure to determine the existence of cointegrating vectors in nonstationary time series as a vector autoregressive (VAR) in the form as indicated in equation (2)[3]. The AR(p) model under the assumption of cointegration of order p can be expressed as

$$\Delta y_t = \mu + \Gamma_1 \Delta y_{t-1} + \dots\dots\dots + \Gamma_{t-p-1} + \alpha\beta^{/} y_{t-1} + e_t \tag{5}$$

where y_t is a vector of nonstationary variables, Γ_i is the matrix of short-run parameters, and $\alpha\beta^{/}$ is the information on the coefficient matrix between the levels of the series.

The relevant elements of the α matrix are adjusted coefficients and the β matrix contains the cointegrating vectors. According to Johansen and Juselius (1990), there are two likelihood ratio test statistics to test for the number of cointegrating vectors, i.e., the maximum eigenvalue statistic and the trace statistic. The two test statistics are compared with the critical values. If the maximum eigenvalue statistic and the trace statistic are greater than the critical values, cointigrating relation(s) will be present. The Johansen procedure bases on the error correction mechanism (ECM) representation of the vector autoregressive model.

In functional form, the error-correction model ECM can be expressed as

$$\Delta LP_t = \alpha_1 + \sum_{i-1}^{p} [\beta_{1i} \Delta LP_{t-i} + \gamma_{1i} \Delta LY_{t-i} + \delta_{1i} \Delta LCPI_{t-i} + \phi_{1i} \Delta LM1_{t-i} + \varphi_{1i} \Delta LEX_{t-i}] + \lambda e_{t-1} + u_{1t} \tag{6}$$

[3] The model is also called 'reduced rank model'.

$$\Delta LY_t = \alpha_2 + \sum_{i-1}^{p}[\beta_{2i}\Delta LP_{t-i} + \gamma_{2i}\Delta LY_{t-i} + \delta_{2i}\Delta LCPI_{t-i} + \phi_{2i}\Delta LM1_{t-i} + \varphi_{2i}\Delta LEX_{t-i}] + \lambda_2 e_{t-1} + u_{2t} \quad (7)$$

$$\Delta LCPI_t = \alpha_3 + \sum_{i-1}^{p}[\beta_{3i}\Delta LP_{t-i} + \gamma_{3i}\Delta LY_{t-i} + \delta_{3i}\Delta LCPI_{t-i} + \phi_{3i}\Delta LM1_{t-i} + \varphi_{3i}\Delta LEX_{t-i}] + \lambda_3 e_{t-1} + u_{3t} \quad (8)$$

$$\Delta LM1_t = \alpha_4 + \sum_{i-1}^{p}[\beta_{4i}\Delta LP_{t-i} + \gamma_{4i}\Delta LY_{t-i} + \delta_{4i}\Delta LCPI_{t-i} + \phi_{4i}\Delta LM1_{t-i} + \varphi_{4i}\Delta LEX_{t-i}] + \lambda_4 e_{t-1} + u_{4t} \quad (9)$$

$$\Delta LEX_t = \alpha_5 + \sum_{i-1}^{p}[\beta_{5i}\Delta LP_{t-i} + \gamma_{5i}\Delta LY_{t-i} + \delta_{5i}\Delta LCPI_{t-i} + \phi_{5i}\Delta LM1_{t-i} + \varphi_{5i}\Delta LEX_{t-i}] + \lambda_5 e_{t-1} + u_{5t} \quad (10)$$

The coefficient of the error-correction term (e_{t-1}) captures the long-run adjustment while the short-run dynamics are depicted by the coefficients of the lagged values of the first difference terms in equations (6) to (9).

3. Empirical Results

The OLS estimate of equation 1 shows that the estimated coefficient of international oil prices is insignificant and this variable is not included in the model. The results of unit root tests before going to cointegration test are reported in Table 1.

Table 1 Results of PP test for unit root

Level of series	PP test (constant)	Optimal bandwidth
LP	-1.408 (0.572)	3
LY	-0.370 (0.907)	26
LCPI	-1.794 (0.380)	3
LM1	-0.969 (0.759)	20
LEX	-1.704 (0.424)	4
First difference of series	PP test (constant)	Optimal bandwidth
ΔLP	-8.573 (0.000)	3
ΔLY	-8.012 (0.000)	21
ΔLCPI	-9.917 (0.000)	2
ΔLM1	-14.478 (0.000)	36
ΔLEX	-6.170 (0.000)	8

Note: The number in parenthesis is the probability of accepting the null hypothesis of unit root provided by MacKinnon (1996).

The PP tests in Table 2 show that all variable are integrated of order one, I(1)[4]. In other words, they are non-stationary at level, but are stationary in first difference. The next step is to employ EG conintegration test and the results are shown in Table 2.

Table 2 Results of EG cointegration test

Panel A: Without financial dummy

$LP_t = -0.702 + 2.149LY_t - 4.677\, LCPI_t + 0.938LM1_t + 1.891LEX_t + e_t$

(-0.866) (2.503)** (-6.234)*** (1.982)* (4.143)***

$R^2 = 0.814$ D-W = 0.899 Log Likelihood = 4.258

DF: $\Delta e_t = -0.453e_{t-1}$

(-4.130)

$R^2 = 0.227$ D-W = 1.852

ADF: $\Delta e_t = -\ 0.503e_{t-1} + 0.121\Delta e_{t-1}$

(-3.977) (0.907)

$R^2 = 0.234$ D-W = 1.981

Panel B: With financial dummy

$LP_t = -1.598 + 2.298LY_t - 5.145\, LCPI_t + 0.967LM1_t + 2.281LEX_t + 0.204D + e_t$

(-0.354) (2.522)** (-4.368)*** (2.016)** (2.581)** (0.517)

$R^2 = 0.815$ D-W = 0.916 Log Likelihood = 4.407

DF: $\Delta e_t = -0.462e_{t-1}$

(-4.187)

$R^2 = 0.232$ D-W = 1.802

ADF: $\Delta e_t = -\ 0.534e_{t-1} + 0.167\Delta e_{t-1}$

(-4.214) (1.265)

$R^2 = 0.249$ D-W = 1.953

Note: The number in parenthesis is t-statistic. ***, **, and * denote significance at the 1, 5 and 10 percent respectively. D is the financial dummy that takes the value of one after the second quarter of 1997 and zero otherwise.

The results in Table 2 show that there exists no long-run relationship between the stock market index (or stock prices) and the four macroeconomic factors: real GDP (LY), money supply (LM1), nominal effective exchange rate (LEX), and price level (LCPI). Real GDP, nominal effective exchange rate and money supply positively influenced stock market index while the price level negatively influenced the stock market index. The non-existence of cointegrating relation in both panels A and B is obtained from the t-statistics of the coefficients of lagged cointegrated residuals from DF and ADF tests which are -4.130 and -3.977 for the equation without financial dummy variable and -4.187 and -4.214 when the financial dummy is included. The absolute values of these coefficients are lower than the critical values provided by Engle and Yoo (1987). Therefore, the results indicate that the null hypothesis of no cointegration is accepted, implying that the Thai stock market index is not cointegrated with the combination of the four macroeconomic variables when EG cointegration technique is used. However, financial crisis does not affect stock prices as shown in panel B.

[4] The ADF test proposed by Dickey and Fuller (1981) is also performed, and the results are similar to the PP test.

In the what follows, Johansen cointegration test is performed as an alternative[5]. The VAR(p) model of five variables along with the financial crisis dummy is used to determined the optimal lag order.[6] Based upon the modified LR test and the final prediction error (FPE) criterion, the optimal lag length is four. The results from Johansen cointegration test are reported in Table 3.

Table 3 Results of Johansen cointegration tests

Null hypothesis	Trace statistic	Maximum eigenvalue statistic
r=0	109.769*** (69.819)	46.884*** (33.877)
r≤1	62.885*** (47.856)	33.395*** (27.584)
r≤2	29.489 (29.797)	16.024 (21.132)
r≤3	13.466 (15.495)	9.445 (14.265)

Note: The number in perenthesis is the 5 percent critical value. *** denote significance at the 1 percent level.

The question is whether all five variables enter into the VAR(p) model exhibit a long-run equilibrium relationship. The likelihood ratio test, which is asymptotically distributed as Chi-square with 5 degree of freedom, shows that there are two cointegrating equations as can be seen from the trace and maximum eigenvalue statistics with the significance level of at least 5 percent. Normalizing on the stock prices variable (LP) gives the estimates shown in Table 4.

Table 4 Estimates of the long-run relationship

Variable	Estimated coefficient	t-statistic
LY	75.596***	6.402
LCPI	-1.210	-0.255
LM1	37.395***	6.170
LEX	30.368***	5.385

Note: Dependent variable is LP. *** denotes significance at the 1 percent level.

The stock market index (LP) is positively related to real GDP, narrow money supply (M1), and nominal effective exchange rate (EX). It is negatively related to the price level (CPI), but the coefficient is not significant. The important results in Table 4 are two folds: first, an increase in real GDP causes the stock market index to increase, and second, depreciation in nominal exchange rate causes the stock market index to increase. The first important result plies that stock returns are positively affected by the economic growth rate.

Having established a valid long-run relationship among the five variables in the model, the next step is to detect the direction of long-run and short-run Granger causality among first differences of the variables. According to the Granger representation theorem, the cointegrating relationship found in Table 3 implies that an error-correction model (ECM) exists. The estimated coefficients of the error-correction term (ECT) are reported in Table 5. These coefficients capture the

[5] Many researchers believe that this method is superior to EG cointegration test.
[6] The coefficient of financial crisis dummy is significant only in the equation of exchange rate (LEX), which is not of much interest in this study.

adjustment to the long-run equilibrium while the short-run dynamics are described by the coefficients on the lagged values of the first-differenced terms. The results in Table 5 indicate only two significant coefficients of the ECT in the ΔLP and ΔLY equations. This implies that stock prices and real GDP adjust to the long-run equilibrium while price level, money supply, and nominal effective exchange rate do not.

Table 5 Results of short-run dynamics and long-run Granger causality

Variable	ΔLP	ΔLY	ΔLCPI	ΔLM1	ΔLEX
ECT	-0.084**	0.016***	-0.001	-0.005	-0.012
(e_{t-1})	(-2.626)	(4.127)	(-0.388)	(-0.536)	(-1.179)

Note: The number in perenthesis is t-statistic from VECM. ***, ** denote significance at the 1 and 5 percent level respectively.

The results of the Granger causality test from the short-run dynamics are shown in Table 6.

Table 6 Short-run dynamics [results of the Granger causality tests for equations (6)-(10)]

Dependent variable	ΔLP	ΔLY	ΔLCPI	ΔLM1	ΔLEX
Coefficient of	na.	11.495**	0.647	3.167	5.487
lagged ΔLP		(0.022)	(0.958)	(0.530)	(0.241)
Coefficient of	8.393*	na.	2.478	8.794*	2.922
lagged ΔLY	(0.078)		(0.649)	(0.067)	(0.571)
Coefficient of	4.061	1.873	na.	0.450	0.386
lagged ΔLCPI	(0.398)	(0.759)		(0.978)	(0.948)
Coefficient of	7.679	12.918**	0.716	na.	2.822
lagged ΔLM1	(0.104)	(0.016)	(0.949)		(0.588)
Coefficient of	17.579**	14.296***	1.124	3.885	na.
lagged ΔLEX	(0.015)	(0.006)	(0.622)	(0.422)	

Note: The number is $\chi^2_{(4)}$ of the Wald test, and the number in parenthesis is the p-value. The term 'na.' stands for 'not applicable'. ***,**, and * denote significance at the 1, 5, and 10 percent respectively.

The results from the short-run dynamics of equations (6)-(10) indicate the existence of the short-run causation from a change in real GDP (growth rate) to stock market return, and vice versa. This is the case of bidirectional causality. In other words, the economic growth rate is a leading indicator of the stock market return, and the stock market return is a leading indicator of economic growth. There is no causation running from inflation (a change in consumer price index) to stock market return or to the economic growth rate. However, there is one-directional causation running from the growth rate of money supply (M1), and a change in nominal effective exchange rate to the economic growth rate, and a change in exchange rate to stock market return. It is believed that what routinely occurs in a well-developed stock market, like that of the US or Japan, may not appear in an emerging stock market. This might not be true in all cases of developing countries. For example, the present study shows that if real economic activity is correctly chosen, i.e., real GDP instead of industrial production, there exists a close relationship between stock market return and economic growth. Also noteworthy is the evidence showing that besides domestic factors, foreign factor, such as exchange rate that is partly determined by external forces affect stock market index.

4. Concluding Remarks

This study examines the relationship between the stock market index and four macroeconomic variables in Thailand. The Phillips and Perron (PP) test is used to test for unit roots in the variables in question. EG and Johansen cointegration tests of the relationship between the stock market index and the four macroeconomic variables are performed, and the financial crisis dummy is used to detect its impact. The results show that cointegation does not exist using EG cointegration test, but it exists using Johansen cointegration test. Based upon Johansen cointegration test that gives the contrasting results to EG cointegration test, there are two conintegrating equations. The existing literature indicates that economic activity measured by industrial production (or real GDP) has a strong and positive effect on the stock market index. Money supply has a positive influence on stock market index while inflation has a negative impact. Furthermore, nominal exchange rate had been found to adversely affect stock market index. Conforming to these findings based upon the results from Johansen cointegation test, this study has found cointegration between stock market index and the four macroeconomic variables. The financial crisis imposes no impact on the long-run relationship. However, bidirectional causality between stock market return and economic growth is clearly observed. It should be noted that real GDP is used instead of industrial production index since Thailand is not classified as an industrialized country.

This paper adds to the literature concerning the long-run relationship between the stock market index and macroeconomic variables. First, no existing empirical studies that investigate this relationship in emerging stock markets using a unit root and cointegration tests that find the results similar to those of the advanced stock markets, the US and Japan stock markets for example. Second, in the presence of cointegration during the period of investigation, the Granger causality test from an error-correction model yields different results from the existing literature, i.e. there is bidirectional causality between economic growth and stock market return in an emerging stock market. In summary, real GDP is an indicator of stock market expansion, and vice versa. The estimated results should be stable and statistically acceptable since well-known and acceptable econometric methods were employed in the analysis. Additionally, understanding the stock market reaction to various macroeconomic variables over time should provide valuable insight to both practitioners and researchers. For example, stock market return can be employed as a leading indicator of economic activity.

References

Abdullah, D. A. and Hayworth, S. C., (1993). Macroeconometrics of stock price fluctuations. **Quarterly Journal of Business and Economics**, 32, 49-63.

Bilson, C. M., Brailsford, T. J., and Hooper, V. J., (2001). Selecting macroeconomic variables as explanatory factors of emerging stock market returns. **Pacific-Basin Finance Journal** 9, 401-

426.

Chen, N. F., Roll, R., and Ross, S. (1986). Economic forces and the stock market. **Journal of Business** 59, 383-403.

Cheung, Y. and Ng, L. K., (1998). International evidence on the stock market and aggregate economic activity. **Journal of Empirical Finance** 5, 281-296.

Choi, S., Hauser, S., Kopecky, K. L., (1999). Does the stock market predict real activity? Time series evidence from the G-7 countries, **Journal of Banking and Finance** 23, 1771-1792.

Chung, S. K. and Tai, S. S., (1999). Cointegration and causality between macroeconomic variables and stock market returns. **Global Finance Journal** 10, 71-81.

Dhakal, D., Kandiland, M., and Shama, S., (1993). Causality between money supply and share prices: A VAR investigation. **Quarterly Journal of Business and Economics**, 32, 52-74**.**

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

Engle, R. F., and Granger, C. W. J., (1987). Co-integration and error correction: representation, estimation and testing, **Econometrica** 49, 1057-1072.

Engle, R. F., and Yoo, B. S., (1987). Forecasting and testing in cointegrated systems, **Journal of Econometrics** 35, 143-159.

Fama, E. F. (1981). Stock return, real activity, inflation, and money. **American Economic Review** 71, 545-565.

Fung, H. G. and C. J. Lie (1990). Stock market and economic activity: A causal analysis. In S. L. Rhee & R. P. Chang (Eds.), **Pacific-Basin Capital Markets Research**, Amsterdam: North-Holland.

Gallinger, G. W., (1994). Causality tests of the real stock return-real activity hypothesis. **Journal of Financial Research** 17, 271-288.

Hamao, Y. (1988). An empirical examination of the arbitrage pricing theory using Japanese data. **Japan and the World Economy**, 1, 45-61.

Hooker, M. A., (2004). Macroeconomic factors and emerging market equity returns: A Baysian model selection approach. **Emerging Market Review** 5, 379-387.

Humpe, A., and Macmillan, P., (2007). Can macroeconomic variables explain long term stock market movements? A comparison of the US and Japan. **CDMA Working Paper Series**, No. 0720.

Ibrahim, M. H. (1999). Macroeconomic variables and stock prices in Malaysia: An empirical analysis. **Asian Economic Journal** 13, 219-231.

Johansen, S., (1988). Statistical analysis of cointegration vectors. **Journal of Economic Dynamics and control** 12, 231-254.

Johansen, S., (1991). Estimation and hypothesis testing for cointegration vectors in Gaussian vector autoregressive models. **Econometrica** 59, 1551-1580.

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

Kwon, C. S. and Shin, T. S., (1999). Cointegration and causality between macroeconomic variables and stock market return. **Global Finance Journal** 10, 78-81.

MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. **Journal of Applied Econometrics** 11, 601-618.

Mookerjee, T. K. and Naka, A., (1995). Dynamic relations between macroeconomic variables and the Japanese stock market: An application of a vector error-correction model. **Journal of Financial Research** 18, 223-237.

Mookerjee, R. and Yu, Q., (1997). Macroeconomic variables and stock prices in a small open economy: The case of Singapore. **Pacific-Basin Finance Journal** 5, 377-388.

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

Rapach, D.E. (2001). Macro shocks and real stock prices. **Journal of Economics and Business**, 53, 5-26.

Wongbangpo, P., and Sharma, S. C., (2002). Stock market and macroeconomic fundamental dynamic interactions: ASEAN-5 countries. **Journal of Asian Economics** 13, 27-51.