African Journal of Business Management Vol.3 (3), pp. 095-106, March, 2009
Available online at http://www.academicjournals.org/AJBM
ISSN 1993-8233 © 2009 Academic Journals

Full Length Research Paper

Macroeconomic determinants of Malaysian stock market

Aisyah Abdul Rahman[1]*, Noor Zahirah Mohd Sidek[2] and Fauziah Hanim Tafri[3]

[1]Faculty of Economics and Business, Universiti Kebangsaan Malaysia (UKM), 43600, Bangi, Selangor, Malaysia.
[2]Faculty of Business and Management, Universiti Teknologi MARA (UiTM), 08400, Sg Petani, Kedah, Malaysia.
[3]Faculty of Information Technology and Quantitative Science, Universiti Teknologi MARA (UiTM), 41450, Shah Alam, Selangor, Malaysia.

Accepted 27 January, 2009

This study explores the interactions between selected macroeconomic variables and stock prices for the case of Malaysia in a VAR framework. Some conventional econometric techniques are applied along with a battery of complementary tests to trace out both short and long run dynamics. Upon testing a vector error correction model, we show that changes in Malaysian stock market index do perform a co-integrating relationship with changes in money supply, interest rate, exchange rate, reserves and industrial production index. Our lag exclusion test shows that all six variables contribute significantly to the co-integrating relationship. This shows that the Malaysian stock market is sensitive to changes in the macroeconomic variables. Furthermore, based on the variance decomposition analysis, this paper highlights that Malaysian stock market has stronger dynamic interaction with reserves and industrial production index as compared to money supply, interest rate, and exchange rate.

Key words: Stock market determinants, VAR, macroeconomic variables.

INTRODUCTION

The growing linkages between macroeconomic variables and the movement of stock prices for the developed countries have well been documented in the literature over the last several years (Fama, 1981; Lee, 1992; Kaneko and Lee, 1995; Mukherjee and Naka, 1995; Booth and Booth, 1997; Mavrides, 2000; Maysami and Koh, 2000; Sadorsky, 2003; Chen, 2003). For studies in the developing countries, Chen and Kim (2005) examine the impact of macro and non-macro economic variables on the Chinese stock market with a special reference on the hotel stock return. In the Malaysian context, Ibrahim (2000), Ibrahim and Aziz (2003) and Janor et al. (2005) investigate the dynamic interactions between stock market and economic activities by conjecturing that the stock market leads the movement of macroeconomic variables. In contrast, this study aims to examine the determinants of the stock market behavior in Malaysia instead of the predictive role of the stock market itself. It is hoped that the finding of this study would provide some meaningful insights to the body of knowledge, policy makers as well as the practitioners. For the academic field, the results from this study should strengthen the theoretical framework of the determinants of stock market movement from the perspective of developing economies like Malaysia. For the policy implication, it is hoped that our findings would help the regulatory bodies to better understand the stock market behavior towards achieving the desired monetary goals. Last but not least, by know-ing which macroeconomic variables affect the stock mar-ket the most, both the personal and corporate investors would be able to proactively strategize their investments according to the change of the monetary policy.

The Malaysian stock market is of special interest as its unique features may trigger a different pattern of stock price movement either from the developed or other emerging economies. From the microeconomic perspective, the Market Efficiency Hypothesis (MEH) and dividend policy are the main issues that distinguish the Malaysian stock market behavior from other countries. For market efficiency hypothesis, Neoh (1989) concludes that the U.S stock market is more efficient than the Malaysian. His efficiency measure is based on the fundamental factor of asset pricing. As the U.S firms only takes into account the factors of true value in pricing their stocks, the Malaysian firms includes other non-fundamental factors like bonus issues, etc. Besides, unlike most of the

*Corresponding author. E-mail: eychah@ukm.my

the developed markets, the Malaysian stock market seems to be in the weak form of efficiency in the sense that it does not follow the random walk theory (Liew et al., 2003; Ibrahim and Abdul Rahman, 2003; Thong and Kok, 2003; and Balkiz, 2003). In terms of the dividend policy, an earlier study by Mansor and Subramaniam (1992) find that the Malaysian market responds to the dividend announcement, but such effect does not hold in a latter study by Yong et al. (2003). This suggests that the dividend signaling effect for the Malaysian stock market is sensitive to a different economic cycle. Unlike Malaysia, the dividend signaling model holds for almost all developed countries (Aharony and Swary, 1980; Eades, 1982; Kwan, 1981; Wooldridge, 1982; Lang and Litzenberger, 1989; Bajaj and Vijh, 1990; Yoon and Starks, 1994; Dennis and Sarin, 1994). From the macroeconomic perspective, studying the interaction of macroeconomic variables and the Malaysian stock market index is our primary interest because of three reasons;

i.) Malaysia pursues a trade-led approach to stimulate its economy.
ii.) Its equity market development is considered rapidly growing [One standard measure of the level of equity market development is the market capitalization to GDP ratio. According to the World Bank, the market capitalization to GDP ratio in 1990 (2000) for Malaysia is 110.4% (127.0%); for Singapore is 93% (165.6%); and for Japan is 96.1% (68.2%) Taken from Pan et al. (2007)].
iii.) Unlike developed countries, Malaysia does not adopt a freely exchange rate system and has more capital control (Pan et al., 2007).

Against these differences, studying the Malaysian context is important in order to provide a deeper understanding of this subject in enhancing a better decision making for the monetary policy.

In terms of the research methodology, we adopt the Vector Autoregressive (VAR) framework by initially looking at the long run and short run relationship between stock market and the macroeconomic variables via the co-integration technique, followed by the Variance Decomposition analysis and Impulse Response Function. The establishment of co-integration analysis has offered an empirical approach in analyzing the relationship between macroeconomic variables and the stock market. For instance, Granger (1986) has verified a long-term equilibrium existed between stock prices and macroeconomic variables via the co-integration approach. In addition to the standard co-integration approach, we also conduct the lag exclusion test to ensure that all variables in this study belong to the co-integrating space. Then, we proceed with the Johansen's vector error-correction model (VECM, hereafter) to further explore the dynamic comovement among the variables and the adjustment process towards the long run equilibrium. Finally, we conduct the Variance Decomposition analysis as well as impulse response function in order to gauge the importance of each macroeconomic variable to the stock market movement when a shock is imposed to the system.

Several factors motivate this study. First, prior studies on the determinants of stock return primarily focus on the well-developed markets with less attention given to the emerging markets. This paper examines the same issue for a developing economy, with a special reference to Malaysia for the period of study 1985 - 2008. Apart from using the latest data, we employ different macroeconomic variables that are considered as most relevant in the Malaysian context. Along with the typical economic variables (industrial production index, money supply, interest rate, and reserves), the exchange rate variable is incorporated. Even though, Pan et al. (2007) show that there is no co-integration between the exchange rate and the Malaysian stock market in the long run, their pair wise causality analysis reveals that a unidirectional causality exists from the exchange rate to the stock market in the short run. Their study differs from ours in at least twofold: 1) they examine using daily data from 1988 - 1997; 2) they adopt the pair wise Granger (1986) causality test. They provide two possible reasons for the insignificant co-integration relation: a managed floating exchange rate system may contribute to the lack of the existence of co-integration and it can also be due to the noise contained in daily data. Against this background, we reinvestigate the impact of exchange rate on stock market based on monthly data, longer time period that cover pegged and managed exchange rate system, and using VECM approach.

Second, in terms of research methodology, we provide rigorous statistical treatment in analyzing the issue. Apart from using the basic VECM approach, we incorporate the lag exclusion test to ensure that all variables belong to the co-integrating space. Besides, we also analyze the dynamic interactions amongst the variables through the Variance Decomposition and Impulse Response Function along with the diagnostic test.

Third, unlike most prior studies that focus on the predictive effect of stock market index in influencing the macroeconomic variables, we focus on the determinants of the stock market return from the perspective of macroeconomic activities. As a consequent, the underpinning theories in this study are different from those who investtigate the leading effect of stock market in forecasting the economic performances.

Finally, the findings of this study show that reserves and industrial production index are positively related while money supply and exchange rate are inversely related to the Malaysian stock market return in the long run. Interestingly, the result of exchange rate shows that the depreciation of the Malaysian Ringgit leads to an increase in the stock market return. The Malaysian stock market is vulnerable to external shock and development to the extent that depreciation of the Malaysian Ringgit increases the stock return. Also, it can be inferred that the Malaysian exporting firms benefit from the currency devaluation.

The remainder of this paper is organized as follows. Section 2 elaborates on the theoretical framework and literature review. Section 3 describes the methodology and data employed in this study while section 4 discusses the findings. Finally, section 5 concludes the paper.

Theoretical framework and review of literature

The theoretical framework of stock market and economic activity is based on Ross (1976), who introduces the Arbitrage Pricing Theory (APT) that links stock returns to several variables that characterize several sources of income volatility. The uniqueness of these variables depends on the models underlying assumptions. Initially the model was developed by assuming that investors have access to domestic securities only (Empirical evidence is provided by, *inter alia*, Cheung and Ng (1998) concluded that GDP, money supply, personal consumption, and petroleum price influenced stock prices in Canada, East Germany, Italy, Japan, and the United States). In recent years, this assumption is revised to incorporate possible integration with foreign market as a result of arbitrageurs who trade stocks internationally. This gives rise to development of international APT. Since then, many studies have looked into the 'exchange rate channel' of monetary policy transmission. Bracker et al. (1999) found that macroeconomic variables were significantly influenced by the extent of international stock market integration]. The interdependence in stock prices across countries reveals economic integration in the form of foreign direct investment and trade linkages. The dividend discount model postulates that the current share price equivalents the present value of future cash flows, which depends on the growth of a company. As a company's growth depends on domestic macroeconomic condition as well as its major trading partners, the co-movement of macroeconomic variables across countries may influence the comovement of stock prices in those countries. Consequently, apart from the traditional variables namely money supply, interest rate, inflation, and reserves, the exchange rate is also one of the macroeconomic factors that could influence stock prices especially in the developed countries.

Previous studies on the macroeconomic determinants of stock returns can be divided into two major categories. The first category is the study to determine the factors affecting stock prices such as Sadorsky (2003), Ibrahim and Aziz (2002), Chen (2003), Mavrides (2000) and Lee (1992). The second category is to examine factors determining stock return volatility such as in Beltratti and Morana (2006) and Schwert (1989). Both groups are different in terms of the research objectives, methodologies, and most importantly the implications of their findings can lead to different inferences. The former focuses on the stock return, which can be measured by the return on the market indices, sectoral indices or individual stocks. On the other hand, the latter is concerned with the volatility of the stock itself, which can be measured via autoregressive conditional heteroscedasticity (ARCH) model. Since our study falls under the first group, the following reviews of literature center on the dynamic interacttion between macroeconomic variables and the stock returns.

Schwert (1989), Koutoulas and Kryzanowski (1996), and Maysami and Koh (2000) show that changes in the macroeconomic variables can predict the stock market movements. As Schwert, Maysami and Koh, and Koutoulas and Kryzanoski study for the case of the U.S., Singapore, and Canada, it can be inferred that the significant influence of the macroeconomic variables on the stock market index is rather empirically proven for the developed countries. Nonetheless, the empirical finding for the case of the developing economies is still a puzzle. Despite the existence of a unidirectional causality from economic activities to stock market, there are also a substantial number of studies that show a significant relationship, running from stock market to economic variables. Among others, Fama (1981), Kaneko and Lee (1995), and Janor et al. (2005) offer evidence on this issue for the case of the U.S., Japanese and Malaysian stock markets, respectively. However, studies on the European market by Poon and Taylor (1991) and Gjerde and Saettem (1999) reveal insignificant relationships between stock market and macroeconomic variables, be it from stock market to economic activities and vice versa. Hence, three conclusions can be made. First, changes in the share prices are affected by the changes in macroeconomic performance in the well-developed markets, but results are inconclusive for the emerging markets. Secondly, the predictive role of stock market on macroeconomic activities is inconclusive for both the developed and emerging markets. Thirdly, whether there is a unidirectional or bidirectional relationship between macroeconomic performance and stock market returns for both developed and developing economies is still subject to further research.

While the association between stock market and economic activities is quite obvious regardless of its causality direction, a standardized set of macroeconomic variables is not found. Macroeconomic variables selected to examine the determinants of stock market tend to differ slightly across studies. Nevertheless, in general, Ibrahim and Aziz (2003), Booth and Booth (1997), Wongbangpo and Sharma (2002), Chen (2003), Chen et al. (2005), Maysami and Koh (2000), and Mukherjee and Naka (1995) reveal that the rate of inflation, money growth, interest rates, industrial production, reserves, and exchange rates are the most popular significant factors in explaining the stock market movement.

The macroeconomic variables per se not only affect the stock market returns, but the changes in the direction of monetary policy also have essential effect on the stock market. For instance, restrictive policies via higher interest rates or discount rates would make cash flows worth less after being discounted. This would reduce the attractiveness of investment, hence, shrinks the value of stock returns. From the 'substitution effect' hypothesis, a raise in the rate of interest increases the opportunity cost of holding cash, which later on leads to a substitution effect between stocks and other interest bearing securities like bonds. In summary, both the restrictive policy and the substitution effect hypothesis suggest that interest rate should be inversely related to stock market return. The common interest rate proxies are the treasury bills rates and the interbank rates as being employed by Mukherjee and Naka (1995), Maysami and Koh (2000), and Hooker (2004). Another new measure for the interest rate is the yield spread. Chen et al. (2005) adopt the yield spread to measure the term structure effect on the Taiwanese hotel stock returns. Their yield spread is derived from a subtraction of 10-year government bond yield and 3-month treasury bills rate. Their result shows that yield spread in not a significant determinant for stock prices. This could be due to the point highlighted by Mukherjee and Naka (1995) who propose that changes in both short and long term rates are expected to affect the discount rate in the similar way.

Another monetary policy tool is money supply. How the money supply affects the stock market returns is also a matter of empirical proof. According to conventional economic theory by Fama (1981), an increase in money supply leads to an increase in discount rates which in turn, lowers the price of stock, thus conferring a negative effect. However, Mukherjee and Naka (1995) argue that if an increase in money supply leads to economic expansion via increased cash flows, stock prices would benefit from economic growth lead by such expansionary monetary policy. In the case of Japan, the study shows that money supply is positively related to stock market. Consistently, Maysami and Koh (2000) support the view of Mukherjee and Naka (1995) for both long run and short run dynamic interaction between money supply and stock returns for the case of Singapore.

Besides interest rate and money supply, inflation can also affect the movement of stock prices. Theoretically, Asprem (1989) put forward that inflation should be positively related to stock return if stocks provide a hedge against inflation. However, empirical studies by Barrows and Naka (1994), Chen et al. (1986) and Chen et al. (2005) conclude that inflation has negative effects on the stock market. Under normal circumstances, a rise in expected inflation rate tends to lead to restrictive monetary policies, which would have a negative effect upon stock prices. Nonetheless, as price stability is one of the macroeconomic policy objectives by the Malaysian government and also an expected target of the Malaysian citizens, we believe that the relationship between inflation and stock price is insignificant.

Another variable of interest is the exchange rates. Based on 'exchange rate channel' of monetary policy transmission as in Pan et al. (2007), a depreciation of the local currency makes exporting goods less expensive and may lead to an increase in foreign demand and sales for the exporting firms. As a result, the value of exporting (importing) firms would increase (decrease). This, however, is only true if the demand for exports and imports are elastic. If the demand for imports is inelastic, the benefit of increased exports would be absorbed by higher prices paid for imports, thus undermining the advantages of depreciation. The 'exchange rate channel' by Pan et al. (2007) is consistent with the 'flow oriented' exchange rate model, introduced by Dornbusch and Fisher (1980). They affirm that exchange rate movements initially affect the international competitiveness and trade position, followed by the real output of the country, and finally affects the current and future cash flows of companies, which can be inferred from the stock price movements. In short, both exchange rate channel and flow oriented model hypothesize that an appreciation (depreciation) of a local currency leads to a decrease (increase) in the firm value of exporting firms, and vice versa for the importing firms. Even if a firm does not directly involve in the export-import business, Adler and Dumas (1984) show domestic firms that have minimal international activities can still be affected by the exchange rate movements if their input prices, output prices, or product demand depends on the fluctuation of exchange rate. To summarize, the impact of exchange rate on stock price depends on the importance of a nation's international trade in its economy as well as the degree of the trade balance.

Empirical studies on the stock market-exchange rate nexus show mixed results. Aggrawal (1981) find that exchange rates have positive effects on the stock market. In contrast, Soenen and Hennigar (1988) discover an inverse relationship. Using three different exchange rate measures namely real effective exchange rate, nominal effective exchange rate and RM/US$, Ibrahim (2000) suggests no long run relationship between stock market and exchange rates in a bi-variate setting for the Malaysian case. However, by including money supply and reserves, he finds some evidence of the long run relationship among the four variables (stock market index, exchange rate, money supply and reserves). His findings also indicate that changes in money supply and reserves affect the stock market index in the short run. Our study differs from him in at least two aspects. First, as his aim is to investigate the dynamic interaction between exchange rate and stock market, ours is to examine the determinants of stock market returns. As a result, different theories and variables are involved along the process. Secondly, our study incorporates the latest data for Malaysia, which comprises before and after crisis period.

Other than the policy monetary tools mentioned above, the level of real economic activity is also crucial in determining the stock market returns. The most popular measure of real economic activity is the gross domestic pro-

Table 1. Definitions of variables.

Acronym	Definitions of Variables	Source
KLCI	Logarithm of the index of market-value weighted average of month-end closing prices for selected shares listed on the Stock Exchange of Malaysia.	Datastream
IP	Logarithm of the month-end Industrial Production Index	DOS (various issues)
M2	Logarithm of the month-end M2 money supply of Malaysia	BNM (various issues)
RER	Logarithm of the month-end real exchange rate (RM/USD)	IFS (various issues)
RES	Natural logarithm of the month-end reserves	IFS (various issues)
TB	The month-end rate of Treasury bill 3 month	BNM (various issues)

Note: IFS is the acronym for the International Financial Statistics published by the International Monetary Fund (IMF), DOS denotes the Department of Statistics, Monthly Industrial Production Index and BNM presents the Bank Negara Malaysia, Monthly Statistical Bulletin).

duct (GDP). Unfortunately, data on GDP is normally on annual basis, and the most frequent is on quarterly basis. Alternatively, previous studies using time-series Vector Autoregressive (VAR) approach adopt the industrial production index as another measure for real economic indicator. Studies by Geske and Roll (1983), Fama (1990), Koutoulas and Kryzanowski (1996), and Kearney and Daly (1998) exhibit a positive relationship between industrial production and stock prices. On the other hand, Sadorsky (2003) fail to reveal a significant effect of industrial production on stock prices. As he focuses on the technology stock prices, the salient feature of the technology industry may contribute to the insignificant result.

Data preliminaries and method of analysis

Since it would be almost impossible to incorporate every potential aspect to explain the stock market behavior, we limit this study to selected macroeconomic variables. We employed Kuala Lumpur Composite Index (KLCI) to proxy for Malaysian stock market, industrial production index (IP) to proxy for the domestic supply factors, real exchange rate (RER), money supply (M2), reserves (RES) and interest rates (TB); all of which are standard variables in the literature. Data selection takes into consideration the availability of data and their consistency within the accessible time frame. Our monthly data ranged from January 1986 which marks the commencement of financial and capital account liberalization, and spans to as far as March 2008. Definitions and sources of data are presented in Table 1.

Prior to deciding on the appropriate method, a preliminary examination of the nature of the data is analyzed. Primary inspection of graphical presentation of the data in Figure 1 indicates possible non-stationary of the variables which facilitates for unit root testing. We follow the standard procedure of unit root testing by employing the Augmented Dickey Fuller (ADF) test. Since the ADF test is often criticized for low power, we complement this test with the Phillips-Perron (PP) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. For the last two decades, emphasis was given for unit root testing to time series data such that the empirical relationship of the variables satisfies the classical stationary assumptions and to avoid spurious regressions if the variables in ordinary regressions are non-stationary. If the time series variables contain unit roots or are co-integrated of the same order, namely I(1), then the long run combination amongst the non-stationary variables can be established although in the short run, the variables may drift apart. Deviations in the short run will force back to its long run equilibrium via the feedback process. Co-integration test involves two steps which include testing for unit root and the likelihood ratio test.

Based on the unit root results in Table 2, all variables are integrated of the same order, I(1). Since the time series variables are co-integrated of the same order, namely I(1), then the long run combination amongst the non-stationary variables can be established although in the short run, the variables may drift apart (Engle and Granger, 1987). The Engle and Granger (1987) approach, however, can only deal with one linear combination of variables that is stationary whereas in a multivariate practice, more than one stable linear combination may exist. To circumvent this problem, we draw on Johansen and Juselius (1990) maximum likelihood (ML) procedure to test for the number of co-integrating vectors which also allows inferences on parameter restrictions. ML procedure operates under a vector autoregressive (VAR) model.

$$\Delta x_t = \sum_{i=1}^{q-1} \Pi_i \Delta x_{t-i} + \Pi_q \Delta x_{t-q} + \mu + v_t \qquad (1)$$

where x_t is an *n x 1* vector of variables, Π_q is an *n x n* matrix of rank r ≤ n, μ is an *n x 1* vector of constant term and *v* is an *n x* 1 vector of residuals. The hypothesis is $H_0 = \Pi_q = \alpha\beta'$ where α and β are *n x r* loading matrices and eigenvectors. The aim of this procedure is to test the number of *r* co-integrating vectors $\beta_1, \beta_2, .., \beta_r$ which provide *r* stationary linear combinations of $\beta' X_{t-q}$. The likelihood ratio (LR) statistics for testing hypothesis $H_0 = \Pi_q = \alpha\beta'$, is a test that there are at most *r* co-integrating vectors, $\lambda_{Max} = -T \ln(1-\lambda_{r+t})$ versus an alternative, $\lambda_{Trace} = -T \sum_{i=r+1}^{k} \ln(1-\lambda_i)$. The linear restriction (LR) statistics for testing *r* against *r+1* co-integrating vectors is given by $-2\ln(Q) = T \sum_{i=1}^{r} \ln\left(\frac{1-\lambda_i^*}{1-\lambda_i}\right)$ which determines the significant eigenvalues and the corresponding number of eigenvectors. The statistic is embodied as a chi-squared distribution

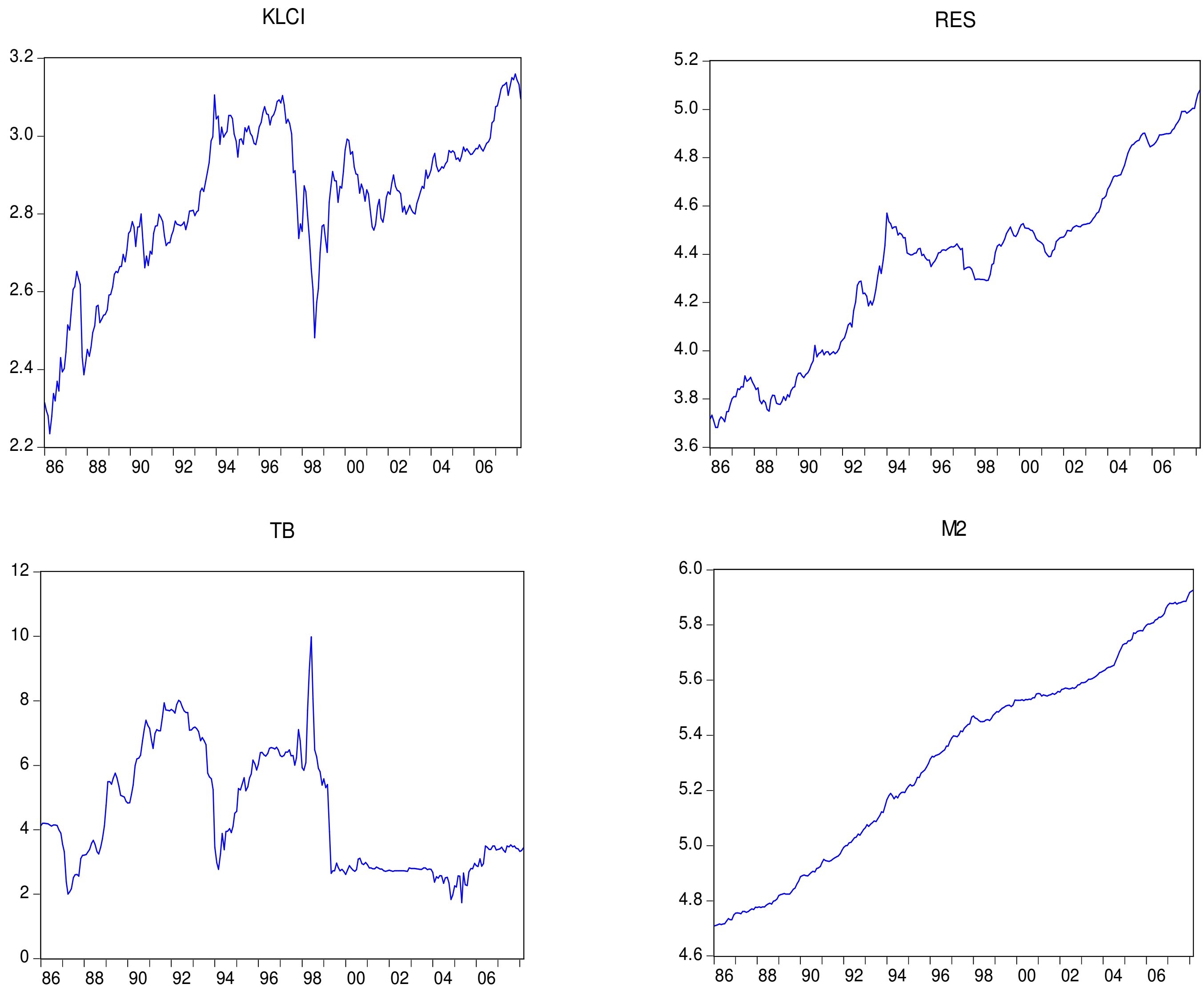

Figure 1. Time Series Plot.

with *r* degrees of freedom.

Once co-integrating relationship has been established, the next step is to estimate the error correction model. Although Engle and Granger (1987) two-step error correction model can be applied in a multivariate context, we choose VECM, a full information maximum likelihood estimation model, since it yields more efficient estimators of the co-integrating vectors. VECM permits testing for co-integration in a whole system of equation in one step without requiring a specific variable to be normalized. Another advantage of VECM is the non-requirement for a prior assumption of endogenity or exogenity of the variables. In addition, VECM allows us to examine the causality in Granger-sense. The error correction term is evaluated using t-test whilst the lagged first-differenced term of each variable uses the *F*-test. Patterns of causal relationship can be established amongst the different pairs of variables. The relationship could be unidirectional from *x* to *y* or *y* to *x*, bi-directional or the variables can be independent of one another.

As identified by Masih and Masih (1996), VECM alone does not provide indications of the dynamic properties of the system nor the relative strength of the Granger causality test beyond the sample period. As such, we draw on the variance decomposition (VDC) technique to examine a breakdown of the change in value of the variable in a given period arising from its own shocks in addition to shocks in other variables in previous periods. In addition, we also include the Impulse Response Function (IRF) based on the unrestricted VAR to map the time profile of the effects of innovations (shocks) in the residuals on the behavior of the series. IRF traces the response of current and future values of endogenous variables to a one standard deviation shock through the dynamic structure of VAR. The IRF is estimated as

$$X_t = \mu + \sum_{i=0}^{\infty} \phi_{jk}(i)\varepsilon_{t-i}$$ where μ is a 6 x 1 vector of constant, ε_{t-i} is a 6 x 1 error vector, $\phi_{jk}(i)$ is a 6 x 6 matrix with $\phi_{jk}(0) = I$ and elements of $\phi_{jk}(i)$ are the impact multipliers which examine the interactions amongst KLCI, CPI, RES, TB, M2 and NEER over the entire path.

Table 2. ADF, PP and KPSS test for unit root.

	Level			First Difference		
	ADF	**PP**	**KPSS**	**ADF**	**PP**	**KPSS**
KLCI	-2.339	-2.385	1.166*	-9.603*	-14.671*	0.115
RES	-0.334	-0.226	1.949*	-9.011*	-13.814*	0.079
M2	0.067	0.118	2.134*	-13.702*	-13.692*	0.152
IP	-1.991	-1.905	2.058*	-4.206*	-27.077	0.202
RER	-1.604	-1.636	1.639	-15.472*	-15.471	0.146
TB	-2.142	-1.818	0.748*	-11.970*	-11.592*	0.079

*significant at 1%. For ADF and PP, H_o = Variable has a unit root and H_o = Variable is stationary for KPSS test.

Table 3. Johansen-Juselius test for multiple co-integrating vectors.

Test Statistics						
H_0	**Trace**	**5% CV**	**1% CV**	**Max. Eigen**	**5% CV**	**1% CV**
r = 1	129.111	95.754	103.18	49.066	40.077	45.10
r = 2	80.045	69.819	76.07	29.584	33.877	38.77
r = 3	50.460	47.856	54.46	24.879	27.584	32.24
r = 4	25.581	29.797	35.65	15.194	14.264	25.52

* CV denotes critical values.

Table 4. Linear restriction test.

Variable excluded	r	Test Statistics
RES	2	7.59
TB	2	19.96
M2	1	9.49
RER	2	27.46
IP	2	23.81

Note: H_o: RES effect is insignificant in the co-integrating relationship (This hypothesis applies to the rest of the variables). 1 and 5% critical values are 9.21 and 5.99 respectively for r = 2, 11.34 and 6.63 and 3.84 for r = 1.

RESULTS

Table 2 describes the results of ADF and PP unit root tests. Both tests unanimously classify selected variables as I(1) that is, these variables are non-stationary in level but are stationary after first differencing. Before proceeding to Johansen-Juselius (JJ) test for co-integration, we performed lag length selection exercise. Results are, however, conflicting, that is, the recommended lag length based on Final Prediction Error (FPE) and Akaike Information Criterion (AIC) is 4, Likelihood Ratio (LR) is 8, Hannan Quinn (HQ) and Schwartz Criterion (SC) is 2. To overcome this problem, we opted for another method based on residual of VAR. Various lag lengths were imposed on the VAR specification until all the residuals of the correllograms are uncorrelated. Based on this method, the optimal lag length is 7. Table 3 reports the results for the co-integration test. Both trace and eigenvalue tests indicate that at least two and one co-integrating equations at 5 and 1% level respectively. This test suggests two major contentions. First, the selected variables move along together in the long run and short terms deviations will be corrected towards equilibrium. Secondly, co-integration literally indicates causality in at least one direction. To further confirm the co-integration test, we assume the linear restriction tests to examine whether the selected macroeconomic variables belong to the co-integrating space. The results are imparted in Table 4. Since the each of computed value is greater than the critical point at respective rank, we can safely suggest that all the selected variables contribute to the co-integrating system.

Table 5 shows the long-run co-integrating vector based on Johansen and Juselius framework. In general, the signs of all variables except money supply are in line with theoretical predictions. This may be due to the inclusion of the real exchange rate variable whereby an increase in money supply would technically induce depreciation. Hence, an increase in money supply, in this case, has negative ramifications on KLCI. The result shows positive association between KLCI and reserves and industrial production and negative relationship with interest rates, money supply and real exchange rate. In the presence of co-integration, in the long run a 1% increase in reserves and industrial production will enhance KLCI by approximately 0.4 and 2.6% respectively. An increase in interest rate by one point brings down KLCI by 0.009% points. KLCI will fall by 1 and 3% given a one percent increase in money supply and depreciation of the exchange. The speed at which KLCI adjusts in the absence of any

Table 5. Long run Co-integrating Equation (Normalized KLCI) and Coefficients of Error Correction terms.

Normalized co-integrating coefficients (Normalized on KLCI)						
KLCI	RES	TB	M2	RER	IP	Constant
1.0000	-0.3945 (0.1727) [-2.2834]**	0.0092 (0.00898) [1.0263]	1.0098 (0.2534) [3.9848]*	3.1586 (0.4336) [7.2850]*	-2.6384 (0.3075) [-8.5806]*	-3.2257
OLS	0.4973 (0.056) [8.939]*	0.0143 (0.003) [4.839]*	-0.3302 (0.079) [-4.168]*	-1.3494 (0.135) [-9.994]*	0.8996 (0.0852) [10.564]*	1.3716 (0.138) [9.936]*
Co-efficient of Error Correction terms						
D(KLCI)	D(RES)	D(TB)	D(M2)	D(RER)	D(IP)	
-0.0591 (0.0277) [-2.1298]**	0.04014 (0.0179) [2.2377]	-0.6170 (0.2661) [-2.3185]*	-0.0131 (0.0045) [-2.9128]*	-0.0162 (0.0085) [-1.9018]***	0.0119 (0.0174) [0.66879]	

***, ** and * represent 10, 5 and 1% significant levels. Standard errors and t-statistics are in parentheses and brackets respectively.

Table 6. Granger causality tests and coefficient of error correction terms.

Dependent Variables	F-test of lagged first-differenced terms						
	ΔKLCI	ΔRES	ΔTB	ΔM2	ΔRER	ΔIP	All
ΔKLCI	-	9.664	6.499	6.212	**20.549***	7.633	**68.628***
ΔRES	8.324	-	7.614	8.370	9.561	10.759	**50.757****
ΔTB	**17.419****	**13.035*****	-	5.435	**31.402***	6.254	**102.421***
ΔM2	8.991	9.327	7.832	-	6.503	5.234	42.526
ΔRER	5.677	9.741	**37.116***	6.453	-	7.327	**72.589***
ΔIP	**13.671*****	8.823	9.112	3.169	10.358	-	43.692

*, ** and *** denote significance at 1, 5 and 10% significant level.
p-values are in parentheses and t-statistics are in squared brackets

shocks is approximately 6% per month. Therefore, half time towards equilibrium is about 9 months. With reference to Table 5, the burden of adjustment process is borne by money supply and exchange rate. In addition, Table 5 also presents the OLS estimates of the variables. The results illustrate almost similar estimates for reserves and interest rates; and all estimates are significant at 1% significant level.

Although co-integration implicitly infers causation, it does not show the direction of causation. The Granger causality test in vector error correction form allows the examination of the dynamic causal interaction amongst the intended variables. The short run causality is based on the *F*-statistics of lagged first-differenced terms whilst the long run term error correction term is based on *t*-test. Significant error correction term in Table 6 reinforces the presence of co-integration in the long run and variables adjust towards long run equilibrium.

Assuming long run equilibrium decreases in money supply or real exchange rate; or increases in reserves or industrial production will compel the error correction term to be less than zero. KLCI will then adjust upwards in order to restore equilibrium. An alternative way to look at it is that in the long run, there is causality from these variables to KLCI. Similarly, the same interpretation is applicable to other variables. Based on Table 7, we can also detect dynamic short run interaction between the variables. One way causality is evident between real exchange rate and KLCI, KLCI and interest rate, reserves and interest rate; and between KLCI and industrial production, whilst two-way causality can be established between interest rate and exchange rate. Overall signifi-

Table 7. Variance Decompositions of KLCI.

	Explained by innovations in					
Period	**KLCI**	**RES**	**TB**	**M2**	**RER**	**IP**
(a) Ordering: KLCI, RES, TB, M2, RER and IP						
4	92.559	0.617	4.036	0.217	2.319	0.252
12	70.905	13.141	4.612	1.247	6.180	3.915
24	53.104	24.360	7.936	1.170	6.570	6.859
36	44.849	30.687	9.023	1.146	5.569	8.727
48	40.606	32.195	9.629	1.188	6.112	10.270
60	38.569	31.637	9.750	1.299	7.024	11.720
(b) Ordering: RES, TB, M2, RER, IP and KLCI						
4	67.326	5.076	13.026	0.357	13.430	0.784
12	45.478	21.891	10.479	0.906	16.219	5.026
24	32.975	33.617	10.557	0.786	14.458	7.607
36	28.013	39.780	10.771	0.772	11.870	8.794
48	25.745	40.892	11.127	0.824	11.655	9.758
60	24.796	40.053	11.167	0.934	12.246	10.804

cance is present within KLCI, reserves, interest rate and the real exchange rate.

Finally, we employed variance decomposition (VDC) and impulse response function (IRF) to further examine the dynamic interaction between KLCI and the selected variables. Taking the variables at level, we simulate how they react to their own shocks and shocks in other variables. The advantage of this approach is that the data is allowed to decide whether the shocks are permanent or transitory. The variables follow the Cholesky factorization (Luthepohl, 1991). However, the major setback using this method is that results depend on the pre-specified ordering of the variables unless the variables are contemporaneously uncorrelated. Thus, wespecified two orderings – (i) KLCI, RES, TB, M2, RER, IP and (ii) RES, TB, M2, RER, IP, KLCI based on previous practices. Both orderings confer almost similar pattern. KLCI responds aptly to its own innovations but the effect fades off over time. Reserves on the other hand, show increasing importance over time. In the second ordering, the real exchange rate has a stronger influence as compared to the first ordering. Responses of industrial production, money supply tend to be of slight importance in both ordering.

The IRF function displayed in Figure 2 shows that KLCI response to its own shock is both significant and positive up to the 15th month. Shocks in reserves are also significant and positive between the 8th to 27th month approximately. KLCI response to shocks in interest rate is marginally significant between the 15th to the 24th month. Other variables, however, are not significant. Finally,

Figure 3 illustrates the cusum test which indicates the stability of the error correction term.

DISCUSSION

This paper sheds some lights on the relationship between stock prices and macroeconomic components. Under the VAR framework, the analysis of both co-integration and Granger causality were applied to test for the linkages. Essentially, we performed the ADF and PP tests of different autoregressive order of integration for each individual variable. Having established the order of integration of I(1), we tested for co-integration. The lag exclusion test was incorporated to ensure that the selected variables belong to the co-integration space. Taking the standard VAR model, we determined the optimum lag length using both the standard procedure and by observing the residuals correllograms. Diagnostic tests were carried out on the resulting equations and then proceeded to test for inference of Granger-causality.

Among the findings of interest, we conclude that there is at least one co-integrating vector at 1% level and all macroeconomic variables in this study belong to the co-integrating space. In general, the long run co-integrating equation is consistent with theoretical prediction, whereby there is positive association between KLCI and price levels, reserves, and interest rate. With regards to Ganger causality test in VECM, KLCI Granger-cause reserves and interest rates in a bi-directional manner whilst other variables have unidirectional linkage with KLCI. Simulation results show that reserves and interest rates tend to respond in a considerable manner in the case of shocks. Thus, in terms of policy relevance, the findings of

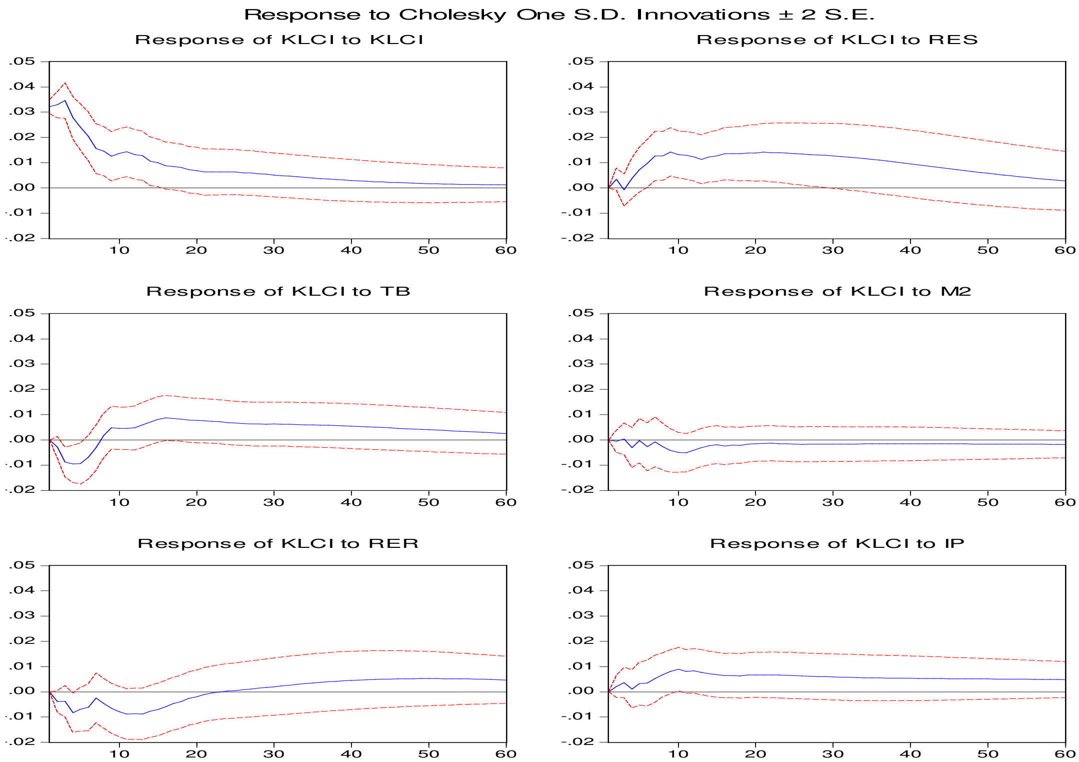

Figure 2. Impulse response functions.

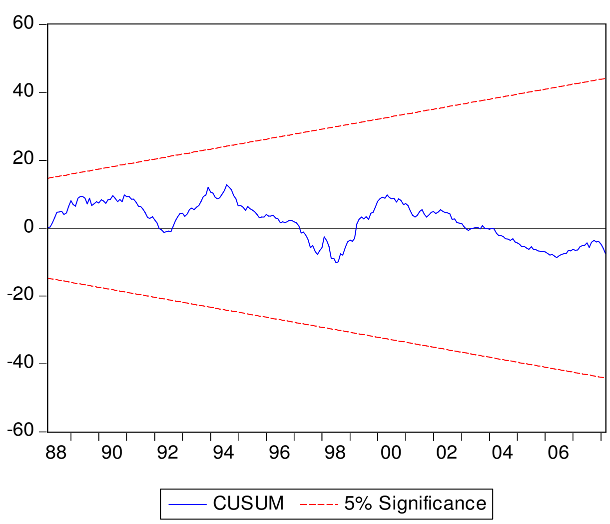

Figure 3. Cusum test.

findings of this paper suggest that the government should be cautious with how interest rates, money supply, inflation rate, and reserves are managed since they have ramifications for the budding stock price.

Contraction in money supply fuels lower interest rates, lower firm investment and subsequently, reduce the attractiveness to invest in the stock market. Increase in reserves further support the expansion of KLCI whilst depreciation tends to deter investors confidence of the stock market. This was evident when KLCI descended by more than 30 percentage points during the onset of the Asian financial crisis in July 1997 where the ringgit depreciated 25% against USD. When the ringgit was pegged to the USD on September, 2nd 1998, the Malaysian stock market again plummeted to as low as 262.70 points.

Nevertheless, stock market is one of the most contentious components to both economic and financial development. Both theoretical and empirical contributions will continue to chart the menu *pari passu* with liberalization and globalization of the financial intermediaries, and the proliferation of new financial products.

Conclusion

This study examines the factors that affect the Malaysian stock market from the macroeconomic perspective. In essence, the monetary policies variables (proxied by money supply, exchange rate, reserves and interest rate) and domestic supply factor (presented by industrial production) have significant long run effects on Malaysia's stock market in a VECM framework. The IRF and VDC further support the contention that the stock market is sensitive towards changes in the stipulated variables. In particular, reserves and industrial production show stronger dynamic interaction vis-à-vis the other monetary policy variables.

Although the linkages in the macroeconomic variables and the movement of the stock prices have been well researched in the developed countries, there are still avenues for research in this area for emerging economies. As in the case of Malaysia, further research could be conducted to examine the relationship between the macroeconomic variables and the various sectors in the stock market.

REFERENCES

Adler M, Dumas B (1984). Exposure to Currency Risk: Definition and Measurement. Fin. Mgt. p. 13, pp. 41-50.

Aharony J, Swary J (1980). Quarterly Dividend and Earnings Announcements and Stockholders's Returns: An Empirical Analysis. J. Fin. p. 35, pp. 1-12.

Aggarwal R (1981). Exchange Rates and Stock Prices: A Study of the U.S. Capital Markets under Floating Exchange Rates. Akron Bus. Econ Rev. p. 12, pp. 7-12.

Asprem M (1989). Stock Prices, Asset Portfolios and Macroeconomic Variables in Ten European Countries. J. Bank. Fin. 13: 589-612.

Bajaj M, Vijh AM (1990). Dividend Clienteles and the Information Content of Dividend Changes. J. Fin. Eco. p. 26, pp. 193-219.

Balkiz Ozer (2003). Testing Informational Market Efficiency on Kuala Lumpur Stock Exchange (KLSE). pp. 686-702.

Barrows CW, Naka A (1994). Use of Macroeconomic Variables to Evaluate Selected Hospitality Stock Returns in the U.S. Int. J. Hosp. Mgt. 13: 119-128.

Beltratti A, Morana C (2006). Break and Persistency: Macroeconomic Causes of Stock Market Volatility. J. Eco. 131: 151-177.

Booth JR, Booth LC (1997). Economic Factors, Monetary Policy and Expected Returns on Stock and Bonds. Econ. Rev Fed. Res. Bank San Francisco. 2:32-42.

Chen N (1991). Financial Investment Opportunities and the Macroeconomy. J. Fin. 46: 529-554.

Chen SJ, Roll F, Ross SA (1986). Economic Forces and the Stock Market. J. Bus. 59(3): 505-523.

Chen MH (2003). Risk and Return: CAPM and CCAPM. Q. Rev. Econ. Fin. 43: 369-393.

Chen MH, Kim WG, Kim HJ (2005). Macro and Non-Macro Explanatory Factors of Chinese Hotel Stock Returns. Int. J. Hosp. Mgt. 24: 243-258.

Cheung YW, Ng LK (1998). International Evidence on the Stock Market and Aggregate Economic Activity. J. Int. Financ. p. 5, pp. 281-296.

Dennis DJ, Denis DK, Sarin A (1994). The Information Content of Dividend Changes: Cash Flow Signaling Over Investment, and Dividend Clienteles. J. Financ. Quant. Anal, 29(4): 567-587.

Dornbusch R, Fisher S (1980). Exchange Rates and the Current Account. Am Econ. Rev. 70: 690-971.

Eades KM (1982). Empirical Evidence on Dividends as a Signal of Firm Value. *J. Fin. Quan. Ana.* p. 17, pp. 471-500.

Engle RF, Granger CWJ (1987). Co-integration and Error Correction: Representation, Estimation and Testing. *Econometrica*. 55(2).251-76.

Fama EF (1981). Stock Returns, Real Activity, Inflation and Money. *The* Am. Econ. Rev. 71: 115-46.

Fama E (1990). Stock Returns, Expected Returns and Real Activity. J. Fin. 45: 1089-1108.

Geske R, Roll R (1983). The Fiscal and Monetary Linkage between Stock Returns and Inflation. *J.* Financ. p. 38, pp. 7-33.

Granger C (1986). Developments in the Study of Cointegrated Variables. Oxford Bull. of Economics and Statistics. 48(3): 213-228.

Gjerde O, Saettem F (1999). Causal Relations among Stock Returns and Macroeconomic Variables in a Small, Open Economy. *J. Int. Fin. Mart*. 9: 61-74.

Hooker MA (2004). Macroeconomic Factors and Emerging Market Equity Returns: A Bayesian Model Selection Approach. Emerg. Mark Rev.. 5: 379-387.

Ibrahim FW, Abdul Rahman R (2003). Speculative Influences in Stock

Ibrahim FW, Abdul Rahman R (2003). Speculative Influences in Stock Market: A Case Study of Kuala Lumpur Stock exchange. Paper presented in the MFA 5th Annual symposium. pp. 620-638.

Ibrahim MH (2000). Co-integration and Granger Causality Tests of Stock Price and Exchange Rate Interactions in Malaysia. *ASEAN* Econ. Bull. 17(1): 36-47.

Ibrahim MH, Aziz H (2003). Macroeconomic variables and the Malaysian equity market: A view through rolling subsamples. J. Econ. Stud. 30(1): 6-27.

Janor H, Halid N, Rahman AA (2005). Stock Market and Economic Activity in Malaysia. Invest. Manage. Financ Innov. 4: 116-123.

Johansen S, Juselius K (1990). Maximum Likelihood Estimation and Inference on Co-integration with Applications to the Demand for Money. Oxford Bulletin of Economics and Statistics. 52: 169-210.

Kaneko T, Lee BS (1995). Relative Importance of Economic Factors in the U.S. and Japanese Stock Markets. J. Jap. Int. Eco. 9: 290-307

Kearney C, Daly K (1998). The Causes of Stock Market Volatility in Australia. Appl. Financ. Econ. 8: 597-605.

Koutoulas G, Kryzanowski L (1996). Macro-factor Conditional Volatilities, Time-Varying Risk Premia and Stock Return Behavior. Financ. Rev. 31(1): 169-195.

Kwan CY (1981). Efficient Market Tests of the Informational Content of Dividends Announcements. J. Fin. Quan. Ana. p. 16, pp. 193-205.

Lang L, Litzenberger R (1989). Dividend Announcements: Cash flow Signaling Vs. Free Cash Flow Hypothesis. J. Financ. Econ. p. 24, pp. 181-192.

Lee B (1992). Causal Relations among Stock Returns, Interest Rates, Real Activity and Inflation. J. Financ. 47: 1591-1603.

Liew KS, Khong WLR, Lim KP, Evan L (2003). Performance of Time series Forecasting models in Predicting the movements of Kuala Lumpur Composite Index. *Paper presented in the MFA 5th* Annual symposium. pp. 569-576.

Lutkepohl, H. 1991. Introduction to Multiple Time Series Analysis. Berlin: Springer-Verlag.

Mansor MI, Subramaniam V (1992). The Effects of Dividends and Earnings Announcements on Stock Prices in the Malaysian Stock Market. Malaysian J. Econ. Stud. 29(1): 35-49.

Masih AMM, Masih R (1996). Modeling the Dynamics of Macroeconomic Activitiy: New Evidence from a Developing Economy. J. Quant. Econ. 12(2): 85-105.

Mavrides M (2000). Granger Causality Tests of Stock Returns: The U.S. and Japanese Stock Markets. Manage. Financ. 26(12). 13-25.

Maysami R, Koh TS (2000). A Vector Error Correction Model of Singapore Stock Market. Int. Review of Econ. Finane. 9:79-96.

Mukherjee TK, Naka A (1995). Dynamic Relations between Macroeconomic Variables and the Japanese Stock Market: An application of a vector error-correction model. J. Financ. Res. 18(2): 223-237.

Neoh SK (1989). Stock Market Investment in Malaysia and Singapore. Kuala Lumpur, Berita Publishing.

Pan Ming-Shiun, Fok Robert Chi-Wing, Liu Y, Angela (2007). Dynamic Linkages between Exchange Rates and Stock Prices: Evidence from East Asian Markets. Int. Rev. Econ. Financ. 16:503-520.

Poon S, Taylor J (1981). Macroeconomic Factors and the U.K. Stock Market. J. Bus Financ. Account. 18(5): 619-636.

Ross SA (1976). The Arbitrage Theory of Capital Asset Pricing. J. Econ. Theo. p. 13, pp. 341-360.

Sadorsky P (2003). The Macroeconomic Determinants of Technology Stock Price Volatility. *Review of Financial Economics*. 12:191-205.

Schwert GW (1989). Why does stock market volatility change over time? J. Financ. 44(5):1115-1153.

Soenen L, Hennigar E (1988). An Analysis of Exchange Rates and Stock Prices: The US Experience (1980-1986). Akron Bus. Econ. Rev. 19(4): 7-16.

Thong LF, Kok KL (2003). Strategies of portfolio Formation in the Kuala Lumpur Stock Exchange. Paper presented in the MFA 5th Annual Sympossium. pp. 671-685.

Wooldridge JR (1982). The Information Content of Dividend Changes. J. Financ. Res. p. 5, pp. 237-247.

Wongbangpo P, Sharma SC (2002). Stock Market and Macroeconomic Fundamental Dynamic Interactions: ASEAN-5 Countries. J. Asian Econ. 13: 27-51.

Yong O, Sapian RZZ, Hamid MA, Yaakob MH (2003). Perubahan Dividen and Prestasi Saham di Papan Kedua Bursa Saham Kuala Lumpur. Paper Presented in the MFA 5th Annual Symposium. pp. 577-585.

Yoon PS, Starks L (1995). Signaling, Investment Opportunities, and Dividend Announcements. Rev. Financ. Stud. p. 8, pp. 995-1018.