Stock Market and Economic Activity in Malaysia

Hawati Janor, Noreha Halid, Aisyah Abdul Rahman

Abstract

This study examines the stock market as a predictor of the economic activity in Malaysia and its sensitivity to different stock market conditions. In doing so, we employ the Johansen cointegration, variance decomposition and the Autoregressive Distributed Lags bound test. For the whole period under study, the Johansen cointegration and the VDC show that the Malaysian stock market lead changes in economic activity. However, the results from the ARDL show no relation between the two variables. Different findings are found for different sub-periods. All the three tests suggest that the stock market lead changes in economic activity only during sub-period of 1986m5-1998m7. This implies that the stock market as predictor to economic activity is sensitive to different stock market conditions. This study also highlights the usefulness of ARDL method especially when stationarity becomes an issue.

Key words: Stock market , Economic activity, Cointegration, ARDL
JEL classification: C22; E44

1. Introduction

Stock price is widely believed to be the predictor of economic activity. Theoretically, the link between stock price and economic activity can be explained through the stock valuation model and the wealth effect. The stock valuation model argues that stock prices reflect expectation about future economy, thus it can somehow indicate what will happen to the economy. The wealth effect contends that stock prices lead economic activity by stimulating or not stimulating the consumption pattern of investors that will later on influence demand and production of the economy.

Empirical researches with respect to the stock market performance as a predictor of the economy yield mixed results. Earlier studies such as Peek and Rosengren (1988) and Barro (1989) found that stock market sometimes does predict the economy in the US. Peek and Rosengren (1988) found that out of eleven cases of a declining stock market, only six were followed by recessions. Barro (1989) found that stock market performances successfully predicted eight out of nine recessions. A more recent study by Muradoglu et al. (2000) found evidence that stock returns lead economic activity in India and Mexico. However studies such as Kwon and Shin (1999), Binswanger (2000) and Hondroyiannis and Papaetrou (2001) found that stock returns do not lead changes in economic activity in Korea, US and Greece respectively. Given these inconclusive evidence, further research on this subject is therefore needed.

Most of the studies cited above examined data for developed countries or the industrialized countries. With the increase of financial integration and the emergence of new stock markets, particularly in the Asian region, these new stock markets have become the focus of international investors. Therefore, studies that can predict the economy of these markets are useful for the international investors. In addition, if it is proven that stock market returns can predict the economy, policy makers can have some insights regarding policy implementation in order to achieve a desired result.

Most of the studies undertaken have employed various techniques such as regressions (Fischer and Merton, 1984; Barro, 1989; Binswanger, 2000), cointegration tests, (Kwon and Shin, 2000; Hondroyiannis and Papapetrou, 2001) and causality tests (Mahdavi and Sohrabian, 1991, Muradoglu et al., 2000). A potential weakness of these techniques is that they require the underlying time series to be non-stationary. While these studies present evidence from tests, which support the presence of a unit root in the underlying series, it is well known that such unit root

© Hawati Janor, Noreha Halid, Aisyah Abdul Rahman, 2005

tests have low power (Atkins and Coe, 2002). Particularly, if the series is persistent, yet stationary, then any inference that can be made about the validity of the relation between the series is conditional on the assumption that the series are I(1) which means conditioning the results of economic hypothesis on shaky statistical ground (Canova, 1994).

The objective of this paper is to examine stock prices as a predictor of the economic activity in Malaysia. We also investigate whether the results hold up in different sample period. In line with most of the studies, we apply the cointegration and the VAR techniques. In addition, we also employ the ARDL bounds test to overcome stationarity issues that may be encountered in the previous techniques that required the non-stationarity of the time series involved. The main advantage of the ARDL bounds test lies in the fact that it can be applied irrespective of whether the regressors are I(0) or I(1), and this avoids the pretesting problems associated with standard cointegration analysis which requires the classification of the variables into I(1) and I(0).

2. Theoretical and empirical framework

Theoretically, the stock valuation model and the wealth effect suggest that the stock market predicts economic activity. The stock valuation model argues that the stock market is forward-looking; thus, current prices reflect the future earnings potential or profitability of corporations. Since stock prices picture the expected profitability, and profitability itself is directly linked to economic activity, fluctuation in stock prices are implied to lead the economic direction. For instance, if the economy is expected to enter into a booming (recession) stage, the stock market will anticipate this by bidding up (down) the prices of stocks. Stock prices will be influenced by expectations about future economy because a firm's profit has a direct relationship with the behavior of the real economy. For instance, if investors predict an economic growth in future, then expected profits will improve (assuming dividend and profit has a positive relationship) and value of the stock will increase; and vice versa for the opposite scenario. Thus, if predictions by investors are fruitful, stock price movements will lead the direction of the economy. According to Fama (1990), the level of real economic activity is expected to have a positive effect on future cash flows and thus is related to stock prices. His study showed that stock returns were actually significant in explaining future real activity in US for the whole period from 1953 to 1987.

The stock market to predict economic activity can also be explained by the 'wealth effect' through the result of wealthy investors' consumptions. Pearce (1983) argues that fluctuations in stock prices have a direct effect on aggregate spending. When the stock market is rising, investors are wealthier and tend to spend more. This will increase the demand for goods and thus expand the economy.

Mahdavi and Sohrabian (1991) explore the effect of the rate of growth of stock prices on the rate of growth of GNP in the United States using quarterly data over a period covering the past three decades; that is, from the first quarter 1960 to the second quarter 1989. Employing the Granger causality method (Granger, 1969), they document evidence that supported Fama (1990) and suggest the leading indicator role of stock prices. However, Binswanger (2000) also using US data, finds that the stock market does not possess any explanatory power on the economy over the sub-samples from 1984 to 1995, but the results hold for the whole period from 1953 to 1995. The results present evidence that stock returns ceased to lead real economic activity during the recent stock market boom (since the early 1980s) compared to the first stock market boom after World War II from the late 1940s to the mid-1960s. For the post-war United States, Lee (1992) investigates causal relations and dynamic interactions among asset returns, real activity, and inflation. The main result indicates that stock returns help explain movements in real activity and support the findings of Fama (1990).

All the above studies focus on the US data. Kwon and Shin (1999) investigate whether economic activities in Korea can explain stock market returns for the period from January 1980 to December 1992. Applying the cointegration test and a Granger causality test from a vector error correction model, the study found that the stock price indices are not a leading indicator of economic activity. This study is inconsistent with the previous findings, which conclude that the stock market rationally signals changes in real activities such as in Fama (1990). Similar result was also found by Hondroyiannis and Papapetrou (2001) for Greece for the period from 1984 to 1999 employing the Johansen cointegration and variance decomposition analysis.

Murodoglu et al. (2000) examined causal relationships between macroeconomic variables (inflation, interest rates, real economic activity, and exchange rates) and stock returns in nineteen emerging markets using a multivariate approach. The results suggested that stock returns lead real economic activity as proxied by industrial production in India and Mexico. He gave two possible explanations for such findings. First, stock returns might simply be leading real economic activity, in which case the relationship must be understood as one of a lead-lag relationship. In this case, stock returns might be used as a barometer. Being able to adjust to information regarding government policy rather instantaneously, changes in stock returns might be the indicators of changes in other variables. An alternative explanation might be related to the size of the stock markets in these countries. If stock markets were not thin, they might serve as a proxy for the financial wealth in the country. In that case, unidirectional causality from stock returns to the variables must be interpreted as the effect of changes on financial wealth on the variables.

3. Data, Methodology and Findings

The data consist of monthly time series spanning January 1980 through December 2004. The economic activity is measured by the industrial production index[1] and the stock market by Kuala Lumpur Composite Index (KLCI). The industrial production index was obtained from the IMF International Financial Statistics and KLCI from the Datastream. All the variables are expressed in logarithmic.

We examine the stock market, measured by KLCI (LCI) as a predictor to the economic activity, measured by industrial production index (LIP) by applying the Johansen cointegration, the variance decomposition and the autoregressive distributed lag (ARDL) bounds test. In order to examine the linkage for different periods, this study divides the monthly data into three periods based on the break in trends of the stock index: 1980m1-1986m3; 1986m5-1998m7; 1998m9-2004m12. We run the data for the whole period from 1980 to 2004 and compare the results over the three sub-samples.

Johansen Cointegration

The Johansen (1991) procedure involves the identification of rank of m by m matrix Π in the specification as follows:

$$\Delta X_t = \partial + \sum_{t=1}^{k-1} \Gamma \Delta X_{t-1} + \Pi X_{t-k} + \varepsilon_t , \quad (1)$$

where X_t is a column vector of the m variables, Γ and Π represent coefficient matrices, Δ is a difference operator, k denotes the lag length, δ is a constant. If Π has zero rank, no stationary linear combination can be identified. If the rank r of Π is greater than zero, however, there will exist r possible stationary linear combinations and Π may be decomposed into two matrices α and β, (each m x r) such that $\Pi = \alpha\beta'$. In this representation β contains the coefficients of the r distinct cointegrating vectors that render βX_t stationary even though X_t is itself non-stationary, and α contains the speed of adjustment coefficients for the equation.

To examine the long run relationship between stock returns and economic activity, first we employ the Johansen cointegration technique (Johansen, 1990, 1991). First, the stationarity of each series is examined by using the augmented Dickey-Fuller (ADF). The ADF unit root tests fail to reject the null hypothesis of the existence of a unit root in log levels but can be rejected in the log first difference of the industrial production series for the whole period and for the three sub-periods using the Schwarz Bayesian Criterion (SBC) but not the AIC. Therefore based on the

[1] Industrial production index is used as proxy to real economic activity by studies such as Muradoglu et al. (2000) and Hondroyiannis and Papapetrou (2001).

SBC, the industrial production index (LIP) is integrated of order one, i.e., I(1). For the KLCI series (LCI), according to the AIC and SBC, the unit root test fails to reject the null hypothesis of the existence of a unit root in log levels but can be rejected in the log first difference for the whole period and for the first two sub-periods only. Therefore based on the AIC and SBC, the KLCI (LCI) and IP (LIP) are I(1) except for the sub-period of 1998m9-2004m12 which is I(0).

Next, the number of significant cointegrating vectors are tested for the I(1) series. The likelihood ratio (LR) tests are performed to determine the lag length of the VAR. The selection of lag order of the unrestricted VAR is determined by Akaike information criterion. Then we proceed with cointegration test according to equation (1). Table 1 reveals that there exists a cointegration relationship between the stock price index and the industrial production index for the whole period and sub-period of 1986m5-1998m7. Both the trace test and the maximum eigenvalue give similar result that is r=1 at 95% significance level. This implies that stock prices and industrial production are in equilibrium in the long run. However for the sub-period of 1980m1-1986m3, there is no cointegration between the two series.

Table 1

Tests for the number of cointegrating vectors of LCI and LIP

		Max eigenvalue	Trace test
The whole period of 1980-2004. Order of VAR =2			
Null	Alternative		
r = 0	r = 1	39.8404*	49.6051
r<= 1	r = 2	9.7648	3.3223
Sub-period of 1980m1-1986m4. Order of VAR =2			
r = 0	r = 1	7.1532	10.4755
r<= 1	r = 2	3.3223	3.3223
Sub-period of 1986m5-1998m7. Order of VAR =12			
r = 0	r = 1	94.2368*	101.5198
r<= 1	r = 2	7.2829	7.2829

*95% significance level; No integration for period of 1980m1-1986m4

Table 2

ECM for variable LIP and LCI

	Coefficient	Standard Error
For the whole period of 1980-2004		
Dependent variable is dLIP		
ecm1(-1)	.30071*	.047968
Dependent variable is dLCI	–.042030	.084310
ecm1(-1)		
For sub-period of 1986m5-1998m7.		
Dependent variable is dLIP		
ecm1(-1)	.36915*	.035101
Dependent variable is dLCI	–.14642	.087965
ecm1(-1)		

*95% significance level

Next the cointegrated series is represented as a Vector Error Correction Model (VECM) which specifies as:

$$\Delta x_t = a_1 z_{t-1} + \beta_1 lagged(\Delta x_t, \Delta y_t) + \varepsilon_{1t}$$
$$\Delta y_t = a_2 z_{t-1} + \beta_1 lagged(\Delta x_t, \Delta y_t) + \varepsilon_{2t} \quad (2)$$

The representation implies that changes in dependent variable are a function of the level of disequilibrium in the cointegrating relationship as well as changes in other explanatory variables. More formally, if x_t and y_t are both integrated of order 1, and they are cointegrated so that $Z_t = x_t - Ay_t$ is I(0), then Engel and Granger (1987) demonstrated that it must be the above ECM is correct. If the error-correction coefficient (α_1 or α_2) in any equation is insignificant, that implies that the corresponding dependent variable of the equation is 'exogenous' (i.e. it does not depend on the deviations of other variables). But if the coefficient is significant, that implies that the corresponding dependent variable is 'endogenous'. The result of ECM from Table 2 reveals that for the whole period error correction term for the composite index equation (LCI) is insignificant (ECT of -.042030), which implies it is exogenous. This means it does not depend on the deviations in the industrial production. It also implies that it is a leading variable and initially receives the exogenous shocks resulting in deviations from equilibrium and transmits the shocks to other variables. When industrial production (LIP) is the dependent variable, the error correction coefficient is significant (ECT of 3.0071), which implies that it is endogenous (it does depend on the deviations of the composite index). Similar result is found for the sub-period of 1986m5-1998m7 where the ECT for LIP is significant.

Variance Decomposition (VDC) and Impulse Response Function (IRF)

The VECM, however, does not provide the relative degree of endogeneity or exogeneity among the variables. We then proceed to test the VAR equations for variance decomposition (VDCs) and impulse response function (IRF). From Table 3 the reported numbers indicate the percentage of the forecast error in each variable that can be attributed to innovations in other variables at nine different time horizons. For the composite index, 99% of its variability is attributed to shocks in itself throughout the whole period. This shows that the LCI is the most exogenous. For the industrial production variable, own shocks account for 99% of the forecast variance for the first month. In the long period, its variations are explained by 40% of its own changes, while approximately 60% are attributed to composite index, thus provide evidence that it is endogenous and can be predicted by the composite index. For the sub-period of 1986m5-1998m7, 97% of the variability in industrial production is attributed to its own shock in the first month, and in the later period, 60% of its variation is explained by the composite index. The IRF gives similar results as the variance decomposition (the result is not reported here).

Table 3

Orthogonalized variance decomposition

For the whole period of 1980-2004

	VDC of LCI		VDC of LIP	
Horizon	LCI	LIP	LCI	LIP
1	.99995	.4800E-4	.00346	.99654
6	.99810	.0019016	.12158	.87842
12	.99114	.0088560	.26582	.73418
18	.99176	.0082389	.31715	.68285
24	.99250	.0075017	.39322	.60678
30	.99204	.0079568	.45873	.54127
36	.99237	.0076280	.50686	.49314
42	.99236	.0076384	.55625	.44375
48	.99239	.0076086	.59588	.40412

Table 3 (continuous)

For sub-period of 1986m5-1998m7

	VDC of LCI		VDC of LIP	
Horizon	LCI	LIP	LCI	LIP
1	.99388	.0061206	.4647E-5	1.00000
6	.99383	.0061715	.18842	.81158
12	.98488	.015117	.44480	.55520
18	.98948	.010518	.73673	.26327
24	.98676	.013242	.85319	.14681
30	.98914	.010856	.91241	.087592
36	.98823	.011775	.94188	.058118
42	.98957	.010426	.95703	.042973
48	.98924	.010757	.96750	.032496

The ARDL bounds test

The ARDL method as suggested by (Pesaran et al., 2001) does not require the assumption that the variables are both I(1) or both I(0). This test is employed to consider the stationarity issues that may be encountered in the previous techniques that required the non-stationarity of the time series involved.

In testing for the ARDL we concentrate on the F-statistic value of the time series to check whether there exists the long-run relationship between LIP and LCI variables. First we check the F-statistic for industrial production as dependent variable F(LIP|LCI). Reference is made to the table by Pesaran and Shin (1996), which has the lower and upper bound for k=1 at 10% significant level as (4.042, 4.788). The F-statistic value is lower than lower bound for the whole period, sub-period of 1980m1-1986m3 and 1998m9-2004m12, therefore the null hypothesis of no cointegration and long run relationship cannot be rejected. On the other hand, we find that F(LIP|LCI)= 20.7310 is well above the upper bound for 1986m5-1998m7 indicating that stock price is the long run forcing variable in explaining economic activity.

Similar procedure is done by taking the stock price as dependent variable. F-statistic F(LCI|LIP) value is lower than lower bound for the whole period, sub-period of 1980m1-1986m3 and 1986m5-1998m7. However, for sub-period of 1998m9-2004m12, F(LCI|LIP)=5.8387 is well above the upper bound suggesting that economic activity is the long run forcing variable in explaining stock price.

Next is to specify the Error Correction Model (ECM). The error correction version of the ARDL (p,q) model of the equation for the industrial production index is given by:

$$\Delta i_t = \theta + \gamma i_{t-1} + \phi \pi_t + \sum_{j=1}^{k} \delta_{i,j} \Delta i_{t-j} + \sum_{j=1}^{k} \delta_{\pi,j} \Delta \pi_{t+1-j} + \vartheta \Delta \pi_{t+1} + u_t \,. \quad (3)$$

Here i_t is the industrial production at time t and Π_{t+1} is the stock price at time t+1. The empirical analysis is based on monthly data for Malaysia. Since the observations are monthly, for maximum order of the lags in the ARDL model we choose 12. The hypothesis that we will be testing is the null of 'nonexistence of the long-run relationship' defined by $\gamma = \phi = 0$. Under the alternative of industrial production $\gamma \neq 0$ and $\phi \neq 0$, there is a stable long-run level relationship between the variables.

The ECM representation for the ARDL model is selected by using the Schwarz Bayesian Criterion, where in this study we specify the maximum order is 12. The ECM representation using this criterion is given in Table 4. The ECM implies that changes in the dependent variable are the function of the level disequilibria in the cointegrating relationship i.e. the departure from the long run equilibrium as well as changes in other explanatory variables. The error correction coefficients, estimated at -.28342 for sub-period of 1986m5-1998m7 and -.29363 for sub-period of

1998m9-2004m12, are statistically highly significant, have the correct sign, and suggest moderate speed of convergence to equilibrium. In our case, for sub-period of 1986m5-1998m7, it implies that LIP is endogenous that is depends on the deviation of LCI and other variables (constant). It also implies that the dependent variable DIP bears the brunt of short run adjustment to bring about long run equilibrium among cointegrating variables. Conversely, for sub-period of 1998m9-2004m12, LCI is endogenous that is depends on the deviation of LIP and other variables (constant).

4. Conclusion

In this study we examine whether stock market can predict economic activity in Malaysia. For the whole economy, the Johansen cointegration and VDC tests seem to confirm previous findings of Fama (1990) and others who found evidence that stock market can lead changes to the economic activity. However the ADRL test is not able to capture any long run relationship between the variables. But when sub-samples are examined, all methods demonstrate that stock market can lead economic activity for sub-period of 1986m5-1998m7. Yet for sub-period of 1998m9-2004m12, ARDL shows economic activity leads stock market. Cointegration tests cannot be applied for this sub-period because all the variables are I(0).

The results suggest that sub-samples study is important to consider when testing the stock market and the economic activity. This study also highlights the usefulness of ARDL method especially when stationarity becomes an issue.

Table 4

ARDL bounds test

Error Correction Representation for the Selected ARDL Model ARDL(12,12) selected based on Schwarz Bayesian Criterion			
For the sub-period of 1986m5-1998m7			
Dependent variable is dLIP			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
ecm(-1)	-.28342	.038946	-7.2774[.000]
ecm(-1) = -.68285*LCI - 0.13176*C			
Error Correction Representation for the Selected ARDL Model ARDL(10,0) selected based on Schwarz Bayesian Criterion			
For the sub-period of 1998m9-2004m12			
Dependent variable is dLCI			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
ecm(-1)	-.28342	.038946	-7.2774[.000]
ecm(-1) = -.68285*LCI - 0.13176*C			

References

1. Atkins, F.J., P.J. Coe. An ARDL Bounds Test of the Long-run Fisher Effect in the United States and Canada // Journal of Macroeconomics 2002. No 24. – pp. 255-266.
2. Barro, R.J. The Stock Market and the Macroeconomy: Implications of the October 1987 Crash, in Robert W. Kamphuis et al. (eds.). Black Monday and Future of Financial Market. – New York: Irwin, 1989.
3. Binswanger, M. Stock Returns and Real Activity: Is There Still A Connection? // Applied Financial Economics, 2000. No 10. – pp. 379-387.
4. Canova, F. Testing Long-run Monetary Neutrality: Empirical Evidence for G7 Countries with Special Emphasis on Germany // Carnegie-Rochester Conference Series on Public Policy, 1994. – No 41. – pp. 119-125.

5. Engle, R.F., C.W.J. Granger. Cointegration and Error Correction: Representation, Estimation, and Testing // Econometrica, 1987. – No 55. – pp. 251-276.
6. Fama, E.F. Stock Returns, Expected Returns and Real Activity // Journal of Finance, 1990. – No 45. – pp.1089-1108.
7. Fama, E. F. Efficient Capital Market: II // Journal of Finance, 1991. – No 46. – pp.1575-1617.
8. Fischer, S., R.C. Merton. Macroeconomics and Finance: The Role of the Stock Market // Carnegie-Rochester Conference Series on Public Policy, 1984. – No 21. – pp. 57-108.
9. Hondroyiannis, G., E. Papapetrou. Macroeconomic Influences on the Stock Market // Journal of Economics and Finance, 2001. – No 25. – pp. 33-49.
10. Johansen, S., K. Juselius. Maximum Likelihood Estimation and Inference on Cointegration-With Application to Demand for Money // Oxford Bulletin of Economics and statistics, 1990. – No 52. – pp. 169-210.
11. Kwon, C.S., T.S. Shin. Cointegration and Causality between Macroeconomic Variables and Stock Market Returns // Global Finance Journal, 1999. – No 10(1). – pp. 71-81.
12. Lee, B.S. Causal relations among stock returns, interest rates, real activity and inflation // Journal of Finance, 1992. – No 47. – pp. 1591-1603.
13. Mahdavi, S., A. Sohrabian. The Link between the Rate of Growth of Stock Prices and the Rate of Growth of GNP in the United States: A Granger Causality Test // The American Economist, 1991. – No 35(2). – pp. 41-48.
14. Muradoglu, G., F. Taskin, I. Bigan. Causality between Stock Returns and Macroeconomic Variables in Emerging Markets // Russian and East European Finance and Trade, 2000. – No 36(6). – pp. 33-53.
15. Pearce, D. K. Stock Prices and the Economy // Federal Reserve Bank of Kansas City Economic Review, 1983. – No November. – pp. 7-22.
16. Peek, J., E.S. Rosengren. The Stock Market and Economic Activity // New England Economic Review, 1988. – No May/June. – pp. 39-50.
17. Pesaran, H.M., Y. Shin, R.J. Smith. Bounds testing Approaches To The Analysis Of Long-Run Relationships // Journal of Applied Econometrics, 2001. – No 16. – pp. 289-326.