

Determinants of Market Inefficiency in Emerging Capital Markets: Evidence From The Colombo Stock Exchange in Sri Lanka

Thushari N Vidanage and O G Dayaratna-Banda

Department of Economics & Statistics, University of Peradeniya, Sri Lanka.

Keywords: *Efficient Market Hypothesis, Semi-Strong form market efficiency, Colombo Stock Exchange, Cointegration, Error Correction Model, Granger Causality Test.*

Introduction

The predictability of the behaviour of capital markets is one of the prominent areas of research in financial economics. Vidanage & Dayaratne-Banda (2012) found that the Colombo Stock Exchange (CSE) is weak form inefficient indicating that variables other than past securities price tend to determine the movements in stock prices. This finding provides the basis for empirically examining the macroeconomic and socio-political sources of stock price movements with a view to explaining the sources of information inefficiencies in emerging stock markets, which could eventually be used to predict the future movements of the prices. Previous studies on the semi-strong form on CSE (Wickramasinghe, 2006; Gunasekarage *et al* 2004), have been limited to identifying the possible causal relationships between selected macroeconomic variables and stock prices up to 2004, and did not focus on the prevailing economic and political situation though they provide important information. In this context, it is interesting and valid empirical question to investigate whether and to what extent socio-political factors and macroeconomic conditions help predict price movements in emerging capital markets, such as the CSE. In other words, this study intends to investigate whether the stock prices in the CSE exhibit the semi-strong form of the Efficient Market Hypothesis.

Objectives

This paper, therefore, aims to investigate whether the macroeconomic environment² and socio-political conditions of the country could explain the stock price movements in emerging capital markets.

² GDP growth and industrial output are important variables when examining the impact of macroeconomic conditions on stock prices. Yet, monthly data on those variables were not available at the time of data collection. Therefore, the behaviour of interest rate, exchange rate, inflation and money supply were made to represents the macroeconomic environment of the country.

Methodology

This study employed several quantitative techniques to test the long run relationship, causality, short run relationships and persistence of short run impacts: including Johansen and Juselius multivariate Cointegration test (JJMCT), the Error Correction Model (ECM), Granger Causality test, Impulse Response Function (IRF) test and Variance Decomposition test. Data for the following variables were collected on a monthly basis for the period from 1985(1) to 2011(5), and transformed into natural logarithms.³ The sample includes 317 observations per variable. The main secondary data source was the various issues of the annual report of the Central Bank of Sri Lanka.

- a) Monthly average United States dollar and Sri Lankan rupee exchange rate(USD),
- b) Monthly inflation rate(INF) – this is calculated as the monthly change in the Colombo Consumer Price Index,
- c) Monthly broad money supply(M2),
- d) Monthly bank rate(B),
- e) Monthly closing price of All Share Price Index(ASPI).

The following five dummy variables will be included to capture economic and political episodes occurred in the economy during the sample time period:

- a) DER – the change in the floating exchange rate [2001(1)-2011(5)]
- b) DFC – the impacts of the 1997 financial crisis [1997(4)-1998(12)]⁴
- c) DMOU – the information on peace agreement (MOU) between Sri Lankan government and the Liberation Tigers of Tamil Eelam (L.T.T.E.) [2002(2)]
- d) DMR – the United Peoples' Freedom Alliance elected in 2005[2005(11)-2011(5)]
- e) DWAR – the civil war and unstable political situation in the country[1985(6)-2009(05)]

Results

The results of the Augmented Dickey Fuller(ADF) test shows that at levels, only Rt [monthly returns on ASPI⁵, calculated as the log difference of the ASPI at time t and

³ As in the existing literature, we also used monthly data to obtain more robust estimations, than using daily or weekly data.

⁴ This time period was roughly estimated, as the crisis began in early May, 1997 and ended by 1998.

⁵ Monthly returns are calculated using the following formular: $R_t = \ln\{P_t|P_{t-1}\}$, where R_t is the returns for ASPI on month t; P_t and P_{t-1} are the monthly closing price of ASPI at month t and month t-1, respectively.

time (t-1)] and INF are stationary and do not contain unit roots. Their order of integration is zero; $I(0)$. When testing for first difference form, all the other variables became stationary. This implies that these variables are integrated in order one; $I(1)$.

The results of the JJMCT given in the Table 1 indicate that there is no more than one cointegration vector either at one percent or at five percent level. Based on the Eigen value and trace statistic, it can be concluded that there is one cointegrating relationship between ASPI returns and selected macroeconomic variables.

Table 1 : The Results of the Johansen & Juselius Test of Cointegration among ASPI and Selected Macroeconomic Variables

Maximum rank (r)	Maximum Eigen value (λ max)	Trace Statistic (λ trace)	Critical value (5%)	Critical value (1%)
0	89.76708	131.6418***	68.52	76.07
1	27.50875	41.87470	47.21	54.46
2	11.41609	14.36611	29.68	35.65
3	2.94158	2.95017	15.41	20.04
4	0.00857	0.00858	3.76	6.65

Note: Exogenous variables are DER, DFC, D WAR, DMR, DMOU.

*** implies significance at the 1% percent level.

Source: Authors' estimations based on data sources described in 'Methodology Section'.

$$R_t = 0.51704 - 0.046146LB_t + 0.24025LUSD_t + 0.00798LINF_t - 0.11084LM2_t \dots (1)$$

(0.03384) (0.07954) (0.00643) (0.03199)
 (1.36345)* (-3.02045)*** (-1.24094) (3.46536)***

These values represent percentage changes, since log values of R_t , INF, B, USD and M2 are used. Values in parentheses are standard errors and t-statistics, respectively (** - 1 percent, * - 5 percent and * - 10 percent significance).

The above equation (1) yields negative relationships between ASPI returns and bank rate and money supply, while positive relationships between ASPI returns and USD exchange rate and inflation rate.

All the estimated coefficients are statistically significant, at least at ten percent level, except for the inflation rate.

Since the above result identifies the presence of at least one cointegration relationship between ASPI returns and selected macroeconomic variables, the following ECM was specified on the optimal lag length 02. In the presence of a one percent deviation from long-run returns on R_t in period $t-1$, the explanatory variables fall by 0.89428 percent. Hence, it is clear that 89 percent of the errors in time t are corrected in the next period. The significant non-zero error correction coefficient proves the cointegration results, i.e. that there is a long-run relationship between the ASPI returns and the selected macroeconomic variables. Interestingly, the dummy variable that represents the civil war and the unstable political situation, DWAR, is highly statistically significant even at the one percent level. Thus, the ECM results confirm the idea that political instability and the civil war had created negative impacts in the short-run as well as in the long run.

The direction of the short-run bivariate relationships between ASPI returns and the selected macroeconomic variables were assessed by using the Granger causality test, provided in the Table 2.

Table 2 : Results of Granger Causality Tests

Null Hypothesis (no Granger causality)	No: of lags	Probability	Rejection of Null Hypothesis	Direction of causality
M2→Rt	02	0.91467	Cannot Reject H0	No Causality
Rt→M2		0.30878	Cannot Reject H0	
Inflation→ Rt	02	0.82867	Cannot Reject H0	No Causality
Rt→Inflation		0.81732	Cannot Reject H0	
Bank rate→Rt	02	0.82576	Can not Reject H0	No Causality
Rt →Bank		0.71563	Cannot Reject H0	
USD →Rt	02	0.89892	Cannot reject H0	No Causality
Rt →USD		0.00229***	Reject H0	Reverse Causality

Source: Authors' estimations based on data sources described in 'Methodology Section'.

Level of significance : *** - 1 percent = 0.01, ** - 5percent = 0.05 & * - 10 percent = 0.1

There is no short-run causal link between bank rate and ASPI. Money supply as well as inflation do not show any significant impact on stock returns in the short-run. The inflation seems to be a less important determinant of stock returns in the CSE. This might be the case because of the fact that the government took certain measures to curb rising price levels in the last few years.

Conclusion and Policy Recommendations

The results of the JJMCT method show that there is a long-run relationship between stock returns and macroeconomic variables, namely interest rate, exchange rate, money supply and inflation. However, the results of the ECM and Granger causality tests reveal that there are no such causal links in the short-run. Socio-political variables also tend to affect the stock price movements. In addition, thirty-year long civil war in Sri Lanka has had significant impacts on stock market activities. These findings suggest that existing public information on macroeconomic conditions as well as socio-political conditions have a significant impact on shaping stock price movements in the CSE which is an emerging capital market in a developing country. The results indicate that macroeconomic variables along with socio-political variables can, to a considerable extent, predict the price movements in emerging capital markets. If the analysts could combine the results of the quantitative tests with qualitative analysis, the predictability can significantly be enhanced.

References

- Fama, E. 1970. "Efficient Capital Markets; a review of theory and empirical work". *Journal of Finance*, 25(2): 383 -417.
- Gunasekarage, A, Power, D M and Pisedtasalsai, A. 2004. "Macroeconomic Influence on the Market: evidence from an emerging market in South Asia". *Journal of Emerging Market Finance*, 3(3): 285-304.
- Johansen, S and Juselius, J. 1990. "Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money". *Oxford Bulletin of Economics and Statistics*, 52(2): 169-210.
- Vidanage, T N. and Dayaratna-Banda, O.G. 2012. "Does past information help predict future price movements in emerging capital markets? : evidence from the Colombo Stock Exchange". *South Asia Economic Journal* (forthcoming).
- Wickramasinghe, G B. 2006. "Macroeconomic Forces and Stock Prices: some empirical evidence from an emerging stock market". *Working Paper for Faculty of Commerce –Accounting & Finance, University of Wollongong: Australia* (No: 06/14).