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Stock Market Price Movements and Macroeconomic Variables

Mazharul H. Kazi

This paper recognizes that intuitively a clear understanding about security market pricing procedures from both long- and short-runs viewpoints are important to an astute investor. Here an attempt is made to identify the efficient method of empirical studies in asset pricing that are relevant under the integrated global market system. Accordingly, it has briefly reviewed recent studies in asset pricing that are particularly important from a security market standpoint under the prevailing global economic and financial market system. Through this survey using the cointegration approach one can efficiently analyze the long-run relationship between a priori variables that are considered as a proxy for systematic risk factors and security market prices from the perspective of any nation within the globe.

Field of Research: Asset pricing, stock market analysis, systematic risk factors, cointegration.

1. Introduction

Security market indices represent security market prices. Stock price index is a way of measuring the performance of a market over time. Indices are regarded as an important indicator by the finance industry and the investing public at large. An index can be used as a benchmark by which an investor or fund manager compares the returns of their own portfolio. As the share market index represents the return of the market as a whole, one can easily evaluate market or industry performance using this index. The market index can also be used to define the universe from which investors or fund managers pick their stocks. Furthermore, indices are useful to form indexed portfolios as the basis for estimating the risk of an investor's own portfolio. Fund managers' portfolios can either be indexed (risk-neutral), overweight or underweight, compared to the weights in their benchmark (Standard and Poor's 2002).

*Send correspondence to Dr Mazharul Haque Kazi, School of Economics and Finance, University of Western Sydney, Australia (Email: m_kazi@optusnet.com.au; m.kazi@uws.edu.au), Tel/Fax: 61+ (02) 4731 8089; Mobile: 61+ 0402 280 325.

Finance literature acknowledges that significant risk factors need to be priced. Hence, understanding systematic risk factors and determining whether these factors are being appropriately priced for both an individual asset and stock indices are important to any investor or fund manager. If systematic risk factors are cointegrated with security market prices, this knowledge is useful to investors in their decision making processes. This type of study is becoming a focal point in finance. The studies suggest that stock market returns are predictable from a variety of financial and macroeconomic variables. The results of various studies suggest that financial and macroeconomic variables influence stock prices across a variety of markets and time horizons (Balvers, Cosimano and McDoanld 1990, Been, Glostone and Jagannathan 1990, Campbell 1987, Campbell and Hamao 1992, Cochrane 1991, Fama and French 1989, Ferson and Harvey 1993, French, Schwert and Sambaugh 1987, Glosten, Jagannathan and Runkle 1993, McMillan 2001, and Pesaran and Timmerman 1995, 2000).

Both international investors and researchers focus their attention on stock markets and fundamental macroeconomic dynamic interactions in countries (including ASEAN) that provide attractive investment opportunities to foreign investors (Wongbangpo and Sharma 2002). A number of studies, for example, modeled relationships between US share prices and real economic activity (Abdullah and Hayworth 1993, Chen 1991, Chen, Roll and Ross 1986, Dhakal, Kandil and Sharma 1993, Fama 1981, Geske and Roll 1983, Huang and Kracaw 1984) for investigating the relationships between the UK stock market and macroeconomic factors, while Brown and Otsuki (1990), Hamao (1988), and Mukharjee and Naka (1995) study the Japanese market. Moreover, Fung and Lie (1990) consider the Taiwanese market and Kwon, Shin and Bacon (1997) investigate the Korean market for any relationship with their respective macro-variables. The outcomes of all these studies suggest that, with minor degrees of variation, fundamental macroeconomic dynamics are indeed influential factors for stock market returns. Following section 2 that reviews the contemporary analytical methods in assessing long tern relationships between stock market price movements and pre-identified macroeconomic variables under the globalised financial market system, section 3 concludes the paper.

2. Analytical Methods Using Cointegration Technique

The cointegration approach has been used by many researchers to analyze pricing factors and to observe the relationships between economic variables and stock markets. Despite the fact that the cointegration approach is still evolving within the realm of time series analysis, it has become popular in empirical work in both economics and finance since its introduction in the 1980s by Granger (1981) and Engle and Granger (1987). There has been a noticeable tendency to shift from the classic testing approach to testing APT with cointegration techniques as it is a more efficient method. The shift can partly be explained by the fact that researchers are now assessing whether systematic risk factors or *a priori* variables are priced in stock markets rather than just condensing factors' dimensions for analyzing the asset pricing of particular markets (Ackert and Racine 1999, Maysami and Koh 2000, McMillan 2001, Mookerjee and Yu 1997, Nasseh and Strauss 2000, Shamsuddin and Kim 2000, 2003). Researchers are aiming to investigate both the long-run and dynamic relationships between *a priori* variables and stock market prices. The trend is towards the cointegration technique. Empirical frameworks are being developed in line with the cointegration techniques of Engle and Granger (1987), Granger (1988) and Johansen (1988, 1991, 1995, and 2000).

McMillan (2001), using US data, undertook to test whether a cointegrating vector exists between stock market indices and industrial production, inflation, money supply and the interest rate. The results provided positive evidence of cointegration between both the US market index (S&P 500) and the Dow Jones Industrial Average index (DJIA) and macroeconomic activity variables. McMillan (2001) focuses his research on both the long- and short-run relationships between stock markets rather than on individual stock returns and financial and macroeconomic variables. He points to the fact that research on long-run relationships between stock markets and the unit root components of economic activity variables is yet to receive significant attention.

By using the concept of cointegration, McMillan (2001) investigates empirically long-run equilibrium relationships between stock market indices and pre-selected economic and financial variables. He also uses variance decompositions to see which macroeconomic factors explain a substantial part of the variation in stock prices over the short and medium-run, namely, one, four and eight years. Variance decompositions are constructed from a vector autoregression (VAR) with orthogonal residuals and can directly address the contribution of macroeconomic variables in forecasting the variance of stock prices (Litternman and Weis 1985, Sims 1980). McMillan (2001) uses Johansen's (1991, 1995) vector error correction model (VECM) for ascertaining the cointegrating relationship between integrated time series through representation by a vector autoregression. He checks whether each series is integrated of the same order by considering both the Augmented Dickey-Fuller and Phillips-Peron tests. He assumes that each series contained a single unit root, and thus is integrated of the same order. He finds a potential for co-movement between these series exists, meaning a linear combination of this co-movement is stationary. This suggests a long-run relationship between these variables.

Researchers who investigate long-run relationships between macroeconomic variables and stock market indices focus their attention on determining the dynamic relationships between *a priori* variables and a representative stock market index (Maysami and Koh 2000, Mookerjee and Yu 1997, Mallik, et al. 2001, Shamsuddin and Holmes 1997, Shamsuddin and Kim 2000, 2003, Nasseh and Strauss 2000). The proxy variables chosen by these researchers vary from one stock market to another. Also, their analytical methods vary noticeably. Yet, the basis of all these studies in security pricing originated from the theoretical perspective of APT. To assess the impact of economic forces on the stock market, Maysami and Koh (2000) relate monthly stock market levels and monthly stock returns using Johansen's VECM. Maysami and Koh (2000) adopt Mukharjee and Naka's (1995) lesson for Singapore. Shamsuddin and Kim (2000, 2003) examine cross-country stock market relationships by employing the cointegration technique of Johansen (1988). Chen (1995) and Clare, Maras and Thomas (1995) use pair-wise cointegration in studying the performances of a group of countries.

While examining the dynamic relationships between the Singapore stock market and the two well-developed stock markets of the US and Japan, Maysami and Koh's (2000) process of selecting macroeconomic variables for the Singapore stock market is based on the simple and intuitive financial theory of Mukherjee and Naka (1995) and Chen, et al. (1986). They recognize that although the Engle and Granger (1987) two-step error correction model (ECM) is suitable for use in the multivariate context, VECM yields efficient estimators of cointegrating vectors. This was because VECM is a full information maximum likelihood estimation method. It allows cointegration to be tested in a whole system of equations in only one step without requiring a specific normalized variable. VECM avoids carrying over the errors from the first step into the second, and it does not require prior assumptions about the variables (endogenous or exogenous).

In estimating a VECM, Maysami and Kho (2000) first check for stationarity and unit roots by performing the Augmented Dickey-Fuller and Phillips-Peron tests on the variables in levels and first differences. Only variables integrated of the same order seem cointegrated, and the unit root tests help them to determine which variables are integrated of order one, or *I* (1). They have chosen lag lengths using Sim's likelihood ratio test. For simplicity, they use the multivariate forms of the Akaike Information Criterion and Schwartz Bayesian Information Criterion. Their choice of the number of maximum cointegrating relationships is based on the λ_{trace} tests. The $\lambda_{\max}$ test is used to test specific alternative hypotheses.

Having determined the order of cointegration, Maysami and Kho (2000) analyze the relevant cointegrating vector and the speed of adjustment coefficients. They perform tests on the parameters of the cointegrating vector using the likelihood ratio test. This is required for understanding whether stock prices contribute to the cointegrating relation and also if the macroeconomic variables are significant in the cointegrating relationship. Maysami and Kho (2000) use monthly time series in natural logarithms of these variables: share price index ($LSES_t$), M2 money supply ($LM2_t$), consumer price index ($LCPI_t$), industrial production index (LIP_t), domestic export ($LTDE_t$), bank rate ($LSTB_t$), and yield on government securities ($LLTB_t$). They gather time series data from various sources including the Public Access Time Series System, an online service of the Singapore Department of Statistics. Data on the exchange rate (LER_t) is obtained from the International Financial Statistics, published by the International Monetary Fund. Both the US stock market price (LUS_t) and the Japanese stock market price ($LJPN_t$) are obtained from the US Bureau of Labor Statistics. Definitions and transformations of these variables are presented in Tables 1 and Table 2 respectively.

Table 1: Definitions of Variables

Variables	Definitions of Variables
$LSES_t$	Natural logarithm of the index of the market-value weighted average of month-end closing prices for all shares listed on the Stock Exchange of Singapore
LER_t	Natural logarithm of the month-end exchange rate of the Singapore
$LM2_t$	Natural logarithm of the month-end M2 money supply in Singapore.
$LCPI_t$	Natural logarithm of the month-end Consumer Price Index.
LIP_t	Natural logarithm of the month-end Industrial Production Index.
$LSTB_t$	Natural logarithm of the month-end 3-month Interbank Offer Rate.
$LLTB_t$	Natural logarithm of the month-end yield on 5-year government securities.
LUS_t	Natural logarithm of the month-end stock-price index of the United States.
$LJPN_t$	Natural logarithm of the month-end stock price index of Japan.
LTDE	Natural logarithm of the month-end Total Domestic Export from Singapore.

Source: Maysami and Kho (2000).

Table 2: Time-Series Transformations

Transformation	Definitions of Transformations
$\Delta SES_t = LSES_t — LSES_{t-1}$	Monthly return on the Singapore stock market (ex-dividend).
$\Delta ER_t = LER_t — LER_{t-1}$	Monthly change in exchange rate.
$\Delta M2_t = LM2_t — LM2_{t-1}$	Monthly growth rate of money supply.
$\Delta CPI_t = LCPI_t — LCPI._{t-1}$	Monthly realized inflation rate.
$\Delta IP_t = LIP_t — LIP_{t-1}$	Growth rate of industrial production.
$\Delta STB_t = LSTB_t — LSTB_{t-1}$	Monthly return on 3-month interbank market (short- term).
$\Delta LTB_t = LLTB_t — LLTB_{t-1}$	Monthly return on government bonds (long-term).
$\Delta US_t = LUS_t — LUS_{t-1}$	Monthly return on US stock market (ex-dividend).
$\Delta JPN_t = LJPN_t — LJPN_{t-1}$	Monthly return on Japanese stock market (ex-dividend).
$\Delta LTDE = LTDE_t — LTDE_{t-1}$	Monthly change in Singapore's total domestic exports

Source: Maysami and Kho (2000).

Maysami and Kho (2000) use seasonally adjusted month-end data for the period from January 1988 to January 1995. The index they use is a value weighted index of all the shares listed, which provide them with a broad measure of market levels. Based on their test results, Maysami and Kho (2000) conclude that there are two cointegrating relationships at the 5% level of significance. Earlier, Mookerjee and

Yu (1997) study the Singapore stock market pricing mechanism by investigating whether there are long-term relationships between macroeconomic variables and stock market pricing. They have chosen the all-share price index to broadly represent Singapore stock market prices. They find that three out of four macroeconomic variables are cointegrated with stock market prices. To test for informational efficiency they employ cointegration and causality techniques because these techniques allow them for any potential linkages between variables in the long-run as well as in the short-run.

Mookerjee and Yu (1997) begin by conducting tests of nonstationarity. They consider four pre-selected macroeconomic variables that include the narrow money supply, the broad money supply, nominal exchange rates, and foreign currency reserves to ascertain whether these variables were related to Singapore stock market prices in both the long- and short-runs. In their unit root testing process, Mookerjee and Yu (1997) can not reject the hypothesis for all five variables at the 1% significance level. But the hypothesis can be rejected in first differences at the 5% significance level. The authors use the Engle and Granger (1987) method for identifying causality and cointegration between stock market prices and macroeconomic variables. They also employ the Johansen (1991) approach for further confirmation of their results. The Engle-Granger tests of cointegration suggest that the Singapore stock market is efficient in the long-run with respect to its exchange rate. Alternatively, they use the causality test of Granger (1996) for short-run informational efficiency. As the test of causality is sensitive to lag length selection as per Thornton and Batten (1985), they conduct causality tests between stock price change and each macroeconomic variable series up to the 12th lag. They observe that changes in Singapore stock prices have a causal relationship only with the narrow money supply. To obtain concrete evidence concerning the efficiency of the Singapore stock market, Mookerjee and Yu (1997) conduct further tests that entail calculating the forecasted or anticipated components of macroeconomic variables.

Nasseh and Strauss (2000) also find support for the existence of significant long-run relationships between stock market prices (represented by relevant share price indices) and domestic and international economic activity in six countries that included France, Germany, Italy, Netherlands, Switzerland and the UK. In their study Johansen's cointegration tests demonstrate that stock price levels are significantly related to industrial production, business surveys of manufacturing orders, short- and long-term interest rates as well as foreign stock prices, short-term interest rates, and production. Nasseh and Strauss (2000) also use variance decomposition methods that support the strong explanatory power of macroeconomic variables in contributing to the forecast variance of stock market prices. They recognize the usefulness of Johansen's framework for analyzing stock market and macroeconomic activity — it incorporates dynamic co-movements or simultaneous interactions, allowing the researchers to study the channels through which macroeconomic variables affected asset pricing, as well as their relative importance. Their variance decomposition methods, based on a vector autoregression with orthogonal residuals, show that macroeconomic factors explain a substantial part of the variation in stock prices in the medium and short-runs. Nasseh and Strauss (2000) find that although stock prices are explained by economic fundamentals in the medium and short-run, the underlying volatility inherent in stock prices is related to macroeconomic movements in the long-run.

Using US equity market index data, Actert and Racine (1999) examine whether spot and futures equity markets are cointegrated. Their analytical model is based on the nonarbitrage, cost-of-carry pricing model of Brenner and Kroner (1995). They assume that a stock index and its futures price is cointegrated if the cost of carry is stationary, otherwise the cointegrating relationship would be trivariate. They find that the S&P500, associated futures series, and the interest rate are all nonstationary. In addition, their cointegrating relationships include the index, futures price, and the cost of carry. Their findings are consistent with the nonarbitrage pricing model and do not appear to be sensitive to the presence of structural breaks in the series. Based on practical experience, Duy and Thoma (1998) notice that although the issue of identifying cointegrating relationships between time series variables is of increasing importance, researchers have to reach an agreement on the appropriate manner of modeling such relationships. They attempt to distinguish between modeling techniques through a comparison of forecast statistics, while at the same time focusing on the issue of whether or not imposing cointegrating relations via an ECM (error correction model) improve long-run forecasts. They found that imposing cointegrating restrictions often improve forecasting power.

Duy and Thoma (1998) construct a model that takes into account z_t, an $n \times 1$ vector of nonstationarity, I(1) and time series variables. They assume that two or more of the elements of z_t form a stationary, I(0), linear combination. Their ECM representing such a system of variables is:

$$\Delta z_t = \alpha w_{t-1} + \sum_{i=1}^{j} \gamma_i \Delta z_{t-1} + \varepsilon_t^{EC} \qquad (1)$$

where $w_t = \beta' z_t$ is the cointegration term; β is an $n \times 1$ vector of coefficients in the cointegrating vector; α is an $n \times 1$ vector of coefficients; and ε_t^{EC} is a vector of Gaussian error terms. Duy and Thoma determine the elements of the cointegrating vector both theoretically and empirically. In doing so they first consider a vector autoregression (VAR) model in pure differences for examination because if cointegration is not present in the variables z_t then the above error correction models would be misspecified. This type of model is often recommended when the elements of z_t are difference stationary but not cointegrated. They also consider VAR models in pure levels as estimates of a VAR in levels often avoids the possibility of imposing false restrictions on the model. Their models are:

$$\Delta z_t = \sum_{i=1}^{j} \gamma_t \Delta z_{t-i} + \varepsilon_t^{D} \quad \text{(differences)} \qquad (2)$$

and

$$z_t = \sum_{i=1}^{j} \gamma_t z_{t-i} + \varepsilon_t^L \quad \text{(levels)} \tag{3}$$

Duy and Thoma (1998) thus test cointegration within their three systems of equations by using the Johansen maximum likelihood procedure, which they find satisfactory. Paul and Mallik (2001) investigates the long-run relationship between three pre-specified macroeconomic factors and stock prices in the banking and finance sector in Australia by using cointegration techniques. As a proxy for stock prices, they use time series data on ASX bank and finance share market indices. All data are quarterly observations for the period 1/1980 to 1/1999. They measure inflation as the change in the quarterly consumer price index. They consider three-monthly bank bill rates as interest rates, and logged seasonally adjusted gross domestic product (GDP) at 1997-98 base prices as a proxy for GDP growth. Upon detection of any cointegrating relationship, for estimation of their model they construct an error correction autoregressive distributed lag (ARDL) model in line with Pesaran and Shin (1995). Their ARDL error correction model is as follows:

$$\Delta \ln BP_t = \phi_{10} + \sum_{t-1}^{p} \phi_1 \Delta \ln BP_{t-i} + \sum_{k=0}^{r} \phi_2 \Delta \ln INT_{t-k} + \sum_{l=0}^{s} \phi_3 \Delta INF_{t-1}$$
$$+ \sum_{j=0}^{q} \phi_4 \Delta \ln GDP_{t-j} + \rho_1 \mu_{t-1} + e_t \tag{4}$$

where Δ denotes a first difference operator; μ_{t-1} is an error correction term; p, q, r and s are the lag lengths; and e_t is the random disturbance term. Although their results can not show any significant effect of inflation on stock prices, they find both the interest rate and GDP growth significant. The interest rate has a negative effect, whereas GDP growth shows a positive effect on the banking and finance sector's stock price. Earlier, Lim and McNelis (1998) study the effect of US and Japanese stock market price movements on that of Australian markets by examining the influence of shocks in the Japanese Nikkei index and in the US S&P index on the Australian All Ordinaries index. They consider logged daily data series from 28 September 1990 to 12 September 1996, and used three models including an autoregressive linear model.

More recently, Wongbangpo and Sharma (2002) investigate the role of five macroeconomic variables, namely, gross national product, consumer price index, money supply, interest rate, and exchange rate on the stock prices in five ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, and Thailand). They observe both long- and short-term relationships between stock prices and their macroeconomic variables for the period 1985 to 1996. They use monthly data that are found to be integrated of order one from the Augmented Dickey-Fuller and Phillips-Peron tests. They also use maximum likelihood based λ_{trace} and $\lambda_{\max}$ statistics through the cointegration analysis technique of Johansen (1988, 1991) and Johansen and Juselius (1990) for tracing any causal relationship within the framework of the VECM. Their system of the short-run dynamics of the stock price series (SP_t) is as under:

$$\Delta SP_t = \alpha_1 + \beta_1 EC_{t-1} + \sum_{i=1}^{k} \delta_{1i}\Delta SP_{t-i} + \sum_{i=1}^{k} \theta_{1i}\Delta GNP_{t-i} + \sum_{i=1}^{k} \xi_{1i}\Delta CPI_{t-i} + \sum_{i=1}^{k} \rho_{1i}\Delta MS_{t-i} + \sum_{i=1}^{k} \omega_{1i}\Delta IR_{t-i} + \sum_{i=1}^{k} \tau_{1i}\Delta ER_{t-1} + \varepsilon_t^{SP} \quad (5)$$

where EC_{t-1} is the error correction term that is obtained from the cointegration vector, $\beta,\delta,\theta,\zeta,\rho,\omega,\tau$ are parameters; *k* is the lag length; and ε_t^{SP} a stationary random process with mean zero and constant variance. Kazi (2004) examines the relationship between the Australian stock market price movements and six macroeconomic variables namely, industrial production, the bank variable interest rate, corporate profits, the dividend yield, the price earnings ratio, and MSCI (Morgan Stanley Capital International world index) . At the outset he considerers a vector autoregressive (VAR) model which has a constant (but no trend) and included the breakpoint dummy as exogenous, as in the following equation:

$$y_t = \mu_0 + \sum_{i=1}^{k} \beta_i y_{t-i} + \varphi D_t + u_t \quad (6)$$

where $y_t = (LNALLORDS, LNBVIR, LNCP, LNDY, LNIPI, LNMSCI, LNPER)'$ a 7×1 vector of I(1) variables considered as endogenous in the model; D_t is a vector of breakpoint dummy exogenous variable; μ_0 is a constant and u_t is white noise. In order to perform Johansen's cointegration analysis Kazi (2004) then converts the VAR in equation (6) into a vector error correction model (VECM) by incorporating an error correction mechanism (ECM_{-1}) into the system. Thus, for analysis, his transformed VECM is as under:

$$\Delta y_t = \mu_0 + \sum_{i=1}^{p-1} \Gamma_i \Delta_i y_{t-i} + \delta ECM_{t-1} + \varphi D_t + \varepsilon_t \quad (7)$$

or,

$$\Delta y_t = \mu_0 + \sum_{i=1}^{p-1} \Gamma_i \Delta_i y_{t-i} + \alpha\beta' y_{t-1} + \varphi D_t + \varepsilon_t \quad (8)$$

where $\varepsilon_t \sim iidN(0,\Omega)$.

3. Conclusion

This paper has reviewed the recent trends of analyzing the relationship between the security market movement and *a priori* variables, while retaining the basic attributes of asset pricing theory. As seen, many researchers are studying the long-term relationship between stock indices and macroeconomic variables as well as short-term dynamics using the cointegration technique as opposed to classical methods of analysis namely, factor analysis, principal component analysis, multivariate analysis, structural time series and/or similar regression analyses. It is now apparent that using the cointegration approach one can efficiently analyze the long-run relationship between *a priori* variables (macroeconomic variables) that are considered as proxy for systematic risk factors and security market prices. This paper recognizes that although an empirical study in asset pricing imposes no limits within the boundaries of its traditional methods or models, the cointegration method or an autoregressive model based on the stock market prices are more suitable for empirical analysis of asset pricing under the globalised market place. Accordingly, researchers, fund managers, analysts and investors at large would benefit from this paper as it points to the future direction about the suitability of contemporary empirical technique that is more efficient over the traditional methods for analyzing asset pricing and its return generating process in any securities market.

References

Abdullah, D. A. and Hayworth, S. C., 1993. Macroeconomics of stock price fluctuations. Quarterly Journal of Business and Economics; 32(1): 49-63.

Ackert, L. F. and Racine, M. D., 1999. Stochastic Trends and Cointegration in the Market for Equities. Journal of Economics and Business; 51:133-143.

Been, W., Glosten, L. R. and Jagannathan, R., 1990. Predictable Variations in Stock Index returns. Journal of Finance; 44: 1177-1189.

Brenner, R. J. and Kroner, K. F., 1995. Arbitrage, cointegration, and testing the unbiasedness hypothesis in financial markets. Journal of Financial and Quantitative Analysis; 30 (1):23-42.

Brown, S. J. and Otsuki, T., 1990. Macroeconomic factors and the Japanese equity markets: the CAPMD project, In: Elton and Gruber, editor. Japanese capital markets, Harper and Row, New York.

Campbell, J. Y., 1987. Stock Returns and the Term Structure. Journal of Financial Economics; 18: 373-399.

Chang, A. C. S., 1995. The UK stock market and economic factors: a new approach. Journal of Business Finance and Accounting; 22(1):129-142.

Chen, B., 1995. Long-run purchasing power parity: Evidence from some European Monetary System Countries. Applied Econometrics; 27: 377-383.

Clare, A. D., Mars, M. and Thomas, S. H., 1995. The integration and efficiency of international bond markets. Journal of Business Finance and Accounting; 22(2): 313-322.

Cochrane, J. H., 1991. Production-Based Asset Pricing and the Link between Stock Return and Economic Fluctuations. Journal of Finance; 46: 209-238.

Dhakal, D., Kandil, M. and Sharma, S. C., 1993. Causality between the money supply and share prices: a VAR investigation. Quarterly Journal of Business Economics; 32(3): 52-74.

Duy, T. A., and Thoma, M. A., 1998. Modeling and Forecasting Cointegrated Variables: some Practical Experience. Journal of Economics and Business; 50: 291-307.

Engle, R. F. and Granger, C. W. J., 1987. Cointegration and Error Correction: Representation, Estimation and Testing. Econometrica; 55: 251-276.

Fama, E. F. and French, K. R., 1989. Business conditions and expected returns on stocks and bonds. Journal of Financial Economics; 25: 23-49.

Fama, E. F., 1981. Stock returns, real activity, inflation, and money. The American Economic Review; 71: 545-565.

Fung, H. G. and Lie, C. J., 1990. Stock market and economic activities: a causal analysis, In: Khee and Chang, editor. Pacific-basin capital market research. Amsterdam, North Holland.

Geske, R. and Roll, R., 1983. The fiscal and monetary linkage between stock returns and inflation. Journal of Finance; 38: 1-33.

Golsten, L. R. Jagannathan, R. and Runkel, D. E., 1993. On the relation between the expected value and the volatility of the nominal excess return on stocks. Journal of Finance; 48(5): 1779-1801.

Granger, C. W. J., 1981. Some properties of Time Series Data and Their Use in Econometric Specification. Journal of Econometrics; 16: 121-130.

Hamao, Y., 1988. An empirical examination of Arbitrage Pricing Theory: using Japanese data. Working Paper. University of California, USA.

Huang, R. D. and Kracaw, W. A., 1984. Stock market returns and real activity: a note. Journal of Finance; 39: 267-273.

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

Johansen, S., 1988. Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control; 12: 231-254.

Johansen, S., 1991. Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. Econometrica; 59(6): 1551-1580.

Johansen, S., 1995. Likelihood-based Inference in Cointegrated Vector Autoregressive Models. Oxford University Press, Oxford.

Johansen, S., 2000. Modeling of cointegration in the vector autoregressive model. Economic Modeling; 17: 359-373.

Kazi, M. H., 2004. Systematic risk factors in Australian security pricing. PhD Thesis. University of Western Sydney, Australia.

Kwon, C. S.; Shin, T. S. and Bacon, F. W., 1997. The effect of macroeconomic variables on stock market returns in developing markets. Multinational Business Review; 5(2): 63-70.

Lim, G. C. and McNelis, P. D., 1998. The Effect of the Nikkei and the S&P on the All-Ordinaries: A Comparison of Three Models. International Journal of Finance and Economics; 3: 217-228.

Maysami, R. C. and Kho, T. S., 2000. A vector error correction model of the Singapore stock market. International Review of Economics and Finance; 9: 79-96.

McMillan, D. G., 2001. Cointegration Relationships between Stock Market Indices and Economic Activity: Evidence from US Data. Discussion Paper; 0104. Centre for Research into Industry, Enterprise, Finance and the Firm (CRIEFF).University of St. Andrews, Scotland.

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.

Mukharjee, T. K. and Naka, A., 1995. Dynamic relations between macroeconomic variables and the Japanese stock market: an application of a vector error-correction model. The Journal of Financial Research; 18 (2): 223-237.

Nasseh, A. and Strauss, J., 2000. Stock prices and domestic and international macroeconomic activity: a cointegration approach. The Quarterly Review of Economics and Finance; 40(2): 229-245.

Paul, S. and Mallik, G., 2001. Macroeconomic Factors and the Bank and Finance Stock Prices: The Australian Experience and Lessons for GCC Countries. Conference Paper. International Conference on Structure, Performance and Future of Financial Institutions in Member States of GCC, Quarter 7-9, April 2001.

Pesaran, M. H. and Shin, Y., 1995. An Autoregressive Distributed Lag Modeling Approach to Cointegtation Analysis. Working Paper. Amalgamated Series; 9514. Department of Applied Economics, University of Cambridge.

Pesaran, M. H. and Timmerman, A., 1992. A simple non-parametric test of predictive performance. Journal of Business and Economic Statistics; 10(4): 461-465.

Shamsuddin, A. F. and Holmes, R., 1997. Cointegration test of the monetary theory of inflation and forecasting accuracy of the univariate and vector ARMA models of inflation. Journal of Economic Studies; 24(5): 294-306.

Shamsuddin, A. F. and Kim, J. H., 2000. Integration and Interdependence of Stock and Foreign Exchange Markets: An Australian Perspective. Conference Paper. Australian Finance and Banking Conference, Sydney.

Shamsuddin, A. F. and Kim, J. H, 2003. Integration and Interdependence of Stock and Foreign Exchange Markets: An Australian Perspective. International Financial Markets, Institutions and Money; 13: 237-254.

Sims, C. A., 1980. Macroeconomics and Reality. Econometrica; 58: 1-48.

Standard and Poor's, 2001. Setting the Standard: Understanding Indices. website: www.standardandpoor.com.au.

Thornton, D. I. and Batten, D. S., 1985. Lag length selection and granger causality between money and income. Journal of Money, Credit and Banking; 17: 164-178.

Wongbangpo, P. and Sharma, S. C., 2002. Stock market and macroeconomic fundamental dynamic interactions: ASEAN5 countries. Journal of Asian Economics; 13: 27-51.