MPRA

Munich Personal RePEc Archive

Multivariate Causal Estimates of Dividend Yields, Price Earning Ratio and Expected Stock Returns: Experience from Malaysia

Wan Mahmood, Wan Mansor and Abdul Fatah, Faizatul Syuhada

Universiti Teknologi MARA Terengganu

20. June 2007

Multivariate Causal Estimates of Dividend Yields, Price Earning Ratio and Expected Stock Returns: Experience from Malaysia

Wan Mansor Wan Mahmood, *PhD**

Faizatul Syuhada Abdul Fatah

Financial Economics and Futures Market Research Group, Universiti Teknologi MARA Terengganu, 23000 Dungun Terengganu, MALAYSIA
Tel: 6098403774 Fax: 6098403777. *Email: dwanmans@tganu.uitm.edu.my*

* Corresponding author

Multivariate Causal Estimates of Dividend Yields, Price Earning Ratio and
Expected Stock Returns: Experience from Malaysia

Abstract

The study examines the relationship among Malaysian's market stock return, dividend yields and price earnings ratio. Specifically, it examines the existence of long-run and short-run relationship and also their predictive power (causality) between and among market stock return, dividend yields and price earnings. Using the monthly data from 1989-2005, the study finds that all these fundamental variables have a strong long run relationship. As for the short run relationship, the results show significant positive predictive power from dividend yield to stock return and significant negative relation from stock returns to price earning ratios. In addition, applying multivariate causality test, the results show that both dividend yields and price earning ratio Granger cause (predict) the stock return. Similar results are found from stock returns and P/E ratio to dividend yield, as well as from dividend yield and stock returns to P/E ration but with lesser magnitude. Thus, fundamental variables are an important source of information in determining stock market returns and useful to investors and other market participants in deciding their investment strategies.

Multivariate Causal Estimates of Dividend Yields, Price Earning Ratio and Expected Stock Returns Based: Experience from Malaysia

1. Introduction

Stock performance has always been an interest for investors or any individuals involved directly or indirectly with market activity and performance. Hence, studies of market behavior, price movement and returns is always sensitive to the fundamental changed and, therefore can have an effect on their wealth. Furthermore, because of its dynamics in nature, stock performance has drawn the attention of economists, both for theoretical and empirical reasons since it influences the country's growth and development in long term period as well as a mirror of the country's economic current activities in short term period.

Since the early 70's, numerous studies on the stock market have been conducted, with most focusing based on stock returns because it is important to both investors and business organizations to know what influences their investment returns and company stock value. Among the factors that being considered greatly by the researchers are dividend price ratio [see Campbell and Shiller (1988a, 1998), Lo and McKindley (1988), Poterba and Summers (1988)]; price earning (P/E) ratio [see Basu (1975) and Lamont (1998)]; dividend yield [see Fama and French (1988), Goetzmann and Jorian (1993), Hodrick (1992) and Khothari and Shanken (1992)]; and exchange rates [see Ma and Kao (1990), Ajayi and Mougoue (1996), and Nieh and Lee (2001).

Although many previous empirical studies have investigated the relationship between stock returns and fundamental ratios such as P/E ratio, dividend yield and book-to-market ratio, the results are ambiguous. Basu (1983) and Banz and

Rolf (1981), among others, find evidence that stock returns are positively affected by their fundamental values. On the other hand, studies by Fama and French (1992, 1988), and Basu (1975) give contradictory results. They find that stock returns are negatively affected by their fundamental values. In general, all these results show that a consensus on the role of fundamental ratios in the process of determining stock returns so far does not exist.

Small sample sizes in some previous research generate concern. The small samples typically employed in examining unit roots and cointegration may significantly distort the power of some standard testing procedures and lead to suspect conclusions. Renewal effort geared to expand sample sizes and to utilize them in the most efficient manner in order to draw new and standard inferences. Therefore, this study extends the existing research on the predictability of aggregate stock returns in Malaysian stock markets by using long time series data. The study investigates the predictive power of dividend yields and price-earning ratios in order to determine whether a predictability phenomenon exists in small and emerging stock market such as Malaysia. Specifically, we examine whether stock returns are influenced by the movement of the fundamental variables in the long run, and whether there is any causality phenomenon between and among the variables under study. The research and literature related to Malaysian stock market is very scarce. Not many researchers have investigated the dynamic short-term and long-term predictability relationship of stock return and the fundamental factors.

The study chooses the explanatory variables based on existing evidence in the US which show that stock price is influenced by the practice of fundamental

security analysis. A large amount of evidence suggests short and long-horizon stock returns are predictable from fundamental variables such as dividend yields and price earnings ratio. Other studies have also found that stock returns are predictable from a common set of stock market variables (such as term of interest rates, inflation, size, book to market ratio and exchange rates). Previous studies have not provided sufficient empirical results on the behavior of other market except for the US market and European market. The present study therefore focuses on the Malaysia stock market - a fast growing emerging stock market which creates great interest amongst investors and other market participants alike.

The study on the Malaysian predictability phenomenon is quite interesting as it contributes to the literature in three distinct areas. First, the present study investigates the relationship on the market level compared to previous studies that use firm level. Second, the remarkable expansion of national stock markets and the increasing interdependence among regional stock markets are developments that have stimulated an interest in studying the behavior of Malaysian stock markets. Third, the framework of Engle-Granger (1987) and Johansen (1988) is applied to test for multivariate cointegration relationships among variables. In addition, the study applies ECM multivariate as opposed to bivariate procedures to test for the short-run relationship and causality between variables. The multivariate model offers great econometrics efficiency since it regress all variables in one single equation.

2. Data and Research Method

2.1 Data Description

The stock indices used in this study are Kuala Lumpur Composite Index (KLCI), a proxy for Malaysian stock market indices employing end of the month closing prices for the period January 1989 through October 2005, along with the corresponding dividend yields and price earning ratios gathered from the DataStream. The KLCI are transformed to monthly rates of return. The descriptive statistics for raw data for all the variables appear in Table 1.

< INSERT TABLE 1 HERE>

The standard deviation of price-earning ratios is larger that the stock index and dividend yields. This shows that raw data of P/E ratios have very large range and thus more volatile behavior that the other two variables.

2.2 Methodology

2.2.1 Unit Root Tests (Stationarity Tests)

The first step in modeling time series is to test for the stationarity of the data. Stationarity tests are carried out using two commonly used procedures. They are Dickey-Fuller (DF) (1979) and Augmented Dickey-Fuller test (ADF) (1979), to determine whether the univariate time-series contain a unit root. However, the most widely used method is ADF. A series is said to be integrated of order d, denoted $I(d)$, if d is the number of the time the series must be differenced to achieve stationarity. Thus, $I(1)$ series means that the series must be differenced once to obtain stationarity, while $I(0)$ series is stationary without difference.

2.2.2 Johansen Cointegration Tests

Since the series are integrated of order one, the number of significant cointegration vectors is tested following the procedure introduced by Johansen (1988, 1991) and Johansen and Juselius (1990). The model uses the maximum eigenvalue test statistic and trace test statistic. Both the test for nonzero eigenvalues is normally conducted using the following formulations:

$$\lambda_{trace}(r) = -T \sum ln(1 - \lambda_t)$$

$$\lambda_{max}(r, r+1) = -T \sum ln(1 - \lambda_t),$$

where T is the number of observations and λ_t are the eigenvalues. The λ *trace* formulation tests the null hypothesis that the number of distinct cointegrating vectors is less than or equal to r, against a general alternative. A r = 0 shows that there are no cointegrating vectors in the system. If it is rejected, then sequential testing of $r \leq 1, r \leq 2, ...$ is used. The λ *max* statistic tests the null hypothesis or r cointegrating vectors against r + 1 cointegrating vectors. Johansen and Juselius (1990) and Osterlaw-Lenum (1992) derive the critical values of λ *max* and λ *trace* by simulation method. The critical values for the two statistics are provided by Johansen and Juselius (1990). If the series are deemed to be cointegrated, they can be expressed as an error correction models (ECM).

2.2.3 Error-Correction Models (ECM)

The Error Correction Model (ECM) is used to test for the short run relationship among the three variables. Engle and Ganger (1987) pointed out that the presence of cointegration always causes corresponding error-correction representation. This means that the change in the dependent variable is a

function of the level disequilibrium in the cointegrating relationship. The cointegrating relationship is captured by the error-correction term and changes in others explanatory variables. This idea is being exploited in the studies of stock markets integration in which there may exist comovement among a set of time series and possibilities that they will tend to move together in finding stable long run equilibrium. Equation (4) presents the multivariate error-correction model.

$$\Delta Y_t = \alpha_0 + \phi_0 \mu_{t-1} + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \delta_j \Delta X_{t-j} + \sum_{k=1}^{p} \chi_j \Delta Z_{t-k} + \upsilon_t \tag{1}$$

where μ_{t-1} is the lagged value of the error correction term derive from long run cointegration. The m and n are the optimal number of lags for the lagged dependent and lagged independent variables, respectively, and υ_t is the residual. In the multivariate ECM, an additional explanatory variable Z is included in the equation besides changing variables Y and X as in bivariate, to explain the changing variable Y. In order to construct the ECM, lag lengths, m and n are selected using a frequently applied approach of Akaike's ((1974) by following the criteria of minimizing the mean square of error prediction.

2.2.4 Granger Causality Tests

The Vector Autoregression model (VAR) is used to test for causality in the sense of Granger (1969). To implement the Granger test, we estimate the reduced form of VAR equation by equation in an OLS regression. The Granger Causality test (multivariate model) can be expressed as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \delta_j \Delta X_{t-j} + \sum_{k=1}^{p} \chi_j \Delta Z_{t-k} + \upsilon_t \tag{2}$$

where changing Y is stock returns (dependent variable) and X, Y and Z are respectively, changing lagged stock return, changing dividend yields ratio and

7

changing earnings price ratio P/E (independent variable). The Granger test regress stock returns on lagged stock returns, lagged dividend yields and lagged earnings-price ratio (P/E), and υ_t assumed to be serially uncorrelated with zero mean. In determining the appropriate lags lengths for the polynomials, we follow the criteria of minimizing the mean square of error of prediction [Akaike(1974)]. The Granger F-statistic, tests the null hypothesis that lagged X and Z does not Granger-cause (predict) Y. The null is rejected if the χ_j coefficient and δ_j are significantly different from zero. If the F-test is significant, we can conclude that variables X and Z have linear predictive power (Granger cause) on Y.

3. Empirical Results

3.1 Results for the stationarity tests

The test results of the DF and ADF in table 2 show that the null hypothesis of stationary of levels for both stock index and dividend-price ratio series cannot be rejected. Only price-erring ratio is stationary for the level series. However, when the null hypothesis of nonstationarity of first difference is tested, it is rejected at 5 percent level as shown in table 2.

< INSERT TABLE 2 HERE>

3.2 Results for the Engle-Granger Tests

Table 3 presents the Engle-Granger multivariate cointegration results. The t statistics results are compared with the critical value from Davidson and MacKinnon (1993). The t statistics results suggest of cointegration in all three cases. All three dependent variables of stock return, dividend yields and price earning ratio are affected by the explanatory variables.

8

< INSERT TABLE 3 HERE>

3.3. Results for the Johansen Multivariate Cointegration test

The Johansen cointegration test results are exhibited in table 4. The results show that there exist at most r = 3 cointegrating vectors. Since the evidence suggests cointegration in the long run, the study further applies error correction model to test for the short run relationship between and among these variables.

< INSERT TABLE 4 HERE>

3.4 Results for the Multivariate Error Correction Model (ECM)

The results for multivariate error correction model are reported in table 5. ECM is used to test for the short term equilibrium relationships between the variables under study. The results indicate that there is short-run relationship between stock returns and dividend yields, and stock returns and price earnings ratio. However, no relationship can be established between price earning ratio and dividend yield in short time period.

< INSERT TABLE 5 HERE>

3.5 Results for the Multivariate Granger causality Test

The results for multivariate Granger causality test are reported in table 6. The results show that DY and P/E ratio Granger-cause the stock return at 1 percent confidence level. The null hypothesis of DY does not cause stock return and P/E ratio is rejected since the F-value is significance at 5 percent level. Similar result is obtained for P/E ratio. Even though the null hypothesis is rejected indicating independent variables Granger caused dependent variable in all cases, the level of significance is different. In general, our findings suggest that dividend yield and price earning ratio Granger caused stock return is higher compared with the others since it magnitude is larger (F-statistic 12.1780). As mentioned often in the literatures, cash dividend announcements are normally used by the managers as signaling devices to convey information to market participants about future changes and their expectation of the prospects of the firm. Therefore, stock prices changed temporarily in response to dividend changes because the market believes that the change suggests probable future course of earnings of the firm. Thus, the change in stock returns following changes in dividend is consistent with the efficient market hypothesis in that on average the stock market adjusts in an efficient manner to new dividend information. As for the results of the present study, we have established significant Granger causality in all cases and therefore may be viewed as evidence of violating the efficient market hypothesis. However, this study does not intend to test the efficient market hypothesis because it required the test of a joint hypothesis as mentioned by Fama (1991).

< INSERT TABLE 6 HERE>

4. Summary and Conclusion

11

In this paper we used time series data to examine the relationship among stock market, dividend yield and price earning ratio in the context of Malaysia market. Previous studies have used either bivariate causality or naïve regression model but both approaches have drawback. We employed multivariate cointegration analysis and the multivariate error correction model to conclude that there is strong evidence of long-run and short-run relationship among variables. We also employed the multivariate Granger causality to estimate the cause effect relationship. The empirical evidence points to the direction that there is significant short run Granger causality among stock returns, dividend yield and price earning with the most significant direction being from dividend yield to stock returns. The finding suggests that market player should use fundamental variables in deciding their investment strategies since it is an important source of information in determining stock market returns

References

Ajayi, R. and Mougoue, M, 1996, On the Dynamic Relation between Stock Prices and Exchange Rates, *Journal of Financial Research,* XIX, pp.193-207.

Akaike, H. 1969, Statistical predictor identification. *Annals of the Institute of Statistical Mathematics,* pp.203 – 217.

Banz and Rolf, W. 1981, The Relationship Between Return and Market Value stocks. *Journal of Financial Economics*, 9, pp.3-18.

Basu, S. 1975, The Information Content of Price-Earnings Ratios. *Financial Management* 4, pp.53-64.

Basu, S. 1983. The Relationship between Earnings Yield, Market Value, and Return for NYSE Common Stocks: Further Evidence. *Journal of Financial Economics*, 12, pp.129-156.

Campbell, J.Y. and Shiller R.J. 1988a, Stock Prices, Earnings, and Expected Dividends, *The Journal of Finance*, 43, pp. 661-676.

Campbell, J.Y and Shiller, R.J. 1988b, The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors, *Review of Financial Studies*, 1, pp.195-228.

Davidson, R. and MacKinnon, J. G. 1993. *Estimation and Inference in Econometrics.* Oxford University Press, Oxford.

Dickey, D. A. and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root, *Journal of the American Statistical Association,* 74, pp.427 – 431.

Engle, R. F. and Granger, C. W. J. (1987). Cointegration and error correction: Representation, estimation and testing. *Econometrica,* 55, pp.251 – 276.

Fama, E. 1991, Efficient Capital Markets: II, *Journal of Finance,* 46, pp.1575-617.

Fama, E. and .French, K.1988, Dividends Yields and Expected Stock Returns, *Journal of Financial Economics,* 22, pp.3-25.

Fama, E.and French, K. 1992, The Cross-Section Of Expected Stock Returns. *Journal of Finance*, 47, pp.427-465.

Goetzmann, W. and Jorion P. 1993, Testing the Predictive Power of Dividend Yields. *Journal of Finance*, 48, pp.663-679.

Hodric, R.J. 1992, Dividend Yields and Expected Stock Returns: Alternative Procedures for Inference and Measurement, *The Review of Financial Studies*, 5, pp.357-386.

Johansen, S. 1988, Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12, pp.231 – 254.

Johansen, S. 1991, Estimation and hypothesis testing of cointegration vectors in gaussian autoregressive models. *Econometrica,* 59, pp.1551 – 1580.

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

Kothari, S.P. and Shanken, J. 1992, Stock Return Variation and Expected Dividends, A Time-Series and Cross-Sectional Analysis, *Journal of Financial Economics*, 11, pp.117-210.

Lamont, O, 1998, Earnings and Expected Returns, *Journal of Finance*, 53, pp.1563-1587.

Lo, A., and MacKinlay, A.G. 1988, Stock Market Prices Do Not Follow Random Walks: Evidence of Simple Specification Tests, *Review of Financial Studies* , 1, pp.41- 66.

Ma, C.K. and Kao, G.W. 1990, On Exchange Rate Changes and Stock Price Reactions, *Journal of Business Finance and Accounting*, 17, pp.441-449.

Osterwald-Lenum, M. 1992, A Note with Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics, *Oxford Bulletin of Economics and Statistics*, 54, pp.461-472.

Nieh, C.C and Lee, C.F, 2001, Dynamic Relationship Between Stock Prices and Exchange Rates for G-7 Countries, *Quarterly Review of Economics and Finance*, 41, pp.477-490.

Poterba, J.M. and Summer, L.H 1988, Mean Reversion in Stock Prices Evidence and Implications, *Journal of Financial Economics*, 22, pp.27-59.

Table 1 Descriptive statistics of raw data of stock index, dividend price ratios and price earning ratio

Variables	Stock Index	Div. Yield	P/E Ratio
Mean	6.5882	2.2381	32.6798
Std. Dev	0.29481	0.66118	99.6538
Minimum	5.8481	0.00	-124.49
Maximum	7.1803	6.0	973.33

Table 2 Unit root tests on level (raw data) and first different

Variables	Dickey-Fuller Test		Augmented Dickey-Fuller Test	
	Raw Data	First Different	Raw Data	First Different
STOCK INDEX	-2.6598	-12.7748	-2.8002	-12.4709*
DY	-2.3983	-15.9251	-2.6606	-11.6266*
P/E RATIO	-7.2287	-18.8502	-5.8415*	-12.5437*

Notes; DY: dividend yields, P/E ratio: earnings-price ratio
95% critical value for the augmented Dickey-Fuller statistic = -2.8759. The Dickey-Fuller regressions include an intercept but not a trend, Significant at 5% level

Table 3 Engle-Granger cointegration tests for models with $I(1)$ variables (First indifference) – Multivariate model

Dependent	Independent	Residual *t*-test for DF	Residual *t*-test for ADF
SR	DY	-12.8372*	-12.4857*
	P/E ratio		
DY	SR	-15.9308*	-11.6121*
	P/E ratio		
P/E ratio	SR	-18.8597*	-12.5512*
	DY		

Notes; SR Stock returns, DY: dividend yields, P/E ratio: earnings-price ratio 95% critical value for the augmented Dickey-Fuller statistic = -2.8759. * Significant at 5% level

Table 4 Johansen Cointegration Multivariate model

Ho	λ *max*	95 % critical value	λ *trace*	95 % critical value
Variables: RS, DY and P/E ratio				
r = 0	106.1696*	(22.0400)	218.3828*	(34.8700)
r ≤ 1	72.5765*	(15.8700)	112.2131*	(20.1800)
r ≤ 2	39.6367*	(9.1600)	39.6367*	(9.1600)

Notes; RS Stock returns, DY ratio: dividend yields, P/E ratio: earnings-price ratio

Table 5 Error Correction Results – Multivariate model

$$\Delta Y_t = \alpha_0 + \phi_0 \mu_{t-1} + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \delta_j \Delta X_{t-j} + \sum_{k=1}^{p} \chi_j \Delta Z_{t-k} + \upsilon_t$$

Dependent ΔY_t	Independent ΔY_{t-i}	Independent ΔX_{t-j}	Independent ΔZ_{t-k}	Constant α	Residual μ_{t-1}	ΔY_{t-i}	ΔX_{t-j}	ΔZ_{t-k}
RS	RS	DY	P/E Ratio	0.63421 [0.527]	0.99917 [0.319]	0.93000 [0.354](2)	5.5182*** [0.000](2)	1.6501 [0.101](4)
DY	DY	RS	P/E Ratio	0.12290 [0.902]	2.0517** [0.042]	2.1737** [0.031](1)	-1.9219** [0.056](5)	-0.46329 [0.644](1)
P/E Ratio	P/E Ratio	RS	DY	0.24588 [0.806]	-1.9209* [0.056]	-5.4596*** [0.000](4)	-2.4040** [0.017](3)	-0.88750 [0.376](5)

Notes: SR Stock returns, DY: dividend yield, P/E ratio: earnings-price ratio
Lags order are in parentheses. The p values are bracket
 * Significance at 10% level, ** Significance at 5% level, *** Significance at 1% level

Table 6

Granger Causality Test Results – Multivariate model

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \delta_j \Delta X_{t-j} + \sum_{k=1}^{p} \chi_j \Delta Z_{t-k} + \upsilon_t$$

Null Hypothesis	F- Statistic	P- value
ΔRS does not cause by ΔDY and ΔP/E ratio	12.1780***	[.000]
ΔDY does not cause by ΔRS and	3.0142**	[.031]

ΔP/E ratio		
ΔP/E does not cause by ΔRS and ΔDY	7.4486***	[.000]

Notes: (SR Stock returns, DY ratio: dividend yields, P/E ratio: earnings-price ratio). *, ** and *** denote rejection of the null hypothesis at 10%, 5% and 1% significance levels, respectively.