Relationship of the Australian Stock Market with its Major Trading Partners: A Simple Exposition

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ABSTRACT

This paper examines the relationship between Australian stock market and the equity markets of its major trading partners namely, UK, USA, Canada, Germany, France, and Japan using 1945 to 2002 annual data series. The analysis of this paper considers both the foreign exchange risk element and the notion of share-return parity into its modified structural model which is estimated by applying both OLS and GMM methods. The UK, Canadian and French markets are found significant from OLS estimation; while GMM estimation suggests four markets including the German are significant at 5% level. Accordingly, this paper concludes that Australian stock market is related to that of its trading partners; and it is being influenced by 3 to 4 markets of which the UK is the most significant. The outcomes of this paper seem beneficial to Australian investors for effective diversifications of their international portfolio risks.

JEL Classifications: G00; G12; G15

Key words: Stock market relationship; Australian securities market; International Portfolio Diversification.

INTRODUCTION AND BACKGROUND

Typically, any potential gain from international diversification of portfolio is inversely related to the extent of stock market interrelationships. A low correlation between returns of national and overseas indices allows investors to minimize portfolio risk through international diversification. Thus, an analysis of co-movement of Australian stock prices with that of overseas trading partners is important to Australian investors. The theoretical basis of the common intuition is traced in the earlier mean-variance analyses of international share price integration or international asset pricing analyses namely the International Asset Pricing Model (IAPM) and International Arbitrage Pricing Theory (IAPT) (Solnik 1974a, Sutlz 1981).

Essentially, IAPM is the extended versions of Capital Asset Pricing Theory (CAPM) of Sharpe (1963, 1964) and Lintner (1965) while the IAPT is influenced by the Arbitrage Pricing Theory (APT) of Ross (1976), Roll (1977), and Roll and Ross (1980). However, the Portfolio Theory of Markowitz (1952) has been the foundation of all asset pricing theories in the literature. Other studies that include Grubel (1968), Levy and Sarnat (1970), Solnik (1974b, 1983), Sutlz (1981), Lessard (1973), Ripley (1973), Panton, et al (1976), Eun and Resnick (1984), Errunza (1983), Chan, et. al (1992), Phillippatos, et al (1983), Arshanapalli and Doukas (1993), Aggarwal and Rivoli (1980), Bekart and Harkey (1995), Eun and Beswick (1984), Janakiramannan and

Lamba (1998), Joen and Chiang (1991), and Cha and Oh (2000) aimed to assess the patterns of global stock market relationships.

While investing in foreign stocks, investors often think that the foreign exchange risk is an important consideration. On this point the literature is divided into two groups and hence two schools of thought prevail. The first school considers the exchange rate factor into their analysis (Taylor and Tonks 1989, Bekaert and Harvey 1997); while the second school ignores it completely based on the assumptions that foreign exchange risks can either be diversified away through appropriate hedging (Bracker et al. 1999, Ragunathan, et al. 1999) or, they are priced in the efficient markets (Dumas and Solnik 1995, Iorio and Faff 2000, Khoo 1994, and Choi et al. 1998).

Although it is convenient to follow the second school of thought while analyzing foreign stocks for investments that serves the purpose, yet ordinary investors might prefer the first school as they are often less skilful than institutional investors and fund managers in hedging foreign exchange risk factor. Besides, hedging methods against foreign exchange risks are commonly used to cover only short-term positions. Accordingly, this paper investigates the selected stock markets relationships following the first school of thought in relation to foreign exchange risk by considering the TWI (Trade Weighted Index) of Australian six major trading partners as proxy. However, to capture other plausible influences into the analysis, the basic model is further adjusted by including the notion of share-return parity in addition to the TWI of Australian six major trading partners.

This paper is structured in the following manner. Section 2 deals with the data and preliminary analyses; Section 3 provides the model; Section 4 presents the estimated results; and Section 5 concludes the paper.

DATA AND PRELIMINARY TESTS

Most comprehensive stock market indices that include Australia, USA, UK, Canada, Germany, France, and Japan are used. The data series consist of yearly index values of the All Ordinaries (ALLORDS), Dow Jones Industrial Average (DJIA), FTA, SBF250, DAX, TSX300, and NIKKEI for Australia, USA, UK, Canada, Germany, France, and Japan respectively. The data are gathered from various sources that include the Australian Bureau of Statistics (ABS), the Reserve Bank of Australia (RBA), and the world wide website of Harcourt College Publishers. The logged values of annual data from 1945 to 2002 are used for this analysis.

As the aim of this paper is to verify if the selected overseas stock markets are linked to the Australian market considering the foreign exchange risk component, TWI is used to proxy for adjusted data series in the analysis. The relative weights of Trading Weighted Index (TWI) for each country composed by RAB (Becker and Davies, 2002) are used. The percentage weights in TWI for US dollar, UK pound, Canadian dollar, and Japanese yen in 2002-03 are 15.07, 5.14, 1.57, and 17.21 respectively. Since both France and Germany now use common currency, the TWI weight for European euro is considered for these countries. The percentage weight of euro for all common currency affiliated European countries (except the UK) is 12.40 in terms of Australian dollar. Since the TWI for euro is relevant to this study, the TWI weight for these countries are readjusted based on the % trading relationships with Australia. The % positions of the average international trades (exports and imports) between Australia and both France and Germany are 13.8% and 23.4% respectively. Accordingly, adjusted TWI values for France and Germany are 1.7 (=12.4 × 13.8%) and 3.0 (=12.4 × 23.4%) respectively.

Breakpoint Test

To check if the time series is free from any structural break, a breakpoint test is carried out before estimating the model using Chow Breakpoint test (Chow 1960). No significant effect of the stock market crash of October 1987 is detected in the time series as the Chow Breakpoint test fails to reject the hypothesis of no Breakpoint effect in the 1987 data even at the 10% level of significance. The observed F-statistic is 0.814644 with p-value 0.580112, and that of the Log likelihood ratio statistic is 7.068216 with corresponding p-value of 0.421812 which are not significant at acceptable levels. As a result, no exogenous dummy variable is considered in the model.

Besides, unit root tests are carried out using both the ADF (Dickey and Fuller 1979, 1981) and PP (Phillips and Perron 1988) test procedures to check if the data series are balanced and integrated of same order and/or stationary. These test results are compared against the MacKinnon (1991) critical values for rejection of the null hypothesis of no unit root. It clearly suggests that time series of both dependent and independent variables are integrated to order one I(1) or non-stationary in levels and are of order zero I(0) or stationary in first differences. As market returns data series in natural logarithm are used in the model, it is less likely that the estimated regression of this paper is spurious. Yet for more robust outcomes the author has performed cointegration analysis in the trail of Johensen in another paper (which is beyond the scope of this paper).

MODELLING

A simple structural relationship of variables may be presented in the following manner:

$$Y_t = \sum_{i=1}^{k} \Gamma_i X_{it} \qquad (1)$$

where Y_t is the criterion variable, $X_{it} = X_{1t}, \ldots, X_{kt}$ refer to explanatory variables, and t = study period. When error term, ε_t, is included, the above relationship takes the shape,

$$Y_t = \gamma \prod_{i=1}^{k} X_{it}^{\delta_i} \varepsilon_t \qquad (2)$$

where γ is a constant or intercept; and δ_i is the parameter. Also, here the relationship between predictors or explanatory variables and between the predictors and the error is assumed to be multiplicative. Further transformation into a logarithmic function provides a linear model:

$$y_t = \mu_0 + \sum_{i=1}^{k} \delta_i x_{it} + u_t \qquad (3)$$

where $y_t = lnY_t$; $\mu_0 = ln\gamma$; $x_{it} = lnX_{it}$; δ_i is the parameter; $u_t = ln\varepsilon_t$; and that ln refers to natural log.

Upon inclusion of TWI into the analytical process, the model takes the following shape:

$$R_A = \sum_{j=1}^{p} T_j R_j + \otimes TWI \qquad (4)$$

where R_A is the return on Australian market, R_j refer to the returns in selected overseas stock markets, $T_j = (t_1, \ldots, t_p)$ is the weight of corresponding currency of selected overseas markets in the TWI, and $\otimes TWI$ is expected depreciation of the TWI or error term . Again, $t_1e_1 + t_2e_2 + \cdots + t_ne_n = \otimes TWI$; and $\sum_{i=1}^{n} t_i = t_1 + t_2 + \cdots + t_n = 1$ for all currency specific countries in TWI for Australia where $T_i = (t_i, \cdots, t_n)$. The above model is derived from the notion of share-return parity reflected in a generalised nature equation, $(t_1 + t_2 + \cdots + t_n)R_A = (t_1R_1 + t_2R_2 + \cdots + t_nR_n) + (t_1e_1 + t_2e_2 + \cdots + t_ne_n)$.

ESTIMATION AND RESULTS

To estimate the above model (4) both Ordinary Least Squares (OLS) and Generalized Method of Moments (GMM) approaches are applied. Results are presented in Table 1 and Table 2 respectively.

Table 1: Model Estimation using OLS method

Dependent Variable: $\boldsymbol{R}_{Australia}$
Method: Least Squares (OLS)
Sample(adjusted): 1946 2002
Included observations: 57 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\boldsymbol{R}_{USA}$	0.028059	0.152705	0.183749	0.8550
$\boldsymbol{R}_{UK}$	0.104235	0.024912	4.184088*	0.0001
$\boldsymbol{R}_{Canada}$	0.018028	0.005080	3.548912*	0.0009
$\boldsymbol{R}_{France}$	0.224051	0.077894	2.876367*	0.0059
$\boldsymbol{R}_{Germany}$	0.001662	0.001833	0.906372	0.3691
$\boldsymbol{R}_{Japan}$	-0.042002	0.041872	-1.003104	0.3206
C	0.002888	0.003341	0.864475	0.3915

R-squared	0.568987	Mean dependent var.	0.011297
Adjusted R-squared	0.517265	S.D. dependent var.	0.031709
S.E. of regression	0.022031	Akaike info. criterion	-4.678109
Sum squared residual	0.024269	Schwarz criterion	-4.427208
Log likelihood	140.3261	F-statistic	11.00096
Durbin-Watson stat	2.398591	Probability of F-statistic	0.000000

Note: * indicates significance at 5% level of confidence; results obtained applying EViews4.

Results of the OLS estimation provided in Table 1 indicate that coefficients of three variables are significant at 5% levels based on *t*-statistics. These variables are stock market returns of UK, Canada, and France. On the other hand, from the results of GMM estimation in Table 2 it appears that coefficients of four variables are significant at 5% levels. These markets are the UK, the Canadian, the French and the German. The t-statistics suggest that out of four markets, the UK market is the most dominating market. Although, the R^2 and adjusted R^2 for both tests do not show very strong fits, yet other parameters that include the Log Likelihood, Durbin-Watson, F-tests statistics and Probability in both tests are within satisfactory levels.

Table 2: Model Estimation using GMM method

Dependent Variable: R*Australia*
Method: Generalized Method of Moments (GMM)
Sample(adjusted): 1946 2002
Included observations: 57 after adjusting endpoints
Instrument list: R_{USA} R_{UK} R_{Canada} R_{France} $R_{Germany}$ R_{Japan}

Variable	Coefficient	Std. Error	t-Statistic	Prob.
R_{USA}	0.028059	0.143685	0.195284	0.8460
R_{UK}	0.104235	0.017845	5.841229*	0.0000
R_{Canada}	0.018028	0.005290	3.407572*	0.0013
R_{France}	0.224051	0.090421	2.477875*	0.0166
$R_{Germany}$	0.001662	0.000563	2.951147*	0.0048
R_{Japan}	-0.042002	0.035899	-1.170002	0.2475
C	0.002888	0.002527	1.142799	0.2586
R-squared	0.568987	Mean dependent var.		0.011297
Adjusted R-squared	0.517265	S.D. dependent var.		0.031709
S.E. of regression	0.022031	Sum squared resid.		0.024269
Durbin-Watson stat	2.398591	J-statistic		1.56E-32

Note: * indicates significance at 5% level of confidence; results obtained applying EViews4.

Based on the above structural analysis, it is established that Australian stock market is linked with other developed overseas markets. Therefore, results of this paper suggest that 3 to 4 overseas markets are influencing the Australian stock market price movements and its return generating process. These significant overseas markets are the UK, Canadian, French and German of which the UK market is more influential.

CONCLUSION

This paper has examined the relationship between Australian stock price movements and that of six overseas markets based on an adjusted structural regression model. Estimations are carried out applying both OLS and GMM. Results confirm that Australian stock market and the equity markets of its trading partners are interrelated. The UK, Canadian and French stock markets price movements are found significant from OLS estimation; while GMM estimation suggests four markets are significant at 5% level. These markets are the UK, Canadian, French and Germany. Accordingly, this paper concludes that returns of the Australian stock market is being influenced by the equity markets of 3 to 4 major trading partners, of which the UK is the most dominating. The outcomes of this paper seem to be valuable to Australian investors when selecting overseas securities into their international portfolios for effective diversifications of their overall investment risks.

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