INFLUENCE OF THE END-OF-THE-WEEK PERFORMANCES OF THE NEW YORK STOCK EXCHANGE AND THE TOKYO STOCK EXCHANGE ON THE BEGINNING-OF-THE-WEEK PERFORMANCE OF THE KLSE.

*Othman Yong**

ABSTRACT

Many past studies suggested that considerable gains were available to investors who diversify their investment portfolio internationally. This is due to the low positive or negative correlations among the world's stock markets. On the other hand, if a market is highly influenced by another market, which means that the correlation between these markets is high and positive, then the international diversification involving these two markets will not result in considerable gains. However, if an earlier performance of a market is highly correlated with the current performance of another market, then this relationship can be exploited profitably. In this paper, we look at the issue of stock market time lag correlation between the advanced markets (of the U.S and Japan) and the Kuala Lumpur Stock Exchange (KLSE), and the influence that these advanced markets might have on the KLSE. Specifically, this paper focuses on the influence of the end-of-the-week performances of the New York Stock Exchange (NYSE) and the Tokyo Stock Exchange (TSE) on the beginning-of-the-week performance of the KLSE. This study covers a period from January 1983 to December 1990. In general, the results do indicate some degree of influence of the NYSE and TSE on the KLSE, but the influence is not stable over time.

I. INTRODUCTION

Diversification can reduce or eliminate risk depending on the values of the correlation coefficients between the assets in the portfolio. If the returns between the assets are negatively correlated, then diversification can theoretically eliminate risk completely. If the correlations are positive and significantly less than 1, then diversification can reduce risk even though not entirely. International diversification will enable an investor to eliminate the part of his portfolio risk

**Dr. Othman Yong is Associate Professor of Finance, Faculty of Business Management, Universiti Kebangsaan Malaysia*

associated with the economic condition of a particular country but not the one associated with the world wide economic conditions.

Potential gains to investor from international protfolio diversification were well documented by studies such as Agmon (1972), Bertoneche (1979), Gruber (1968), Gruber and Fadner (1971), Saunders and Woodward (1977), and Watson (1978). These studies suggested that considerable gains were available to those investors willing to diversify internationally due to usually low positive or negative correlations between stock markets (i.e., the unsystematic risk is reduced).

The benefit of international diversification, however, is heavily dependent on the stability of the correlation matrix among different national stock markets. Instability of the correlation structure will result in a continuously changing efficient frontier which makes it dificult to identify an optimal investment strategy. That is why many works have been concentrated on the issue of correlation stability, such as studies by Makridakis and Wheelwright (1974), Watson (1980), Maldonado and Saunders (1981), Scholhammer and Sand (1985), Farragher and Hui (1985), Hui and Kwan (1988), to name a few. The results of these studies are mixed; some do indicate stability (e.g., Watson (1980), and Farragher and Hui (1985)), while others do not.

In the case of co-movement between the KLSE and other markets, a study by Chuan, Alhabshi and Kiew (1981) examined the correlations between the KLSE and those of New York, London, Hong Kong, Tokyo, Sydney, and Johannesburg, for the period between May 1974 and December 1978. The results indicated that the correlation coefficients, with the exception of New York market, were very high (correlation coefficients between 0.68 and 0.85). Another study by Yong (1987/88) examined the weekly correlations between the KLSE and those of Hong Kong, Tokyo, Singapore, and New York, for a period between January 1983 and December 1987. However, the correlations found in this study were not as high as those found in the earlier study, and the lagged correlations were mostly not significant. Both of these studies did not examine the stability of correlations over time.

Most of the studies cited above calculated the same-day correlations among the stock markets. None studied the effect of the end-of-the-week performance of major markets on the beginning-of-the-week performance of other markets. Since Malaysia is ahead of the U.S. in terms of time zone, the effect of Friday's performance of NYSE is not felt on the KLSE until Monday. In addition, even though Japan and Malaysia are in the same time zone, the effect of Saturday's

trading on TSE will not be felt on the KLSE until Monday since there is no trading on Saturday on the KLSE[1].

The experience of the October 1987 Crash has made people realize that a significant event in a major world market could have a strong influence on other markets, especially the smaller or emerging stock markets in the Pacific-Basin. In Malaysia, there is a belief among some investors and speculators that the KLSE is influenced by the big and advanced stock markets of the NYSE and TSE. As a result, these people would look at the performances of these big markets before deciding whether or not to enter the local market. In fact, if the earlier performance of a market (due to the difference in time zone) can influence the current performance of another market, then this relationship can be exploited profitably. A study by Cheung and Ho (1989) on the causal relationship between the U.S. market and four Asian-Pacific markets, i.e., Australia, Hong Kong, Singapore, and Malaysia, found that a bi-directional relationship exists between the U.S. and Australia, and between the U.S. and Singapore. However, a uni-directional relationship running from the U.S. market to the Hong Kong market and to the Malaysian market is found.

Fischer and Palasvirta (1990) used a spectral analysis of the price behaviour of stock market indices in 23 countries to test for independence between the time series of stock market indices. The results indicated that the level of interdependence grew substantially from 1986 to 1988 due mainly to historical trend and less related to factors associated with the October 1987 crash. The study also shows that the U.S. market seems to lead almost every other stock market in the world.

Jeon and von Furstenberg (1990) studied the interrelationships among stock prices in major stock exchanges (Tokyo, Frankfurt, London and New York), using the vector autoregression (VAR) approach to daily stock price indices of those markets for the period between January 1986 and November 1988. The study shows a significant structural change with regard to the correlation structure and leadership in the world's stock markets since the stock market crash of October 1987. Also, the degree of international co-movements in the stock price indices

[1] *During the period of this study, in general, Tokyo market opens two hours before the opening of the KLSE. The New York market opens after the Tokyo market and the KLSE are closed, and it closes before the Tokyo market and the KLSE open.*

increased significantly since the crash. The role of the immediately preceding market in the determination of stock prices was greatly enhanced after the crash. The findings also suggest that the leadership of the New York Stock Exchange has been reduced, especially against the Tokyo market. The Tokyo market has shown greater independence from other major stock exchanges since the October crash.

Mathur and Subrahmanyam (1990) studied the interdependencies among the stock market indices for four Nordic countries (Denmark, Finland, Norway and Sweden) and the U.S., using the concept of Granger causality. The VAR model results indicate that the U.S. market affected only the Danish market. The Swedish market was causally affected prior to both the Norwegian and Finnish markets. The Norwegian, Danish, and Finnish markets did not "Granger cause" any other market. The results also indicate that the Nordic stock markets are less than fully integrated.[2]

On the issue of volatility spillover, a study by Ng, Chang and Chou (1991) which examined the transmission of volatility from the U.S. market to four Pacific-Basin trading partners of the U.S., i.e., Japan, Korea, Taiwan and Thailand, indicated that while the market fundamentals of these countries are believed to be closely related to the U.S. market fundamentals, there was no volatility spillover from the U.S. to Korea and Taiwan, the two markets with the most severe restrictions on cross-country investing. There was also no volatility spillover from the U.S. to Thailand before the opening of the Alien Board to facilitate the trading of Thai securities by foreign investors. The volatility spillover from the U.S. to Japan took place mostly after U.S. stocks were allowed to be traded on the Japanese market. The authors concluded that cross-country investing does play a very important role in the transmission of volatility between stock markets. A study by King and Wadhwani (1989) indicated that the increased volatility after the crash of October 1987 raised the covariances of returns among different stock markets. This means that higher volatility in one market may lead to increased correlation between price movements in that market and price movements in other markets.

[2] *Full integration refers to simultaneous adjustment to any new information coming into the market, thereby not providing opportunities for abnormal profits associated with lagged information processing.*

The purpose of this paper is to examine the ability of predicting the beginning-of-the-week returns on the KLSE based on the end-of-the-week performances of the developed or advanced markets of NYSE and TSE. If there exists a significant relationship between the end-of-the-week performances of the developed markets (of TSE and NYSE) and the beginning-of-the-week performance of the KLSE, then this relationship can be exploited profitably. In addition, the "stability" of the relationship is also important for any trading rule to succeed. So the central issues to be investigated are the causal relationship that might exist between developed markets and the emerging KLSE, and whether or not the relationship is stable over time.

2. DATA AND METHODOLOGY

The data base consists of Friday's index changes for the NYSE, Saturday's index changes for the TSE, and Monday's index changes of the KLSE.[3] The indices used in study are the KLSE Industrial (KLSE), Nikkei Dow Jones (TSE), and Dow Jones Industrial Average (NYSE).[4] These indices were chosen because they are widely referred to and considered to be representative of the respective markets[5]. The period of the study is from January 1983 to December 1990.

---

[3] *In prior studies (Gruber & Fadner 1971; Watson 1978; Maldonado & Saunders 1981), the percentage changes in indices (or returns) were usually adjusted for exchange rate changes to reflect returns received by a United States investor. In this study this adjustment is not made due to a few reasons. First, as indicated by Gruber and Fadner (1971), the effect of exchange rates on the stability of the value of foreign assets is theoretically indeterminate. Furthermore, they found in their study that the standard deviation of returns from holding foreign assets with and without exchange rate adjustments are statistically not different. In fact, they found the correlation of returns between U.S. and foreign assets with and without the exchange rate adjustment are statistically not different and fail to show a consistent pattern of change. Secondly, adjustment for exchange rate alone is not enough because other factors such as dividends, taxes (both on dividends and capital gains), transaction costs, and inflation rates (in respective countries) are equally important in determining the returns received by an investor. However, by excluding all of these factors, the purpose of this study is still valid since we are interested in finding out whether or not the end-of-the-week performance of advanced markets of NYSE and TSE can influence the KLSE. Finally, an investor will usually convert his income from foreign investment at the end of his investment period (i.e., not throughout his investment period). This means that the adjustment made by those prior studies is not quite a true reflection of the reality. If investors cash in their foreign income throughout their investment period (i.e., on a daily or weekly basis), then the transaction costs will eat up any profit they have. That is why this adjustment is not practical, and does not really reflect the reality.*

Friday's index changes refer to end-of-the-day Friday returns over Thursday. Monday's index changes refer to end-of-the-day Monday returns over Friday. Arguably, the more appropriate returns are Monday returns over Friday. However, these returns are not used because of the unavailability of the opening Monday price data for the KLSE during the period of the study. Furthermore, the effect of the end-of-the-week performance of the NYSE and TSE are arguably not supposed to be "fully" reflected "immediately" at the opening of the trading hour, on Monday, of the KLSE. With the "inefficiency" of a small and thinly traded stock market like the KLSE, it is quite safe to assume that it will take some time before the full effect can take place. The question is when exactly will the effect take place? By taking the end-of-the-day Monday returns over Friday, it will not totally solve this problem. However, our concern is not finding the exact hour the full effect will take place. Rather, we are interested in finding out the ability of predicting the end-of-the-day Monday returns over Friday of the KLSE based on the end-of-the-week performances of the TSE and NYSE.

---

[4] *KLSE Industrials is a value-wighted index. Both the DJIA and Nikkei are price-weighted indices. Some people might object to the use of indices instead of the actual stock prices. They might argue that indices cannot be bought or sold, plus the fact that some of these indices are not similar in terms of measurement due to the omission of dividend yield. To answer this objection, one should look at the various aspects of the index itself. First, an index is a representative of the general movement of the market it tries to represent and thus should reflect the behaviour of the stocks in the respective market. Secondly, annual dividend yields are usually quite small in value, and the daily and weekly observations make them even smaller and insignificant. Even if these indices were to be recomputed with the inclusion of these dividend yields, the results would not be significantly different from the ones that ignore the adjustment. A study by Lee, Pettit & Swankoski (1990) calculated correlations among Asian stock markets both using adjusted data (change in indices adjusted for dividend yields) and unadjusted data. They found that there is no significant difference in terms of results of these two groups of data. Thirdly, in the formula, rate for return = change in price + dividend yield, the dividend yield portion (or to be more exact, the daily dividend yield or the weekly dividend yield) is constant (usually annual dividend yield is apportioned equally for each transacted day or week) in any given year, and more or less stable from year to year, so "the change in price" portion of that formula is the one that contributes significantly to the value of correlation (or any other measure) that we try to measure. Finally, many studies cited in this article used indices and they did not adjust the indices for dividend yields.*

[5] *Some people might argue that the use of KLSE Industrial Index may not be appropriate as an indicator of the performance of the KLSE. However, it should be pointed out here that a better index than the KLSE Industrial Index, namely the KLSE Composite Index, was only launched in 1986 a few years after the beginning of this current study.*

One can also use daily data to illustrate the relationship that might exist, but from the practical point of view, the frequent trading will eat up any profit that can be benefitted from the relationship that might exist. So, it is quite justifiable to use the weekly data (specifically, the end-of-the-week and the beginning-of-the-week data) to illustrate the relationship between TSE and NYSE and the KLSE.

First, the mean, variance and standard deviation were computed for each market to give some preliminary measures regarding the performance and volatility of each market. In addition, the variance ratios between the KLSE and NYSE and between KLSE and TSE were computed.

Next, the correlation coefficients between the KLSE and TSE, and between KLSE and NYSE for each period were computed. One word of caution is warranted here. As pointed out by Jeon and Furstenberg (1990), it is not easy to tell whether strong positive correlations imply that markets are integrated across countries or rather that markets are segmented and responding to common international shocks. In addition, correlation coefficients do not provide information on causal relationships between variables in the model.

The null hypothesis that the correlations are equal between two sub-periods was tested using the Z-statistic (Maldonado & Saunders 1981).

$$Z_{ij} = [X_{ij}(1) - X_{ij}(2)]/\{[1/(N_1 - 3) + 1/(N_2 - 3)]\}^{1/2}$$

where, $X_{ij}(k) = \text{In } \{\{[1 + r_{ij}(k)]/[1 - r_{ij}(k)]\}^{1/2}\}$, which is a Fisher transformation of the correlation coefficients in sub-period k,

$r_{ij}(k)$ = correlation coefficient of market i and market j for sub-period k,

and N_k = number of observations in sub-period k.

This test gives us the basis for determining whether or not the correlations are stable over-time.

A regression analysis was also performed to determine whether there is a significant linear relationship between the index changes of the KLSE (the dependent variable) and that of the NYSE and also the TSE. If there exists a significant linear relationship between the KLSE and

those of other developed markets, then this analysis can help us in constructing the appropriate model to be used. The Durbin-Watson test was conducted to detect any autocorrelation in the data.

Even though the R^2 can tell us the degree of variability (or volatility) in the KLSE that can be explained by the TSE or the NYSE, it is also helpful to conduct another test, called the Brown-Forsythe modified Levene test, to determine how much the volatility in the KLSE differs from that of the NYSE or the TSE. So, the null hypothesis that two markets have the same variance was examined using the Brown-Forsythe modified Levene test statistic

$$F = \frac{[\sum_{j=1}^{c} n_j (\bar{w}_{.j} - \bar{w}_{..})^2]/[c-1]}{[\sum_{j=1}^{c}\sum_{i=1}^{nj} (w_{ij} - \bar{w}_{.j})^2]/(n-c)}$$

where, $w_{ij} = |Y_{ij} - \hat{M}_{.j}|$ is the absolute difference between

the *i*th observation in the *j*th group and the sample median of that *j*th group,

$\bar{w}_{.j} = \sum_{i=1}^{n_j} w_{ij}/n_j$ is the mean of the absolute differences in group j,

and $\bar{w}_{..} = \sum_{j=1}^{c}\sum_{i=1}^{n_j} w_{ij}/n$ is the overall mean common to all the absolute differences

The F-statistic above is distributed $F_{c-1,\, n-c}$ under the null hypothesis.

We used this modified Levene F-test because the standard F-test for variance equality is not robust to departures from normality in the data (Layard 1973). Conover et al. (1981) evaluated more than 50 procedures for testing the homogeneity of variance hypothesis and concluded that a Brown-Forsythe (1974) modification of the Levene test (1960) is among the most powerful and robust with respect to violations in the assumption of normality. Their modification involves the use of the sample median $\hat{M}_{.j}$ to obtain the absolute differences w_{ij} in lieu of the sample mean $\bar{Y}_{.j}$ as initially described by Levene.

As mentioned earlier, correlation does not tell the whole story about causal relationship. Therefore a formal causality test was conducted. In testing the causality between two variables X and Y, a one-way Granger causality test as suggested by Geweke (1984) was used. The test uses the ordinary least squares regression (OLS) with the following specification:

$$Y_t = \alpha_0 + \sum_{i=1}^{M} \alpha_i Y_{t-i} + \varepsilon_t \qquad (1)$$

$$Y_t = \beta_0 + \sum_{i=1}^{M} \beta_i Y_{t-i} + \sum_{j=1}^{M} \beta_j X_{t-j} + \mu_t \qquad (2)$$

ε_t and μ_t are the error terms, α_j and β_i are parameters relating Y_t and its lagged values, and β_j are parameters relating X_t and its lagged variables. As a rule of thumb applied in most causality studies, four lags are used in this study. It should be noted here that the causality test suggested by Sims (1972) employed 8 past lags and 4 future lags. But, in an efficient market, it is quite ridiculous to imagine that there exist correlations beyond lag 1 or lag 2.[6] A null hypothesis that X does not cause Y based on equations (1) dan (2) is tested using the F-statistic estimated as:

$$[(SSE_1 - SSE_2)/N]$$
$$[SSE_2/(T-M-N-1)]$$

SSE_1 and SSE_2 are the sum of squared errors from the OLS regression on equations (1) and (2), respectively. T is the number of time series observations on Y_t. F-statistic is distributed with (N, T-M-N-1) degrees of freedom. M and N are the number of lags in the X and Y variables, respectively.

---

[6] *Other methods, such as Akaike's information criterion, can be used to determine the number of lags in the study on Granger causality. However, as a rule of thumb applied in most causality studies, four lags of X, were used in this study. Annuar and Shamsher (1993), for example, also employed 4 lags in their study.*

3. FINDINGS

3.1 Mean and Volatility of Return

The volatility, as measured by the standard deviation, and the mean of index changes of each market are shown in Table 1. For the KLSE, negative mean return can be seen in almost all years, which means that the average return on Monday is negative. The same can also be said for the entire period of 1983-1990. On the other hand, the NYSE showed positive mean return for almost all periods, which means that the average return on Friday is positive. These results are quite consistent with the results of the day-of-the-week or weekend effect studies on the Malaysian or the U.S. markets (e.g., French (1980) on the U.S. market, and Annuar and Shamsher (1987) on the Malaysian market). In the case of the TSE, the signs of the mean return are mixed. The standard deviations of the KLSE are relatively larger than those of the NYSE. The TSE exhibited a wide fluctuation in its standard deviations. The larger standard deviations might be attributed to the longer time span (from Friday to Monday) of return data for the KLSE compared to the shorter time span of return data for the NYSE.

TABLE 1

STANDARD DEVIATION AND MEAN, ACCORDING TO PERIOD

	NYSE		TSE		KLSE	
Period	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev	Mean
1983	.8480	.0803	1.1912	.3990	1.2616	–.0641
1984	1.0995	.0313	12.5905	–1.4411	1.0052	–.1166
1985	.6217	.1535	.6528	.0507	1.8345	–.3228
1986	.8902	.0698	1.0329	.2203	1.5083	–.0737
1987	1.3153	–.1126	12.4762	–1.7270	2.8076	–.2386
1988	1.4464	.0651	.6360	.1583	1.3765	–.0013
1989	1.3424	.1061	.4428	.0447	1.6208	–.0021
1990	1.1714	.0321	1.7493	–.1810	1.9423	.0837
1983–90	1.1161	.0328	6.3605	–.3134	1.7375	–.0933

3.2 Correlations

Table 2 shows the correlation coefficients between the beginning-of-the-week performance of the KLSE and the end-of-the-week performances of the NYSE and also the TSE. With the exception of years 1983, 1985 and 1986, the correlation coefficients between NYSE and KLSE were highly significant. The highest correlation was 0.6861, in year 1989. The correlations between KLSE and TSE were significant in years 1983, 1985, 1987, 1988, 1990 and for the entire period 1983-1990. The correlations between KLSE and NYSE were very significant after 1986, but no equally significant between KLSE and TSE.

Table 3 shows the Z-values for significant difference of the correlation coefficients among subperiods between the KLSE and the NYSE and the KLSE and the TSE. In general, the correlation coefficients between sub-periods were significantly different at the 5 percent level. In fact, the high Z-values also indicate that the differences are significant at the 1 percent level. These results indicate that, overall, the correlation coefficients are not quite stable from one sub-period to another.

TABLE 2

CORRELATION COEFFICIENTS BETWEEN THE BEGINNING-OF-THE-WEEK PERFORMANCE OF THE KLSE AND THE END-OF-THE-WEEK PERFORMANCES OF THE NYSE AND THE TSE ACCORDING TO PERIOD

Period	KLSE and NYSE	KLSE and TSE
1983	0.1407	0.2750*
1984	0.4375**	0.1630
1985	0.2142	0.2762*
1986	– 0.0190	– 0.1090
1987	0.3237*	0.3086*
1988	0.5686**	0.4669**
1989	0.6861**	– 0.0269
1990	0.5776**	0.3319*
1983 – 1990	0.3775**	0.1711**

Notes: * Significant at the 5 percent level.
** Significant at the 1 percent level.

TABLE 3

CALCULATED Z-STATISTICS FOR SIGNIFICANT DIFFERENCE OF THE CORRELATION COEFFICIENTS AMONG SUB-PERIODS BETWEEN THE KLSE AND THE NYSE AND TSE

	1984	1985	1986	1987	1988	1989	1990	1983-90
NYSE (Friday's perfromance) and KLSE (monday's performance)								
1983	–8.02**	–1.86	3.90**	–4.76**	–12.22**	–16.95**	–12.41**	–11.18**
1984		6.16	11.84**	3.27**	–4.28**	–9.01**	–4.55**	3.15**
1985			5.74**	–2.90**	–10.38**	–15.11**	–10.59**	–7.86**
1986				–8.60**	–15.95**	–20.63**	–16.10**	–17.87**
1987					–7.51**	–12.24**	–7.75**	–2.68**
1988						–4.68**	–0.32	10.66**
1989							4.31**	19.04**
1990								11.03**
TSE (Saturday's perfromance) and KLSE (monday's perfromance)								
1983	2.89**	–0.03	9.50**	–0.90	–5.43**	7.50**	–1.50	4.79**
1984		–2.92**	6.64**	–3.79**	–8.28**	4.64**	–4.33**	–0.36
1985			9.53**	–0.87	–5.40**	7.53**	–1.47	4.85**
1986				–10.39**	–14.77**	–1.98*	–10.79**	–12.12**
1987					–4.54**	8.39**	–0.62	6.40**
1988						12.79**	3.83**	14.31**
1989							–8.83**	–8.58**
1990								7.26**

Notes: * Significant at the 5 percent level.
** Significant at the 1 percent level.

3.3 Regression Analysis

Table 4 shows the results of the regression analysis on the end-of-the-week performance of developed markets of NYSE and TSE and the beginning-of-the-week performance of KLSE, with KLSE as the dependent variable. For comparison purpose, we also ran regression analysis between the end-of-the-week performances of the NYSE and the TSE and the beginning-of-the-week performance of the Hong Kong Stock Exchange (HKSE). In terms of size and trading activity, HKSE is considered smaller than the NYSE or TSE, but more developed than the KLSE. The results of the regression analysis for the HKSE are shown in Appendix 1.

Significant linear relationship between NYSE and the KLSE can be seen in 1984, 1987, 1988, 1989, 1990 and for the entire period 1983-1990, and between NYSE and HKSE in 1987, 1988 and 1990, as indicated by the relatively high R^2 values and significant beta values for these periods. In the case of NYSE and KLSE, the high values of R^2 were recorded in 1988, 1989 and 1990, with the highest value of 0.4707 recorded in 1989. The R^2 value of 0.4707 indicates that about 47 percent of the variability or volatility in the KLSE is explained by the volatility in the NYSE. The relationships between the TSE and KLSE, and between TSE and HKSE, are less significant compared to the relationships between NYSE and KLSE, and between NYSE and HKSE, as indicated by the relatively lower R^2 values and relatively less significant beta values. It is interesting to note that at the 1 percent level, none of the Durbin-Watson statistics indicate significant autocorrelation in the residuals.

The results of the regression analysis somewhat reinforce the belief that there is a relationship between the end-of-the-week performance of the NYSE, and to a lesser degree the TSE, and the beginning-of-the-week performance of the KLSE and also the HKSE. In the case of the relationship between NYSE and KLSE, and to a lesser degree between NYSE and HKSE, the relationship was more significant after 1986. In the case of the TSE and KLSE, the relationship was not quite consistent from year to year. The relationship between TSE and HKSE was not quite significant for all years.

TABLE 4

RESULTS OF THE REGRESSION ANALYSIS ON THE RELATIONSHIP BETWEEN THE KLSE AND THE NYSE AND TSE

Period	Alpha	Beta	Std. Error of Beta	R^2	Durbin-Watson
NYSE and KLSE (dependent variable)					
1983	–.0473	.2094	.2083	.0198	1.51209
		(.3197)			
1984	–.1291	.4000**	.1163	.1914	2.24755
		(.0012)			
1985	–.4198	.6321	.4076	.0459	2.00736
		(.1273)			

Period	Alpha	Beta	Std. Error of Beta	R^2	Durbin-Watson
1986	–.0715	–.0323	.2420	.0004	1.56761
		(.8944)			
1987	–.1608	.6911*	.2856	.1048	1.34910
		(.0192)			
1988	–.0366	.5411**	.1118	.3233	2.41540
		(.0000)			
1989	–.0900	.8283**	.1255	.4707	2.25856
		(.0000)			
1990	.0530	.9577**	.1954	.3336	1.92813
		(.0000)			
1983-90	–.1125	.5876**	.0713	.1425	1.77971
		(.0000)			
TSE and KLSE (dependent variable)					
1983	–.1803	.2912*	.1440	.0756	1.64802
		(.0485)			
1984	–.0978	.0130	.1111	.0266	2.17331
		(.2482)			
1985	–.3621	.7762*	.3820	.0763	1.91688
		(.0475)			
1986	–.0387	–.1592	.2074	.0119	1.61589
		(.4464)			
1987	–.1187	.0694*	.0303	.0952	1.51058
		(.0260)			
1988	–.1613	1.0106**	.2734	.2180	2.18437
		(.0006)			
1989	.0023	–.0983	.5227	.0007	2.49137
		(.8516)			
1990	.1504	.3685*	.1512	.1102	1.86349
		(.0185)			
1983-90	–.0786	.0467**	.0133	.0293	1.81628
		(.0005)			

Notes: 1) P-values are shown in the parentheses.
2) * Significant at the 5 percent level.
3) ** Significant at the 1 percent level

3.4 Variance Ratios

The variance ratios between KLSE and NYSE and also between KLSE and TSE are shown in Table 5. In addition, the results of the robust Brown-Forsythe modified Levene test for equality of variance are presented. As can be seen, except for years 1984 and 1988, the variance ratios between KLSE and the NYSE are substantially greater than 1. This implies that the returns on the KLSE are more volatile compared to the returns on the NYSE. However, the Levene test detected significant inequality in variance only in years 1987, 1988, and 1989 and also for the entire period of 1983-1990. In the case of variance ratios between KLSE and TSE, the values are substantially greater than 1 except for years 1984 and 1987, and also for the entire period 1983-1990, where the variances of the TSE are tremendously larger than those of the KLSE. Overall, the Levene test detected significant inequality in variance between the KLSE and the TSE only after 1986.

TABLE 5

RESULTS OF THE BROWN-FORSYTHE MODIFIED LEVENE TEST (F-STAT) FOR EQUALITY OF VARIANCES AND THE RATIO OF VARIANCES BETWEEN THE KLSE AND THE NYSE AND TSE

	KLSE versus NYSE			KLSE versus TSE		
Period	Var. ratio	F-stat	P-value	Var. ratio	F-stat	P-value
1983	2.21	.02345	.8789	1.12	.63260	.4302
1984	.84	.36617	.5478	.01	.21889	.6419
1985	8.71	1.39124	.2438	7.90	.04556	.8319
1986	2.87	.33228	.5670	2.13	.11887	.7317
1987	4.56	7.25347**	.0096	.05	4.72255*	.0345
1988	.91	30.61002**	.0000	4.68	13.72561**	.0005
1989	1.46	47.36897**	.0000	13.40	6.83760*	.0118
1990	2.75	2.53905	.1176	1.23	9.28165**	.0038
1983-90	2.42	44.19870**	.0000	0.07	9.38318**	.0023

Notes: 1) * Significant at the 5 percent level.

2) ** Significant at the 1 percent level.

3.5 Causality

Table 6 shows the results of the Granger test for causality. The NYSE seems to influence the KLSE for the entire period 1983-1990, which is consistent with the findings of the study by Cheung and Ho (1989). Looking closer at the results for the sub-periods, the NYSE influence on the KLSE was quite significant in years 1984 and 1987, and highly significant in years 1989 and 1990. The TSE influence on the KLSE was significant in 1988, and quite significant for the entire period 1983-1990. For other sub-periods, the influence was not that significant.

As in the case of regression analysis, the Granger test for causality for the HKSE was also conducted for comparison purposes. The results are shown in Appendix 2. NYSE's influence on the Hong Kong market was significant in almost all years. This is consistent with the findings of the study by Cheung and Ho (1989), which found that the relationship is uni-lateral. The influence of Tokyo market on the Hong Kong market was highly significant in 1984 and for the entire period of 1983-90, and quite significant in 1985 and 1987.

TABLE 6

RESULTS OF THE GRANGER CAUSALITY TEST (F-STAT) BETWEEN MARKETS

Period	NYSE Influence on KLSE	TSE Influence on KLSE
1983	1.85	2.14
1984	3.64*	1.64
1985	0.50	1.66
1986	1.27	0.24
1987	3.40*	0.97
1988	1.59	4.18**
1989	12.68**	0.32
1990	5.17**	1.76
1983-90	17.17**	2.46*

Notes: * Significant at the 5 percent level.
** Significant at the 1 percent level.

4 CONCLUSION AND IMPLICATION

For the KLSE, almost all years showed negative mean return, which means that the average return on Monday is negative. On the other hand, the NYSE showed positive mean return for almost all periods, which means the average return on Friday is positive. These results are quite consistent with the result of the day-of-the-week or weekend effect studies on the Malaysian or the U.S. markets. In the case of the TSE, the signs of the mean return are mixed. The standard deviations of the KLSE are relatively larger than those of the NYSE. The TSE exhibited a wide fluctuation in its standard deviations.

The results of the regression analysis, with KLSE as the dependent variable, show some significant relationship between NYSE and KLSE. As shown by the Granger causality test, the influence of the NYSE on the KLSE was quite significant, especially since 1987. The influence of the NYSE on the HKSE can also be seen in almost all years during the period of the study.

The variance ratios between KLSE and NYSE are substantially greater than 1. This implies that the returns on the KLSE are more volatile compared to the returns on the NYSE. However, the Levene test detected significant inequality in variance only in 3 out of 8 years, and also for the entire period 1983-1990. In the case of variance ratios between KLSE and TSE, the values are substantially greater than 1 except for 2 out of 8 years, and also for the entire period 1983-1990. Overall, the Levene test detected significant inequality in variance between the KLSE and the TSE only after 1986. This inequality in variance implies that these markets are not always in tandem in terms of their volatility. In other words, a significant change or event in the advanced market will not necessarily or always be reflected in the smaller market.

The relationship between TSE and KLSE was relatively less significant compared to the relationship between NYSE and KLSE. The results of the Granger causality test also show slight causal relationship from TSE to KLSE. The causal relationship from TSE to HKSE existed for some years, but only before 1988.

The results of the regression analysis and Granger causality test somewhat reinforce the belief that the end-of-the-week performances of the NYSE, and to a lesser degree the TSE, do influence

the beginning-of-the-week performance of the KLSE. In the case of the NYSE, the influence was more pronounced after 1986. In the case of the TSE, the influence was not quite consistent from year to year. These results, however, do indicate some validity in the claim that the performances of developed markets of NYSE and TSE do influence the performance of the KLSE. However, the degrees of influence are not quite stable from one sub-period to another.

REFERENCES

1. Agmon, T (June 1972). "The Relations Among Equity Markets: A Study of Share Price Co-Movements in the United States, United Kingdom, Germany and Japan," *Journal of Finance,* pp. 839-855.

2. Annuar, M.M. & Shamsher, M. (August 1987), "Stock Returns and the Weekend Effect; The Malaysian Experience," *Proceedings of the Academy of International Business South East Asia Regional Conference,* Kuala Lumpur, Malaysia, August 27-29, 1987, pp. V70-V94.

3. Annuar, M.N. & Shamsher, M. 1993, "An Empirical Study of the Capital Structure of Malaysian Listed Firms," *Capital Market Review,* Vol. 1, No. 1, pp. 96-108.

4. Bertoneche, M.L. (1979), "An Empirical Analysis of the Interrelationships among Equity Markets under Changing Exchange Rate Systems," *Journal of Banking and Finance,* Vol. 4, pp. 397-405.

5. Brown, M.B. & Forsythe, A.B. (1974), "Robusts Tests for the Equality of Variances," *Journal of the American Statistical Association,* Vol. 69, pp. 364-367.

6. Cheung, D.W. & Ho, Y.K. (November 1989), "Causal Relationship between U.S. and major Asian-Pacific Emerging Markets," *Proceedings of the Inaugural International Conference On Asian-Pacific Financial Markets,* November 16-18, Singapore, pp. 289-301.

7. Chuan, G.T., Alhabshi, S.Y. & Kiew, C. (June 1981), "Market Wisdom and Inter-relatedness of Stock Market Performances," Occasional Paper series, Faculty of Economics, Universiti Kebangsaan Malaysia.

8. Conover, W.J., Johnson, M.E., & Johnson, M.M. (1981), "A Comparative Study of Tests for Homogeneity of Variances, with Applications to the Outer Continental Shelf Bidding Data," *Technometrics,* Vol. 23, pp. 351-361.

9. Farragher, E.J. & Hui, T.K. (1985), "Co-Movements among U.S. and Asian-Pacific Equity Rates of Return," Paper presented at the Academy of International Business Annual Conference held in New York on October 17-20, 1985.

10. Fischer, K.P. & Palasvirta, A.P. (August 1990), "High Road to a Global Marketplace: The International Transmission of Stock Market Fluctuations," *The Financial Review*, Vol. 25, No. 3, pp. 371-394.

11. French, K.R. (1980), "Stock Returns and the Weekend Effect," *Journal of Financial Economics,* Vol. 8, pp. 57-70.

12. Geweke, J.P. (1984), "Inference and Causality in Economic Time Series Models," *Handbooks of Econometrics,* vol. 3, edited by Zui Griliches and M. Intriligator, Amsterdam: North-Holland Publishing Co.

13. Gruber, H. 1968 (December 1968), "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," *American Economic Review,* pp. 1299-1314.

14. Gruber, H. & Fadner, K. (March 1971), "The interdependence of International Equity Markets," *Journal of Finance,* pp. 89-94.

15. Hui, T. K. & Kwan, K. C. (1988), "International Portfolio Diversification among the U.S. and Asia-Pacific Markets," Proceeding of teh 1988 Academy of International Business Southeast Asia Regional Conference, Bangkok, June 23-25, 1988, pp. C220-C238.

16. Jeon, B.N. & von Furstenberg, G.M. (Autumn 1990), "Growing International Co-Movements in Stock Price Indexes," *Quarterly Review of Economics and Business,* Vol. 30, No. 3, pp. 15-30.

17. King, M. & Wadhwani, S. (March 1989), "Transmission of Volatility between Stock Markets," Paper presented at National Bureau of Economic Research Conference on Stock Market Volatility and the Crash, Puerto Rico.

18. Layard, M. (1973), "Robust Large-Sample Tests for Homogeneity of Variances," *Journal of the American Statistical Association,* Vol. 68, pp. 195-198.

19. Lee, I., Pettit, R. & Swankowski, M. (Spring 1990), "Daily Return Relationships among Asian Stock Markets," *Journal of Business Finance and Accouting,* pp. 265-284.

20. Levene, H. (1960), "Robust Tests for Equality of Variances," *Contributions to Probability and Statistics.* I. Olkin, Ed. Palo Alto, Calif.: Stanford University Press, pp. 278-292.

21. Madridakis, S. G. & Wheelwright, S. C. (Summer 1974), "An Analysis of Inter-Relationships among the Major World Stock Exchanges," *Journal of Business Finance and Accounting,* pp. 195-216.

22. Maldonado, R. & Saunders, A. (Autumn 1981), "International Portfolio Diversification and the Inter-Temporal Stability of International Stock Market Relationships 1957-78," *Financial Management,* pp. 54-63.

23. Mathur, I. & Subrahmanyam, V. (1990), "Interdependence among the Nordic and U.S. Stock Markets," *Scandinavian Journal of Economics,* Vol. 92, No. 4, pp. 587-597.

24. Ng, V. K., Chang, R.P. & Chou, R.Y. (1990), "An Examination of the Behaviour of Pacific-Basin Stock Market Volatility," In the *Pacific-Basin Capital Markets Research,* Vol. 2. Rhee, S.G., & Chang, R.P., eds. Amsterdam: North-Holland, pp. 245-260.

25. Saunders, A. & Woodward, R. S. (Autumn 1977), "Gains from International Portfolio Diversification: U.K. Evidence 1971-75," *Journal of Business Finance and Accounting,* pp. 299-309.

26. Schollhammer, H. & Sand O. (First Quarter 1985), "The Interdependence among the Stock Markets of Major European Countries and the United States: An Empirical Investigation of Interrelationships among National Stock Price Movements," *Management International Review (Germany),* pp. 17-26.

27. Sims, C.A. (September 1972), "Money, Income and Causality," *American Economic Review,* pp. 540-552.

28. Solnik, B. H. (July-August 1974), "Why Not Diversify Internationally Rather Than Domestically?" *Financial Analysts Journal,* pp. 48-54.

29. Watson, J. (1978), "A Study of Possible Gains from International Investment," *Journal of Business Finance and Accounting,* Vol. 5, No. 2, pp. 195-205.

30. Watson, J. (1980), "The Stationarity of Inter-Country Correlation Coefficients: A Note," *Journal of Business Finance and Accounting,* Vol. 7, No. 2, pp. 297-299.

31. Yong, O. (July 1987/88), "A Study of the Performance of the Malaysian Stock Market in Relation to Selected Stock Markets in the Far East and New York," *Jurnal Pengurusan (a publication of the Faculty of Business, Universiti Kebangsaan Malaysia),* Vol. 6 & 7, pp. 35-43.

APPENDIX 1

RESULTS OF THE REGRESSION ANALYSIS

Period	Alpha	Beta	R^2	D-W
NYSE and HKSE (dependent variable)				
1983	–.3307	–.5570 (.2030)	0.322	2.19226
1984	2.0721	–.4108 (.8067)	.0012	2.00769
1985	.2781	–.2218 (.5180)	.0084	2.10428
1986	.0104	–.1471 (.4651)	.0109	1.79084
1987	–.6799	1.1296* (.0262)	.0950	1.23300
1988	.0051	.4257** (.0005)	.2214	1.97859
1989	–.3307	.4208 (.3119)	.0209	2.73353
1990	–.1309	.7503** (.0002)	.2595	2.14223
1983-90	.0969	.3617 (.1245)	.0058	1.93770
TSE and HKSE (dependent variable)				
1983	–.3680	.2054 (.5121)	.0086	2.23514
1984	2.1103	.0354 (.8090)	.0012	2.01431
1985	.2659	–.4319 (.1834)	.0351	2.12358
1986	–.0350	.1595 (.3575)	.0173	1.86418
1987	–.7946	.0073 (.8946)	.0004	1.17470
1988	–.0753	.6828* (.0173)	.1102	2.11333
1989	–.3630	1.7221 (.1703)	.0380	2.80319
1990	–.0500	.3135* (.0245)	.1011	2.05686
1983-90	.1156	.0219 (.5963)	.0007	1.94243

Notes: 1) P-values are shown in the parentheses.
2) * Significant at the 5 percent level.
3) ** Significant at the 1 percent level.

APPENDIX 2

RESULTS OF THE GRANGER CAUSALITY TEST (F-STATISTIC) BETWEEN MARKETS

Period	NYSE Influence on HKSE	TSE Influence on KLSE
1983	4.14*	0.85
1984	3.18*	576.13**
1985	2.77*	2.65*
1986	3.16*	1.36
1987	5.67**	3.15*
1988	3.69*	2.34
1989	0.57	0.87
1990	3.39*	0.89
1983-90	2.70*	56.61**

Notes: * Significant at the 5 percent level.

** Significant at the 1 percent level.