THE EFFECTS OF COMMON ECONOMIC FACTORS ON INTERNATIONAL EQUITY MARKETS

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ABSTRACT

This paper is concerned with investigating the effects of macroeconomic variables on stock prices in the United States, the United Kingdom, Germany, France, Norway, Japan, Singapore, Malaysia, Australia, and South Africa. Using APT and Multi-Index model through Fama-MacBeth procedures (1973), we found that international stock prices are systematically affected by similar economic factors, i.e. the US industrial production, French unemployment, Australian unemployment, Singapore exports and Japanese money supply. This implies the equity markets and the economies between these countries are becoming integrated.

1. INTRODUCTION

Several studies including Robichek, Cohn and Pringle (1972), Panton, Lessig and Joy (1976), Hilliard (1979), Maldonado and Saunders (1981) and Condoyanni, O'Hanlon and Ward (1987) show that there is some stability and structure of relationship between international equity markets, and that the relationship between some markets are very close. Similar results are also found in Ripley's (1973) study which estimated that more than half of the joint movement in market indices was dependent on the same factor. Cho, Eun and Senbet (1986) discovered that the number of common factors between two countries ranged from one to five depending on the degree of economic integration in both countries. Although a number of economic factors that accounted for the common movement of equity markets have been identified, previous studies fail to examine rigorously the characteristics of the common factors (see for example Agmon [1972], Lessard [1973], Ripley [1973] and Cho, Eun and Senbet [1986]). Therefore, most of the past studies are unable to offer strong evidence on whether the stability and the

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structure of economic integration in respective countries are related to the co-movements of international equity markets.

The knowledge of the relationship between international stock markets and macroeconomic variables is of interest to a wide range of people. Individual investors are interested in the co-movement relationships of international share prices and the underlying common factors for possible diversification motives. Other interested parties include economists, corporate planners, and the like who are concerned with the behaviour of international equity markets because it influences capital flows, investment decisions and consumption patterns. Academics would also be interested in seeing new evidence of structural issues such as integration and segmentation of international equity markets.

The major objective of this study is to examine empirically the influence of economic forces on international stock prices. More specific research question is addressed as follows: Are the stock markets from the United States, the United Kingdom, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia and South Africa influenced by common underlying factors?

There is an implicit model which generates the hypothesis being tested in this study. The starting point of the model is the viewpoint of an investor seeking to construct an efficient portfolio in a developing and developed capital market. Such an investor might take the view that stock market returns are influenced by market expectations of earnings or profits from companies. A company's profits in turn would, in a portfolio context, be influenced by the state of the respective economy, the level of production and employment and several economic forces contributing to the changes in aggregate demand.

The investor, in valuing a company, (with a view to participating in the profitability of the company) would be concerned with the outlook for trade and business of the sector in which the company operated. If the forecast for the economic environment suddenly improved, the investor might reasonably argue that company profitability would also improve and the shares would become more valuable. Thus, the returns from owning shares would reflect changes in the perception of the economic state of the economy in which companies operated. This model is consistent with a stock market which reacts to changes in economic variables concurrently but which is also useful as an indicator of the future economic environment.

This paper is organised as follows: Section 2 explains the data, the sample, the time period involved in this study. The methodology and statistical procedures used, together with their limitations, are described in section 3. Section 4 reports and discusses the results of statistical tests. A summary and conclusion of this study are presented in the final section.

2. DATA

The data in this study consist of stock market indices and economic variable indicators from 10 countries, namely the United States (US), the United Kingdom (UK), West Germany (WG), France (FR), Norway (NW), Japan (JP), Singapore (SP), Malaysia (MY), Australia (AU) and South Africa (SA). The equity market indices are S & P Industrials (US), FTSE 100 (UK), Commerzbank (WG), Paris C.A.C Industrial (FR), Oslo Stock Exchange Industry (NW), Tokyo S. E. (New) Ordinary Share (JP), Singapore-Straits Times Industrial (SP), the Kuala Lumpur Stock Exchange (KLSE) Composite Index (MY), Australian All Ordinaries (AU) and Johannesburg Stock Exchange Industrials (SA). For economic variable indicators, the data base includes gross national product (GNP), industrial production (IP), consumer price index (CP), money supply (MS), Treasury bill rate (TB), unemployment (UN), import (IM) and export (EX).

The data cover a period of 8 years from January 1980 to December 1987. Except for GNP, all data are calculated on month end observations. The GNP data are based on quarter end observations because the monthly figures are difficult to access. The data, excluding the Malaysian stock market index, were obtained from Datastream. The Malaysian stock market index was not available in Datastream and therefore was collected from the Kuala Lumpur Stock Exchange's Daily Dairy. The above mentioned countries are chosen on two main criteria, the availability of data and the need to reflect the overall world equity markets[2]. The market indices involved in this study represent share prices in the industrial sector when available, or share prices in various sectors to facilitate a comparison between series. The macro-economic variables included in this research represent the major economic activities in respective countries[3].

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[2] *As a result of some data retrieval difficulties, the data which would represent stock exchanges in Latin America are not considered. Lessard (1973) and Levy-Sarnat (1970) indicated that most countries in Latin America do not have sufficiently active markets to provide the data necessary for research purposes.*

[3] *The data was not seasonally adjusted.*

Both market indices and economic variable indicators are transformed into percentage changes as:

$$R_t = [(I_t - I_{t-1})/I_{t-1}] \ 100 \qquad (1)$$

where, R_t is the monthly percentage change in the level of stock market indices and I_t and I_{t-1} are the level of indices at time t and t-1, and

$$E_t = [(Ec_t - Ec_{t-1})/Ec_{t-1}] \ 100 \qquad (2)$$

where, E_t is the monthly percentage change in the level of economic indicators and Ec_t and Ec_{t-1} are the levels of each economic indicator at time t and t-1. Percentage changes reflect the relative changes rather than the actual changes. For the purpose of making comparisons a relative change is more meaningful than an actual change. In prior studies done by Grubel and Fadner (1971) and Maldonado and Saunders (1981), the percentage changes in indices (or returns) are adjusted for exchange rate changes to reflect returns received by the United States investors. In this study, this adjustment is not made because the effect of exchange rates on the stability of the value of foreign assets is minimal. Many researchers have found that the different ways of calculating international returns are not important as a factor in analysing international market relationship. Grubel and Fadner (1971) found that there is no significant difference between the standard deviation of returns from holding foreign assets before and after the exchange rate adjustments. A later study by Panton, Lessig and Joy (1976) showed that the correlations between stock market returns with and without the exchange rate adjustment are nearly identical. Furthermore, Kaplanis (1985) examined the stability of international stock markets using a variety of returns calculations, including returns denominated in national currencies and British pounds. She found that the results of the study were not affected by the definition of the returns.

3. METHODOLOGY

In order to investigate the effects of similar common underlying factors on the international stock markets, a model which is based on Arbitrage Pricing Theory (APT) (Ross [1976]) and Multi-Index model (Elton and Gruber [1987]) is constructed. The APT states that the returns of risky assets are related to a k-factor linear generating model as follows:

$$R_i = E(R)_i + \beta_{i1}F_1 + ...+ \beta_{ik}F_k + e_i \qquad (3)$$

where, R_i is rate of return from asset i, $E(R)_i$ is expected return for asset i, F is the mean-zero factor common to returns of all assets, β is the coefficient that measures the sensitivity of asset i to the movement in factors 1 to k and e is a random error term. A corollary of the APT is that returns for any asset i are a linear combination of the risk free rate of return plus one or more risk premia, such as

$$E(R)_i = \lambda_o + \lambda_1\beta_{i1} + ...+ \lambda_k\beta_{ik} \qquad (4)$$

where, $E(R)_i$ is the expected return from asset i and β_{ik} is the measure of systematic risk component of asset i with the common factor k. λ_o can be interpreted as rate of return from a risk free asset or a zero-beta portfolio. λ_k is defined as a risk premium, the excess return on portfolio with only systematic risk associated with the k-factor. The APT is clearly more general than the traditional CAPM in the sense that λ_k can be any factor, not necessarily the market portfolio. The APT also provides a testable alternative which is not subject to criticism as found in the CAPM. Roll and Ross (1980) state:

"The APT is a particularly appropriate alternative because it agrees perfectly with what appears to be intuition behind CAPM. Indeed, the APT is based on linear generating process as a first principle and require no utility assumptions beyond monotonicity and concavity. Nor is it restricted to a single period; it will hold in both the multiperiod and single period. Though consistent with every conceivable prescription for portfolio diversification, no particular portfolio plays a role in the APT. Unlike the CAPM, there is no requirement that the market portfolio be mean-variance efficient." (p.1074)

It is noted that the APT and Multi-Index model are almost similar. However, one major difference between these two models is that the Multi-Index model explicitly identifies other indices such as industry indices and the consumer price index (as well as the market index) that explain stock returns, while the APT does not identify these factors. In applying the APT/Multi-Index model in this study, the following procedures are adopted:

(1) The common factors are identified through factor analysis and regression. Factor analysis is used to compute the number of common factors and the factor scores. Factor scores of market returns and economic variables are then divided into 2 equal subperiods, January 1980 to December 1983 and January 1984 to December 1987. For each subperiod, the factor scores

of market returns are regressed on the economic variables to see the degree and stability of the relationship. The economic variables whose factor scores are strongly related to those of market returns within the two periods are considered. Following that, the economic indices from countries which have the higher degree of loading factors are regressed against factor scores of market returns to determine the most significant economic variables for this analysis.

(2) The coefficients of the related economic variables from the first-pass time-series regression are computed. By utilising the Fama-MacBeth procedure (1973), 24 coefficients of the related economic variables are obtained from the first 24 of the sixty monthly observation sets covering August 1980 to July 1987. The first of the sixty monthly data set is from August 1980 to July 1985, the second is from September 1980 to August 1985; the same procedure is repeated for the following periods after dropping the first monthly observation set and adding the next monthly observation set. In addition, 24 means of returns of the 10 stock markets are calculated from 24 of six monthly data sets covering August 1985 to December 1987 (the first of six monthly data ranges from August 1985 to January 1986, the second is from September 1985 to February 1985; the rest of the subperiods are obtained by repeatedly dropping the first monthly observation set and adding the next monthly observation set).

(3) Finally, for each of the 24 subperiods, the cross-sectional analyses are performed by regressing the beta coefficients of the economic variables from the first-pass time series regression against the mean returns of the stock markets. These 24 cross-sectional regression analyses are used to test the effects of the common factors on the stock markets.

A number of limitations may be present in the research methodology. As suggested by Elton and Gruber (1987) and Sharpe (1982), a thorough equity valuation based on micro and macro-economic theories should be developed to derive the risk-return factors model. In view of that, the Multi-Index model or the APT procedures as carried out in this study are rather ad hoc in nature. Furthermore, the suspicion arises that the appropriate economic variables may not all have been identified. Previous studies by Shanken (1984) and Cho, Eun and Senbet (1986) fail to offer strong support for the APT when they respectively examine national and international sets of data. One fundamental problem with the APT is the estimate of the beta coefficients. Since the theoretical ex ante beta coefficient is not observable, historical betas are normally used as proxies. This may lead to the problem of measurement error and may produce a biased interpretation of the tested hypothesis.

However, despite the above limitations, it is believed that the statistical procedures described in this section should adequately provide tools for examining the effects of underlying common factors on international stock markets, and therefore, the statistical conclusions can be made to provide empirical evidence for useful implications of international stock market behaviour.

4. RESULTS

The analysis begins with identifying common factors to include in the APT/Multi-Index model. For stock market returns, the results of factor analysis show that over 57 percent of the common movement is accounted for by the first factor. It is noted that the first factor loads heavily on market returns in the US, UK, Australia and, to some extent, France, Norway, West Germany, Singapore and South Africa. These countries mostly have well developed stock markets and flexibility in capital flows. The second factor is dominated by the market returns from Malaysia, Singapore and Australia in the Asia-Pacific region. These results are largely consistent with those of Quantec Ltd. Quantac publishes the World Market Research Quarterly (a bulletin circulated to institutional clients) and reports the following observations about the structure of international equity market correlations: (1) There are 4 main groups of equity markets, namely Core Global, Continental Europe, Pacific basin and English-speaking; and markets within each group tend to move together and (2) The markets in the Core Global group, which consists of US, UK, Canada, Netherlands and Switzerland, have a relatively high and significant correlation with each other.

For the economic variables, the number of common factors ranges from 2 to 5, and their contribution to the common movement is between 57 to 80 percent. Among economic variables which have the biggest common factors (5 factors) are industrial production, treasury bills and unemployment, while consumer prices, money supply and imports each has 3 factors. Exports own only 2 factors. It is noted that countries whose economic indicators have large weights in the same common factors are those with similar economic structures. For example, Singapore loads on the same factor as Malaysia for six of the eight economic variables.

In the following section, this study investigates whether the common factors of economic variables are related to those of stock markets. Table 1 shows the results of regressing the market return factors against economic variable factors for 2 subperiods and the cases of significant

relationship between them.[4] From the results, there is an indication that economic variables have some links with market returns. A considerable number of economic variable factors,

TABLE 1

REGRESSIONS OF MARKET FACTORS (F_R) ON ECONOMIC VARIABLE FACTORS (F_E)

($F_R = \alpha + \beta_1 F_{E1} + ...+ \beta_k F_{Ek} + e$)

	Stock Market Factor			
	Factor 1		Factor 2	
Econ. Factors	P1	P2	P1	P2
α	–0.03	0.09	0.06	–0.30
β (IP:factor 2)		0.15		
t-value		2.10**		
β (IP:factor 3)	–0.21			
t-value	–1.89*			
β (CP:factor 2)				–0.35
t-value				–1.83*
β (MS:factor 2)	0.19			
t-value	1.76*			
β (MS:factor 3)		0.15	0.43	
t-value		1.86*	2.62**	
β (TB:factor 1)		–0.33		0.44
t-value		–2.52**		1.96*
β (TB:factor 4)		0.15		
t-value		1.75*		
β (UN:factor 2)		–0.19		
t-value		–3.00**		
β (UN:factor 5)	0.12	0.37	–0.16	–0.29
t-value	1.48	2.97**	–1.53	–1.39
β (IM:factor 1)		0.30		
t-value		3.53**		
β (EX:factor 2)		–0.16		
t-value		–2.07**		
R-square	0.19	0.62	0.19	0.23
R-square (adj.)	0.13	0.51	0.16	0.16
F-ratio	3.05	5.59	4.86	3.31
DW	1.55	1.85	1.31	1.53

** & * Significant at the 5 and 10 percent level
P1 = 1980-1983, P2 = 1984-1987. Factors = rotated

[4] *Note that GNP is not included in this regression model because it consists of quarterly data and is therefore inconsistent with the other economic variables.*

i.e. factor 2 and 3 of industrial production, factor 2 of consumer price index, factor 2 and 3 of money supply, factor 1 and 4 of treasury bill, factor 2 and 5 of unemployment, factor 1 of import and factor 2 of export, do relate significantly to factor 1 and 2 of market returns. However, their relationships are unstable since no similar economic factors have a strong correlation with market factors in both periods. From the above regression, there is little doubt that there is a relationship, albeit an unstable one, between the common factors of economic variables and market returns. Based on this evidence, the analysis proceeds further to find whether there is a specific common factor which might represent in a more stable way, the return generating model. This is attempted by regressing the economic indices from countries which have a higher weight of factor loadings against the common factors of market returns. The countries whose indices highly load on each common factor are derived from the factor analysis. The regression results and the cases of significant relationship are presented in Table 2. It appears that there are a number of economic variables which have a significant relationship with the common factors of market returns. From the results of stepwise regression, the economic variables which are related to factor 1 and 2 of stock market returns at the 5 percent level are: (1) industrial production from West Germany, Singapore and the US (2) the Japanese consumer price index (3) the Japanese money supply (4) unemployment from Singapore, France and Australia and (5) the Singapore exports. Previous studies by Ripley (1973), Gehr (1978), Roll and Ross (1980) and Cho, Eun and Senbet (1986) claim that there are about three to five factors which influence the movement of stock markets. In order to investigate the effect of common economic factors on international equity market returns, the above five economic factors (the US industrial production (IP-US), the Japanese money supply (MS-JP), the French unemployment (UN-FR), the Australian unemployment (UN-AU) and Singapore exports (EX-SP)) are then considered to be employed in the Fama-MacBeth procedure.

The results of the first-pass time series regression show that there is a significant relationship between the 5 economic indicators and these 10 stock markets. Then, cross-sectional analyses are performed by regressing 5 measures of beta (i.e. IP-US, MS-JP, UN-FR, UN-AU and EX-SP) against the mean return of each stock market. The estimated beta coefficients derived from the cross-sectional regression are transformed into an average value. The average results are reported in Table 3. It appears that the average beta of the US industrial production, the Japanese money supply, the French and the Australian unemployment and the Singapore exports are significant at the 5 percent level. This implies that these economic variables could act as a

TABLE 2

REGRESSIONS OF MARKET FACTORS (F_R) ON ECONOMIC INDICES (I_E)

($F_R = \alpha + \beta_1 I_{E1} + ...+ \beta_k I_{Ek} + e$)

		Stock Market Factors			
		Multiple Regression		Stepwise Regression	
		Factor 1	Factor 2	Factor 1	Factor 2
α		0.036	–0.419	–0.023	–0.095
IP:	β1 (SA)	0.014	–0.109		
	t-value	0.418	–1.873*		
	β2 (WG)	0.114	–0.024	0.072	
	t-value	2.833**	–0.344	2.397**	
	β3 (AU)	0.043	0.012		
	t-value	1.501	0.233		
	β4 (SP)	0.064	0.121		0.114
	t-value	1.426	1.567		2.065**
	β5 (US)	0.129	0.024	0.244	
	t-value	1.386	0.152	3.138**	
CP:	β6 (MY)	0.122	0.094		
	t-value	0.696	0.319		
	β7 (JP)	0.212	0.257	0.375	
	t-value	1.245	0.888	2.866**	
	β8 (AU)	–0.157	0.233		
	t-value	–0.755	0.658		
MS:	β9 (AU)	–0.006	0.064		
	t-value	–0.161	0.974		
	β10 (WG)	–0.009	0.013		
	t-value	–0.354	0.291		
	β11 (JP)	0.062	0.050	0.068	
	t-value	2.405**	1.155	2.911**	
TB:	β12 (WG)	–0.027	–0.018	–0.027	
	t-value	–2.215**	–0.862	–1.352	
	β13 (AU)	–0.000	0.014		
	t-value	–0.051	1.075		
	β14 (NW)	–0.005	–0.008		
	t-value	–0.681	–0.731		
	β15 (UK)	0.001	–0.013		
	t-value	0.072	–0.783		
	β16 (MY)	–0.031	–0.042		–0.047
	t-value	–1.604*	–1.275		–1.792*
UN:	β17(WG)	–0.004	0.007		
	t-value	–0.163	0.173		
	β18 (SP)	–0.002	0.002	–0.002	
	t-value	–1.601*	0.981	–2.259**	
	β19 (SA)	0.014	–0.004		
	t-value	1.019	–0.178		

TABLE 2 (CONTINUED)

REGRESSIONS OF MARKET FACTORS (F_R) ON ECONOMIC INDICES (I_E)

		Stock Market Factors			
		Multiple Regression		Stepwise Regression	
		Factor 1	Factor 2	Factor 1	Factor 2
	β20 (FR)	–0.103	–0.057	–0.076	
	t-value	–2.962**	–0.975	–3.077**	
	β21 (AU)	0.063	–0.053	0.056	
	t-value	2.514**	–1.254	2.467**	
IM:	β22 (FR)	0.029	–0.021		
	t-value	2.321**	–0.986		
	β23 (MY)	–0.007	–0.014		
	t-value	–0.873	–1.068		
	β24 (US)	–0.041	0.036		
	t-value	–1.884*	0.972		
EX:	β25 (WG)	–0.027	0.042		
	t-value	–1.534	1.432		
	β26 (SP)	–0.017	0.001	-0.022	
	t-value	–2.021**	0.072	-2.980**	
	R-sq.	0.523	0.292	0.363	0.072
	R-sq(adj)	0.297	0.000	0.283	0.048
	F-ratio	2.317	0.871	4.550	3.077
	DW	1.917	1.501	1.774	1.498

** statistically significant at the 5 percent level.
* statistically significant at the 10 percent level.

reasonably good proxy for common factor measures for international stock market returns. From the APT viewpoint, there is a positive tradeoff between return and risk factor on international stock markets. Furthermore, given that our proxy for the international market portfolio is approximately efficient, the average returns on international stock prices might reflect the attempts of risk averse investors from international communities to hold efficient portfolios. The findings in this study support our contention that international stock markets are influenced by common underlying factors. In fact, it is not surprising that these 5 economic variables offer a good fit for a linear relationship between common factors and returns of the 10 stock markets. One reason why the international capital markets are jointly affected by similar economic variables is that their economies are becoming more integrated. For example, if exports in Singapore are closely associated with the imports into the US, Japan and other countries, it

is reasonable to expect investors from Singapore to react directly to the state of the economies in the US, Japan and other countries. Many studies, specifically Ripley (1973) also observed that more than 50 percent of a country's stock index may be explained by non-domestic factors.

TABLE 3

THE AVERAGE OF MONTH-BY-MONTH BETA COEFFICIENTS & t STATISTICS[5]

Statistics	AV1	AV2	AV3	AV4	AV5	AV6	AV7	AV8
â1(IP-US)	0.52	1.13	–0.28	0.70	1.48	–0.21	0.52	0.27
t-value	1.59	2.59*	–0.46	1.21	3.14*	–0.37	0.67	0.40
â2(MS-JP)	0.20	–6.99	4.74	2.84	–10.67	3.56	8.84	–0.93
t-value	0.10	–1.75	3.05*	0.88	–2.47*	2.71*	3.74*	–0.33
â3(UN-FR)	5.41	7.76	–0.25	8.73	9.66	–3.53	10.48	5.03
t-value	2.86*	4.78*	–0.08	2.19*	6.84*	–1.41	2.75*	1.17
â4(UN-AU)	3.44	8.70	–1.34	2.94	10.89	0.22	–1.73	4.36
t-value	2.73*	4.04*	–0.99	2.13*	5.00*	0.12	–1.68	3.68*
â5(EX-SP)	8.98	40.13	1.70	–14.89	46.11	10.10	0.70	–21.02
t-value	1.31	7.44*	0.14	2.02*	11.37*	0.97	0.05	–2.52*

Notes: AV1 = 24 months' beta average value (Period 1 to 24), AV2 and AV4 = the average of the first to third 8 months' beta (Period 1-8, 9-16 and 17-24), AV5 to AV8 = the average of the first to fourth 6 months' beta (Period 1-6, 7-12, 13-18 and 19-24). * Significant at the 5% level.

The results of a cross-sectional test of the APT/Multi-Index model suggest the argument that international equity markets are becoming more integrated. If capital markets in different countries are integrated, the scope for independent monetary policy of individual countries will be reduced. For example, a plan to change the interest rates in one country may be neutralised by rapid capital movements across countries and changes in interest rates in other countries. Because of this relationship phenomenon, the government of any country must consider the implications of its monetary policy for both national and international economies. In addition, an integrated international capital market has far-reaching implications for the cost of capital

[5] *Following Fama and MacBeth (1973), we calculate the average beta coefficients (â) based on 24, 8 and 6 months period. While, the t-statistics for testing the hypothesis that â = 0 are obtained from:* $t(\hat{a}) = \hat{a}/[s(\hat{a})/(n)^{1/2}]$, *where n is the number of beta coefficients which are used to estimate â and s. s denotes the standard deviation of monthly estimate beta coefficients.*

of industrial and commercial companies. Projects can be valued using the same hurdle rate regardless of the country in which the projects are undertaken. Multinational firms may then invest their funds in countries where the projects are expected to give the highest net present value. The firms also may choose to float shares in countries where they can get the highest price to reduce the cost of capital. This is of crucial importance both to the corporate sector and to investors. At present, investors in say, the UK, will expect that the valuation of, say, oil companies quoted in the UK exchange will be closely related to other UK companies as well as to US oil companies. Once capital markets are internationally integrated, the local market effect may be reduced and the global market/industry effects will tend to increase. This study may be premature in suggesting that investors are already sensitive to the global dimension of risk. The evidence in early studies certainly has varied widely. Nevertheless, the results suggest that there is sufficient growth to support the plausible interpretation that international markets are becoming more integrated and that investors would do well to recognise the international dimension of risk.

5. CONCLUSION

The purpose of this study has been to investigate the influence of economic forces on international equity markets. The analysis of this study has focused mainly on empirical tests of stock market and economic variable indices from the US, the UK, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia and South Africa. A model which is based on the concept of APT/Multi-Index model was developed to find and discuss the effects of common underlying factors on the international stock markets. Factor analysis and regression were used to find specific economic variables which represent international underlying common factors.

From the empirical test, five common factors, namely the US industrial production, French unemployment, Australian unemployment, Singapore exports and Japanese money supply, were identified. These five economic variables are significant cross-sectionally in explaining variations in returns in the ten stock market prices over the period tested. This leads to support the hypothesis that international stock markets are influenced by common underlying factors. The acceptance of this hypothesis implies that the common underlying economic factors are systematically priced across the international equity markets. Since the model is one of the techniques to explain the factor-return relationship, it means that there is a positive tradeoff between returns and factors on international stock markets. Finally, it can be concluded that the findings of this study are as expected. The results are largely consistent with earlier works.

REFERENCES

1. Agmon, T (1972). "The Relations Among Equity Markets: A Study of Share Price Co-Movements in the United States, the United Kingdom, Germany and Japan." *Journal of Finance,* September, pp.839-855.
2. Branch, B. (1974). "Common Stock Performance and Inflation: An International Comparison." *Journal of Business,* Jan., pp.48-52.
3. Cho, D.C., C.S. Eun and L.W.Senbet (1986). "International Arbitrage Pricing Theory: An Empirical Investigation." *Journal of Finance,* vol.41 no.2, June, pp.313-329.
4. Chen, N. F. (1983). "Some Empirical Tests of the Theory of Arbitrage Pricing." *Journal of Finance,* vol.38, no.5, December, pp. 1393-1414.
5. Condoyanni, L., J. O'Hanlon and C. W. R. Ward (1987). "Day of the Week Effects on Stock Returns: International Evidence." *Journal of Business Finance and Accounting,* Summer, pp.159-174.
6. Dhrymes, P. J., I. Friend, N. B. Gultekin and M. N. Gultekin (1985). "An Empirical Examination of the Implications of Arbitrage Pricing Theory." *Journal of Banking and Finance,* 9, pp. 73-77.
7. Diacogiannis, G. P. (1986). "Arbitrage Pricing Model: A Critical Examination of its Empirical Applicability for the London Stock Exchange." *Journal of Business Finance and Accounting* 13(4) Winter, pp. 489-504.
8. Elton, E. J. and M. J. Gruber (1987). *Modern Portfolio Theory and Investment Analysis.* New York: John Wiley.
9. Fama, E.F. and J.D. MacBeth (1973). "Risk, Return and Equilibrium: Empirical Tests." *Journal of Political Economy,* May-June, vol.81 no. 3, pp.607-636.
10. Gehr, A. (1978). "Some Tests of the Arbitrage Pricing Theory." *Journal of Midwest Financial Association*, pp. 91-105.
11. Gultekin, N. B. (1983). "Stock Market Returns and Inflation: Evidence from Other Countries." *Journal of Finance,* vol. 38 no. 1, March, pp. 49-65.
12. Gray, W. S.(1984), "The Stock Market and the Economy in 1988," *The Journal of Portfolio Management,* Summer, pp.73-80.

13. Grubel, H. G. and K. Fadner (1971). "The Interdependence of International Equity Markets." *Journal of Finance,* vol.26 no.1, March, pp.84-94.

14. Hilliard, J.E. (1979)."The Relationship Between Equity Indices on World Exchanges." *Journal of Finance,* vol. 34 no.1, March, pp.103-114.

15. Hamburger, M. J. and L. A. Kochin (1972). "Money and Stock Prices: The Channels of Influences." *Journal of Finance,* vol.28 no.2, May, pp.231-249.

16. Kaplanis, E. C. (1988) "Stability and Forecasting of the Comovement Measures of International Stock Market Returns". *Journal of International Money and Finance,* July, pp. 63-75.

17. King, B. (1966). "Market and Industry Factors in Stock Price Behaviour." *Journal of Business,* Supplement, vol. 39 no. 1, January, pp.139-190.

18. Levy, H. and M. Sarnat (1970). "International Diversification of Investment Portfolio." *American Economic Review*, Sept. pp.668-675.

19. Lessard, D.R. (1973). "International Portfolio Diversification: A Multi-Variate Analysis for a Group of Latin American Countries." *Journal of Finance*, vol.38 no.3, June, pp.619-633.

20. Malkiel, B.G. and R.E. Quandt. (1972) "The Supply of Money and Common Stock Prices: Comment." *Journal of Finance,* Sept., pp.921-926.

21. Maldonado, R. and A. Saunders (1981). "International Portfolio Diversification and the Inter-Temporal Stability of International Stock Market Relationships 1957-1978." *Financial Management,* vol.10 no.4, Autumn, pp.54-63.

22. McCulloch, R. and P. E. Rossi (1990). "Posterior, Predictive and Utility-based Approaches to Testing the Arbitrage Pricing Theory" *Journal of Financial Economics,* 28, pp. 7-38.

23. Oldfield, G. S. and R. J. Rogalski (1981). "Treasury Bill Factors and Stock Returns." *Journal of Finance,* vol.36 no.2, May, pp.337-353.

24. Panton, D. B., V. P. Lessig and D. M. Joy (1976). "Comovement of International Equity Market: A Taxonomic Approach." *Journal of Finance and Quantitative Analysis,* Sept., pp.415-432.

25. Rozeff, M. S. (1974). "Money and Stock Prices." *Journal of Financial Economics,* Sept. pp.245-303.

26. Ripley, D. M. (1973). "Systematic Elements in the Linkage of National Stock Market Indices." *The Review of Economics and Statistics,* August, pp.356-361.

27. Robichek, A. A., R. A. Cohn and J.J. Pringle (1972). "Returns on Alternative Investment Media and Implications for Portfolio Construction." *Journal of Business,* July, pp.427-443.

28. Roll, R. and S. A. Ross (1980). "An Empirical Investigation of the Arbitrage Pricing Theory." *Journal of Finance,* 35, December, pp. 1073-1104.

29. Ross, S. A. (1976). "The Arbitrage Pricing Theory." *Journal of Economic Theory,* 13, pp. 341-360.

30. Shanken, J. (1982). "The Arbitrage Pricing Theory: Is it testable." *Journal of Finance,* vol. 37, no. 5, December, pp.1129-1140.

31. Sharpe, W. F. (1982). "Factors in New York Stock Exchange Security Returns." *Journal of Portfolio Management,* Summer, pp.5-19.

32. Solnik, B. H. (1983). "International Arbitrage Pricing Theory." *Journal of Finance,* vol. 38 no.2, May, pp.449-457.

33. White, H. (1980). "A Heteroskedasticity Consistent Covariance Matrix Estimator and a Direct Test of Heteroskedasticity." *Econometrica,* vol. 48, pp. 817-838.