Thesis

THE STRUCTURAL RELATIONSHIP BETWEEN STOCK MARKET RETURNS AND MACROECONOMIC VARIABLES IN INTERNATIONAL EQUITY MARKETS

A Thesis submitted for the degree of Doctor of Philosophy

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I dedicate this dissertation to every member of my family, to my parents, wife and daughters.

ABSTRACT

This study is concerned with investigating the structural relationship between stock markets and economic variables in different countries.

In investigating the relationships, the following six questions are posed:- Are stock markets in the United States, the United Kingdom, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia and South Africa related to each other and do they influence each other ? Does the level of any relationship change over time ? Are variables representing economic activity in each country related to similar variables in the other countries ? Does the level of any economic relationship change over time ? Are the comovements of both equity markets and economic indicators consistent ? and Are stock markets examined in this study influenced by similar common underlying factors ?

The empirical results suggest positive answers to these questions. The main findings from the study suggest that equity returns are related and although some markets have a higher degree of similarity, the covariance between international equity returns remain stable over the short period but tend to change in the long run. It is also found that economic variables of different countries are related in a consistent way to the equity markets. Finally it is shown that stock prices in each country are systematically affected by similar economic factors.

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CHAPTER ONE

INTRODUCTION

1.0. The Problem

If UK investors consider buying a share quoted on the UK exchange, there are numerous sources of information to which they can turn. The received view from the financial research literature suggests that they might find advice on constructing efficient portfolios by estimating expected returns and the relationship between future returns of the share with their own portfolio. If they were to follow the portfolio analysis advocated by Markowitz (1952), they would estimate covariances of returns between the set of shares under consideration. If they were to follow the advice of Sharpe (1963) or Ross (1976), they would instead be looking for systematic relationship between the share returns and one or more market-wide factors.

In a domestic market framework, the models and approaches are well-researched both in the US and UK. Although much controversy has raged over the years, it is probably uncontroversial to assert that most financial researchers now accept that some relationship holds between the returns of shares in most equity markets and some underlying factor or factors. Argument still may surround whether the relationship is stable, how many factors are involved and whether there are significant anomalies which distort the relationship but few researchers would assert that no relationship exist - at least in well developed capital markets.

However, no consensus is apparent when we consider the possibility of diversifying in capital markets overseas. Although first principles of Markowitz-type analysis would suggest that international diversification would be beneficial because the correlations between returns from shares traded on stock exchanges in different countries would be likely to be low, the amount of research on international diversification is still small and few of the fundamental relationships have been explored.

The knowledge of the relationship between international stock markets is of interest to a wide range of people. Individual investors are interested in the comovement relationships of international share prices and the underlying common factors for possible diversification motives. Other interested parties included economists, corporate planners, and the like who are concerned with the structural 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, segmentation and efficiency of international equity markets.

Previous research has not provided a coherent picture. For example Grubel (1968), Levy and Sarnat (1970), Grubel and Fadner (1971), Solnik (1973) and McDonald (1973) reveal that the correlation coefficients between international stock markets are hardly statistically significant. Agmon (1972) and Lessard (1973) support this notion by claiming that country factors do exist in the movement of equity markets but they are independent and specific to particular countries.

However, other 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 in 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.

Furthermore, 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 structure of economic factors in countries are related to those of the respective equity markets.

Testing the degree of international capital market integration is essential for the future development of international finance (Copland and Weston [1983]). Despite its importance, a strong test for international capital market integration has not yet been found. Previous tests of the international capital market integration have been subject to various weaknesses. They not only lack theoretical frameworks but have also relied heavily on the validity of international asset pricing models (see for example (1) the International Asset Pricing Model developed by Solnik [1974], Black [1974], Grauer, Litzenberger and Stehle [1976] and Stulz [1981] and (2) the international Arbitrage Pricing Theory formulated by Solnik [1983] and Cho, Eun and Senbet [1986]).

Having tested whether there is or not a stable relationship between the capital markets, a natural question remains about the cause of any association in returns. Might it be, for example, that the US market "drives" other capital markets ? or does the association stem from an increasing trend towards globalisation, towards a more integrated trading system characterized by falling barriers to international trade ?

The question of causality is clarified by adopting of Granger-causality approach. Granger (1981) argues that a statistical definition of causality must stem from the assumption that events can only determine, influence or "cause" other events that occur later. Thus relationship between markets are analyzed by examining whether the returns from one market can improve the prediction of returns from other markets in future periods. A test for the causal relationship between the domestic price and the foreign price of the international stocks not only facilitates the measurement of international capital market integration but also help to identify the informational of international capital markets. Moreover, the causality test (Granger [1981]) in international stock prices has only previously been performed by Taylor and Tonks (1989) and on a small sample of countries over a short sample period.

In view of the above mentioned disagreements and failures, it is, therefore, important to conduct a further investigation of the structure of international equity markets and the relationship between economic activities.

1.1. Major Objective

The major objective of this dissertation is to examine empirically: (a) the relationship between share prices in stock markets in different countries, and (b) the influence of the economic forces in each country on any observed international relationship between stock prices. More specific research questions are addressed below.

There is an implicit model which generates the hypotheses 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 markets. Such an investor might take the view that stock market returns were influenced by the 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.

In an international context, investors may see movements in other capital markets as constituting information in their own sight; the news that the New York Stock Exchange index has declined by five per cent may be sufficiently important as to change UK investors' views of the UK Stock Market. Alternatively, UK investors may react to information about both other capital markets and other economic variables. If the US economy is reputed to be suffering unexpectedly bad information, the news might quite legitimately affect (a) US stocks (b) the outlook for the US economy (c) the outlook for the UK economy and (d) UK stocks. It, therefore, implies that in a world in which communication has become both faster and more pervasive, investors in one country may react to a much larger information set than previously was the case.

This study attempts to throw light on the extent and influence of the international information set by examining the relationships, not only between international capital markets,

but also between the capital markets and the economic variables that are likely, at the domestic level, to enter into national information sets.

In order to produce a structure and coherent programme of study, the linkages and the associated issues are split into a series of hypotheses. These hypotheses are identified in Chapter Four. At this stage, they are briefly identified in the form of the following questions which require answering in the course of the thesis.

1. Do stock markets in the US, the UK, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia and South Africa relate to and influence each other ? If it is correct to assume that investors are aware of international influence on the profitability of companies traded on their own capital market, one would expect to see some markets e.g. the US capital market, influencing other capital markets around the world. On the face of it, one would not expect to see markets in countries which were either politically or economically important, being correlated with markets in other countries which were in a similar economic situation. Thus, the answer to this question might be expected to reveal either blocks or groups of markets which tended to be influenced by common issues or a dominating influence from say the US or Japan.

2. Has the level of any observed relationship in (1) changed over time ? Earlier discussion would lead one to expect that the degree of international linkages would have been expected to increase over the last decade.

3. To what extent, do variables representing economic activity in each country relate to similar variables in the other countries ? One reason why capital markets might be jointly interacted in a similar information is that the economies may be linked by common forces. If exports in the UK are associated with imports into the US, it is reasonably to proceed to

test whether UK investors (as represented by the UK market) react directly to the state of the US economy.

4. Has the level of any observed relationship in (3) changed over time ?

5. Are the comovements of both equity markets and economic indicators from these countries consistent ?

6. Are the stock markets examined in this study influenced by similar common underlying factors ?

1.2. Organisation of the Study

The chapters of this study are organised as follows: Chapter One states the objectives of the study, the research questions and the importance of the study. In Chapter Two, the empirical evidence of relationship between international equity markets as reported in previous research is reviewed. Chapter Three discusses the development of relevant asset pricing theories. It provides a critical review of their application in national and international fronts. Chapter Four describes the methodology and statistical procedures employed in this study. It explains the related hypotheses to be tested, the data, the sample, the time period and the statistical techniques used. Chapter Five and Six report the results of statistical tests. A comparison of these findings with those of previous studies is also made in these chapters. A summary of this thesis, its limitations and suggestions for future research are presented in Chapter Seven.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

Previous research on the international structure and relationship of equity markets is reviewed in the following sections of this chapter. This review includes: (1) studies examining on the degree of correlation between international stock market returns, (2) the identification of factors which might explain the results reported in (1) above, (3) other statistical tests which have been used to measure the relationship between equity markets, (4) the effects of economic factors or links on the structure of international equity markets and (5) inferences which can be drawn from the review.

2.1. Correlation Between Stock Markets

Several studies have examined the correlation between stock markets. This includes studies which have been carried out by Grubel (1968), Levy-Sarnat (1970), Grubel and Fadner (1971), Robichek, Cohn and Pringle (1972), Joy, Panton and Reilly (1976) Maldonado and Saunders (1981), Cho, Eun and Senbet (1986) and Condoyanni, O'Hanlon & Ward (1987). The results of their studies are shown in Appendix 2.0 to this chapter.

It is noted that although the studies do not produce similar results on the degree of correlation between any particular pair of countries, they do consistently report that:

1. The inter-market correlations (i.e. the correlation between stock market indices from different markets) are usually low and weaker than the intra-market correlations (i.e. the correlation of returns from stocks within markets). The average inter-market correlation coefficients for all pairs of countries in the studies range from 0.14 (Joy, Panton and Reilly [1976]), 0.15 (Robichek, Cohn and Pringle [1972]), 0.17 (Condoyanni, O'Hanlon and Ward [1987]), 0.19 (Levy and Sarnat [1970]), 0.23 (Cho, Eun and Senbet [1986]), 0.27 (Grubel [1968]) and 0.27 (Grubel and Fadner [1971]) to 0.43 (Maldonado and Saunders [1981]). In contrast, the average intra-market correlations as documented in Grubel and Fadner (1971), Robichek, Cohn and Pringle (1972) and Cho, Eun and Senbet (1986) are 0.50, 0.59 and 0.52 respectively.

2. The correlation between the US and Canadian markets is stronger than other countries. The US-Canada correlation is 0.70 in Grubel (1968), 0.63 in Joy, Panton and Reilly (1976), 0.79 in Maldonado and Saunders (1981) and 0.38 in Cho, Eun and Senbet (1986). Apart from that, most studies indicate that the US-Canada correlation is larger than the average of other inter-market correlations; about 2.5 times (Grubel), 1.8 times (Maldonado-Saunders), 1.1 times (Cho-Eun-Senbet) and 3.6 times (Condoyanni-O'Hanlon- Ward).

3. Most intra-continental Europe pairs have a relatively close relationship. The studies also show that each correlation between stock markets in Amsterdam, Frankfurt, Paris, Brussels and Zurich are greater than the average correlation between other markets. For example (a) the correlation between Amsterdam and Frankfurt is four times higher than the inter-market average in Levy-Sarnat (1970), 2.6 times in Joy, Panton and Reilly (1976) and 1.7 times in Cho, Eun and Senbet (1986), (b) the Amsterdam-Paris correlation is more than

2.6 times the average estimate in Levy-Sarnat (1970) and 1.1 times in Joy, Panton and Reilly (1976) and (c) the correlation coefficient between Frankfurt and Paris is bigger than the average correlation by 2.4 times in Levy-Sarnat (1970), 1.1 times in Joy, Panton and Reilly (1976) and 1.3 times in Cho, Eun and Senbet (1986). A departure from this generalisation is the stock markets from Italy and Austria. Previous studies do not show consistent results of the correlations between these two markets when compared with other continental European markets. Some studies report that they are more highly correlated than other markets in continental Europe, while other studies report the opposite.

4. All London-European market correlations are lower than intra-European market relationships. The average correlation between London and European markets is estimated at 0.06 (Joy, Panton and Reilly [1976]) and 0.28 (Cho, Eun and Senbet [1986]) but the average of all other intra-European pairs is higher (0.16 in Joy, Panton and Reilly [1976] and 0.35 in Cho, Eun and Senbet [1986]).

5. The London-US relationship tends to be weakly correlated, having a correlation coefficient of 0.10 (Joy, Panton and Reilly [1976]), 0.14 (Condoyanni, O'Hanlon and Ward [1987]), 0.21 (Grubel and Fadner [1971]), 0.23 (Cho, Eun and Senbet [1986]), 0.24 (Grubel [1968]) and 0.26 (Levy & Sarnat [1970]). Exceptionally, Maldonado and Saunders (1981) show that this coupling has a relatively large correlation coefficient, 0.42, but this figure is below their inter-market average (0.43).

6. The correlation between Amsterdam and New York markets is relatively strong, 0.53 in Levy-Sarnat (1970) and 0.34 in Joy, Panton and Reilly (1976). The correlation as measured by Grubel (1968) and Cho, Eun and Senbet (1986) is, however, rather lower, 0.21 and 0.24 respectively. Other markets in the Continental Europe which tend to be closely related to the US market (or North America) are West Germany and Switzerland.

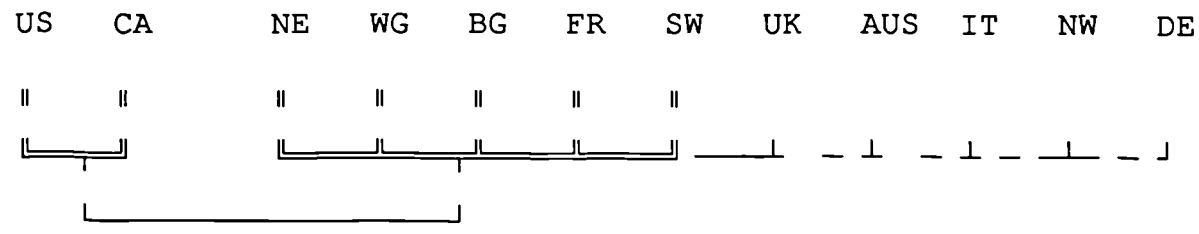
7. The Asian-Pacific equity markets are largely independent of each other and other world equity markets as well, except Singapore and Australia which both are significantly correlated with each other and some markets in the Asian-Pacific region.

8. The Latin American equity markets are not closely related to each other, nor to other world equity markets.

9. The South African market does not have a strong link with other equity markets.

From the evidence of the past studies, linkage diagrams are developed and shown in Appendix 2.1. These diagrams illustrate the intra and inter-relationship of major world's equity markets. Diagram 2.2.1 also reproduced below, shows a strong relationship between Canada and the United States and between the Netherlands, West Germany, France, Switzerland and Belgium. These seven countries in two continents, thus, form a core of world international markets. The United Kingdom tends to behave as though it was independent of others.

North America-Europe



As demonstrated in diagram 2.2.2, which is also found here, countries in the Asian-Pacific region are not closely related to each other. However, Singapore is an exception to this, with relatively strong relationship with Australia and Hong Kong. It also indicates that Singapore and Australia have a significant relationship with those of North American countries.

North America-Asian-Pacific

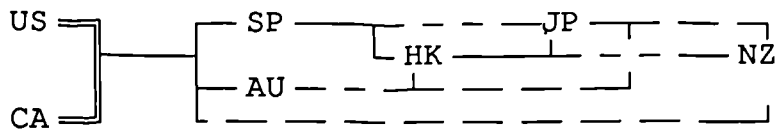
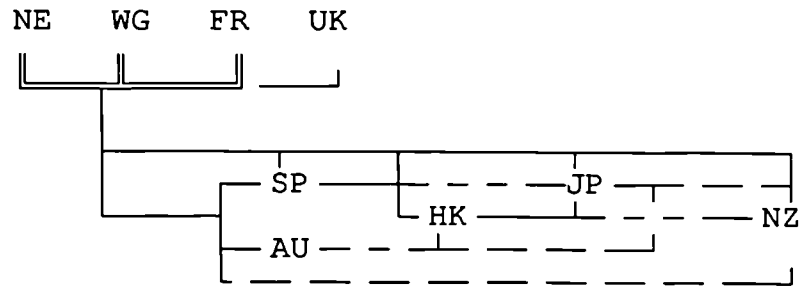


Diagram 2.2.5., as reproduced below, most equity markets in the Asian-Pacific region are correlated with Netherlands, West Germany, France and London in Europe.

Europe-Asian Pacific



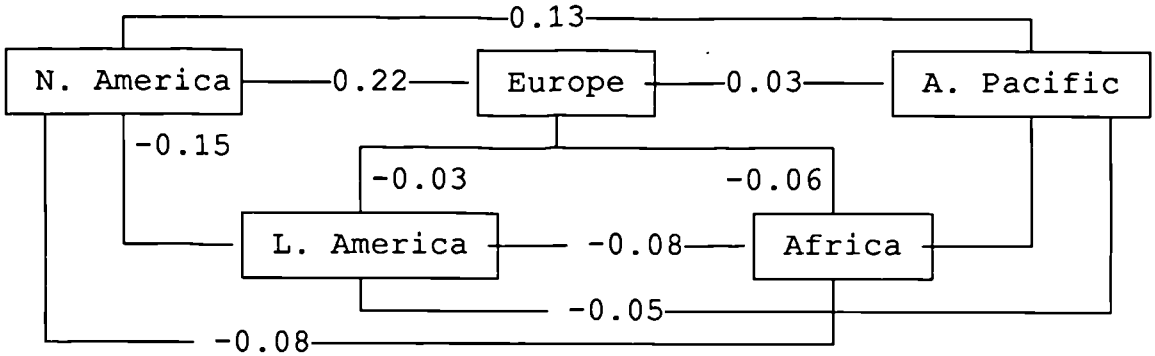
Stock markets in Latin America and South Africa are weakly related to each other and with other world equity markets (see diagrams 2.2.3., 2.2.4. and 2.2.6. to 2.2.10.).

Diagram 2.2.11, which is also shown here, portrays the results of average correlation[1] coefficients between 5 main geographical areas, namely the North America, Europe, Asian-Pacific, Africa and Latin America. North America is positively related with both Europe and Asian-Pacific and negatively with South Africa and Latin America. The correlation coefficients are relatively small between Europe and Asian-Pacific and become

[1]Note that because these average correlations are taken from a variety of time period and independent studies, it is not possible to estimate a significance test of the information.

negative for both Europe-South Africa and Europe-Latin America pairs. Both Asian-Pacific and South Africa are negatively correlated with Latin America.

Estimated Correlation Coefficients Between 5 Main Regions: North America, Latin America, Europe, Asian Pacific and Africa.



2.2. Reasons for Different Results

The correlation coefficients as indicated in Appendix 2.0 vary from one study to another due to several reasons. Among the most obvious reasons are:

1. The difference in the methods used in estimating correlations. Although most of the studies employ a similar correlation analysis, the approaches are different. For example, the studies of Grubel (1968), Levy and Sarnat (1970), Grubel and Fadner (1971), Robichek, Cohn and Pringle (1972), Joy, Panton and Reilly (1976), Cho, Eun & Senbet (1986) and Condoyanni, O'Hanlon and Ward (1987) estimate the correlation coefficients by using the cross-correlation for the entire period of the respective studies, while Maldonado and Saunders (1981) calculate the correlation coefficients based on monthly observations for each year from

1957 through 1978 and average them out to obtain the correlation estimate of each country-pair.

2. The definition of stock returns as well as the holding period of the returns differ between studies. Grubel (1968) uses monthly compounded rates of return after adjusting for exchange rates and dividends. Returns are given by:

$$r = [(Yo/12 + P1/Po)(Xo/X1)]^{12} - 1.0 \qquad (1)$$

where, r = monthly rates of return

Yo = annual dividend yields (at the beginning period)

Po & P1 = the indices of share price (at the beginning and end of period respectively)

Xo & X1 = the beginning and end period of dollar exchange rate (expressed as the value of foreign currency per dollar).

The rate of return in Grubel-Fadner (1971) is derived by using the same compounded procedure, but no adjustment has been made for changes in the foreign exchange rate. Levy and Sarnat (1970) use annual rates of return expressed in dollars. Formally their calculation can be expressed by

$$R = (P1/Po)(Xo/X1) - 1 \qquad (2)$$

where, R is the annual rate of return excluding dividends, and other variables are as explained in (1) above.

Joy, Panton and Reilly (1976) employ the same technique but their rates of return are based on weekly holding periods. Furthermore, they also use unadjusted rates of return in their study which are calculated in the following manner:

$$R = (P1-Po)/Po \qquad (3)$$

where, P1 and Po are the market indices at the beginning and end of the period.

The rates of return in the studies of Maldonado and Saunders (1981) and Cho, Eun and Senbet (1986) are similar, that is they are based on monthly returns, calculated by the procedure in equation (18) and expressed in dollars. The returns in Cho, Eun and Senbet were also converted into the Japanese yen. The rates of return in Robichek, Cohn and Pringle (1972) are calculated on a yearly basis and no adjustments have been made for changes in the exchange rate. In the study of Condoyanni, O'Hanlon and Ward (1987), continuously compounded returns are used.

From the above calculation, it is noted that the correlation coefficients measured in US dollars are relatively lower than those denominated in national currencies. This is, in fact, not surprising, because there is a strong evidence that the instability of US dollar has historically reduced the correlation coefficients between the US and other international equity markets. The evidence of this phenomenon is also supported by the Journal of World Market Research which persistently reports that the correlation coefficients of the world equity markets are generally lower when translated into a common currency.

In fact, some studies including Solnik (1983), Madura and Reiff (1985), Eun and Resnick (1988), Kritzman (1989) and Black (1989) recognise that the effect of exchange rate changes might cause instability in the relationship between foreign and domestic returns. After considering both fully and partially hedged returns data, they suggest that investors might gain

by taking an appropriate amount of exchange risk, i.e. by investing overseas using partial hedging against exchange rate changes. Solnik develops a theoretical model which is expressed in unhedged returns. However, when the model is tested (see Cho, Eun and Senbet [1986]), the results do not support Solnik's model.

Mantell (1984) criticises other authors in the method used to estimate actual and expected returns from foreign investments. His analysis points to an explicit recognition of the relationship between exchange rate changes and security returns. However, neither this nor the other research mentioned above, directly affects the estimation of fully hedged returns used in this study. It does imply that for some, if not all, investors who do not hedge against exchange risk, the derivation of expected returns and covariances is more complex than previous research has sometimes recognised.

The results from empirical studies reveal that the correlation matrices of returns with and without hedging are not statistically different. 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. They showed that the correlation between international equity markets calculated in US dollars were not statistically different from those denominated in domestic currencies. Panton, Lessig and Joy (1976) examined the comovement structure of international equity markets using cluster analysis based on the hedged and unhedged return data. Their correlation matrices with and without the exchange rate adjustment are nearly identical. Furthermore, Kaplanis (1985) investigated the stability of international stock markets using a variety of returns calculations, including returns denominated in national currencies and returns expressed in sterling. She found that the results of the study were not affected by the definition of the returns.

3. The sources and the type of data used in the previous studies differ. The studies (in Appendix 2.1 of this chapter) use the following data and sources for the US market: Moody's industrial average of common stocks from Moody's Industrial Manual (Grubel [1968]), the American common stocks indices from International Financial Statistics (Levy-Sarnat [1970]), the subindices of Standard and Poor's Stock (sector index) from Standard and Poor's Weekly Stock Price Index (Grubel-Fadner [1971]), the Standard and Poor's Industrial and Utility indices from Standard and Poor's (Robichek, Cohn and Pringle [1972]), the Dow Jones Industrial Average from Barron's magazine (Joy, Panton and Reilly (1976), the US market index from the IMF report (Maldonado-Saunders [1981]), the prices of individual American stocks from CRSP of the University of Chicago (Cho, Eun and Senbet [1986]) and Dow Jones Industrial from Datastream (Condoyanni, O'Hanlon and Ward [1987]).

It is observed that the correlation coefficients produced by the samples that are based on the market indices are relatively larger than those which are computed from the individual stock prices at the corporate level. This occurs because market indices represent the combined movements of various stock prices. Because much of the day-to-day "noise" is eliminated, the estimated returns and the correlation coefficients tend to be larger.

4. Previous studies cover different time periods; 1959-1966 (Grubel [1968]), 1951-1967 (Levy-Sarnat [1970]), 1965-1967 (Grubel-Fadner [1971]), 1949-1969 (Robichek, Cohn and Pringle [1972]), 1963-1972 (Joy, Panton and Reilly [1976]), 1957-1979 (Maldonado-Saunders [1981]), 1973-1983 (Cho, Eun and Senbet [1986]) and 1969-1984 (Condoyanni, O'Hanlon and Ward [1987]).

Over the periods tested the correlation coefficients have tended to increase. The mean correlation coefficients increased from 0.066 (1963) to 0.135 (1972) in Joy, Panton and Reilly

(1976) and from 0.165 (1957) to 0.445 (1978) in Maldonado and Saunders (1981). This implies that the correlation coefficients have not been stable throughout the period of studies.

2.3. Other Statistical Tests of Equity Market Relationship

Besides correlation coefficients, there are other measures which have been used to reflect the international structure of equity markets. These measures focus on three main areas of international stock markets relationship: (a) the comovement and lead-lag relationship between equity markets, (b) the integration versus segmentation of international equity markets and (c) the seasonality of international equity markets. Each of these study areas is described below.

2.3.1. The Comovement and Lead-lag Relationship

Several studies have been concerned with the comovement and lead-lag relationship of international equity markets (see for example, the study of Ripley [1973], Lessard [1973], Panton, Lessig and Joy [1976], Hilliard [1979] and Cho, Eun and Senbet [1986]). The findings and approaches in their studies are:

1) Most intra-continental stock indices move jointly and simultaneously. Ripley (1973) and Cho, Eun and Senbet (1986) use factor analysis and suggest that the movements of the New York and Toronto stock indices and between the stock indices of Amsterdam, Frankfurt, Paris, Brussels and Zurich are closely related. They also show that the movement of most intra-continental stock indices are affected by the same common factors. Panton, Lessig and Joy (1976), through cluster analysis, reveal that the stock markets from the US and Canada

and between each pair of the Netherlands, West Germany, France, Switzerland and Belgium have a highly similar comovement characteristic. Hilliard (1979) using spectral analysis supports the above phenomenon; that the relationship between the movement of intra-continental stock prices is simultaneous (i.e. it does not involved leading or lagging terms).

2) There is a structural relationship between equity markets in North America and continental Europe. Ripley (1973) shows that the returns in the markets in these countries are influenced strongly by one common factor. In statistical terms, the first common factor accounts for a larger part of variation in returns for different countries, about 0.74 (U. S.), 0.75 (Canada), 0.73 (Switzerland), 0.81 (the Netherlands), 0.67 (Belgium), 0.56 (West Germany) and 0.46 (France). Cho, Eun and Senbet (1986) estimate that there are about 3 factors which affect the comovement of stock markets from these countries. Panton, Lessig and Joy (1976), using cluster analysis, claim that the North America and continental Europe form a core of international stock markets. The results of Hilliard's spectral analysis (1979) also support the above findings.

3) London has weak but identifiable ties with Australia and continental Europe. Ripley (1973) indicates that the United Kingdom shares a common factor with Australia and major countries in Continental Europe. Cho, Eun and Senbet (1986) report that all of these countries can be linked with about 2 common factors. Panton, Lessig and Joy (1976), also reveal that more than 50 percent of the movement in these stock markets is common.

4) Stock markets in Latin American countries are independent of each other and other major equity markets. Lessard (1973) uses factor analysis to examine four Latin American markets (Colombia, Chile, Argentina and Brazil) and finds that there is no structural

relationship either with the rest of world capital markets or even between these individual stock markets.

5) Some studies indicate that the comovement characteristics are stable. For example, Panton, Lessig and Joy (1976) argue that the structure of the international market relationship is stable over a three years period.

2.3.2. Integration versus Segmentation

It is noted that market integration or segmentation here does not depend on the correlation coefficients or communality estimates. In fact, it refers to whether stocks are priced internationally or locally. Hence, a market may be weakly correlated but integrated with other capital markets if its stocks are priced internationally. On the other hand, a market could be segmented even if it has some correlation with other markets. It is plausible that significant correlation would indicate integration but it is not a sufficient condition. To give an example of the difference between these two concepts, consider a market in country A in which a company's shares are traded. The company might be producing a product which is largely sold in country B. The investors in A would presumably look at the economic environment in B in assessing the outlook for the company. If the stock markets in countries are related to the state of the domestic economy, it is feasible that the share price of the company would be related to the stock market indices both in A and B.

However, investment in A might be controlled so that investors in B could not easily invest in shares listed in A and A investors could not easily invest outside A. In CAPM terms, the appropriate "market portfolio" in A would therefore be A's capital market. The expected returns of the company would thus depend on its systematic risk vis-a-vis the market

index in A. The shares are priced not in relation to a "world portfolio" but simply in relation to their own domestic market. Thus the market in A is correlated with the market in B but the two markets remain segmented.

Among studies which consider whether the world equity markets are segmented or integrated are Agmon (1972), Solnik (1974), Lessard (1976), Stehle (1977) Ibbotson, Carr and Robinson (1982), Jorion and Schwartz (1986) and Cho, Eun and Senbet (1986). Some of the studies support the hypothesis of international market integration and show that stocks are priced identically across markets. Agmon (1972) uses a market model and reports that stock markets from the United States, the United Kingdom, West Germany and Japan are integrated. Solnik (1974) also derives the same conclusion after applying an international market model (IAPM) on stock prices from the United States, the United Kingdom, France, West Germany, Sweden, Switzerland, Italy, the Netherlands and Belgium.

There are contrasting studies which conclude that the international equity markets are segmented and that stocks are priced domestically. Lessard (1976) employs multi-index models to examine whether equity markets are internationally integrated. Lessard shows that some major world's capital markets, namely Australia, Austria, Belgium, Denmark, France, Germany, Italy, Japan, the Netherlands, the United States and the United Kingdom are segmented. The world and industry factors are not strongly reflected in domestic stock prices although correlation coefficients between the equity markets of these countries are significant.

Other studies which tend to support the hypothesis of market segmentation are Stehle (1977) and Ibbotson, Carr and Robinson (1982). These studies, which test a specific form of integration (IAPM) fail to show the validity of the model for the international equity markets.

More recently, an analysis of the international market model (IAPT) by Cho, Eun and Senbet (1986) also supports the hypothesis of market segmentation. The results of factor

analysis indicate that there are about four common factors for stock prices from the US, Canada, France, Germany, the Netherlands, Switzerland, the UK, Australia, Hong Kong, Singapore and Japan. However, a test of the APT on these markets is not supported and therefore, the authors conclude that the international capital markets are not integrated. Jorion and Schwartz (1986) also agree with the notion of market segmentation after examining the Canadian and the North American stock markets.

2.3.3. The Seasonality of International Equity Market

It is widely believed that the international stock markets are seasonal. Corhay, Hawawini and Michel (1987) examine whether the movement of stock prices in the United States, the United Kingdom, France and Belgium are similarly affected by seasonality. Their analysis shows that returns in the United States, Belgium and France are positive in January but negative in other months. However, the United Kingdom has a relatively positive return in April and negative in other months.

Another study on seasonal behaviour of international stock returns is carried out by Condoyanni, O'Hanlon and Ward (1987). The hypothesis of their study is that the weekend effects would occur internationally rather than domestically. The results confirm that the weekend effects strongly exist on the world equity markets. Most equity markets in North America, Europe and Far East and Australia exhibit significant negative returns on Monday. It is not clear from these studies whether there is a segmented or integrated seasonality effect. The implication of Corhay et al's work is that seasonality is fiscally-influenced, thus suggesting a domestic influence i.e. segmentation.

2.4. The Effects of Economic Factors or Links on the Structure of International Equity Markets

There is a general agreement that economic factors or links contribute significantly to the structure of international equity markets. Ripley (1973) employs factor analysis to investigate systematic sources of comovement among rates of return in 19 international equity markets. The results suggest that there are some common economic forces which may dictate the patterns of covariation between equity markets. His study finds that (a) countries in the North America and Europe whose GNP tends to move together may share similar expectations. The effect of the expectation will be to link stock price movement between those countries (b) dominant financial centres in Europe may facilitate within-area capital flows, reduce interest rate differentials and stimulate comovement between equity indices.

Cho, Eun and Senbet (1986) agree with Ripley's suggestion: that the degree of relationship between equity markets is influenced by economic factors. Their factor analysis results show that the number of common factors between two countries ranges from one to five depending on the degree of economic integration. Condoyanni, O'Hanlon and Ward (1987) argue that the impact of economic events on international equity markets is also apparent. Their study suggests that the present of weekend effects on the international equity markets may result from the information about global macro-economic events.

For Grubel and Fadner (1971), the amount of importing and exporting done by two countries has a significant effects on the degree of relationship between stock markets. The results indicate that the stock prices in the US have a closer relationship with those of the UK than West Germany, reflecting the proportion of trade between the US and the UK being relatively high. Lessard (1974) also accepts the findings in Grubel and Fadner and claims that

stock markets in some European countries are closely related because they have strong economic ties through trade and capital flows.

2.5. Summary and Conclusion

This chapter examines research into international equity market relationships. Although the results vary from one study to another and although researchers have used different techniques of analyses, different time frames and data sources, the studies agree that there is some degree, form and stability in the relationship between equity markets of different countries and that economic factors or integration contribute significantly to such relationships. It is noted that although the results of correlation matrices of unhedged returns are relatively stronger than those of fully hedged returns, previous tests show that the results of these two types of data definitions are not significantly different.

The relationships between stock markets in the same continent (North America and Europe) are closer than those of different continents. Most intra-continental stock indices in the North America and Europe move simultaneously and have highly similar co-movement characteristics. There are identifiable ties between the major markets in North America, Europe and the Asian-Pacific region. The notion of a structural relationship in the international equity markets is supported by the evidence of seasonality in stock returns. January and weekend effects exist strongly in some international equity markets. The results also show that the relationship is stable for periods of up to three years.

The strong links between stock markets may stem partly because of the dominant operation of international financial centres, the similarity of income expectations and the absence of impediments to capital flows. Moreover, previous studies imply that the prices

of stocks on international equity markets are affected by information on global macro-economic factors.

Equity markets are considered integrated if stocks are priced internationally. Markets, on the other hands, are segmented if the stocks are priced domestically or regionally. Some studies support the hypothesis of international market integration, while others conclude that international equity markets are segmented.

In sum, previous studies have been unable to agree on the structure and underlying relationships between equity markets and have also failed to examine rigorously the effect of economic factors or links on the degree of equity market relationship. Because of this disagreement, the issue of international market integration versus segmentation remains unsolved. It implies, therefore, that an investigation of worldwide macro-economic effects on international stock markets will help to explain further the relationship, efficiency and integration of international equity markets.

APPENDIX 2.0

PREVIOUS EVIDENCE OF INTER-MARKET CORRELATION COEFFICIENTS

(Notes: (1) the authors and the period of their studies are as follows: G = Grubel (1968), 1959-1966; GF = Grubel and Fadner (1971), 1965-1967; LS = Levy and Sarnat (1970), 1951-1967; RCP = Robichek, Cohn and Pringle (1972), 1949-1967; MS = Maldonado and Saunders (1981), 1957-1979; JPR = Joy, Panton and Reilly (1976), 1963-1972; CEN = Cho, Eun and Senbet (1986), 1973-1983; COHW = Condoyani, O'Hanlon and Ward (1987), 1969-1984.(2) * shows statistically significant at the 5 percent level)

Country	G	GF	LS	RCP	MS	JPR	CES	COHW
USA:								
USA							0.38*	
Canada	0.70*				0.79*	0.63*	0.26*	0.61
U.Kingdom	0.24*	0.21	0.26		0.42*	0.10	0.23*	0.14
W.Germany	0.30*	0.05	0.43*		0.31*	0.16	0.14	
France	0.19*		0.34*			0.11	0.20*	
Norway								
Netherlands	0.21*		0.53*			0.34*	0.19	
Italy	0.15		0.09			0.002		
Belgium	0.11		0.83*			0.21		
Austria			0.26			0.03		
Switzerland						0.24	0.20*	
Denmark			0.19					
Japan	0.11		-0.26	-0.07	0.21	0.09	0.11	
Singapore							0.23*	0.07
Hong Kong							0.11	
Australia	0.06			0.22		0.14	0.27*	
N.Zealand			0.08					
S.Africa	-0.16		0.08					
Mexico			0.02					
Venezuela			-0.17					
CANADA:								
Canada							0.43*	
U.Kingdom						0.15	0.26*	0.23
W.Germany						0.20	0.15	
France						0.16	0.23*	
Norway								
Netherlands						0.36*	0.20*	
Italy						0.06		
Belgium						0.18		
Austria						0.06		
Switzerland						0.29	0.24*	
Denmark								
Japan						0.19	0.13	0.12
Singapore							0.22*	0.11
Hong Kong							0.14	
Australia						0.17	0.26*	

The Correlation Coefficient - Continued

N.Zealand				
S.Africa				
Mexico				
Venezuela				
U.KINGDOM:				
U.Kingdom			0.62*	
W.Germany		0.03	0.23*	
France		0.04	0.32*	0.19
Norway				
Netherlands		0.13	0.26*	
Italy		0.08		
Belgium		0.09		
Austria	0.38*	0.03		
Switzerland		0.002	0.32*	
Denmark	0.26			
Japan	0.04	0.11	0.18*	0.10
Singapore			0.32*	0.11
Hong Kong			0.21*	
Australia		0.17	0.28*	
N.Zealand	0.59*			
S.Africa	0.05			
Mexico	-0.18			
Venezuela	-0.32			
W.GERMANY:				
W.Germany			0.54*	
France	0.46*	0.15	0.29*	
Norway				
Netherlands	0.76*	0.36*	0.39*	
Italy	0.71*	0.05		
Belgium	0.60*	0.19		
Austria		0.07		
Switzerland		0.21	0.40*	
Denmark				
Japan		0.11	0.24*	
Singapore			0.21*	
Hong Kong			0.20*	
Australia		0.11	0.15*	
N.Zealand				
S.Africa				
Mexico				
Venezuela				
FRANCE:				
France			0.55*	
Norway				
Netherlands	0.49*	0.16	0.29*	
Italy	0.60*	0.01		
Belgium	0.66*	0.18		
Austria		0.07		
Switzerland		0.15	0.34*	
Denmark				
Japan		0.11	0.21*	0.15

The Correlation Coefficients - Continued

BELGIUM:				
Belgium				
Austria			0.04	
Switzerland			0.16	
Denmark				
Japan			0.09	
Singapore				
Hong Kong				
Australia			0.12	
N.Zealand				
S.Africa				
Mexico				
Venezuela				
AUSTRIA:				
Austria				
Switzerland			0.05	
Denmark	0.10			
Japan	0.05		0.07	
Singapore				
Hong Kong				
Australia			0.01	
N.Zealand	0.29			
S.Africa	-0.51*			
Mexico	-0.14			
Venezuela	0.15			
SWITZERLAND:				
Switzerland				0.58*
Denmark				
Japan			0.19	0.25*
Singapore				0.31
Hong Kong				0.26
Australia			0.17	0.28*
N.Zealand				
S.Africa				
Mexico				
Venezuela				
DENMARK:				
Denmark				
Japan	0.04			
Singapore				
Hong Kong				
Australia				
N.Zealand	0.53*			
S.Africa	-0.09			
Mexico	0.17			
Venezuela	-0.17			
JAPAN:				
Japan				0.40*
Singapore				0.19* 0.10
Hong Kong				0.23*
Australia		-0.15	0.09	0.15*

The Correlation Coefficients - Continued

N.Zealand	-0.20	
S.Africa	0.18	
Mexico	-0.24	
Venezuela	-0.09	
SINGAPORE:		
Singapore		0.56*
Hong Kong		0.29*
Australia		0.27*
N.Zealand		
S.Africa		
Mexico		
Venezuela		
HONG KONG:		
Hong Kong		0.67*
Australia		0.19*
N.Zealand		
S.Africa		
Mexico		
Venezuela		
AUSTRALIA:		
Australia		0.49*
N.Zealand		
S.Africa		
Mexico		
Venezuela		
N.ZEALAND:		
N.Zealand		
S.Africa		
Mexico	0.22	
Venezuela	-0.32*	
S.AFRICA:		
S.Africa		
Mexico		
Venezuela	-0.08	
MEXICO:		
Mexico		
Venezuela	0.21	

APPENDIX 2.1

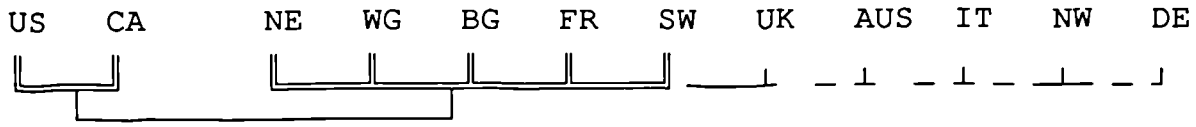
STRUCTURAL LINKAGE DIAGRAMS FOR INTERNATIONAL EQUITY MARKETS SHOWN IN THE PREVIOUS STUDIES

Legend for diagrams 2.2.1 to 2.2.11:

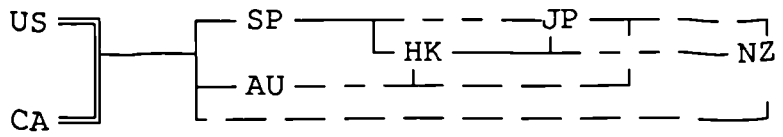
═══ a strong correlation
——— a significant correlation
- - - a weak correlation or no correlation

(Notes: North America = the United States and Canada; European countries = Netherlands, West Germany, Belgium, France, Switzerland, the United Kingdom, Austria, Italy, Norway and Denmark; Asian-Pacific countries = Singapore, Australia, Hongkong, Japan and New Zealand; Latin America = Mexico, Venezuela, Brazil, Argentina and Chile and Africa = South Africa).

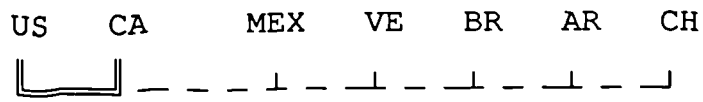
2.2.1. **North America-Europe**



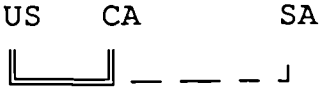
2.2.2. **North America-Asian-Pacific**



2.2.3. **North America-Latin America**

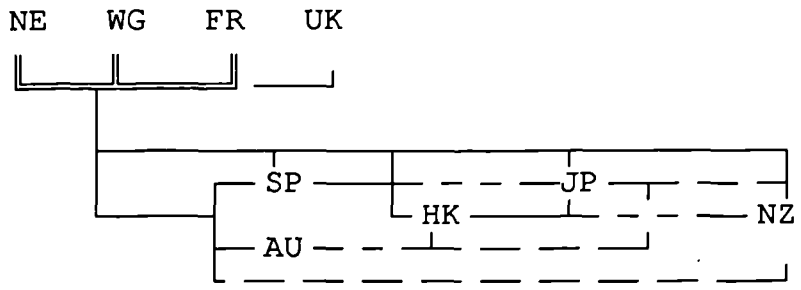


2.2.4. **North America-Africa**

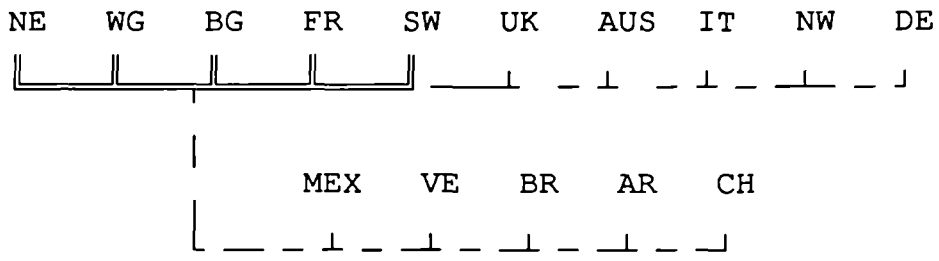


Diagrams continued

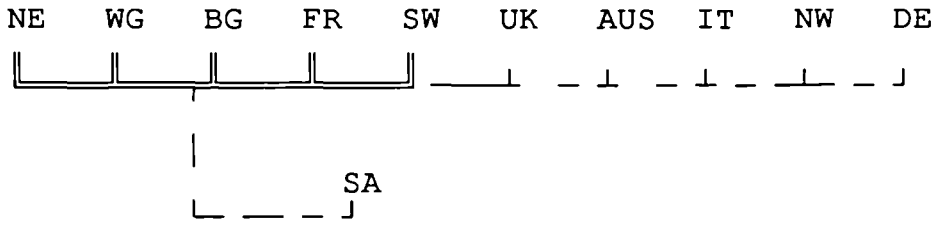
2.2.5. **Europe-Asian Pacific**



2.2.6. **Europe-Latin America**



2.2.7. **Europe-Africa**



2.2.8. **Asian Pacific-Latin America**

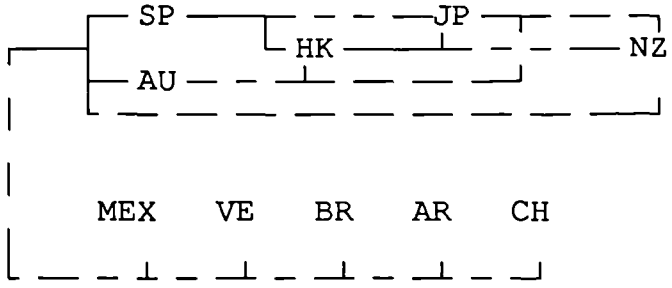
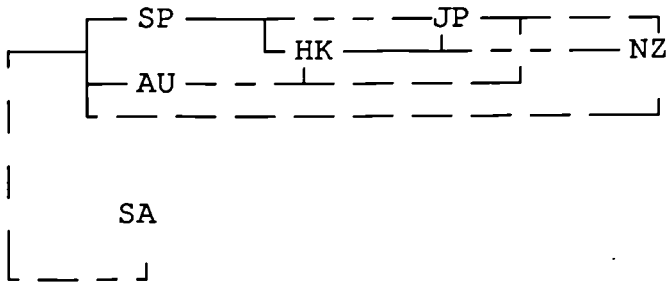
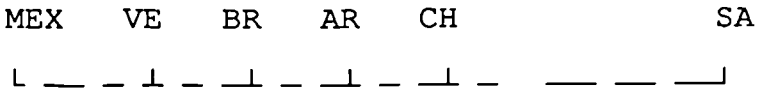


Diagram continued

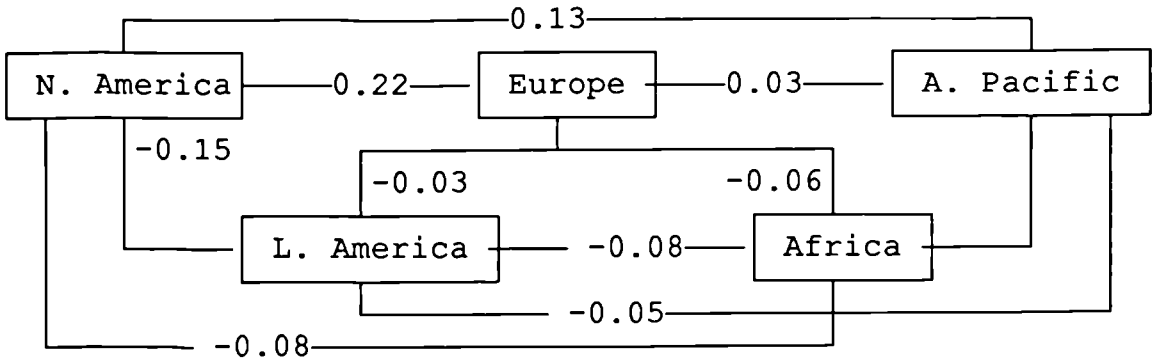
2.2.9. **Asian Pacific-Africa**



2.2.10. **Latin America-Africa**



2.2.11. **Estimated Correlation Coefficients Between 5 Main Regions: North America, Latin America, Europe, Asian Pacific and Africa.**



CHAPTER THREE

THE DEVELOPMENT OF EQUITY PRICING MODEL

3.0. Introduction

This chapter reviews the development of equity pricing models. The chapter is divided into three sections. Section one discusses the concepts and criticisms of the Mean-Variance Portfolio Theory (Markowitz [1952]), the Capital Asset Pricing Model (CAPM) (Sharpe [1964]) and the Arbitrage Pricing Theory (APT) (Ross [1976]). Section two analyses the international versions of pricing models which include the international version of Mean-Variance Portfolio Theory, the International Asset Pricing Model (IAPM) and the International Arbitrage Pricing Theory (IAPT). Finally Section three presents a summary and conclusion of the review.

3.1. The Mean-Variance Portfolio Theory

One of the seminal studies dealing with the risk and return relationship in stocks was Markowitz (1952). Markowitz suggests that investors might evaluate a stock in terms of its effect on their portfolios. For any given return, a stock which is weakly correlated to the current portfolio is preferable because it will reduce the investment risk.

Markowitz's model assumes that investors: (1) aim to maximize their wealth (utility), (2) make choice on the basis of risk and return, (3) that risk could be measured by the standard deviation (or variance) of the returns (wealth) distribution.

The expected return of a portfolio is derived by calculating the weighted average of the expected returns of all individual stocks in the portfolio,

$$E(R_p) = \sum_{i=1}^{n} W_i E(R_i) \qquad (4)$$

where, $E(R_p)$ is the expected return of a portfolio, W_i denotes the proportion of security i in the portfolio, $E(R_i)$ is the expected return from the ith security in the portfolio and n represents the number of securities in the portfolio.

The risk of a portfolio depends on the degree to which the returns from securities varies with each other and is measured by:

$$\sigma_p^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} W_i W_j \, COV_{ij} \qquad (5)$$

where, σ_p^2 is the expected variance of the portfolio, W_i and W_j are weights of the securities i and j in the portfolio and COV_{ij} is the covariance of the returns from securities i and j.

The contention of this model is that a rational investor will choose an investment which provides the highest return for a given level of risk or that offers the least risk for a given return. The portfolios which offer the optimal return are called efficient portfolios. The curve which links all efficient portfolios together is known as the Efficient Frontier.

Markowitz's model is considered as a major landmark in the investment literature but many practical difficulties with the model became apparent (Black [1969]). For example in order to identify an efficient set of portfolio, one must estimate future returns and variances

of return for each possible investment and covariances for each pair of possible portfolio constituents. As the size of the portfolio expands, the computational burden of estimating the required returns, variances, covariances increase dramatically. Another problem lies in estimation risk, i.e. that the construction of efficient portfolios becomes more difficult when there is uncertainty regarding the estimation of the underlying coefficients (COV_{ij}, σ_i, σ_j).

3.2. The Capital Asset Pricing Model

Sharpe (1964) simplified Markowitz's model first by introducing the market model and secondly by deriving the Capital Asset Pricing Model (CAPM). Since all stocks are correlated with the market, the relationship of each security to the market could act as a surrogate for the covariance for each security relative to other securities. The degree of relationship between returns on a stock and a market is called beta or market risk.

The Capital Asset Pricing Model (CAPM) was derived by the further assumptions of: (1) a single period expected utility function, (2) a similar time horizon for all investors, (3) investors evaluate portfolios on the basis of mean and variance, (4) investors can lend and borrow at the risk free rate of interest, (5) investors have homogeneous expectations about the future distribution of returns, (6) all assets are perfectly divisible and marketable, (7) there are no taxes and transaction costs, (8) all investors are rationally price takers and (9) the capital market is in equilibrium.

The Capital Asset Pricing Model (CAPM) states that, in equilibrium, investors will price capital assets so that the expected return on a security (or a portfolio) is equal to the riskless rate of return plus a premium which is proportional to the covariance between the security's return and the expected return on the market portfolio.

The CAPM derives the equilibrium returns of a security in relation to the market as:

$$E(R_i) = R_f + [E(R_m) - R_f]\, ß_i \qquad (6)$$

where, $E(R_i)$ is the expected return on stock i, R_f indicates the risk free rate of interest, $E(R_m)$ is the expected return of the market portfolio, and $ß_i$ is the beta factor also equal to

$$COV(R_i,R_m)/VAR(R_m) \qquad (7)$$

It is noted that under CAPM, all residual (unsystematic) risk is diversifiable. Therefore, investors hold portfolios which differ only by the weights held in the risk free asset and the market portfolio respectively.

In reality, the ex ante relationship in equation (3) is hard to obtain. As a proxy the following ex post calculation may be useful:

$$R_i = R_f + ß_i\,(R_m - R_f) + e_i \qquad (8)$$

Several empirical tests of the CAPM have been carried out to examine the assumptions and the explanatory power of the CAPM. Some of the findings are:

1) There are no true risk free assets. The estimated relationship is flatter than the one predicted by the theory and has a higher intercept than the risk free rate (see Black, Jensen and Scholes [1972] and Fama and MacBeth [1973]). The implication is that low beta securities earn a higher return than the CAPM predicts and higher beta securities earn a lower return.

2) One of the ways in which CAPM was derived was based on the mean-variance theory which assumes that returns are normally distributed. This assumption may not hold in reality. Many researchers have shown that returns distributions are not all normal and therefore it is not appropriate to use mean and variance as the measure of return and risk respectively (Simkowitz and Beedles [1978]). However, Fama (1965) demonstrates that if the distribution of returns is stable and symmetric, other measures of dispersion can be used and the model still holds. Furthermore, Markowitz (1990) argues that normality was never a necessary condition for mean-variance analysis to be optimal, only that returns could be approximated locally by a normal distribution.

3) The CAPM is a single-period model. This implies that investors buy all the assets in their portfolios at one point in time and sell them at some undefined but common point in the future. Although necessary, this assumption is unrealistic because investors make a series of reinvestment rather than a single-period buy-and-hold decision. Thus, a continuous model is more appropriate. Merton (1973) shows that if returns are continuously generated over time and lognomally distributed, the model still holds. By assuming a stationary risk free rate, investors hold a different combination of two assets: a risk free asset and the market portfolio. However, if the risk free asset varies, investors are exposed to the risk of shifting in the investment opportunity set. Therefore, investors will hold portfolios which are combination of these three assets: the risk free asset, the market portfolio and a portfolio perfectly negatively correlated with the risk free asset.

4) If investors do not have homogeneous expectations about distribution of returns, they will choose different portfolios. Lintner (1969), Mayers (1972) and Gonedes (1976) report that even when investors do not have homogeneous expectation, a similar structural relationship to CAPM can be derived.

5) Transaction costs may prevent investors from holding perfectly efficient portfolios. Stapleton and Subrahmanyam (1977) have shown that transaction costs make it difficult for investors to hold a perfectly diversified portfolio.

7) If assets are not perfectly divisible, the linear relationship between the systematic risk or beta coefficient and the rate of return may not hold (see Klein [1973]).

8) There is evidence which shows that the relationship between risk and return is not linear. One interpretation for such results is that beta squared might be acting as a proxy for a relevant omitted parameter. This leads to the development of a three moment CAPM (Jean [1971, Arditti and Levy [1975] and Krause and Litzenberger [1976]).

9) The behaviour of security returns can be explained by factors other than beta. Among these factors include dividends and taxes (Brennan [1971], Black and Scholes [1974], Litzenberger and Ramaswamy [1979] and Rosenberg and Marathe [1978]), price earning ratios (Basu [1977], the size of firm (Banz [1981] and Reinganum [1981]) and the infrequent trading of shares in small firms (Roll [1981]).

Roll (1977) concludes in his critique of the CAPM as follows:

"Testing the two-parameter asset pricing theory is difficult (and currently infeasible). Due to a mathematical equivalence between the individual return/beta linearity relation and the market portfolio's mean-variance efficiency, any valid test presupposes complete knowledge of the true market portfolio's composition. This implies inter alia, that every individual asset must be included in a correct test" (p.131)

Roll,in fact, exposes the fundamental problem of the CAPM which implies that the theory is not testable because the exact composition of the true market portfolio is almost impossible to identify. All tests of the model will be unable to distinguish between the validity of the model and the correct identification of the portfolio used to proxy the market portfolio. In short this amounts to reducing the CAPM to a model of equilibrium similar to the model of Perfect Competition used by economists. In practice, researchers have continued to use and apply the CAPM as a model which is open to refutation.

3.3. Arbitrage Pricing Theory

One alternative and attractive explanation of the risk-return relationship avoiding the problem of identifying the market portfolio is the Arbitrage Pricing Theory (APT) which was developed by Ross (1976). The appeal of the model comes from Ross' contention that composition for bearing risk may be comprised of several risk premia rather than just one risk premium as in the CAPM.

Unlike the assumptions stipulated in the CAPM, the APT assumes there exists a linear return generating process which related each asset's expected return to a set of common or market wide factors. These factors are not identified explicitly in the APT, they are simply assumed to exist.

The returns of risky assets are related to a k-factor linear generating model as:-

$$R_i = E_i + b_1 F_1 + \ldots + b_{ik} F_k + e_i \qquad (9)$$

where, E_i is the expected return on asset i, b measures the sensitivity of asset i to the movement in common factor F. k is the number of factors and e_i, a disturbance term which is assumed to reflect the random influence of information unrelated to other assets.

As in the traditional CAPM, the APT also has factor-coefficients which reflects the sensitivity of a particular asset to fluctuations of a factor. The APT also assumes that the residual term, component of unsystematic risk, are independent across assets, thus eliminating unsystematic risk in a well diversified portfolio. In equilibrium with no arbitrage opportunity, the expected return on any asset i is given by:

$$E_i = a_o + a_1 b_i + ...+ a_k b_{ik} \qquad (10)$$

where, E_i is the expected return on asset i and b_{ik} represents the measure of the sensitivity of asset i to changes in the common factor k. If there exists a risk free asset or a zero-beta portfolio, a_o can be interpreted as a rate of return from a risk free asset or zero-beta portfolio. a_1 to a_k are defined as a risk premia, the excess return on portfolio with systematic risk associated only with the kth-factor and no sensitivity to the other factors. The above equation which states the general equilibrium of the APT implies that the return for any asset i is a linear combination of the risk free rate of return plus one or more risk premia.

The APT is clearly more general than the traditional CAPM in the sense that a_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)

Even though the APT is relatively new compared with the CAPM, a number of empirical tests have been conducted. Among the significant tests are:

(1) Roll and Ross (1980) use factor analysis to examine the daily returns of 1,260 stocks on the NYSE from 1962 to 1975. After factor loadings were estimated, they use 'cross-sectional' multiple regression (the Fama-MacBeth procedure to test the CAPM). They report that 50 per cent of the 42 groups of stocks had at least 2 statistically significant factors. They also used variables such as GNP, interest rate and other economic indicators to represent these factors. Roll and Ross (1980) state:

"If there are only few systematic components of risk, one would expect these to be related to fundamental economic aggregates such as GNP, or interest rate or weather (although no causality is implied by such relations). The factor model formalism suggests that a whole theoretical and empirical structure must be explored to better understand what economic forces actually affect returns systematically." (p.1077)

(2) An earlier study of factor analysis on 41 stocks by Gehr (1978) concludes that no more than 3 factors exist and that only 2 of them are statistically significant.

(3) Reinganum (1981) uses the APT to control risk of small and large firm and finds a significant 'firm effect' in his study.

(4) Gibbons (1981) utilises the likelihood ratio technique and suggests that the number of factors affecting stock and bond portfolio returns are not similar.

(5) Chen (1983) reveals 5 parameters in his study and shows that the APT performs relatively better than the CAPM.

(6) Kryzanoswki and To (1983) suggest that a larger number of factors may be significant.

(7) Diacogiannis (1986) examines whether (a) the returns on different portfolio sizes are affected by the same number of factors (b) the number of factors affecting security returns from the portfolios which have the same size remains unchanged across various time periods. Using Rao's factor analysis which can provide the capability of estimating the relevant number of factors, he concludes that the number of factors increase as the size of portfolios increases and that the returns on the same group of securities for different time periods are affected by different number of factors.

(8) McCulloch and Rossi (1990) estimate the number of factors required in the APT by using a very large sample, that is over 2000 stocks from NYSE and AMEX. Their emphasis was on investigating the effect of company size as an additional explanatory factor. After applying factor analysis to portfolios, they found little evidence that size was important but also they found little support for any multi-factor pricing. The APT was therefore found

inadequate because it failed to explain security prices significantly better than a one factor model. They conclude that the advantage of the APT for investors is questionable. This conclusion is supported by Chang's study (1991), which suggests that the APT may be useful in explaining portfolio performance in previous periods but has been weak in predicting the movement of stock prices in future periods.

Although notwithstanding Diacogiannis' work, the empirical tests of the APT as shown above are to some extent supportive, the earlier studies have several problems. The problems are, in fact, associated with factor analysis, not with the APT model. Reinganum (1981), Shanken (1982), Dhrymes (1984), Dhrymes, Friend and Gultekin (1985) and Diacogiannis (1986) argue that the procedures of factor identification in the APT by using factor analysis is quite vague. Specifically, they raise the following problems:

1) Factor analysis is unable to test specific hypotheses rigorously. Some studies uses factor analysis in estimating the APT but their statistical procedures fail to indicate the influence of a specific factor in the model. Regression analysis, in contrast, is a statistical tool that can be used to rigorously test specific model and indicates whether or not the data support the model being tested.

2) Sampling error may easily influence the results. Dhrymes, Friend and Gultekin (1984) indicate that the factor analysis used to test the APT is seriously flawed for a number of reasons, especially (a) the number of factors is subject to the number of assets included in the sample group and (b) whether a given 'factor' is priced, cannot be tested directly.

3) The availability of large and heterogeneous data banks creates another problem. Some studies suggest that the number of significant factors delineated in the previous researches was too small because the data sampled were inadequate. Kryzanowski and To (1983) agree that

the larger the sample size, the simpler is the factor structure in term of the number of relevant factors.

4) Identifying factors that are statistically distinguished by factor analysis is crucial and difficult. Elton and Gruber (1984) suggest that micro and macro economic theories could be applied to identify respectively the characteristics of the underlying economic factors which influence stocks returns.

Using micro-economic theory, they suggest that some of the firm characteristics might be the dividend yield, the equity beta coefficient and a numeric surrogate for stock quality rating published by Standard and Poor's. One such model had been developed and tested by Sharpe (1982). Sharpe hypothesised that returns are affected by the following characteristics: equity beta, stock dividend, firm size, the value of alpha, and membership of eight specific sectors (i.e. basic industries, capital goods, construction, consumer goods, energy, finance, transport and utility). To measure the significance of the characteristics, the following equation was used:

$$R_i = a_o + a_1 b_{i1} + ...+ a_j b_{ij} \qquad (11)$$

where, R_i is stock returns and b_{ij} is the value of characteristics j which represents risk premia. Sharpe reports that most of the characteristics are significant and that the use of firm characteristics in addition to beta increases the explanatory power of the model.

Furthermore, economic intuition suggests that the following factors might have significant impact on the return-generating process: GNP, interest rate, money supply, industrial production and other related economic indicators. Chen, Roll and Ross (1984) constructed and tested such a model by employing a set of economic variables including inflation, the

structure of interest rate and risk premia. The two step procedure (Fama-MacBeth's procedure in testing the CAPM) is employed to estimate the effects of the macro-economic variables on stock returns. In the first step, the following time series regression is used:

$$R_i = a_i + \sum_{j=1}^{k} b_{ij} I + e_i \qquad (12)$$

where, R_i is the return on stock i, b_{ij} measures the sensitivity of economic indices, I is the related economic indices and e_i denotes error terms. Then, a cross-sectional regression is performed to estimate the average relationship between the average stock returns and the factor coefficients (b_{ij}). The equation is:

$$R_i = a_o + a_1 b_{i1} \ldots + a_k b_{ik} \qquad (13)$$

where, R_i is the average return of security i, b_{ij} denotes the value of each characteristics in relation to the security and a_j is the risk premia. The results in their study showed that the economic variables had a significant influence on the share prices.

3.4. Extensions of Asset Pricing Models to International Studies

The above three models were extended to the international front to examine the behaviour of international stock prices. This part of the chapter deals with the international models which include (1) the international version of Mean-Variance Portfolio Theory (Grubel [1968]), (2) the International Asset Pricing Model (IAPM) (Solnik [1974] and Grauer,

Litzenberger and Stehle [1976] (GLS) and (3) the International Arbitrage Pricing Theory (IAPT) (Solnik [1983]).

3.4.1. International Version of Mean-Variance Portfolio Theory

The ex post mean-variance portfolio theory (Markowitz) is considered as the earliest model used in the study of international equity market relationship. Grubel (1968) applied the model in his study of international diversification under the assumption that there are two countries which are economically isolated and that each of these countries has three types of wealth, namely real assets, money and marketable bonds. The model explores what will happen if the initial economic barriers are removed (i.e assuming that only marketable bonds and consumer goods can be exchanged).

In this model, the expected portfolio returns are determined by the expected return in each country and the proportion of assets invested in each country. After diversification, the expected return of portfolio which contains marketable bonds from both countries is shown below:

$$E(R)_{a,b} = P_a R_a + P_b R_b \qquad (14)$$

where, $E(R)_{ab}$ is the expected portfolio return from investing in country a and b, P_a and P_b are proportions invested in country a and b and R_a and R_b are returns on investment from country a and b.

The variance of this two-country bond portfolio would be influenced by the variance of returns in each country, the proportion of assets in each country and the correlation of returns

between both countries. In this analysis, the correlation of investment returns is the key factor for the reduction of a portfolio risk. The weaker the correlation between 2 countries, the smaller the portfolio risk will be and vice versa.

Another study by Grubel and Fadner (1971), using the same mean-variance model, shows that the average correlation of the same industries in different countries is smaller than the average correlation of different industries within countries.

Levy and Sarnat (1970) also employ a similar model for their study on 28 countries. Their study indicates that there is a continuous reduction in variance as the opportunity set is broadened until the efficient frontier is achieved; that is when all 28 countries are considered.

However it should be noted that claims about the benefits from international diversification cannot be made solely on the evidence of correlation coefficients. Agmon (1972) argues that earlier studies of international diversification which simply examined the correlation by using the mean-variance model were inadequate. Their results were not very revealing, because the full risk-return profile of each of the markets was not identifiable. The issue of market segmentation versus integration could not therefore be addressed effectively because the model was based on a market theoretical framework.

3.4.2 The International Asset Pricing Model (IAPM)

There are two major versions of IAPM. One was developed by Solnik (1974) and another model was introduced by Grauer, Litzenberger and Stehle (GLS) (1976). These two models are similar in content and are concerned with exchange risk and the effect of exchange risk on the price of real assets and financial assets.

Solnik's version is based on the assumptions that (a) exchange risk arises from differences in consumption baskets between investors of different countries (b) the traditional assumptions of CAPM (c) capital flows between countries without any restriction (d) exchange rates are flexible and (e) asset returns and exchange rate returns are independent.

From the above assumptions, a mutual fund theorem is derived. It states that any investor's portfolio can be decomposed into the following three funds: (1) a portfolio of stocks hedged against exchange risk (2) a portfolio of bonds of all denominations and (3) the risk free asset of the investor's home country.

In this model, the relevant efficient frontier for any investor is in units of his currency and foreign assets must be converted to the appropriate unit currency by hedging to eliminate exchange risk. An investment is extended to include an asset's return in its home currency and exchange rate fluctuation. Investors in any country have homogeneous expectation about return on foreign and domestic securities. A risk free rate is assumed to exist in each country although the rate may differ between countries. Homogeneous expectations and the risk free rate insure that a single portfolio is optimal for all investors in any country. The risk pricing relation in this model is calculated as:

$$E(R)_s = R_{fc} + ß_s [\, E(R_m) - R_{fm} \,] \qquad (15)$$

where, $E(R)_s$ is the expected return on security s denominated in local currency, R_{fc} is the risk free rate of interest in country c, $E(R_m)$ is the expected return on the world market portfolio (where each component is expressed in its own currency and value weights, calculated as $\Sigma W_j R_j$, and R_{fm} is the world average interest rate i.e. $\Sigma W_j R_{fm}$), and $ß_s$ is the international systematic risk of security s.

Secru (1980) argues that exchange risk is a form of business risk resulting from changes in demand and supply forces of the international economy and therefore share prices of firms can hardly be expected to be independent of the exchange rate. After relaxing the assumption of independence between the exchange rate and the asset price, he concludes that exchange risk could be eliminated by the process of hedging.

Differences in taxation may be another crucial factor which gives a significant impact to the movement of international share prices. Based on Solnik's model, Black (1974) and Stulz (1981) consider taxation across countries as below:

$$E(R)_s = R_f + T_s + \beta_s [E(R_m) - R_f - T_m] \qquad (16)$$

where, T_s is the weighted average of the tax rates applied to holdings of securities by the residents of each country, T_m represents the weighted average of the tax rate on all securities, and other variables in the above formula are as explained in Solnik's model. If the tax rates are zero and the interest rates in different countries are equal, then, the above equation reduces to Solnik's IAPM.

Another important element in the behaviour of international share which is not fully addressed in the previous models is inflation. Adler and Dumas (1983) extend the work of Solnik and Secru by considering inflation. In their study, an investor will hold a combination of (a) the universal portfolio which will be the same for all investors and (b) a portfolio which provides the investor with a hedge against inflation. According to their model, fund (b) reduces to the risk free asset of the investor's country in Solnik's IAPM, if there is no inflation.

The version of IAPM which is explicitly concerned with inflation is introduced by Grauer, Litzenberger and Stehle (1976)(GLS). They argue that Solnik's model is a pure exchange risk asset portfolio and is entirely based on a money illusion. To them, an appropriate international pricing model should be developed on the basis of exchange risk arising from different stochastic national inflation rates.

Their model is expressed in real terms and assumes: (a) there is free international transferability of real and finance assets (b) all investors have homogeneous expectation about returns on the assets expressed in the assets' own country (c) there exists an international price index (d) all investors evaluate investment based on real return, namely return after adjusting for inflation (e) there are homogeneous expectations with respect to real return and (f) there is a common risk free real rate across countries.

Given the above assumptions, the international equilibrium price of an asset could be established in real terms as follows:

$$E(R)_i = R_f + ß_i [E(R_m - R_f)] \qquad (17)$$

where, $E(R)_i$ is the expected real rate of return on asset i, R_f is the common risk free rate across countries in real terms, R_m is the real rate of return from the international market portfolio and $ß_i$ is the real beta coefficient of asset i.

3.4.3. International Arbitrage Pricing Theory (IAPT)

Solnik (1983) extends the APT to multicurrency international capital markets. The IAPT requires (a) perfect and integrated international markets and (b) homogeneous expectations

in related countries. With these assumptions, it could be shown that the returns on asset i measured in currency of foreign country j is:

$$r_{ij} = r_i - s_j - \sigma_{ij} + \sigma_j^2 \qquad (18)$$

where, r_{ij} is return of foreign asset i measured in home currency of country j, r_i is return on domestic asset i in domestic currency, s_j is random variation of the exchange rate of foreign country j's currency expressed in units of domestic currency, σ_{ij} is covariance between r_i and s_j, and σ_j^2 is variance of s_j.

If there is a risk free rate in different countries, the relation in IAPT will be as below:

$$r_{ij} = a_{jo} + a_{j1}\, b_{j1} + ... + a_{jn}\, b_j \qquad (19)$$

where, aj_o is the currency j risk free rate, a_{j1} to a_{jn} are the risk premia which represent the price implication of the covariance structure between asset returns and the currency j.
The APT is newly extended to international setting. Therefore, a substantive test of this international model has not yet been published. Cho, Eun and Senbet (1986) employ IAPT based on monthly return data after converting into US dollar and Japanese yen, i.e. returns without hedging as suggested in Solnik's IAPT. They report that the model does not hold internationally. However, the results of factor analysis show that there are at least three international common factors and that the number of common factors between two countries depends on the degree of their economic integration. They also claim that the results are rather similar in terms of US dollar and Japanese yen. Furthermore, the analysis, in contrast to the earlier studies, seems to suggest that the sample size does not affect significantly the

number of common factors. Earlier studies, for example in Kryzanowaki and To (1983), Dhrymes, Friend and Gultekin (1984) and Diacogiannis find that the correlation coefficients between the number of common factors and the size of sample is high (about 0.98), implying that the number of factors increases as the number of variables in a sample increases.

Another interesting observation is that Cho, Eun and Senbet (1986) find the number of worldwide common factors is less than those of national common factors. The number of common factor in an international setting ranges from two to five, whereas in domestic context, the number fluctuates from two to nine (Cho [1984]).

3.5. Summary

This chapter reviews three main theories of pricing capital assets, namely Mean-Variance Portfolio Theory, Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT). Their concepts, assumptions, statistical procedures and extensions to international front have been explained.

A systematic way to construct a security pricing model begins in 1952, when Markowitz pioneered a portfolio theory which is known as the Mean-Variance Portfolio Theory. The notion of this model is that investment risk could be reduced by using a well diversified portfolio. The theory is conceptually sound but it demands sophisticated calculation and volume of work to estimate risk and return for each security. Its application was limited until Sharpe, in 1963, introduced several simplifying assumptions.

The model developed by Sharpe is the Capital Asset Pricing Model (CAPM). It provides the insight that the relevant risk for securities (or portfolio) is systematic risk representing by beta. The model is widely used in the financial literature, although criticisms have been made

of the single factor market assumption and the difficulties of identifying an ex ante efficient market portfolio.

As an alternative, Ross (1976) introduces the Arbitrage Pricing Theory (APT) which does not depend on the need for an underlying market portfolio. The APT can incorporate more complex types of equilibrium than merely one single market factor and is thus more robust than CAPM. On the other hand, APT through factor analysis, encounters a problem of explaining factors which generate stock returns.

On an international front, Grubel (1968) initially used using Markowitz's model to examine the potential gains of international diversification. Since the nature of this model is not a market equilibrium type, it can not explain (a) the real price of market risk (b) the issue of market segmentation versus integration and (c) the efficiency of international stock markets.

Then, the market model, CAPM, was extended by Solnik (1974) to the international stock market studies. The model assumes that exchange risk stemmed from differences in consumption preferences between individual of different countries. However, Solnik's version is not overwhelmingly accepted. Following that, other versions of international CAPM which consider inflation are introduced (Adler and Dumas [1983] and GLS [1976]).

Another alternative model which could be used in international studies is IAPT, introduced by Solnik (1983). However, to date there are very little published empirical studies which have extensively attempted testing this theory.

3.6. Conclusion

The review generally agrees that the APT has some explanatory power in analysing stock prices at national and international levels. Since the APT (or IAPT) provides a theoretical framework to investigate the existence of factors that generate security returns, it is therefore possible to empirically test whether these factors are 'priced' in international capital markets. It is suggested that an alternative statistical procedure should be developed to solve the problem of factor analysis. An approach as described by Elton and Gruber through the use of Fama-MacBeth procedure can be an appropriate alternative to factor analysis in testing the APT. In this study, we use the IAPT based on Fama-MacBeth approach to investigate the integration and efficiency of international stock market. The details of the testing procedures are described in the following chapters.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.0. Introduction

This chapter describes the methods and procedures used in this study. First, the hypotheses that are to be tested are enumerated. Then, follows an explanation of statistical techniques that are employed in this study. Next, a description of the data and variables used in the tests will be provided. Finally, the limitations of research methodology are discussed.

4.1. Statement of Hypotheses

As explained in chapter one, six research questions have been formulated to examine the relationship between the international stock markets. In order to deal with the questions, the following alternative hypotheses are developed:

H1. Stock markets in the US, the UK, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia, South Africa are related to and influence each other.

H2. The level of any relationships observed in (H1) has changed over time.

H3. Variables representing economic activity in each country relate to similar variables in the other countries.

H4. The level of any relationship observed in (H3) has changed over time.

H5. The comovements of both equity markets and economic indicators are consistent.

H6. Stock markets examined in this study are influenced by similar common underlying factors.

4.2. Statistical Technique

The following are descriptions of statistical procedures and methods for each hypothesis.

Hypothesis 1 - Null Hypothesis (H1,0): There is no relationship between the stock markets in the US, the UK, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia and South Africa. Alternative Hypothesis (H1,1): Stock markets in the US, the UK, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia, South Africa are related to and influence each other.

4.2.1. Correlation Analysis

Correlation analysis is used to test the first hypothesis. The sample correlation coefficients, r_{ij}, are computed for each pair of countries i and j from monthly market observations.

$$(R_{it} ; t= 1,2,.....,N), i= 1,2,....,C \qquad (20)$$

Where, R_{it} is the rates of return on market i for period t, N represents the total number of market index change observations and C denotes total number of markets in the study.

The null version of the first hypothesis is that $p_{ij} = 0$, where p_{ij} is the population correlation coefficient between market i and j by using Fisher's z-transformation (Fisher [1921]). The sample correlation coefficients, r_{ij} is transformed to z_{ij} value as shown below:

$$z_{ij} = 1/2 \ln (1 + r_{ij})/(1 - r_{ij}) \qquad (21)$$

This transforms the z value as a standard normal distribution. (Note that the calculation of the z value can be avoided by using the Fisher z-transformation tables)

4.2.2. Regression Analysis

Regression analysis may provide greater insights into the linkage between stock markets and is also employed in testing the first hypothesis. For the univariate model, the regression equation is:

$$R_{it} = a + b_i(R_{jt}) + e_{it} \qquad (22)$$

Where, R_{it} and R_{jt} represent the returns from market i and j in time period t, a (intercept) and b (slope or beta coefficient) are regression parameters which are determined by the method of Ordinary Least Squares (OLS) and e, error term, is assumed to be a normal random variable with mean zero and a constant variance.

For multiple regression, the equation below is fitted for each country's market returns:

$$R_{it} = a + \sum_{j=1}^{9} b_j (R_{jt}) + e_t \qquad (23)$$

Where, i and j are not equal, R represents market returns, a, b are regression parameters and e denotes an error term.

This equation models the returns from one market index using the returns from the remaining nine market indices. The strength of the regression in explanatory term of variations in the returns from the market index by the linear combination of the other indices is indicated by the R-squared. The F-ratio is used to test the significance of the R^2.

Another statistical technique to be applied in this investigation is stepwise regression. The procedures of this analysis are similar to those of multiple regression except that this technique can eliminate variables which have no predictive ability or which are highly correlated with other predictor variables. The advantage of stepwise technique is thus the minimizing of the problem of multicollinearity. As pointed by Younger (1979) and Klein (1962), when multicollinearity is present, the regression coefficients become unreliable measures of the effects of the associated regressors; they not only measure the effect of the related regressor, but are confounded with the effect of other regressors related to it. One method of eliminating correlated predictor variables in the regression equation is to use stepwise selection procedure (Berenson and Levine [1986]).

It is noted that the Durbin-Watson statistic and autocorrelation technique are employed to find out whether residuals (e) in the regression analysis conform with the following assumptions: (i) normally distributed (ii) zero mean (iii) constant variance (iv) covariance between a residuals pair is equal to zero or serially non-correlated (v) not correlated with the explanatory variables.

The violation of the assumptions may occur when (1) the DW statistic is "abnormally" high or low and (2) the autocorrelations show a strong pattern in the original and differences data. Should the assumptions be violated, we introduces the following two procedures to

obtain 'new' acceptable residuals: (1) the autoregressive model, that is the lagged dependent variables are included as predictors in the regression model and (2) the differencing method in, which the original data are replaced by the differences (the differences between original and lagged data). There may appear to be an inconsistency in this respect since later in this study cointegration tests are executed in order to test these assumptions more rigorously.

It should be recognised that the ordering of the testing methods truly reflects the researcher's approach and incidentally reflects the improvement in econometric methodology over the last few years. At the time this study was started and planned, the techniques referred to above were standard and acceptable even in prestigious journals such as the Journal of Finance (e.g. Cho, Eun and Senbet). Over the period covered by the research work for this thesis, financial market researchers started using and referring to the cointegration approach. The decision to apply these techniques thus was taken in order to provide a rigorous check of the validity of the earlier conventional techniques.

Hypothesis 2 - Null Hypothesis (H2,0): The level of any relationship observed between stock markets does not change over time. Alternative Hypothesis (H2,1): The level of any relationship observed between stock markets will be changing over time.

In order to test this hypothesis, the following statistical techniques are considered.

4.2.3. Box Chi-square

Following Kaplanis (1988) we use the Box Chi-square statistics to test the stability of the covariance matrix. Box (1949) proposed a statistic for testing the hypothesis of the equality of k covariance of p-dimension multinormal population, as

$$M = N \log_e S - \sum_{i=1}^{k} N_i \log_e S_i \qquad (24)$$

Where, $N = \sum_{i=1}^{k} N_i$, N_i are the degree of freedom of the sample covariance matrix S_i, while S_i = a pxp unbiased sample covariance matrix from the ith population and $S = \sum_{i=1}^{k} N_i S_i/N$.

If the following scale factor is introduced,

$$C = 1 - \{(2p^2+3p-1)/(6[p+1][k-1])\} \{\sum_{i=1}^{k} 1/N_i - 1/N\} \qquad (25)$$

then, MC will be asymptotically distributed as a Chi-square (X^2) variate with 1/2 (k-1)p(p+1) degree of freedom as the sample size increases.

To estimate the Box Chi-square each set of returns, R_{it}, is divided into 4 subsets as follows: (1) [R_{it}; t = 1, 2,.....N_1] (2) [R_{it}; t = N_1+1,. .. N_2], (3) [R_{it}; t = N_2+1,...N_3] and (4) [R_{it}; t = N_3+1,...N]. Subsets one to four cover respectively the periods (1) from January 1980 to December 1981, (2) from January 1982 to December 1983, (3) from January 1984 to December 1985 and (4) from January 1986 to December 1987. With these 4 subsets of returns, the sample covariance for each pair of countries i and j is calculated.

According to the Box Chi-square procedure, the covariance matrices of returns are stable over four time periods if the sample covariance matrices are drawn from the same population. A larger value of the Chi-square at a certain significance level suggests that the sample covariance matrices for these four periods belong to different populations and therefore the hypothesis is rejected.

4.2.4. Cointegration Technique - Engle & Granger Procedure

Cointegration tests were developed by Engle & Granger (1987) because it was argued that in some circumstances, series which were themselves non-stationary might by suitable manipulation be shown to have persistent long term relationships by regression.

As mentioned above, if two non-stationary series after regression, gave rise to autocorrelated residuals, a conventional and traditional response was to transform each series by differencing until each was stationary. The lesson from researches on cointegration was that under very specific circumstances a regression of the original series was appropriate. Cointegration tests are designed to validate regressions of this type.

The cointegration technique (Engle & Granger two-step procedure [1987] and Dickey-Fuller [1979,1981]) for testing the long-run relationship of time series is introduced in this analysis. In order to have a long-run relationship, all the series require to be integrated processes of order one, denoted I 1) and the cointegrating residuals must be integrated of order zero, denoted I 0 .

Non-augmented Dickey-Fuller (DF) statistics (the unit roots test) are used to see if the series are I 1 , as:

$$\Delta \ln(I_t) = a + b \ln(I_{t-1}) \qquad (26)$$

where, I is the series of market indices and $\Delta I = I_t - I_{t-1}$. If the series are I(1), then, an estimation of cointegrating regression is proceeded by using ordinary least square (OLS), as shown in equation below:

$$\ln(I_m) = a + b \ln(I_{jc}) + e_t \qquad (27)$$

Where, I_i and I_j represent market indices from country i and j, a and b are regression parameters and e is error term or residuals. To test the null hypothesis of non-cointegration (or to find out whether cointegration residuals are integrated of order zero), augmented Dickey-Fuller (ADF) is employed:

$$\Delta e_t = a + be_{t-1} + b\Delta e_{t-1} + b\Delta e_{t-2} + b\Delta e_{t-3} + b\Delta e_{t-4} \qquad (28)$$

where e are the residuals obtained from (27) and $\Delta e_t = e_t - e_{t-1}$. The null hypothesis of non-cointegration is rejected if I(1) residuals in the cointegration are not found, implying that a form of long-run stock market integration is present. (Note that Durbin Watson statistics are also used to test the null hypothesis of non-cointegration).

In applying the Engle-Granger technique, the following procedures are involved: (1) market indices (level) are converted to natural logarithms, (2) each data set is divided into 2 subsets [I_{it}; t = 1,2,3,..N_1] and [I_{it}; t = N_1+1,..N] covering period 1980-1983 and 1984-1987 respectively and finally (3) the Engle and Granger two-step estimation procedures are used for each period.

4.2.5. Cointegration Technique - Johansen Model

Johansen (1988) suggests a maximum likelihood procedure which provides estimates of the cointegrating vectors (**r**) between a set of variables X and offers test statistics for the number of cointegrating vectors. The model begins with the lag polynomial distribution of order k as

$$X_t = \pi_1 X_{t-1} + ... + \pi_k X_{t-k} + e_t \quad t = 1,...,T \qquad (29)$$

where, X is a vector of N related variables; e_t, an N-dimensional vector, which is independently and identically distributed with zero mean and variance matrix Ω; π denotes cointegrating matrix which is defined as $\pi = \alpha\beta'$ (α and β are Nxr matrices) and the rows of β form the **r** distinct cointegrating vectors.

In fact, Johansen's model is based on the following theorem:

"The maximum likelihood estimate of the space spanned by β is the space spanned by the r canonical variates corresponding to the r largest squared canonical correlations between the residuals of X_{t-k} and ΔX_t corrected for the effect of the lagged differences of the X process. The likelihood ratio test statistic for the hypothesis is that there are at most r cointegrating vectors is

$$-2 \ln Q = -T \sum_{i=r+1}^{N} \ln (1 - \lambda_i) \qquad (30)$$

where, λ_{r+1}... ...λ_N are the N-r smallest squared canonical correlations." (pp. 236-237)[2]

In order to employ this model, Hall's regression program REG-X is used. The program begins by reparameterizing (29) into

the following error correction model:

$$\Delta X = \Gamma_1 \Delta X_{t-1} + ... + \Gamma_{k-1} \Delta X_{t-k+1} + \Gamma_k X_{t-k} + e_t \qquad (31)$$

where, $\Gamma_i = -1 + \pi_1 + ... + \pi_i$; i= 1... k

Then, the program estimates (a) a set of residuals R_{0t} by regressing ΔX_t on the lagged differences of ΔX_t and X_{t-k} (b) a set of R_k residuals by regressing X_{t-k} on the same set of lagged first difference. These two sets of residuals are, therefore, used to form the four matrices S_{00}, S_{0k}, S_{kk} and S_{k0} as defined below.

Hall shows the likelihood function of parameters α, β, Ω, as

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[2]S. Johansen, "Statistical Analysis of Cointegration Vectors," Journal of Economic Dynamics and Control 12 (1988), pp. 231-254.

$$L(\alpha,ß,\Omega)=|\Omega|^{-T/2}\exp[-1/2\sum_{t=1}^{T}(R_{0t}+\alpha ß'R_{kt})'\Omega^{-1}(R_{0t}+\alpha ß'R_{kt})] \quad (32)$$

If ß is fixed, it can be maximized over α and Ω by regressing R_{0t} on $-ß'R_{kt}$, this gives:

$$\alpha(ß) = - S_{0k}ß(ß'S_{kk}ß)^{-1} \quad (33)$$

and $$\Omega(ß) = S_{00} - S_{0k}\, ß(ß'S_{kk}ß)^{-1}ß'S_{k0} \quad (34)$$

where, $$S_{ij} = T^{-1}\sum_{t=1}^{T} R_{it}R_{jt} \; ; \; i,j = 0,k$$

So, maximizing the likelihood function may be reduced to minimizing

$$|S_{00} - S_{0k}ß(ß'S_{kk}ß)^{-1}ß'S_{k0}| \quad (35)$$

and Hall shows that (35) will be minimized when

$$|ß'S_{kk}ß - ß'S_{k0}S_{00}^{-1}S_{0k}ß| / |ß'S_{kk}ß| \quad (36)$$

attains a minimum with respect to ß

Then, he defines a diagonal matrix D consisting of ordered eigenvalues $\lambda_1 ..> .... > \lambda_N$ of $S_{k0}S_{00}^{-1}S_{0k}$ with respect to S_{kk}, that is λ_i satisfies

$$|\lambda S_{kk} - S_{k0}S_{00}^{-1}S_{0k}| = 0 \quad (37)$$

and E as the matrix of the corresponding eigenvectors, then, $S_{kk}ED = S_{k0}S_{00}^{-1}S_{0k}E$, where E is normalised such that $E'S_{kk}E = I$.

To calculate eigenvalues in (37) the Reg-X program decomposes the matrix $S_{kk} = CC'$ using a Cholesky decomposition which gives

$$| \lambda I - C^{-1}S_{k0}S_{00}^{-1}S_{0k}C'^{-1} | = 0 \qquad (38)$$

and if $V_1 \ldots\ldots V_N$ denote the normalised eigenvectors such that $V'V = I$, then $E = C'^{-1}V$.

In applying the Johansen model in this study, the following procedures are involved:

(1) The sample of ten related countries in this study is divided into four groups, i.e. the US, the UK, West Germany, France, and Japan (Group 1), Japan, Singapore, Malaysia, Australia and South Africa (Group 2), the UK, West Germany, France and Norway (Group 3) and West Germany, France and Norway (Group 4). Then, the long-run relationship and the stability of stock market returns and economic variables within each group are examined.

(2) The market indices and economic variable (levels) are converted to natural logarithms.

(3) Each data set (market indices and economic variables) is divided into 2 subsets [I_{it}; $t = 1,2,3,\ldots\ldots N_1$] and [I_{it}; $t = N_1+1,\ldots\ldots N$] covering period 1980 - 1983 and 1984 - 1987 respectively and

(4) Hall's Reg-X program is run for each period with a maximum lag of 3, that is the lowest order which is adequate to obtain approximate whiteness of the residuals.

4.2.6. Chow Test

The Chow test of equality between sets of coefficients in two linear regressions (1960) is also carried out here. Chow's F ratios are derived from

$$F = ((RSS - RSS_1)/N_2)/(RSS_1/N_1\text{-}k\text{-}1) \qquad (39)$$

where, RSS = residual sum of squares from the regression based on $N_1 + N_2$ observations and RSS_1 = residual sum of squares from the regression based on N_1 observations.

With 2 subsets of returns (N1 and N2) for each pair of countries i and j, RSS1, RSS2 and RSS (RSS1 + RSS2) are computed using regression analysis. It is noted that (1) the Chow F-test has an F-distribution with d.f. N2 and N1-k-1 and (2) the Chow test is valid if there is no heteroscedasticity. To see whether there is heteroscedasticity in the estimated errors (e_t), this analysis uses the test as suggested by White (1980). This test involves regressing e_t^2 on the independent (explanatory) variables and their squares as follows:

$$e_t^2 = a + bx \quad \text{and} \quad e_t^2 = a + b_1x + b_2x^2 \qquad (40)$$

where, e_t is the estimated residuals, x represents an independent variable and a and b are regression parameters.

Hypothesis 3 - Null Hypothesis (H3,0): There is no relationship between the similar economic activities in different countries. Alternative Hypothesis (H3,1): Variables representing economic activity in each country relate to similar variables in the other countries.

For this hypothesis, the statistical procedures as described in the first hypothesis above are used again. Therefore, (a) correlation coefficients between identical economic variables for each pair countries i and j are computed, then, Fisher's z transformation is used to test the significance of the correlation coefficients and (b) regression parameters are estimated from the respective economic variables.

In addition, the following form of regression model is formulated to test this hypothesis:

$$E_i = a + b\,(W) + e \qquad (41)$$

Where, E_i is index of national economic variable, W represents the international economic index (formed by an equally weighted average of the economic variables from individual countries), a and b are regression parameters and e is an error term.

It is expected that a significant relationship between identical economic variables will be formal exist if they are similarly affected by an international economic index. Countries whose national economic variables are strongly affected by the appropriate international index will be those whose economies are well developed and open to international capital flows.

A further effort is made to confirm whether countries whose national identical economic variables have a close relationship with the international index are similar to those whose economies are open to capital flows by using 2 regression models below: (1) the import variable from country i is regressed against the export variable from country j and (2) the export variable from country i is regressed against the import variable of country j as

$$M_i = a + b\,(X_j) + e \qquad (42)$$

$$X_i = a + b\,(M_j) + e \qquad (43)$$

Where, M and X represent import and export data from country i and j, a and b are regression parameters and e, error terms. If the slope coefficients in both (42) and (43) are significant and consistent , this implies that (1) country i's imports are affected by country j's exports and (2) country i's exports are affected by country j's imports. It is, therefore, expected that the economic tie between country i and j is close and a substantial capital flows between these two countries will take place.

Hypothesis 4 - Null Hypothesis (H4,0): The level of any relationship observed between economic variables from each country does not change over time. Alternative Hypothesis (H4,1): The level of any relationship observed between economic variables from each country will be changing over the period studied.

The statistical procedures as stated in the second hypothesis above are repeated in this test. Thus, this analysis uses (1) the Box Chi-square to examine the stability of sample covariance matrices of identical economic variables for four equal time periods, (2) the cointegration technique for testing the long run relationship between similar economic indices from each country pair for two equal subperiods and (3) the analysis of variance based on the Chow test to investigate the equality of slope coefficients for identical economic variables from each country pair for two equal subperiods.

Hypothesis 5 - Null Hypothesis (H5,0): There is no relationship between the comovement between equity markets and the comovement between economic indicators from these countries. Alternative Hypothesis (H5,1): The comovements of both equity markets and economic indicators from these countries are consistent.

The statistical techniques involved in the fifth hypothesis are (1) canonical correlation (2) factor analysis and (3) regression analysis, as described below.

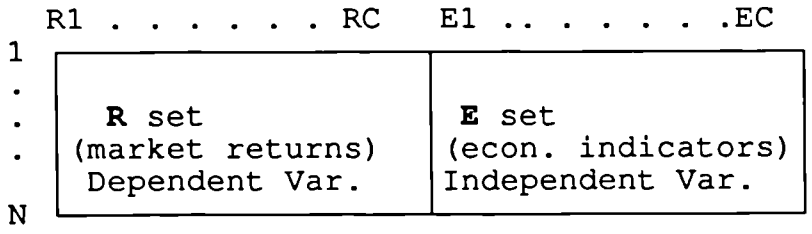
4.2.7. Canonical Correlation

The canonical correlation procedure is used to identify linear combinations of dependent variables in the first set that are most highly correlated to linear combinations of independent variables in the second set.

Canonical correlation analysis identifies the number of canonical variates, eigenvalues, the estimated canonical correlations, statistical tests (Wilks' lambda and chi-square) and the correlation coefficients of each original variable with each of the canonical variates.

It is expected that 2 sets of variables which have a large common share of variance (eigenvalue) will produce a higher canonical correlation and a significant value of Wilks' lambda and Chi-square. It is also noted that individual variables which have higher correlations will load heavily on the same set of canonical variates.

Following this technique, the data are classified into two sets, **R** (market returns) and **E** (economic indicators) which represent dependent and independent variables respectively (see data matrix below) to compute canonical correlation parameters. (Note that C shows total number of stock markets and N indicates the total number of observations)



4.2.8. Factor Analysis

Factor analysis is used to find a parsimonious set of general variables or factors that explain the structural variation of a large set of variables. This technique is used to condense many variables into a few underlying factors and also to help in dealing with the problem of multicollinearity.

A standard factor analysis solution will provide the following statistics: (1) a proportion of variance in the variable explained by all factors (called the communality), (2) the number of common factors (3) the amount of variance underlying all the variables associated with a

particular factor, also known as the eigenvalue (4) the percentage of variance explained by a particular factor (5) factor loading, that is the correlation of a variable with a factor.

Using factor analysis, an attempt is made to identify the number of common factors which have a significant effects on the movement of equity markets and economic variables. Besides that, an examination is made whether there are similar underlying factors which influence the comovement of both equity markets and economic variables. It is expected that countries whose indices (market returns or economic variable) move together will jointly load on to the same factor.

In order to investigate further the consistent movement in both equity markets and economic variable, regression analysis is introduced. Therefore, factor scores of market returns are regressed against those of economic variables, as

$$R_f = a + b\ E_{f1} + ...+ b\ E_{fk} + e \qquad (44)$$

where, R_f shows factor scores of market returns and E_{f1} to E_{fk} indicate factor scores of 1 to kth economic variables, a and b are regression parameters and e is an error term.

Hypothesis 6 - Null Hypothesis (H6,0): Stock markets examined in this study are not influenced by similar common factors. Alternative Hypothesis (H6,1): Stock markets examined in this study are influenced by similar common underlying factors.

4.2.9. APT/Multi-Index Model

For the last hypothesis (H6), a model which is based on Arbitrage Pricing Theory (APT) (Ross [1976]) and Multi-Index model (Elton and Gruber [1984]] is constructed.

The APT states that the returns of risky assets are related to a k-factor linear generating model as follows:

$$R_i = E_i + b_{i1}F_1 + ...+ b_{ik}F_k + e_i \qquad (45)$$

Where, R_i is rate of return from asset i, E_i is expected return for asset i, F is the mean-zero factor common to returns of all assets, b 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

$$E_i = a_o + a_1b_{i1} + ...+ a_kb_{ik} \qquad (46)$$

Where, E_i is the expected return from asset i and b_{ik} is the measure of systematic risk component of asset i with the common factor k. a_o can be interpreted as rate of return from a risk free asset or a zero-beta portfolio. a_k is defined as a risk premium, the excess return on portfolio with only systematic risk associated with the k-factor.

It is noted that the APT and Multi-Index model are almost similar. However, one major difference between these two model 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 this analysis, a model is formulated using both the APT and Multi-Index model through Fama-MacBeth (1976) procedures. Following these procedures, 2 regression analyses, (1) the first-pass time series regression and (2) the cross-sectional regression will be employed.

In the first-pass time series regression, the related economic variables which are identified through factor analysis are regressed against the market returns, as given below

$$R_i = a + b_{i1}E1 + ...+ b_{ik}E_k + e \qquad (47)$$

where, R_i is returns from market i, E_k is economic variable k, b_1, b_2...,b_i are coefficients which measure the correlation between returns i and economic variables 1 to k, a is constant and e, an error term.

Utilising the 'Fama-MacBeth' approach, 24 beta coefficients are obtained from sixty monthly observations; the first set is from August 1980 to July 1985, the second is from September 1980 to August 1985 and the same procedure is repeated for following periods by dropping the first monthly set of observation and adding the next monthly set. In addition, 24 means of returns of the 10 stock markets are calculated for the six monthly data covering firstly August 1985 to January 1986, secondly from September 1985 to February 1986. The rest of the subperiods' returns are obtained by repeatedly dropping the first monthly set and adding the first monthly set following the six month sample formed by the previous procedure.

The beta coefficients from the first-pass time series regression are used as independent variables while the mean rate of returns are considered as dependent variables in the second-pass cross-sectional regression, as

$$r = a_o + a_1b_1 + ...+ a_k b_k \qquad (48)$$

where, r is an average market return for each country, b_1 through b_k are beta coefficients derived from (47) above, a_o = constant (risk free rate or zero beta portfolio as implied by the APT) and a_1 through a_k are defined as factor risk-premia (excess return on portfolio).

The cross-sectional regression analysis in (34) is expected to have an explanatory power of the general equilibrium of APT model and is used to test the effects of the similar common factors on the stock markets.

4.3. The 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 (West Germany), 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 variables indicators, the data base includes gross national product (GNP), industrial production (IP), consumer price index (CP), money supply (MS), Treasury bill rate (TB), unemployment (UNEMP), Trade Figure (Import-Export).

The data cover a period of 8 years from January 1980 to December 1987. Except 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, are obtained from Datastream. The Malaysian stock market index is not available in Datastream and therefore is collected from the KLSE Monthly Bulletin.

The above mentioned countries are chosen on two main criteria, the availability of data and the need to reflect the overall world equity markets[3]. The market indices involved in this study represent industrial share prices when available or general share prices to facilitate a comparison between series. The macro-economic variables included in this research represent the major economic activities in respective countries.[4]

Both market indices and economic variables indicators are transformed into percentage changes (or returns) as[5]

$$R_t = [(I_t - I_{t-1})/I_{t-1}] \, 100 \qquad (49)$$

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

$$E_t = [(F_t - F_{t-1})/F_{t-1}] \, 100 \qquad (50)$$

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[3]Because of some data retrieved 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.

[4]The data was not seasonally adjusted. Part of the analysis was concerned with analysing the transformations required to deseasonalise the data. It could be argued that stock market returns require de-seasonalising when used in the kind of analysis. In the end it was decided to use data which had been subject to as little "doctoring" as possible.

[5]Note that the data at value level were converted into natural logarithms before using the cointegration technique.

where, Et is monthly percentage changes in economic indicators and F_t and F_{t-1} are the level of each economic indicators at time t and t-1.

Percentage changes reflect the relative changes rather than the actual changes. For the purpose of making comparison a relative change is more meaningful than an actual change. Prior studies such as Grubel and Fadner (1971), Watson (1978) 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. As discussed in Chapter Two, researchers have found different ways of calculating international returns not to be an important 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 study were not affected by the definition of the returns.

Factors like dividends, taxes (both on dividends and capital gains), transaction costs and inflation rates (in respective countries) in determining returns are also not considered in this study. Although all of these factors are excluded, the study is still valid since its main purpose is to find out the international structure of both equity markets and economic variables and to examine the macro-economic effects (or economic integration) on international share prices.

4.4. Limitations

A number of limitations may be present in the research methodology. These limitations could arise from the procedures of theoretical framework and the special characteristics of this study.

As suggested by Elton and Gruber (1984) and Sharpe (1982), a thorough equity valuation based on micro & macro-economic theories should be developed to derived the risk-return factors model such as the Multi-Index model or the APT. In view of that, the procedure as carried out in this study is 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.

Theoretically, an application of the Fama-MacBeth procedure to estimate systematic risk and risk premia is plausible. This study, however, could be criticised because a relatively small group of market returns (10 groups of stock markets) is used for cross-sectional analysis to estimate risk premia. Roll and Ross (1980) run cross-sectional analysis for 42 groups of stock returns to test the APT. Having a smaller groups of returns or observations in a cross-sectional regression may limit the power of the statistical techniques. At the same time, a small number of observations may generate spurious correlation among variables rather than true relationships.

Using a regression model based on OLS in this study may pose some problems in statistical analysis. The problem which is frequently encountered when running regression analysis is that the residuals terms fail to hold the following assumptions: (i) normally distributed (ii) the mean value is zero (iii) the variance is constant (iV) the covariance between a residuals pair is equal to zero or serially non-correlated (v) not correlated with the explanatory variables. Then, the estimated results obtained from the method do not possess some or all of their optimal properties such as unbiasedness, minimum variance and consistency, implying that their standard errors and related values (t and F statistics) become unreliable criteria.

In order to detect whether the assumptions are violated while applying the OLS, this study employs three techniques (1) the value of Durbin-Watson statistic and (2) autocorrelations of original and differences data and (3) the White procedure (1980) for the test of homoscedasticity against heteroscedasticity.

Some special characteristics of this study could also bring disadvantages to the above statistical procedures. The special characteristics are:

(1) Time series data, such as market indices and economic indicators in this study, which are prone to trend and nonstationarity may cause some problems to many statistical analyses. Although several attempts are made in dealing with the problem of time series data, a complete solution is impossible. Therefore, the results obtained here must be interpreted with caution. Even by adopting the cointegration analysis, the problem is not eliminated, see Alogoskoufies (1991).

(2) Market indices have a broad measurement characteristic. They may not reflect a true movement of individual stock prices at various industrial sectors. The results might be much weaker when regressing company share returns against the various economic indices.

(3) Due to the difficulties in data collection, some replacements and adjustments are made: (a) Because of availability, the unemployment figures for Singapore and Malaysia are replaced by a proxy, i.e. the construction industry index of the relevant country. This replacement is possible because the construction industry plays a major role in their economies and is a very sensitive to the level of unemployment. However, it may not well represent a true unemployment figures since other economic sectors which provide a substantial employment opportunities are excluded. (b) Singaporean and Malaysian GNP are available on yearly basis. The following procedure is adopted to derive quarterly estimation a suitable proxy: (i) Using the annual industrial production index of the related countries in this regression: GNP = a + b Industrial Production Index and (ii) multiplying the slope coefficient obtained from the regression equation by the quarterly industrial index of the respective countries to obtain the estimated GNP data on a quarterly basis. Although this adjustment procedure is statistically correct, the estimated GNP might not represent a true figure because the proxy may be biased.

However, despite the above limitations, it is believed that the statistical procedures described in this chapter should adequately provide tools for testing the major hypotheses of this study, and therefore, the statistical conclusions can be made to provide empirical evidence for useful implications of the ternational stock market behaviour.

CHAPTER FIVE

STATISTICAL ANALYSIS AND RESULTS

5.0. Introduction

The results of statistical tests conducted to examine the structures of both international equity markets and similar economic variables from the 10 countries are reported in this chapter. The discussion involves: (1) a description of the statistical results from testing the six hypotheses and (2) a discussion of the implications and limitations of the results. With the exception of Johansen's model[6], these findings are derived from using the statistical methodology and procedures explained in the previous chapter.

Results from testing hypothesis H1,0: Stock markets in the US, the UK, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia and South Africa are not related to and do not influence each other.

The first objective of this study is to determine whether there is a significant relationship between the selected capital markets. In order to carry out this examination, two statistical

[6]Since Johansen's model, as an alternative technique for testing for cointegration, was introduced in the later stages of the research, it was decided to report its results in a separate chapter (i.e. chapter 6) although the points of discussion are not independent of the results produced by other methods.

techniques, namely correlation and regression, are employed. This analysis begins with the correlation analysis.

5.1. Correlation Between Equity Markets

Results of the correlation analysis are shown in Table 5.0.

TABLE 5.0

INTER-MARKET CORRELATION COEFFICIENTS FOR 10 SELECTED COUNTRIES FOR PERIOD JANUARY 1980 to DECEMBER 1987

	US	UK	WG	FR	NW	JP	SP	MY	AU
UK	0.64								
WG	0.43	0.42							
FR	0.48	0.51	0.41						
NW	0.53	0.49	0.41	0.49					
JP	0.42	0.50	0.32	0.39	0.27				
SP	0.53	0.45	0.25	0.22	0.44	0.29			
MY	0.53	0.44	0.21	0.10*	0.41	0.27	0.94		
AU	0.59	0.60	0.40	0.47	0.57	0.32	0.55	0.51	
SA	0.45	0.44	0.24	0.43	0.40	0.24	0.37	0.38	0.48

* Not significant at 5 percent level.

The evidence from Table 5.0 above rejects the null hypothesis: that there is no a relationship between these stock markets. Except for the France-Malaysia pair, all inter-market correlation coefficients are significant at the 5 percent level. Most of the equity markets in the study are considerably related to the New York Stock Exchange (NYSE) and the London Stock Exchange (LSE). The correlation coefficients of the US against other markets vary from 0.42 (US-Japan) to 0.64 (US-UK), while the correlation between the UK and the other countries (excluding the US) ranges from 0.42 (UK-WG) to 0.60 (UK-AU). The US and the UK have an average correlation of 0.51 and 0.49 respectively with other markets. It is interesting to note that the correlation coefficients of the US and the UK with the markets in continental Europe, Asia-Pacific and South Africa are similar. The US and the UK have an

average correlation of 0.48 and 0.47 with continental Europe, 0.52 and 0.50 with Asia-Pacific and 0.45 and 0.43 with South Africa respectively. The three equity markets in continental Europe are firmly related to each other, ranging from 0.41 (WG-NW) to 0.49 (FR-NW) and having an average correlation of 0.43. These three markets also have some connection with Asia-Pacific and South Africa. Their average correlation with Asia-Pacific and South Africa are 0.34 and 0.36 respectively. However, if the UK (Europe) is considered, the average correlation of Europe with Asia-Pacific and South Africa increases to 0.378 and 0.375.

With regard to the relationship of stock markets in Asia-Pacific, they are also related to each other. Malaysia and Singapore enjoy common influences and therefore the Singapore-Malaysia pair produces the highest correlation (0.94), while Japan-Malaysia is the weakest pair (0.27). The average correlation coefficients of pairs in Asia-Pacific is estimated to be 0.48. The Asia-Pacific group of markets also appear to be correlated with South Africa, having an average correlation of 0.37.

In many cases, the above results do not come as a surprise. The characteristics of the correlation do not differ with those estimated by a commercial service, Quantec Ltd. and other past studies. Quantec publishes in 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 Core Global group, which consists of US, UK, Canada, Netherlands and Switzerland have a relatively high and significant correlation with each other.

The figures reported in Table 5.0 are also consistent with the findings of Ripley (1973), Panton, Lessig and Joy (1976), Lessard (1976) and Hilliard (1979): that there is a structural

relationship between international stock markets. However, in terms of characteristics of correlation, some of these results differ from the previous findings. Most of the previous studies report that while the major markets in continental Europe have a close relationship with each other, each of them was weakly linked to the UK. This study finds that the correlations coefficients in intra-continental Europe markets are smaller than those between the UK and continental Europe. Thus, some changes in the characteristics of correlation coefficients between stock markets in Europe have taken place and one of the main reasons might well be the absence of the constraints on currency purchase and sale. It is also worth noting that the relationships between Japan and other world stock markets, especially the UK and the US are fairly significant. Previous studies found that the Tokyo Stock Exchange was only weakly linked to other world stock markets.

An alternative representation of the relationship between equity markets might be obtained using the slope coefficient from simple regression in the Table 5.1 below.

TABLE 5.1

INTER-MARKET BETA COEFFICIENTS FOR 10 SELECTED COUNTRIES FOR PERIOD FROM JANUARY 1980 TO DECEMBER 1987

	Independent Variables									
	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	1.00	0.70	0.49	0.65	0.83	0.36	0.86	0.97	0.85	0.59
UK	0.57	1.00	0.44	0.62	0.68	0.39	0.67	0.73	0.78	0.52
WG	0.37	0.41	1.00	0.48	0.55	0.23	0.36	0.31	0.51	0.27
FR	0.35	0.41	0.35	1.00	0.56	0.25	0.26	0.14*	0.49	0.41
WG	0.34	0.35	0.30	0.43	1.00	0.15*	0.46	0.47	0.53	0.34
JP	0.49	0.65	0.42	0.62	0.49	1.00	0.55	0.55	0.53	0.37
SP	0.32	0.31	0.18*	0.18*	0.42	0.15*	1.00	1.04	0.48	0.29
MY	0.29	0.27	0.14*	0.08*	0.36	0.13*	0.85	1.00	0.40	0.28
AU	0.41	0.46	0.32	0.44	0.62	0.19*	0.62	0.66	1.00	0.44
SA	0.34	0.37	0.21	0.44	0.47	0.16*	0.45	0.52	0.53	1.00

Notes: (1) direct regression i.e. $R_i = a + b(R_j) + e$ and (2) reverse regression i.e. $R_j = a + b(R_i) + e$, where Ri represents countries on vertical line and Rj are countries on horizontal line. * not significant at 5 percent level.

Results in Table 5.1 are derived from a linear regression model which uses only one predictor variable to describe the behaviour of dependent variable. Therefore, admittedly, the results obtained here must be interpreted with caution, because in reality, it seems reasonable to expect more than one factor to jointly influence a stock market. The combined effects of more than one factor on stock markets are shown later in multiple regression analysis. Alternatively, the results in Table 5.1 above could be interpreted as foreign market betas (risks) relative to a particular local market.

A further evidence of international equity market structure and a combined effect of stock markets in predicting a particular market are analysed by using multiple regression. The results are presented in Table 5.2.

TABLE 5.2

MULTIPLE REGRESSION PARAMETERS FOR THE MARKET RETURNS

$$R_i = a + \sum_{j=1}^{n} b_j R_j + e$$

(Where, R = the percentage changes in stock market indices, n = 9 stock markets. a, b and e are multiple regression parameters)

	Dependent Variables								
Coef.	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
a	-0.09	0.32	0.07	-0.55	0.31	1.12	0.36	-0.58	-0.02	0.57
bUS		0.26	0.19	0.18	0.19	0.15	0.12	-0.01	0.04	0.23
t		2.19*	1.00	0.97	0.95	1.04	1.24	-0.11	0.25	1.19
bUK	0.23		0.13	0.24	0.20	0.29	-0.11	0.15	0.29	0.05
t	2.17*		0.74	1.47	1.08	2.45*	-1.33	1.53+	1.88*	0.31
bWG	0.08	0.06		0.12	0.07	0.05	0.03	-0.05	0.11	-0.10
t	1.03	0.77		1.06	0.51	0.53	0.56	-0.73	1.03	-0.84
bFR	0.08	0.14	0.14		0.19	0.13	0.07	-0.15	0.04	0.22
t	1.00	1.69+	1.17		1.49+	1.45+	1.24	-2.28*	0.32	1.84*
bNW	0.06	0.07	0.07	0.20		-0.09	0.06	-0.04	0.21	0.09
t	0.86	0.99	0.62	1.92*		-1.16	1.15	-0.65	2.14*	0.84
bJP	0.02	0.27	0.09	0.23	-0.19		0.03	-0.01	-0.01	-0.05
t	1.14	2.44*	0.53	1.42	-1.08		0.32	-0.12	-0.03	-0.28
bSP	0.17	-0.23	0.13	0.27	0.37	0.05		1.01	0.24	-0.35
t	1.18	-1.43	0.54	1.18	1.44	0.28		17.87*	1.09	-1.74*
bMY	-0.01	0.23	-0.14	-0.44	-0.21	-0.01	0.81		-0.02	0.36
t	-0.07	1.65+	-0.67	-2.20*	-0.91	-0.03	18.02*		-0.08	1.70*
bAU	0.03	0.16	0.13	0.03	0.30	-0.01	0.06	-0.00		0.21
t	0.32	1.82*	0.99	0.28	2.25*	-0.13	0.98	-0.02		1.65+
bSA	0.09	0.03	-0.05	0.18	0.09	-0.01	-0.09	0.12	0.15	
t	1.34	0.34	-0.43	1.59+	0.70	-0.07	-1.58+	1.93	1.43	
$R^{2\prime}$	0.52	0.54	0.18	0.39	0.43	0.23	0.88	0.88	0.47	0.30
F	9.73*	10.50*	2.80	6.26*	7.34*	3.44	64.78*	61.77*	8.45*	4.53*
DW	1.93	2.12	1.98	2.07	1.92	2.05	2.00	2.20	1.90	1.98

Notes: t = t statistics and F = F-ratios. * statistically significant at the 5 % level. + significant at the 10 % level.

Table 5.2 summarises the multiple regression parameters. The significant test for the F-ratios shows the multiple correlation coefficients are significant at the 5 percent level for the prediction of these markets (excluding stock markets in West Germany and Japan). The results of this statistical technique do not differ greatly from the earlier conclusions, except this analysis finds (1) the US is related only to the UK and (2) stock markets in Continental Europe do not show a strong link with each other. This might be due to some interaction effect between the explanatory indices (multicollinearity).

To overcome this problem, stepwise regression is carried out. Table 5.3 shows the results of stepwise regression.

TABLE 5.3

RESULTS OF STEPWISE REGRESSION

	Dependent Variables									
Coef.	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
a	.07	0.16	0.17	0.04	0.28	0.94	-0.03	0.51	-0.04	0.66
bUS		0.37	0.26		0.36		0.51			0.24
t		3.71	2.07		2.25		3.06			1.68
bUK	0.32			0.29		0.31			0.38	
t	3.80			2.33		3.91			3.28	
bWG				0.20				-0.27		
t				1.79				-1.69		
bFR	0.12		0.17		0.25	0.13				0.20
t	1.76		1.94		2.36	2.06				2.03
bNW	0.11		0.13	0.19					0.23	
t	1.86		1.61	2.24					2.95	
bJP		0.35								
t		3.54								
bSP	0.16							0.26	0.21	
t	3.03							2.33	2.81	
bMY		-0.09				0.08				
t		-2.16				2.01				
bAU		0.26			0.35		0.41			0.24
t		3.86			3.21		3.47			2.44
bSA				0.19					0.18	
t				2.03					1.99	
$R^{2\prime}$	0.51	0.53	0.23	0.36	0.40	0.28	0.34	0.04	0.51	0.28
F	25.22	28.49	10.61	13.99	22.04	13.43	26.16	3.38	25.81	13.49
DW	2.07	2.38	1.98	1.74	1.54	2.03	1.82	2.01	1.92	1.71

Notes: all t statistics (t) are significant at the 5 % level

As indicated in Table 5.3, the US market is not only correlated with the UK but also with other markets in continental Europe, Asia-Pacific region and South Africa. The analysis also confirms that there is a strong relationships between equity markets in continental Europe.

Therefore, these results are almost consistent with the previous analysis. Thus, results in Table 5.4 reject the null hypothesis and it is therefore concluded that the stock markets in the US, the UK, West Germany, France, Norway, Japan, Singapore, Malaysia, Australia and South Africa are related to and influence each other.

5.2. The Stability of Inter-Market Relationship

The second objective of this study is to examine the stability of inter-market relationship over a time period. For this purpose, the following three statistical techniques are used: (a) The Box Chi-square (Box [1949]) procedure for testing the hypothesis of equality of k covariance matrices of p-dimension multinormal populations (b) The cointegration methodology for testing a long run relationship (Engle & Granger [1987] and Dickey & Fuller [1979, 1981]) and (c) The Chow test of equality between sets of coefficients in two linear regressions (Chow [1960])[7]. The results of statistical test for the second hypothesis are presented and discussed in the next section.

Results from testing hypothesis H2,0: The level of any relationship observed between the stock markets has not changed over time.

The covariance matrices of equity returns for these ten markets for four equal length periods of 8 years are found in Appendix 5.0, while the results of Box's test procedure are presented in Table 5.4.

[7]Note that an application of the Chow test is valid only if errors in regression have a constant variance. Therefore, we run the White's test (1980) to see whether there is heteroskedasticity in residuals.

Appendix 5.0 shows that the covariance matrices for a similar pair in consecutive and non-consecutive periods are different. Furthermore, the covariances increase in the fourth and most recent period. However, the results of the Box test in Table 5.4 indicate that none of the covariance matrices between two sub-periods differ significantly. The hypothesis that the relationship between stock markets are stable cannot be rejected at the 5 percent significance level (see Table 5.4). It is also interesting to note that the chi-square statistic for one period tends to increase as time increases, e.g. the chi-square statistic for period I/period II is 20.0, whilst the corresponding statistic for period I/period III is greater. Similarly period II/period III is lower than period II/period IV. It is expected that the statistics for non-consecutive periods are relatively higher.

TABLE 5.4

RESULTS OF THE BOX TEST FOR THE STABILITY OF THE COVARIANCE MATRIX OF THE 10 EQUITY MARKET RETURNS FOR 4 EQUAL LENGTH PERIODS

PERIODS	I	II	III	IV
I		20.0	35.4	1.9
II			3.5	10.8
III				24.0

Notes: (a) Four equal sub-periods are (I) Jan 1980 to Dec 1981, (II) Jan 1982 to Dec 1983, (III) Jan 1984 to Dec 1985 and (1V) Jan 1986 to Dec 1987. (b) Degree of freedom = 55

The above results are consistent with the observations of Grubel & Fadner (1971), Hilliard (1979), Maldonado & Saunders (1981) and Kaplanis (1988) that: (a) for some countries, there are evidence of stability of the co-movement characteristics for a relatively short period (however, the comovement does not remain stable in the long run) and (b) in the

longer period, some unique characteristics affecting market returns would be overpowered by the underlying factors such as growth, profits and other significant fundamental variables in the related individual countries.

Interestingly, Taylor and Tonks (1989) reveal that the degree of relationship between international stock markets is not stable over a long period. They hypothesized that, since the Conservative government abolished exchange control in October 1979, the degree of integration of U.K. and other foreign markets should increase after that date. Using cointegration technique (Engle and Granger [1987])[8] and the unit roots test procedure as suggested by Dickey-Fuller (1979, 1981), the results supported the hypothesis as cointegrating residuals became significant at the 5 percent level for the post-abolition of exchange control period.

To provide further evidence of the stability of international stock market relationship, this study also employs the Engle-Granger cointegration methodology. This analysis involves:

(1) Dickey-Fuller technique to test whether the indices of the stock market are integrated of order one, i.e. unit roots test;

(2) Ordinary Least Square Method to estimate cointegration regression parameters and

(3) The augmented Dickey-Fuller (ADF) and Durbin Watson (DW) statistics to test the significance of cointegrating residuals, this is to test the null hypothesis of non-cointegration.

The results of this statistical analyses are shown in Tables 5.5 and 5.6 and Appendix 5.1.

[8]Also known as the Engle-Granger two-step procedure. First, a level regression is performed to test the hypothesis of cointegration. Second, the residuals from this regression are entered into a dynamic model (error correction model).

TABLE 5.5

RESULTS OF UNIT ROOT TESTS FOR 10 SELECTED STOCK MARKET INDICES AND RETURNS FOR 2 PERIODS

	MARKET INDICES		MARKET RETURNS	
COUNTRY	PERIOD 1	PERIOD 2	PERIOD 1	PERIOD 2
United States	-0.71	-1.10	-6.00	-5.90
United Kingdom	-1.11	-1.55	-8.45	-6.40
West Germany	0.41	-1.29	-6.56	-5.56
France	-1.06	-1.40	-6.11	-5.17
Norway	0.16	-2.15	-5.94	-5.18
Japan	-0.33	-0.71	-6.13	-6.56
Singapore	-2.10	-1.55	-5.86	-5.62
Malaysia	-1.57	-1.58	-4.51	-5.99
Australia	-1.38	-1.01	-6.15	-6.07
South Africa	-1.56	-0.82	-5.72	-4.89

Notes: Period 1 (1980-1983) & Period 2 (1984-1987)
Non-augmented Dickey-Fuller statistics are used for all the test. The critical value at the 5 % level is -2.85 (Fuller [1976])

Table 5.5 reports the results of unit root tests for market prices (level) and market returns. The critical value of Dickey-Fuller statistic at the 5 percent level is -2.89, thus, the hypothesis of a unit root in the stock market indices (level) cannot be rejected at that level. However, the hypothesis of a unit root in the market returns (percentage change) is obviously rejected even at a significance level of less than 5 percent. The results in Table 5.5 imply that these 10 stock market indices (level) are integrated of order one during each subperiod, i.e. in period 1 and 2.

Appendix 5.1 contains both the estimate of cointegration parameters and the results of unit root test in cointegrating residuals. The test statistics are transferred to Table 5.6.

TABLE 5.6

CASES OF REJECTION AND ACCEPTANCE OF NULL HYPOTHESIS OF NON-COINTEGRATION AT THE 5 PERCENT SIGNIFICANCE LEVEL FOR PERIOD ONE/TWO - ADF & DW TESTS

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	adf		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	dw		-/*	*/-	-/*	-/-	-/*	-/-	-/-	-/*	*/*
UK	adf	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	dw	-/*		-/-	-/*	-/*	-/*	*/-	-/-	-/*	*/-
WG	adf	*/-	-/-		-/-	*/-	-/-	-/-	-/*	-/-	*/-
	dw	-/-	-/-		-/-	*/-	-/-	-/-	-/-	-/-	*/-
FR	adf	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-
	dw	-/*	-/*	-/-		-/-	-/-	-/-	-/-	-/*	-/-
NW	adf	*/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-	*/-
	dw	-/-	-/*	*/-	-/-		-/-	-/-	-/-	-/-	-/-
JP	adf	-/-	-/-	-/-	-/*	-/-		-/-	-/-	-/-	-/-
	dw	-/*	-/*	-/-	-/-	-/*		*/-	-/-	-/*	*/*
SP	adf	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-
	dw	-/-	*/-	-/-	-/-	-/-	*/-		-/-	-/-	-/-
MY	adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-
	dw	-/-	-/-	-/-	-/-	-/-	-/-	-/-		*/-	-/-
AU	adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-
	dw	-/*	-/*	-/-	-/*	-/*	-/*	-/-	*/-		-/*
SA	adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	
	dw	*/*	-/-	*/-	-/-	-/-	*/*	-/-	-/-	-/*	

Notes: (a) Minus signs show statistically insignificance at the 5 % level, i.e. the null hypothesis of non-cointegration is not rejected, while, asterisk signs indicate the rejection of null hypothesis (b) Each pair has 2 periods, period 1/period 2 (c) The approximate critical value for ADF and DW at the 5 % level is 3.17 and 0.389 respectively.

In many cases, the results show that the null hypothesis of non-cointegration cannot be rejected. ADF unit root tests on cointegrating regression residuals are significant at the 5 % level for only 7 out of 180 cases (5 cases in period 1 and 2 cases in period 2), while DW statistics from the cointegrating regression are significant in 44 cases (i.e. 16 in period 1 and 28 in period 2). This strongly suggests that the international stock markets in this study are not cointegrated in both periods (or their relationships are not stable over the long period).

However, it is very important to note the following observations:

(1) ADF statistics are significant at the 5 percent level for the cases of US-WG, US-NW, NW-WG, SA-WG and SA-NW in period 1 and FR-JP and MY-WG in period 2. Besides that, in many occasions, the UK with other countries has a relatively high ADF statistics (see Appendix 5.1). This evidence tends to support the findings in Taylor and Tonks (1989) that (a) some major equity markets within Europe are integrated over the period 1979-1986 and (b) the degree of relationship between the UK and other important overseas stock markets increases after 1979 (i.e. the post-abolition of exchange control period).

(2) The results indicate that a few similar pairs have statistical significance in both periods, and that more than half of significant cases take place in period 2. This implies that the relationship between stock markets in this study is not stable over the long run. This evidence attests to the earlier conclusions in the Box Chi-square analysis and to the results of Hilliard (1979), Maldonado and Saunders (1981) and Taylor and Tonks (1989).

(3) Many time series such as stock market indices in this study are non-stationary (they are integrated of order one, I(1)), therefore, the regression coefficients where cointegration is not found are irrelevant, since they are from 'spurious regression' (Granger and Newbold [1974]). This does not affect the discrimination of the first group of test on the first hypothesis since the tests involved returns, not level, and returns were found to be order zero (see Table 5.5).

(4) It is believed that the coefficient estimates of cointegrating parameters may possess asymptotic characteristics, but it is not clear whether they provide an unbiased estimate (Stock [1984]). This might also explain why a substantial number of cointegration tests are not significant in this study.

Finally, the stability of international stock markets is examined by using F test as suggested by Chow (1960). The aim of this test is to find out whether the beta coefficients

of each market pair in period one and two are different.[9] The beta coefficients for period one and two and the observed F ratios are shown in Appendix 5.2 and the results are summarised in Table 5.7 below.

TABLE 5.7

THE F-CHOW TEST AT THE 5 PERCENT LEVEL FOR PERIOD ONE/TWO

	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US		-	-	-	-	-	-	-	-	-
UK	-		-	-	-	-	-	*	-	-
WG	-	*		-	-	-	-	-	-	-
FR	-	-	*		-	*	-	-	-	-
NW	-	-	-	-		-	*	-	-	-
JP	-	-	-	-	-		-	-	-	-
SP	-	*	-	-	-	-		-	-	-
MY	-	*	-	-	-	-	-		-	-
AU	-	-	*	-	-	-	-	-		-
SA	-	-	-	-	-	-	-	-	-	

Notes: (a) minus signs show statistically insignificance at the 5 percent level, while, asterisk signs indicate a significant statistical test.

It is noted that the critical value of F at 5 percent significance level with 92 degrees of freedom is 3.09, which is higher than almost all of the above observed F ratios. Therefore, the hypothesis that there is no significant difference in the beta coefficients of the stock markets obtained from these two periods cannot be rejected. Hence, the result is consistent with previous studies: the relationship between most of the international stock markets is stable over a period of three or four years.

[9]The Chow test assumes the variance of residuals is constant (homoscedastic). We checked this assumption by using White's test (1980) and found this test is appropriate to consider here because most results reject the hypothesis of heteroscedasticity in residuals. Thus, the errors in the regression model have a constant variance and satisfy the assumptions of the F Chow test (see the statistics in Appendix 5.3).

5.3. Relationship between Similar Economic Activities

This section examines the comovements of 8 similar economic variables in the 10 selected countries. The economic activities are gross national products (GNP), industrial production (IP), consumer price (CP), money supply (MS), Treasury bill (TB), unemployment (UNEMP), import (IMP) and export (EXP). All the variables are expressed in returns form i.e. they are I(0). For this analysis, correlation and regression are involved. The results are documented in the following section.

Results from testing H3,0: Variables representing economic activity in each country are not related to similar variables in the other countries.

The correlation coefficients of similar economic activities between countries are demonstrated in Table 5.8. A substantial number of the coefficients are significant at the 5 percent level. Thus, the results support evidence the hypothesis that variables representing economic activity are related to similar variables in the other countries.

There are 5 economic variables (consumer prices, unemployment, money supply, imports and exports). These economic variables have a considerable number of significant correlation coefficients (i.e. statistically significant at the 5 percent level): the significant cases ranging from 14 (unemployment), 17 (money supply), 26 (consumer price index), 29 (exports) and 33 (imports). Their correlations for each country pair vary from:- 0.03 to 0.79 (imports), -0.26 to 0.87 (exports), -0.75 to 0.58 (unemployment), -0.18 to 0.60 (money supply) and -0.20 to 0.61 (consumer price index).

TABLE 5.8

THE CORRELATION COEFFICIENTS OF EIGHT SIMILAR ECONOMIC VARIABLES FOR 10 SELECTED COUNTRIES FROM JANUARY 1980 TO DECEMBER 1987

	GNP**	IP	CP	MS	TB	UNEMP	IMP	EXP
US-UK	-0.17	0.16	0.41*	0.21*	0.15	0.18	0.26*	0.47*
WG	0.13	0.07	0.61*	0.17	0.14	0.51*	0.14	0.54*
FR	0.01	0.09	0.49*	0.40*	0.18	-0.12	0.06	0.52*
NW	-0.00	0.11	0.34*	0.18	-0.22*	0.20*	-0.00	0.49*
JP	0.15	0.10	0.33*	0.25*	-0.19	0.23*	-0.01	0.44*
SP	0.10	0.08	0.39*	0.04	0.27*	0.05	0.29*	0.27*
MY	0.00	0.13	0.25*	0.23*	0.02	0.08	0.06	0.37*
AU	0.28*	0.12	0.33*	0.49*	0.10	0.02	0.19	0.01
SA	-0.14	0.05	0.01	0.11	0.18	0.33*	0.26*	0.19
UK-WG	0.16	-0.01	0.38*	0.29*	-0.02	0.58*	0.71*	0.87*
FR	0.00	-0.04	0.49*	0.34*	0.04	0.46*	0.64*	0.74*
NW	-0.09	0.04	0.07	0.07	0.04	0.46*	0.59*	0.48*
JP	0.30*	-0.13	0.34*	0.41*	0.10	0.31*	0.36*	0.54*
SP	0.04	-0.19	0.26*	0.06	0.01	-0.06	0.19	0.26*
MY	0.04	0.05	0.01	-0.17	0.06	-0.01	0.28*	0.25*
AU	0.22*	0.02	0.10	0.10	0.06	0.01	0.43*	-0.04
SA	0.16	-0.13	0.05	0.12	0.00	0.09	0.33*	0.43*
WG-FR	0.33*	0.50*	0.56*	-0.01	0.31*	0.24*	0.79*	0.84*
NW	0.16	0.11	0.42*	0.10	0.04	0.70*	0.49*	0.51*
JP	0.09	0.06	0.18	0.33*	0.12	0.22*	0.57*	0.59*
SP	-0.10	-0.04	0.43*	0.02	0.02	0.05	0.21*	0.24*
MY	0.18	-0.07	0.34*	-0.11	-0.02	0.08	0.37*	0.23*
AU	0.01	0.03	0.13	0.00	0.11	0.14	0.42*	-0.12
SA	-0.10	0.00	-0.18	0.17	0.30*	0.19	0.22*	0.28*
FR-NW	0.32*	0.33*	0.34*	0.15	0.07	0.13	0.47*	0.53*
JP	-0.02	0.17	0.23*	0.60*	0.04	0.12	0.26*	0.63*
SP	-0.26*	-0.07	0.43*	-0.03	0.24*	-0.06	0.09	0.17
MY	0.06	-0.02	0.39*	0.04	0.08	-0.04	0.16	0.14
AU	-0.05	0.21*	0.20*	0.56*	0.07	0.02	0.22*	-0.13
SA	0.07	0.30*	0.00	0.16	0.12	-0.09	-0.03	0.17
NW-JP	0.21*	0.04	0.17	0.23*	-0.01	0.15	0.27*	0.32*
SP	-0.06	-0.05	0.09	-0.13	-0.07	0.03	-0.02	0.12
MY	-0.12	-0.11	0.28*	-0.18	-0.02	0.03	0.10	0.26*
AU	-0.06	-0.12	0.21*	0.20*	0.01	0.12	0.33*	-0.06
SA	0.09	0.34*	0.03	0.14	0.02	0.04	0.20*	0.14
JP-SP	-0.03	0.06	0.02	0.04	-0.02	-0.01	0.21*	0.00
MY	0.17	0.05	-0.02	-0.07	0.09	-0.04	0.51*	0.22*
AU	0.02	-0.19	0.03	0.38*	0.16	-0.05	0.36*	-0.26*
SA	-0.01	0.41*	0.06	0.24*	0.03	0.30*	0.36*	-0.02
SP-MY	0.19	0.01	0.54*	0.36*	-0.02	-0.75*	0.32*	0.23*
AU	-0.08	0.10	0.17	0.05	-0.25*	0.08	0.25*	0.17
SA	-0.53*	0.14	-0.14	-0.10	0.11	0.04	0.21*	0.37*
MY-AU	-0.01	-0.19	0.16	0.23*	0.01	0.13	0.37*	0.10
SA	-0.26*	-0.14	-0.20*	-0.03	0.11	0.04	0.31*	0.23*
AU-SA	0.20*	-0.02	0.18	0.05	-0.18	0.20*	0.42*	0.01

* Statistically significant at the 5 % level.
** GNP data are based on quarter end observations.

The relationships of other similar economic variables which include GNP, industrial production and Treasury bill are rather weak, having a relatively small number of significant correlation coefficients: 6 for both industrial production and Treasury bill and 10 for GNP (see Table 5.8).

Countries whose similar economic variables have a higher number of significant correlation coefficients (at the 5 percent significance level) are the United Kingdom (33), West Germany (32), France (32), Japan (32) and the United States (30), while the number of significant correlations of similar economic variables in less developed countries are relatively low: 29 (Norway), 24 (South Africa), 23 (both Singapore and Malaysia) and 22 (Australia).

Based on the degree of correlation of the similar economic variables and the number of significant pairs, the structure of economic activities between these countries can be explained as follows:

(1) The economic activities in the US are closer to those in European countries than they are to the Asia-Pacific region and South Africa;

(2) The relationship of economic activities within European counties appears to be strong;

(3) Economic activities in the UK are closer to those in continental Europe than to Asia-Pacific countries and South Africa;

(4) The degree of relationship between similar economic variables within Asia-Pacific, apart from Malaysia-Singapore, is relatively weak;

(5) Japan has a stronger economic tie with Europe and the US than with countries in Asia-Pacific and

(6) South Africa appears to be closer to Asian-Pacific countries than to the European countries and the US.

The above results are not surprising. Adler and Dumas (1973), Ripley (1973), Branch (1974), Solnik (1974), Panton, Lessig and Joy (1976) and Cho, Eun and Senbet (1986) claim that there is a core of international countries which have a higher degree of economic integration. It is argued that since these countries have a higher level of economic integration, their stock markets tend to move together. A potential systematic risk reduction may not be obtained from diversifying over the equities of such countries. Besides that, Levy and Sarnat (1970) and Lessard (1973) believe that some developing countries are not economically integrated with more developed countries.

The structures of economic relationship between these countries are confirmed by regression analysis as shown in Appendix 5.4.

The above analysis uses two variables in evaluating the movement of similar economic activities between two countries. However, to secure the evidence of combined effects of similar economic activities between all these countries, multiple regression model is considered. The results are shown in Appendix 5.5, as summarised in Table 5.9.

The results of the multiple regressions are consistent with the statistical analyses cited earlier, implying that there is a relationship between similar economic variables in these countries. As shown in Tables 5.9, a substantial number of slope coefficients are significant at the 5 percent level. The F-ratios test indicates that the multiple correlation coefficients are significant at the 5 percent level for the predictions of most variables (except GNP). The results also indicate that there are joint effects among the similar economic variables. On average, the estimated R-squared is 0.427 (adjusted), suggesting that the movement of any particular economic variables in these countries can be explained by the changes of similar economic variables from other countries.

TABLE 5.9

CASES OF SIGNIFICANT BETA AT THE 5 PERCENT LEVEL USING MULTIPLE REGRESSION ANALYSIS

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	g/p		+/-	-/-	-/-	-/-	-/-	-/-	-/-	+/-	-/-
	c/m		-/-	+/-	-/-	-/-	+/-	-/-	-/-	+/+	-/-
	t/u		+/-	-/+	-/+	+/+	+/-	+/-	-/-	+/-	-/+
	i/x		+/-	-/-	-/-	-/+	-/+	+/-	-/+	-/-	+/-
UK	g/p	+/-		-/-	-/-	-/-	-/-	-/+	-/-	+/-	-/-
	c/m	-/-		-/+	+/+	-/-	+/-	-/-	+/+	-/-	-/-
	t/u	+/-		-/+	-/+	-/-	-/+	-/-	-/-	-/-	-/-
	i/x	+/-		+/+	+/-	+/-	-/+	-/-	-/-	-/+	+/+
WG	g/p	-/-	-/-		-/+	-/-	-/-	-/-	-/-	-/-	-/-
	c/m	+/-	-/+		+/+	+/-	-/+	-/-	-/-	-/-	+/-
	t/u	-/+	-/+		+/+	-/+	-/-	-/-	-/-	-/-	+/-
	i/x	-/-	+/+		+/+	-/-	+/-	-/-	-/-	-/-	-/-
FR	g/p	-/-	-/-	-/+		-/+	-/-	-/-	-/-	-/+	-/+
	c/m	-/-	+/+	+/+		-/-	-/+	-/-	+/-	-/+	-/-
	t/u	-/+	-/+	+/+		-/+	-/-	+/-	-/-	-/-	-/-
	i/x	-/-	+/-	+/+		-/+	+/+	-/-	-/+	-/-	+/-
NW	g/p	-/-	-/-	-/-	-/+		-/+	-/-	-/-	-/+	-/+
	c/m	-/-	-/-	+/-	-/-		-/-	+/-	+/+	-/-	-/-
	t/u	+/+	-/-	-/+	-/+		-/-	-/-	-/-	-/-	-/-
	i/x	-/+	+/-	-/-	-/+		-/+	-/-	-/-	-/-	-/-
JP	g/p	-/-	-/-	-/-	-/-	-/+		+/-	-/-	-/+	-/+
	c/m	+/-	+/-	-/+	-/+	-/-		-/-	-/-	-/-	-/-
	t/u	+/-	-/+	-/-	-/-	-/-		-/-	-/-	+/-	-/+
	i/x	-/+	-/+	+/-	+/+	-/-		-/-	+/+	-/+	+/+
SP	g/p	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-	+/-
	c/m	-/-	-/-	-/-	-/-	+/-	-/-		+/+	-/-	-/-
	t/u	+/-	-/-	-/-	+/-	-/-	-/-		-/+	+/-	-/-
	i/x	+/-	-/-	-/+	-/-	-/-	-/-		+/-	-/-	-/+
MY	g/p	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/+	+/-
	c/m	-/-	+/+	-/-	+/-	+/+	-/-	+/+		-/+	-/-
	t/u	-/-	-/-	-/-	-/-	-/-	-/-	-/+		-/-	-/-
	i/x	-/+	-/-	-/-	-/+	-/-	+/+	+/-		-/-	-/-
AU	g/p	+/-	+/-	-/-	-/+	-/+	-/+	-/-	-/+		+/-
	c/m	+/+	-/-	-/-	-/+	-/-	-/-	-/-	-/+		+/-
	t/u	+/-	-/-	-/-	-/-	-/-	+/-	+/-	-/-		+/+
	i/x	-/-	-/-	-/-	-/-	-/-	-/+	-/-	-/-		+/-
SA	g/p	-/-	-/-	-/-	-/+	-/+	-/+	+/-	+/+	+/-	
	c/m	-/-	-/-	+/-	-/-	-/-	-/-	-/-	-/-	+/-	
	t/u	-/+	-/-	+/-	-/-	-/-	-/+	-/-	-/-	+/+	
	i/x	-/-	+/+	-/-	+/-	-/-	+/+	-/+	-/-	+/-	

Notes: (a) plus signs = significant at the 5 % level (b) minus signs = not significant at the above level (c) each sign follows the position of the indices at the beginning of the row, i.e g/p = GNP/IP, c/m = CP/MS, t/u = TB/UNEMP, i/x = IMP/EXP. (d) the number of significant slopes = 13 (GNP), 22 (IP), 28 (CP), 22 (MS), 22 (TB), 26 (UNEMP), 29 (IMP) and 29 (EXP) (e) the results of GNP are based on quarterly observations.

The evidence of joint effects of the similar economic variables is revealed further by the stepwise regression analysis. As shown in Appendix 5.6 and Table 5.10, although the stepwise regression produces a smaller number of significant variables, i.e. reduces the number from 191 to 116, the fundamental structure of economic relationship between these countries remains the same.

TABLE 5.10

CASES OF SIGNIFICANT BETA AT THE 5 PERCENT LEVEL DERIVED FROM STEPWISE REGRESSION ANALYSIS

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	g/p									+/	
	c/m		/+	+/			+/			+/+	
	t/u		+/	/+	/+	+/+	+/	+/		+/	/+
	i/x		+/	/+		/+	+/+	+/	/+		+/
UK	g/p										
	c/m			/+	+/+				+/+		
	t/u	+/		/+	/+		/+				
	i/x	+/		+/+	+/	+/	/+			/+	+/+
WG	g/p				/+						
	c/m	+/	/+		+/+	+/	/+				+/
	t/u	/+	/+		+/	/+					+/
	i/x		+/+		+/+		+/				
FR	g/p			/+		/+	/+			/+	/+
	c/m		+/+	+/+			/+		+/	/+	
	t/u	/+	/+	+/				+/			
	i/x		+/	+/+		/+	+/+			+/	
NW	g/p				/+		/+			/+	/+
	c/m			+/					/+	/+	
	t/u	+/+		/+							
	i/x	+/+	+/		/+						
JP	g/p					/+		+/		/+	/+
	c/m	+/	+/	/+	/+						
	t/u	+/	/+							+/	/+
	i/x	/+	/+	+/	+/+				+/	/+	/+
SP	g/p										+/
	c/m			+/					+/+		
	t/u	+/			+/				/+	+/	
	i/x	+/+							+/		/+
MY	g/p									/+	+/
	c/m		+/+		+/	+/		+/+		/+	
	t/u							/+			
	i/x	/+					+/	+/			/+
AU	g/p	+/	+/		/+	/+	/+		/+		
	c/m	+/+			/+				/+		+/
	t/u	+/					+/	+/			+/+
	i/x		+/				/+		+/		+/
SA	g/p					/+	/+	+/	+/+		
	c/m							/+	+/	+/	
	t/u	/+		+/			/+			+/+	
	i/x		+/+		+/		+/+		/+	+/	

Notes: (a) plus signs = significant at the 5 % level (b) each sign follows the position of the indices at the beginning of the row, i.e g/p = GNP/IP, c/m = CP/MS, t/u = TB/UNEMP, i/x = IMP/EXP. (d) the number of significant slopes = 7 (GNP), 21 (IP), 24 (CP), 24 (MS), 18 (TB), 25 (UNEMP), 29 (IMP) and 28 (EXP) (e) the analysis on GNP is based on quarterly data.

The results in Table 5.10 confirm that there is a form of economic integration between these selected countries. Most of the similar economic variables in the US, the UK, West Germany, France and Japan are correlated. In fact, the findings in this analysis are not totally unexpected. Ripley (1973) points out that some European countries are economically related to each other because there is a flexibility of capital movements and a closer similarity of income expectations. Furthermore, the evidence in this study also indicates that economic activities in Asian-Pacific countries tend to move independently except Singapore and Malaysia. Adler and Dumas (1983) argue that this phenomenon is common since developing countries tend to have some economic barriers and inflexibility of capital movements.

A further attempt to examine the linkage structure of similar economic activities in these countries is made by using a world (or an international) index. For this purpose, each national economic variable is regressed against the respective world economic indices. The regression results are shown in Appendix 5.7.

TABLE 5.11

CASES OF SIGNIFICANT RELATIONSHIP BETWEEN NATIONAL AND INTERNATIONAL ECONOMIC INDICES

	International Indices							
	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
National Indices:								
US	-	+	+	+	+	-	+	+
UK	-	-	+	+	+	-	+	+
WG	-	+	+	+	+	+	+	+
FR	-	+	+	+	+	-	+	+
NW	+	+	+	+	+	-	+	+
JP	-	+	+	+	+	-	+	+
SP	-	-	+	-	+	+	+	+
MY	-	+	+	-	+	+	+	+
AU	-	-	+	+	+	-	+	-
SA	-	+	+	-	+	-	+	+

Notes: (a) plus sign = significant at the 5 percent level and minus sign = not significant at the abovementioned level (b) quarterly observations are used for GNP.

Table 5.11 shows cases of significant relationship between national and international economic indices. The results indicate that most national economic variables from all countries are significantly related to the respective similar indices on an international basis at the 5 percent level. However, national economic variables from developed countries such as the US, Japan and European countries tend to move closely with the international indices. This implies that the international (or world) elements are present to a stronger extent in the economic activities of these countries than those of the Asian-Pacific region and South Africa.

Lessard (1976) and Adler and Dumas (1983) also point out that a significant portion of the national economic movements from developed countries is explained by the world factors. Therefore, the findings seem to suggest that the world factors play a major role to link the inter-country economic activities in some developed countries.

To confirm further the structure of economic integration, this study investigates the import and export relationship in a country pair. The results are tabulated in Appendix 5.8. The significant cases are transferred to Table 5.12. Appendix 5.8 presents the coefficients of two regression models: (1) regressing import variable from country i against export variable of country j and (2) regressing export variable from country i against import variable of country j. The results indicate that the two regression models produce a substantial number of significant parameters at the 5 percent level.

As shown in Table 5.12, import and export variables within European countries are closely related. Imports and exports of the US appear to move together with those of Australia and Japan. Countries in Asian-Pacific region also enjoy a considerable amount of import-export link with each other and with South Africa. Undoubtedly, this evidence reflects the existence of a relationship between the economic activities in these countries.

TABLE 5.12

CASES OF SIGNIFICANT RELATIONSHIP BETWEEN IMPORTS AND EXPORTS IN A COUNTRY PAIR

(R1 = regressing country i's imports against country j's exports and R2 = regressing country i's exports against country j's imports)

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	R1		−	−	−	−	−	−	−	+	−
	R2		+	+	+	+	+	+	+	+	−
UK	R1	+		+	+	+	−	+	+	−	+
	R2	−		+	+	+	+	−	+	+	+
WG	R1	+	+		+	+	+	+	+	−	+
	R2	−	+		+	+	+	−	−	−	−
FR	R1	+	+	+		+	+	+	−	−	−
	R2	−	+	+		+	+	−	+	+	−
NW	R1	+	+	+	+		−	−	−	+	+
	R2	−	+	+	+		+	+	+	+	−
JP	R1	+	+	+	+	+		+	+	−	+
	R2	+	−	+	+	−		+	+	−	+
SP	R1	+	−	−	−	+	+		+	−	+
	R2	−	+	+	−	−	+		+	+	+
MY	R1	+	+	+	+	+	+	+		−	+
	R2	−	+	+	−	−	+	+		+	+
AU	R1	+	+	+	+	+	−	+	+		+
	R2	+	−	−	−	+	−	−	−		+
SA	R1	−	−	−	−	−	+	+	+	+	
	R2	−	+	+	−	+	−	+	+	+	

Notes: plus signs show significant slopes at the 5 percent level, minus signs indicate insignificant slopes at the above level and no. of significant slopes equal 61 in (R1) and 60 in (R2).

5.4. The Stability of Similar Economic Variables

The fourth objective of this study is to examine whether the degrees of relationship between similar economic variables from these 10 countries are stable over time. For this purpose, three statistical techniques, namely (1) cointegration techniques (Engle and Granger [1987]) (2) the Box Chi-square statistic (Box [1949]) and (3) the Chow test (Chow [1960]), are employed. The results are reported in the following sections.

Results from testing H4,0: The level of any relationship observed between economic variables from each country does not change over time.

This study begins with an analysis based on cointegration technique. In order to test this statistical proposition, a unit root test for the indices of 8 economic variables from these countries are carried out by using Dickey-Fuller statistic.

TABLE 5.13

CASES OF REJECTION AND ACCEPTANCE OF NULL HYPOTHESIS AT THE 5 PERCENT SIGNIFICANCE LEVEL FOR PERIOD ONE/TWO - DF TEST FOR A UNIT ROOT IN ECONOMIC VARIABLE INDICES

		GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
US	IL	-/-	-/-	+/-	-/-	-/-	-/-	+/-	+/-
	PC	-/+	-/+	+/+	+/+	+/+	+/+	+/+	+/+
UK	IL	-/-	-/-	+/-	-/-	-/-	+/-	-/+	-/+
	PC	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
WG	IL	-/-	-/-	+/-	-/-	-/-	-/-	+/+	+/+
	PC	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
FR	IL	-/-	+/+	+/+	-/-	-/-	-/-	+/+	+/+
	PC	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
NW	IL	-/-	+/+	-/-	-/-	-/-	-/-	+/+	-/+
	PC	+/-	+/+	+/+	+/-	-/+	+/+	+/+	+/+
JP	IL	+/-	-/-	-/-	-/-	-/-	-/-	+/-	+/+
	PC	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
SP	IL	-/+	-/-	+/-	-/-	-/-	-/-	+/-	+/-
	PC	+/+	+/-	+/+	+/+	+/+	+/+	+/+	+/+
MY	IL	+/-	-/+	-/-	-/-	+/-	-/-	+/+	-/-
	PC	+/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+
AU	IL	-/-	-/-	-/-	-/-	+/-	+/+	-/+	+/-
	PC	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
SA	IL	-/-	-/+	-/-	-/-	-/-	+/+	+/+	+/-
	PC	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+

Notes: (a) minus signs show statistically insignificance at the 5 percent level, i.e. the null hypothesis of a unit root in economic variable indices is not rejected, while, plus signs indicate rejection of the null hypothesis (b) each pair has 2 periods, period 1/period 2 (c) IL=index level, PC= % change (d) GNP data are based on quarterly observations.

Appendix 5.9 contains the results of unit root tests for 8 economic variables (index levels and percentage changes) for 2 subperiods, 1980-1983 and 1984-1987. Table 5.13 below summarises the cases of rejection and acceptance of the null hypothesis.

When the tests are carried out using the index levels, there is evidence of a unit root in all series at the 5 percent level, except for the following cases:

(a) GNP from Japan and Malaysia for subperiod 1 and from Singapore for subperiod 2,

(b) IP from France and Norway for both periods 1 and 2 and from Malaysia for subperiod 2,

(c) CP from the United States and the United Kingdom for subperiod 1 and from France for both periods 1 and 2,

(d) TB from Malaysia and Australia for subperiod 1,

(e) UNEMP from the United Kingdom for subperiod 1 and from Australia and South Africa for both periods 1 and 2,

(f) IMP and EXP from most countries for both periods 1 and 2.

However, if the percentage change values are used, there does not appear to be a unit root in most cases. Therefore, the results support the null hypothesis of a unit root in the economic indices series. This implies that the economic indices from these countries are integrated of order one, I(1) for these two periods. The next step in the cointegration technique is to estimate the cointegration regression parameters and to test for a unit root in the cointegrating residuals.

Appendix 5.10 shows the results of estimating the cointegration regression and of testing for a unit root in the cointegrating residuals of the 8 economic indicators from the related 10 countries for 2 subperiods. The cases of rejection and acceptance of the null hypothesis of non-cointegration are reported in Table 5.14.

TABLE 5.14

CASES OF REJECTION AND ACCEPTANCE OF NULL HYPOTHESIS AT THE 5 PERCENT SIGNIFICANCE LEVEL FOR PERIOD ONE/TWO (INDEX LEVEL)

(Note: (a) plus signs denote statistical significance at the 5 percent level, i.e. the null hypothesis of non-cointegration is rejected, while, minus signs indicate statistical insignificance at the level, i.e the null hypothesis cannot be rejected.

GNP

	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US dw		+/+	+/+	+/+	-/+	+/+	+/-	-/+	+/+	+/+
adf		-/-	-/-	-/+	-/-	+/-	-/-	-/-	-/-	-/-
UK dw	+/+		+/+	+/+	-/+	+/+	+/-	-/+	+/+	+/+
adf	-/-		+/-	+/-	-/-	-/-	-/-	-/-	-/-	-/-
WG dw	+/+	+/+		+/+	-/+	+/+	+/-	-/+	+/+	+/+
adf	-/-	-/-		+/-	-/-	-/-	-/-	-/-	-/-	-/-
FR dw	+/+	+/+	+/+		-/+	+/+	+/-	-/+	+/+	+/+
adf	-/+	-/-	-/-		+/-	-/-	-/-	-/-	-/-	-/-
NW dw	+/+	+/+	+/+	+/+		+/+	+/+	+/+	+/+	+/+
adf	-/+	-/-	-/-	-/+		-/+	-/+	-/-	-/+	-/+
JP dw	+/+	+/+	+/+	+/+	-/+		+/-	-/+	+/+	+/+
adf	+/-	-/-	-/-	-/-	-/+		-/-	-/-	-/-	-/-
SP dw	+/+	+/+	+/+	+/+	+/+	+/+		+/+	+/+	+/+
adf	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-
MY dw	+/+	+/+	+/+	+/+	+/+	+/+	+/-		+/+	+/+
adf	-/-	-/-	-/-	-/-	-/+	-/-	-/-		-/-	-/-
AU dw	+/+	+/+	+/+	+/+	-/+	+/+	+/-	-/+		+/+
adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-
SA dw	+/+	+/+	+/+	+/+	-/+	+/+	+/+	-/+	+/+	
adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	

IP

	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US dw		-/+	-/+	-/+	-/+	-/+	-/-	-/+	-/-	-/-
adf		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
UK dw	-/+		-/+	+/+	+/+	+/+	-/-	-/+	-/+	-/-
adf	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
WG dw	+/+	+/+		+/+	+/+	+/+	+/+	+/+	+/+	+/+
adf	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-
FR dw	+/+	+/+	+/+		+/+	+/+	+/+	+/+	+/+	+/+
adf	-/+	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-
NW dw	+/+	+/+	+/+	+/+		+/+	+/+	+/+	+/+	+/+
adf	-/-	-/+	-/-	-/-		-/-	-/-	-/-	-/-	-/-
JP dw	-/+	+/+	-/+	-/+	+/+		-/-	+/+	-/+	-/-
adf	-/-	-/-	-/-	-/-	-/-		-/+	-/-	-/-	-/-
SP dw	-/-	-/-	-/-	-/-	-/+	-/-		-/-	-/-	-/-
adf	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-
MY dw	+/+	+/+	+/+	+/+	+/+	+/+	-/+		+/+	-/+
adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-
AU dw	-/+	-/+	+/+	-/+	+/+	-/+	-/+	+/+		+/+
adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-
SA dw	-/+	-/+	-/+	-/+	-/+	-/+	+/+	-/+	-/+	
adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	

Table 5.14 - continued

(b) dw = Durbin Watson statistic and adf = augmented Dickey-Fuller statistics (c) signs on the left and the right are respectively shown for period 1 and 2).

CP

	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US dw		+/-	-/-	-/-	-/-	+/+	-/-	+/+	-/-	-/-
adf		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
UK dw	+/-		-/-	-/+	-/-	+/+	-/-	+/+	-/-	-/-
adf	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
WG dw	-/-	-/-		-/-	+/-	+/+	-/-	-/-	-/-	-/-
adf	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-
FR dw	-/-	-/+	-/-		+/-	+/+	-/-	-/+	-/-	-/-
adf	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-
NW dw	-/-	-/-	+/-	+/-		+/-	-/-	-/-	-/-	+/-
adf	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-
JP dw	+/+	+/+	+/+	+/+	+/+		+/-	+/+	+/+	+/+
adf	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-
SP dw	-/+	-/+	-/-	-/+	-/+	+/+		-/+	-/+	-/+
adf	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-
MY dw	+/+	+/+	-/+	-/+	-/+	+/+	-/+		-/+	-/+
adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-
AU dw	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/+		+/-
adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-
SA dw	-/-	-/-	-/-	-/-	+/-	+/-	-/-	-/+	+/-	
adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	

MS

	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US dw		+/+	+/+	+/+	+/-	+/+	+/+	+/-	-/-	+/-
adf		+/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
UK dw	+/+		+/+	+/+	+/+	+/+	+/+	+/+	-/+	+/-
adf	+/-		-/-	+/-	-/-	-/-	-/-	-/-	-/-	-/-
WG dw	+/+	+/+		+/+	+/+	+/+	+/+	+/+	+/+	+/-
adf	-/-	-/-		-/-	-/-	-/+	-/-	-/-	-/-	-/-
FR dw	+/+	+/+	+/+		+/+	+/+	+/+	+/+	-/+	+/+
adf	-/-	+/-	-/-		-/-	-/-	+/-	+/-	-/-	-/-
NW dw	+/+	+/+	+/+	+/+		+/+	+/+	+/-	+/+	+/-
adf	-/-	-/+	-/-	-/-		-/-	+/-	-/-	-/-	-/-
JP dw	+/+	+/+	+/+	+/+	+/+		+/+	+/+	+/+	+/+
adf	-/-	-/+	-/+	+/-	+/-		+/-	-/-	-/-	+/-
SP dw	+/+	+/+	+/+	+/+	+/+	+/+		+/+	+/+	+/+
adf	-/-	+/-	-/-	+/-	+/-	+/-		-/-	-/-	-/-
MY dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+		+/+	+/+
adf	-/-	-/-	-/-	+/-	+/-	-/-	-/-		-/-	-/-
AU dw	+/-	-/+	+/+	-/+	+/-	+/+	+/+	+/+		+/-
adf	-/-	-/-	-/-	-/-	+/-	-/-	-/-	-/-		-/-
SA dw	+/-	+/-	+/-	+/-	+/+	+/+	+/+	+/-	+/-	
adf	-/-	-/-	-/-	-/-	-/-	+/-	+/-	-/-	-/-	

Table 5.14 - continued

TB

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	dw		-/-	+/+	-/+	-/+	-/-	+/+	-/-	+/-	-/-
	adf		-/-	+/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
UK	dw	-/+		-/+	-/+	-/+	-/+	-/+	+/+	+/+	-/+
	adf	+/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
WG	dw	-/+	-/-		-/-	-/+	-/-	-/-	-/+	-/-	-/-
	adf	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-
FR	dw	-/+	-/-	+/-		-/+	-/-	-/-	-/-	-/-	+/-
	adf	-/-	-/-	-/-		-/+	-/-	-/-	-/-	-/-	-/-
NW	dw	-/+	-/-	-/+	-/+		+/+	-/+	-/+	+/+	-/-
	adf	-/+	-/-	-/+	-/+		-/-	-/-	-/-	-/-	-/-
JP	dw	-/-	+/-	-/-	-/-	+/-		-/-	-/-	+/+	-/-
	adf	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-
SP	dw	+/+	+/-	+/+	-/+	+/+	-/-		+/-	+/-	-/-
	adf	-/-	-/-	-/+	-/-	-/-	-/-		-/-	-/-	-/-
MY	dw	-/-	+/-	-/+	-/-	-/-	-/+	-/-		+/+	-/-
	adf	+/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-
AU	dw	+/+	+/-	+/+	+/-	+/+	+/+	+/+	+/+		+/-
	adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-
SA	dw	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	
	adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	

UNEMP

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	dw		-/+	-/-	-/+	-/+	+/-	-/+	-/+	+/-	+/-
	adf		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
UK	dw	-/+		-/-	-/-	-/-	-/-	-/-	-/-	+/-	+/-
	adf	-/-		-/-	+/-	-/-	-/-	+/-	+/-	-/-	-/-
WG	dw	-/+	-/+		-/+	-/+	+/+	-/+	-/+	+/+	+/+
	adf	-/-	-/-		-/+	-/+	-/-	-/+	-/+	-/+	-/+
FR	dw	-/+	-/-	+/-		-/-	-/-	-/-	-/-	+/-	-/-
	adf	-/+	+/+	-/+		-/+	+/+	+/-	-/+	-/+	-/+
NW	dw	-/-	-/-	+/-	+/-		+/-	+/+	-/-	+/-	+/-
	adf	-/-	-/-	-/-	-/-		+/-	+/-	+/-	-/-	-/-
JP	dw	+/+	+/+	+/+	+/+	+/+		+/+	-/+	+/+	+/+
	adf	-/-	+/-	+/-	+/-	+/-		+/-	+/-	-/-	-/-
SP	dw	-/-	-/-	-/-	-/-	-/+	+/-		-/+	-/-	-/-
	adf	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-
MY	dw	-/-	-/-	-/-	-/-	-/-	-/-	-/+		-/-	-/-
	adf	-/-	-/-	-/-	-/-	+/-	-/-	-/-		-/-	-/-
AU	dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+		+/+
	adf	-/+	+/+	+/+	-/+	+/+	-/+	-/+	-/+		-/-
SA	dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	
	adf	+/+	-/+	+/+	+/+	+/+	-/+	-/+	-/+	-/-	

Table 5.14 - continued

IMP

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	dw		+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
	adf		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
UK	dw	-/+		+/+	+/+	+/+	-/+	+/+	+/+	+/+	-/+
	adf	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
WG	dw	+/+	+/+		+/+	+/+	+/+	+/+	+/+	+/+	+/+
	adf	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-
FR	dw	+/+	+/+	+/+		+/+	+/+	+/+	+/+	+/+	+/+
	adf	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-
NW	dw	+/+	+/+	+/+	+/+		+/+	+/+	+/+	+/+	+/+
	adf	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-
JP	dw	+/+	+/+	+/+	+/-	+/+		+/-	+/-	+/+	+/+
	adf	+/-	+/-	+/-	+/-	+/-		+/-	+/-	+/-	+/-
SP	dw	+/+	+/+	+/+	+/+	+/+	+/+		+/+	+/+	+/+
	adf	-/-	+/-	+/-	+/-	-/-	-/-		+/-	-/-	-/-
MY	dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+		+/+	+/+
	adf	-/-	-/-	-/-	+/-	-/-	-/-	-/-		-/-	-/-
AU	dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+		+/+
	adf	-/-	-/-	+/-	+/-	-/+	-/-	-/-	-/-		-/-
SA	dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	
	adf	-/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	

EXP

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	dw		+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
	adf		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
UK	dw	+/+		+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
	adf	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
WG	dw	+/+	+/+		+/+	+/+	+/+	+/+	+/+	+/+	+/+
	adf	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-
FR	dw	+/+	+/+	+/+		+/+	+/+	+/+	+/+	+/+	+/+
	adf	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-
NW	dw	+/+	+/+	+/+	+/+		+/+	+/+	+/+	+/+	+/+
	adf	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-
JP	dw	+/+	+/+	+/+	+/+	+/+		+/+	+/+	+/+	+/+
	adf	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-
SP	dw	+/+	+/+	+/+	+/+	+/+	+/+		+/-	+/+	+/+
	adf	-/-	+/-	+/-	+/-	+/-	+/-		+/-	-/-	-/-
MY	dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+		+/+	+/+
	adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-
AU	dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+		+/+
	adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-
SA	dw	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	
	adf	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	

Paradoxically, the evidence in Table 5.14 indicates that Durbin Watson (DW) and the Augmented Dickey-Fuller (ADF) statistics produce the opposite results. Based on the DW, most cases in period 1 and 2 are statistically significant at the 5 percent level. Therefore, the null hypothesis of non-cointegration and the hypothesis of I(1) residuals in the cointegrating regression can be rejected for both subperiods. However, using the ADF test, most cases become insignificant at the 5 percent level and hence the null hypothesis of non-cointegration cannot be rejected. For the purpose of understanding the overall picture of cointegrating phenomenon, we summarise the above results in the Table 5.15 below.

TABLE 5.15

SUMMARY OF TEST STATISTICS AT THE 5 PERCENT SIGNIFICANCE LEVEL

Statistics /Region	+/+	-/-	+/-	-/+	No. of Tests	d.f.
		GNP				
dw	69	0	7	14	90	
adf	0	74	6	10	90	
SUB-TOTAL	69	74	13	24	180	32
Europe	9	7	4	4	24	
Asia Pacific	7	12	3	2	24	
US-JP-Europe	20	13	5	2	40	
Others	33	42	1	16	92	
		IP				
dw	45	15	0	30	90	
adf	0	87	0	3	90	
SUB-TOTAL	45	102	0	33	180	95
Europe	11	11	0	2	24	
Asia Pacific	4	15	0	5	24	
US-JP-Europe	11	19	0	10	40	
Others	19	57	0	16	92	
		CP				
dw	18	41	13	18	90	
adf	0	90	0	0	90	
SUB-TOTAL	18	131	13	18	180	95
Europe	0	18	4	2	24	
Asia Pacific	4	14	1	5	24	
US-JP-Europe	8	28	2	2	40	
Others	6	71	6	9	92	

Table 5.15 - continued

Statistics /Region	+/+	-/-	+/-	-/+	No. of Tests	d.f.
		MS				
dw	69	1	16	4	90	
adf	0	66	20	4	90	
SUB-TOTAL	69	67	36	8	180	95
Europe	12	9	2	1	24	
Asia Pacific	12	10	2	0	24	
US-JP-Europe	20	12	5	3	40	
Others	25	36	27	4	92	
		TB				
dw	17	30	21	22	90	
adf	0	82	3	5	90	
SUB-TOTAL	17	112	24	27	180	95
Europe	0	13	1	10	24	
Asia Pacific	5	16	2	1	24	
US-JP-Europe	0	28	4	8	40	
Others	12	55	17	8	92	
		UNEMP				
dw	30	30	13	17	90	
adf	9	46	14	21	90	
SUB-TOTAL	39	76	27	38	180	95
Europe	1	13	4	6	24	
Asia Pacific	5	10	2	7	24	
US-JP-Europe	7	18	6	9	40	
Others	26	35	15	16	92	
		IMP				
dw	84	0	3	3	90	
adf	0	72	16	2	90	
SUB-TOTAL	84	72	19	5	180	95
Europe	12	12	0	0	24	
Asia Pacific	11	7	6	0	24	
US-JP-Europe	16	15	5	4	40	
Others	45	38	8	1	92	
		EXP				
dw	89	0	1	0	90	
adf	0	84	6	0	90	
SUB-TOTAL	89	84	7	0	180	95
Europe	12	12	0	0	24	
Asia Pacific	11	10	3	0	24	
US-JP-Europe	20	20	0	0	40	
Others	46	42	4	0	92	
GRAND TOTAL	430	718	139	153	1440	
EUROPE	57	95	15	25	192	
ASIA PACIFIC	59	94	19	20	192	
US-JP-EUROPE	93	153	27	47	320	
OTHERS	221	376	78	61	736	

dw & adf= Durbin Watson & Augmented Dickey-Fuller statistics.

Table 5.15 summaries the statistical results of a similar economic variable relationship in the long run. The following conclusions could be drawn from the findings:

a) Throughout both periods, 430 out of 1440 cases are statistically significant at the 5 percent level. There are 718 cases which are not statistically significant during the same period. Therefore, no strong statistical evidence can be used to reject the null hypothesis of non-cointegration. This implies that most of the inter-country economic activities are not integrated in a long run (or their relationships are not stable in a long period).

b) The economic activities within developed countries as well as the intra-continental European economic activities and also some economies within Asia-Pacific region, especially the Singaporean and Malaysian coupling tend to be integrated over these 2 periods.

c) There evidence also shows that the inter-country economic activities tend to be cointegrated in period two. As indicated in Table 5.15, there are 139 and 153 significant cases in period one and two respectively.

In order to draw conclusions about the stability of inter-country economic relationship, this study re-uses the Box Chi-square statistic (1949). According to this technique, the covariance matrices of 8 similar economic variables from 10 countries are considered stable over any two time periods if the sample covariance matrices of these economic variables are drawn from the same population.

The covariance matrices of the four 24 months estimation periods of 8 similar economic variables are given in Appendix 5.11. The Box Chi-square statistics for testing the stability of the covariance are presented in Table 5.16. In the table, each cell entry is the statistic relating to the similarity between two covariance matrices. The column heading denotes the variable, the cell entries relate to the covariances of the economic variable between each possible pair of countries. The rows identify the covariance periods. Thus 33.33 is the Chi-

square value relating to the covariances of each country with GNP sampled from periods 1 and 2. Therefore, the degree of freedom = (number of covariances X number of countries)/2.

TABLE 5.16

RESULTS OF THE BOX TEST FOR THE STABILITY OF COVARIANCE MATRIX OF THE 8 SIMILAR ECONOMIC VARIABLES FROM THE 10 COUNTRIES FOR 4 EQUAL LENGTH PERIODS

PERIOD	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
I-II	33.33	13.09	2.99	1.48	11.43	99.26	2.28	0.08
I-III	24.00	6.86	3.00	0.58	30.56	45.33	5.42	0.15
I-IV	73.64	51.14	3.00	89.98	19.21	129.02	2.73	0.08
II-III	1.18	1.20	0.00	0.28	6.42	26.00	0.73	0.01
II-IV	137.77	18.80	0.00	100.99	1.32	8.32	0.02	0.01
III-IV	126.78	27.34	0.00	95.42	2.03	45.91	0.49	0.01

Notes: (a) 4 equal sub-periods are (I) Jan 1980 to Dec 1981, (II) Jan 1982 to Dec 1983, (III) Jan 1984 to Dec 1985 and (IV) Jan 1986 to Dec 1987 (b) Degree of freedom = 55.

Results in Appendix 5.11 would appear, at first sight, to indicate that the covariance matrices of the economic variables for similar pairs over any two subperiods are different. The degrees of the differences of covariance matrices for similar pairs in non-consecutive periods tend to be larger than those in consecutive periods. However, the results of Box test in Table 5.16 reveal that most covariance matrices of economic variables over two subperiods are not significantly different at the 5 percent level. Therefore, the hypothesis that the relationship between the similar economic variables are stable over the period examined cannot be rejected.

It is also important to note that the Chi-square statistics in Table 5.16 tend to increase as time increases and become significantly different at the 5 percent level for the following

cases: (a) GNP - period I/IV & II/IV (b) MS - period I/IV & II/IV and (c) UNEMP - period I/IV. The fact that the statistics for non-consecutive periods are higher than the statistics for consecutive periods is indicative of a change in the covariance matrices. This phenomenon is not totally unexpected. As suggested by Grubel and Fadner (1971) and Ripley (1973), in the long run, some unique characteristics may affect the stability of the economic relationship between countries.

Finally, the stability of economic relationship of these 10 countries is examined by employing the F test as proposed by Chow (1960). This test is, in fact, to find out whether the slope coefficients of 8 similar economic variables from these countries for period one and two are significantly different. The coefficients for period 1 and 2 and the observed F ratios are given in Appendix 5.12.[11] The significant cases at the 5 percent level are summarised in Table 5.17.

The results of the Chow test show that almost all coefficients of the similar economic variables from these 10 countries for period 1 and 2 are not statistically different at the 5 percent level. As indicated in the Appendix 5.12, nearly all the observed F ratios are smaller than 3.09 (the critical value of F statistic at the 5 percent significance level with 92 degrees of freedom). Therefore, the economic relationships being studied do not change significantly over these two sub-periods. Hence, the findings support the earlier analyses which suggest that the relationships between similar economic variables are stable over the relatively short term.

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[11]The application of the Chow test is considered valid in this analysis because most of the errors in the regression equation have a common variance (σ_e^2). As shown in Appendix 5.13, most White's statistical test supports that there is no significant heteroscedasticity in errors.

TABLE 5.17

THE F-CHOW TEST FOR 8 ECONOMIC VARIABLES FOR PERIOD ONE/TWO

		US	UK	WG	FR	NW	JP	SP	MY	AU	SA
US	g/p		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	c/m		+/-	+/-	-/-	+/-	+/-	+/-	+/-	+/-	+/-
	t/u		-/-	-/-	-/-	-/-	+/-	-/-	-/-	-/-	-/-
	i/x		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
UK	g/p	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	c/m	-/+		-/-	-/-	+/-	+/-	+/-	+/-	+/-	+/-
	t/u	-/+		-/+	-/+	+/+	-/+	-/+	-/+	-/+	-/-
	i/x	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
WG	g/p	-/-	-/-		+/-	-/-	-/-	-/-	-/-	-/-	-/-
	c/m	+/-	+/-		+/-	+/+	+/-	+/-	+/-	+/-	+/-
	t/u	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-
	i/x	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-	-/-
FR	g/p	+/-	+/-	+/+		+/+	+/-	+/-	+/-	+/-	+/+
	c/m	+/-	+/+	+/-		+/-	+/+	+/-	+/-	+/-	+/-
	t/u	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-
	i/x	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-	-/-
NW	g/p	-/-	-/-	-/-	+/+		-/-	-/-	-/-	-/-	-/-
	c/m	-/-	+/-	-/-	-/-		-/-	+/-	+/-	+/-	+/-
	t/u	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-
	i/x	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-	-/-
JP	g/p	-/-	-/-	-/-	-/+	-/-		-/-	-/-	-/-	-/-
	c/m	-/-	-/-	-/-	-/+	-/-		-/-	+/-	-/-	-/-
	t/u	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-
	i/x	+/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-	-/-
SP	g/p	-/-	+/+	-/-	-/-	+/-	+/-		-/-	+/-	+/-
	c/m	-/-	+/-	-/-	-/-	+/-	+/-		-/-	+/-	+/-
	t/u	-/-	-/-	-/-	-/-	-/-	-/-		-/+	+/+	-/-
	i/x	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-	-/-
MY	g/p	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-
	c/m	+/-	+/-	+/-	-/+	+/-	+/-	+/-		+/-	+/-
	t/u	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-
	i/x	-/-	-/-	-/-	-/-	-/-	-/-	-/-		-/-	-/-
AU	g/p	-/-	-/-	-/-	-/+	-/-	-/-	-/-	-/-		-/-
	c/m	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-		+/-
	t/u	-/-	-/-	-/-	-/-	-/-	-/+	-/+	-/+		-/+
	i/x	-/-	-/-	-/-	-/-	+/-	+/-	+/-	-/-		-/-
SA	g/p	-/-	-/-	-/-	-/+	-/-	-/-	-/-	-/-	-/-	
	c/m	-/-	-/-	-/-	+/-	-/-	-/-	-/-	-/-	-/-	
	t/u	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	
	i/x	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	

Notes: (a) plus signs = significant at the 5 % level (b) minus signs = not significant at the above level (c) each sign follows the position of the indices at the beginning of the row, i.e g/p = GNP/IP, c/m = CP/MS, t/u = TB/UNEMP, i/x = IMP/EXP.

5.5. Consistent Movements in Equity Markets and Economic Variables

This section examines whether there is a consistent relationship between the comovements of both equity markets and economic variables from these 10 countries. In order to carry out this investigation, 3 statistical techniques, namely canonical correlations, factor analysis and multiple regression are applied.

The canonical correlations procedure is used to identify linear combinations of dependent variables in the first set (stock markets) that are most highly correlated to linear combinations of independent variables in the second set (economic variables). The factor analysis is allowed to find a general variable or factor that explains variations among the equity markets and the economic variables, while regression analysis is employed to measure a significant relationship between the common factors (factor scores) of equity markets and those of economic variables. The results of these statistical procedures are presented in the following sections.

Results from testing H5,0: The comovements of both equity markets and economic indicators from these countries are not consistent.

The results of canonical correlation between stock markets and each of economic variable (GNP, IP, CP, MS, TB, UNEMP, IMP and EXP) are given in Appendix 5.14.

Each set of canonical correlations analysis produces the number of canonical variates, eigenvalues, the estimated canonical correlations, statistical tests (based on Wilks' lambda & Chi-square) and the correlation coefficients of each original variable with each of the canonical variates.

The results in Appendix 5.14 show that only the first canonical correlation between the stock market returns and the Treasury bill rates is significant at the 5 percent level. This canonical correlation, which is 0.6572, indicates that the first canonical variates share about 43 percent of their variance (its eigenvalue). Looking at the loadings of individual (original) variables on the canonical variates shows that the canonical variates largely load on market returns and Treasury bills from countries which have a developed capital markets and a relatively free capital movement. These countries include US, UK, Norway, Japan, Singapore, Malaysia and Australia in the first set (market returns) and US, West Germany, France, Japan, Malaysia, Australia and South Africa in the second set (Treasury bills).

However, other cases of canonical correlations in Appendix 5.14 are not statistically significant at the 5 percent level. Therefore, the above canonical correlation analysis is unable to provide evidence of a consistent relationship between the comovements of equity markets and those of economic variables from these countries.

To provide further evidence of the above phenomenon, this study employs factor analysis and regression model. The results of factor analysis are tabulated in Appendix 5.15. There are 9 sets of factor analysis results in Appendix 5.15, i.e. 1 set for stock market returns plus 8 sets for the economic indicators. The results of factor analysis in this study are based on Varimax rotation. This type of rotation is chosen because it attempts to simplify the factor structure by making all values close to either 0 or 1.

For stock market returns, the results show that over 57 percent of the common movement is accounted for by the first two factors. It is noted that the first factor loads heavily on market returns from US, UK, Australia and to some extent from 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.

For the 8 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 GNP, IP (industrial production), TB (Treasury bills) and UNEMP (unemployment), while CP (consumer prices), MS (money supply) and IMP (imports) each has 3 factors and EXP (exports) owns only 2 factors. Countries whose economic indicators load highly on each common factor are as follows:

a) GNP:
Factor 1 - Singapore and Malaysia
2 - West Germany, France, Norway and Malaysia
3 - UK and Australia
4 - US, Japan and Australia
5 - Norway and Japan

b) IP:
Factor 1 - West Germany, France, Norway, Japan, South Africa and US
2 - Japan, Malaysia and South Africa
3 - UK, West Germany, Norway and Malaysia
4 - UK, Norway and South Africa
5 - US, UK, Singapore and Australia

c) CP:
Factor 1 - US, West Germany, France, Singapore and Malaysia
2 - US, UK, West Germany, France and Japan
3 - US, Norway, Australia and South Africa

d) MS:
Factor 1 - US, France, Norway, Japan and Australia
2 - UK, West Germany, Japan and South Africa
3 - Singapore and Malaysia

e) TB:
Factor 1 - US, West Germany, France, Singapore and South Africa
2 - West Germany, Japan and Australia
3 - US, UK and Australia
4 - UK, Japan and Malaysia
5 - Malaysia and South Africa

f) UNEMP:
Factor 1 - US, UK, West Germany and Norway
2 - Singapore, Malaysia and UK
3 - US, Japan and South Africa
4 - US and France
5 - Australia and South Africa

g) IMP:
Factor 1 - UK, West Germany, France, Norway, Japan and Australia
2 - West Germany, Japan, Singapore, Malaysia, Australia and South Africa
3 - US, UK, Singapore, Australia and South Africa

h) EXP:
Factor 1 - US, UK, West Germany, France, Norway and Japan
2 - US, UK, Singapore, Malaysia, Australia and South Africa

It is noted that countries whose economic indicators have large weights in the same common factors are those whose economic structure are similar. For example (see the above factor loadings), 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. Results of testing the relationship between stock market and economic variable factors derived from regression analysis are given in Appendix 5.16.

Except for GNP, the movements of most economic variable factors are related to those of the stock market factors. It is also interesting to note that the first factor of stock market has a stronger link than the second one to the economic variable factors. As shown in Table 5.18, the relationships between the first factor of stock market and 4 factors of economic variables, (i.e. the fourth factor of IP, the second factor of MS, the first factor of TB and the first factor of UNEMP) are significant at the 5 percent level. While, the following 11 economic factors, namely factor 2, 3, and 5 of IP, factor 1 of CP, factor 2, 3 and 5 of TB, factor 3 and 5 of UNEMP, factor 1 of IMP and factor 2 of EXP are significantly correlated with the first factor of the stock market returns at the 10 percent significance level.

TABLE 5.18

CASES OF SIGNIFICANT RELATIONSHIP BETWEEN STOCK MARKET & ECONOMIC VARIABLE COMMON FACTORS

	Market Factors (rotated)	
Econ.Factors	Factor 1	Factor 2
IP: Factor 2		
Factor 3	*	
Factor 4		
Factor 5	*	
CP: Factor 1		
MS: Factor 2		
Factor 3	**	*
TB: Factor 1	**	
Factor 2		
Factor 3		
Factor 5	*	
UN: Factor 1		
Factor 3		
Factor 4		
Factor 5	*	*
IM: Factor 1	*	
EX: Factor 2	*	

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

The linkage between the second factor of the stock market and the economic variable factors are noticeably weaker. In order to investigate this phenomenon further, stepwise regressions are carried out. The results of the regression analysis are reported in Table 5.19. From the results of stepwise regression, there is evidence which shows that the economic variable factors are significantly related to the second factor of stock market returns. These economic variable factors are: (1) money supply's third factor and unemployment's fifth factor at the 5 percent significance level and (2) industrial production's third factor and the fifth factors of treasury bill and unemployment at the 10 percent level. Besides, the results of stepwise regression also produce some changes in the relationship between the factors of market returns and those of economic variables. In this analysis, the economic variable factors which have a significant relationship with the first factor of market returns are: factor 5 of

TB, factor 3 of MS and factor 2 and 5 of UNEMP (at the 5 percent significance level) and factor 2 of IP (at the 10 percent significance level).

TABLE 5.19

RESULTS OF STEPWISE REGRESSION

(i.e regressing stock market factors against economic variable factors)

	Market Factor (rotated)	
Economic Factors	Factor 1	Factor 2
a	0.041	-0.081
b (IP: factor 2)		
t-value		
b (IP: factor 3)		-0.186
t-value		-1.679*
b (TB: factor 5)	-0.230	
t-value	-2.118**	
b (MS: factor 3)		0.265
t-value		2.402**
b (UNEMP: factor 2)	-0.199	
t-value	-2.796**	
b (UNEMP: factor 5)	0.166	-0.207
t-value	2.350**	-2.037**
R-square (adj)	0.159	0.092
R-square	0.192	0.127
F-ratio	5.943	3.650
DW	1.780	1.420

** Statistically significant at the 5 percent level
* Statistically significant at the 10 percent level

The evidence from both regression analyses seems to suggest that the covariation of similar economic variables has a significant influence over the comovement of stock markets. In general, the results also reveal that the source of covariations of both stock markets and economic variables are consistent and attributed to the same common country factors.

Countries that enter dominantly into the related economic variable factors are almost similar to those which enter into each of the market return factors.

As shown in the earlier factor analysis, the first factor of market returns consist of variables from the US, the UK, Australia, Norway, France and to some extent from West Germany, Singapore, South Africa and Japan. The economic indices from these countries are also found in the following related economic variable factors: (1) the fifth factors of IP (2) the third factors of MS (3) the first factor of TB and (4) the first and second factors of UNEMP. Meanwhile the second factor of market returns, together with the 4 related economic variable factors (i.e. the third factor of IP and MS and the fifth factor of TB and UNEMP) load consistently on the data from Malaysia, Singapore and Australia.

To demonstrate consistency in the source of covariation between stock markets and economic variables, market returns are regressed on economic variable factors. The results are reported in Table 5.20.

Regression analysis in Table 5.20 produces similar common country factors in the covariation. Since data from the US, the UK, France, Norway, Australia and South Africa enter into factor 5 of IP, factor 3 of MS, factor 1 of TB and factor 1 and 2 of UNEMP, it is, therefore, not surprising to find out that these economic variable factors have a significant effect on the market returns of those countries. Furthermore, market returns from Malaysia, Singapore and Australia are significantly correlated to factor 3 of IP and MS and factor 5 of TB and UNEMP. This correlation is expected to exist because the economic variable factors are commonly shared with the economic data from Malaysia, Singapore and Australia.

TABLE 5.20

THE EFFECTS OF ECONOMIC VARIABLE FACTORS ON STOCK MARKET RETURNS (RESULTS OF REGRESSING MARKET RETURNS ON ECONOMIC VARIABLE FACTORS)

	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
a	0.98	1.42	1.56	1.65	1.75	1.61	0.76	0.29	1.34	1.29
IP FACTOR:										
b1 (factor 1)	-0.12	-0.01	0.58	0.23	0.86	0.63	0.08	-0.61	0.68	-1.17
t-value	-0.29	-0.01	1.01	0.31	1.13	1.28	0.10	-0.68	1.12	-1.67
b2 (factor 2)	0.48	0.36	0.94	0.16	-0.02	0.91	0.06	0.33	0.74	-0.13
t-value	1.07	0.65	1.59	0.20	-0.03	1.81	0.07	0.36	1.17	-0.18
b3 (factor 3)	-0.32	-0.47	0.04	-1.25	-1.33	-0.38	-0.22	-2.11	-0.99	-1.15
t-value	-0.67	-0.79	0.06	-1.48	-1.59	-0.71	-0.23	-2.11*	-1.48	-1.48
b4 (factor 4)	0.50	0.31	-0.21	0.60	1.69	-0.06	1.54	0.53	1.53	0.64
t-value	0.96	0.48	-0.30	0.66	1.87	-0.11	1.54	0.49	2.10*	0.77
b5 (factor 5)	0.28	-0.34	0.71	0.19	1.84	0.41	1.34	0.52	0.68	0.73
t-value	0.64	-0.61	1.22	0.25	2.39*	0.81	1.57	0.56	1.10	1.02
MS FACTOR:										
b6 (factor 1)	0.25	-0.36	-0.72	-0.26	-0.86	-0.13	0.36	1.28	-0.63	0.52
t-value	0.50	-0.57	-1.09	-0.29	-0.99	-0.23	0.37	1.22	-0.90	0.65
b7 (factor 2)	0.94	0.26	-0.37	-0.49	0.27	-0.15	1.38	0.21	-0.76	-0.45
t-value	1.73	0.39	-0.52	-0.52	0.28	-0.25	1.33	0.18	-1.01	-0.52
b8 (factor 3)	0.91	0.54	1.01	0.68	1.28	0.46	0.42	3.59	2.57	1.01
t-value	1.67	0.81	1.40	0.72	1.35	0.75	0.40	3.17*	3.37*	1.14
TB FACTOR:										
b9 (factor 1)	-1.20	-0.37	-0.79	-1.34	-0.15	0.08	0.95	-0.16	-1.09	-1.61
t-value	-2.76*	-0.69	-1.38	-1.78	-0.21	0.17	1.14	-0.18	-1.81	-2.33*
b10 (factor 2)	-0.63	-0.23	-0.67	-0.17	0.61	-0.42	-0.01	0.05	-0.07	0.58
t-value	-1.42	-0.42	-1.15	-0.22	0.79	-0.84	-0.01	0.05	-0.12	0.82
b11 (factor 3)	0.42	0.21	0.23	0.25	-0.51	-0.44	1.45	-0.58	0.22	0.13
t-value	0.94	0.37	0.39	0.32	-0.65	-0.86	1.67	-0.62	0.34	0.18
b12 (factor 4)	0.38	0.42	0.75	0.18	0.76	-0.12	-0.67	-0.47	-0.10	0.24
t-value	0.87	0.77	1.30	0.23	1.00	-0.25	-0.80	-0.51	-0.16	0.34
b13 (factor 5)	-0.02	-1.03	-0.25	-1.24	1.27	-0.29	-0.65	3.21	-1.86	-1.56
t-value	-0.04	-1.18	-0.27	-1.01	1.03	-0.36	-0.48	2.18*	-1.87	-1.37
UNEMP FACTOR:										
b14 (factor 1)	0.25	-0.52	-0.78	-1.98	-2.11	-0.31	0.36	-1.44	-1.91	-0.57
t-value	0.44	-0.74	-1.04	-2.02*	-2.15*	-0.47	0.33	-1.22	-2.42*	-0.63
b15 (factor 2)	-0.42	-1.20	-0.64	-1.97	-1.51	-0.68	-1.11	0.64	-1.25	-0.81
t-value	-0.91	-2.07*	-1.03	-2.43*	-1.87	-1.31	-1.23	0.66	-1.91	-1.07
b16 (factor 3)	0.23	0.37	-0.21	0.02	0.63	0.01	1.81	1.71	-0.49	0.47
t-value	0.43	0.56	-0.31	0.02	0.68	0.03	1.75	1.54	-0.65	0.55
b17 (factor 4)	-0.33	0.76	-0.30	-0.32	-1.01	0.18	-1.31	-0.67	-0.77	-0.39
t-value	-0.72	1.33	-0.49	-0.40	-1.26	0.36	-1.47	-0.71	-1.19	-0.53
b18 (factor 5)	0.64	0.54	0.88	0.51	1.39	0.40	1.18	-2.41	0.07	0.35
t-value	1.42	0.97	1.48	0.65	1.79	0.79	1.37	-2.59*	0.12	0.49
R-sq	0.32	0.21	0.25	0.24	0.34	0.15	0.26	0.29	0.36	0.25
R-sq (adj)	0.12	0.00	0.02	0.02	0.15	0.00	0.05	0.08	0.17	0.03
F-ratio	1.62	0.94	1.12	1.07	1.78	0.63	1.22	1.41	1.88	1.14
DW	2.06	2.35	2.05	1.83	1.81	1.84	1.84	1.71	1.75	1.76

* Statistically significant at the 5 % level

Undoubtedly, the above evidence supports the hypothesis that the comovements of both equity markets and economic indicators are consistent. In fact, these findings are not totally unexpected, because studies such as Ripley (1973), Hilliard (1979), Adler and Dumas (1983)

and Cho, Eun and Senbet (1986) have shown that economic integration is a possible explanation for the comovement of international stock markets. They argue that countries whose economies have a highly integrated are those whose stock markets are closely related.

5.6. The Effects of Common Factors on International Stock Markets

In order to investigate the effects of the similar common underlying factors on the international stock markets, 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, Jan. 1980 to Dec. 1983 and Jan. 1984 to Dec. 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' approach, 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 is from August 1980 to July 1985, the second is from September 1980 to August 1985 and the same procedure is repeated for the following periods after dropping the first monthly observations set and

adding the next monthly observations. In addition, 24 means of returns of the 10 stock markets are calculated from 24 of six monthly data covering from 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 and the rest of subperiods will be obtained by repeatedly dropping the first monthly observation and adding the next monthly observation).

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 similar common factors on the stock markets. The results are elaborated in the following section.

The analysis begins with identifying common factors to include in the model. Appendix 5.17 and Table 5.21 show respectively the results of regressing the market return factors against economic variable factors for 2 subperiods and the cases of significant relationship between them.[12]

From the results in Table 5.21, there is an indication that economic variables have some links with market returns. The results show that a considerable number of economic variable factors, except consumer price index (CP), do relate significantly to those of market returns. However, their relationships are unstable since no similar economic factors have a strong correlation with market factors in both periods.

[1212]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.

TABLE 5.21

CASES OF SIGNIFICANT RELATIONSHIP BETWEEN STOCK MARKET AND ECONOMIC VARIABLE FACTORS FOR 2 SUBPERIODS

	Stock Market Factor			
	Factor 1		Factor 2	
Econ.Factors	P1	P2	P1	P2
IP: factor 1				
factor 2		**		
factor 3				
factor 4	**			
MS: factor 1		*		
factor 2		*		
factor 3	**			
TB: factor 1	*			*
factor 4		**		
factor 5				
UN: factor 1	**			
factor 3			*	
factor 5				
IM: factor 1		*		
factor 2				
factor 3			*	
EX: factor 1		*		

** & * Significant at the 5 & 10 percent level
P1 = period 1, P2 = period 2. Factors = rotated

To confirm the stability of these factor relationship, stepwise regression is introduced. As reported in Table 5.22, the stepwise regression analysis also tends to agree that their relationships are not stable over these two periods. Most market factors are significantly related to those of economic factors in period one or two only. This implies that the degree of relationship between market and economic variable factors is not very strong.

TABLE 5.22

STEPWISE REGRESSION PARAMETERS FOR 2 SUBPERIODS (RESULTS OF REGRESSING MARKET FACTORS ON ECONOMIC VARIABLE FACTORS)

	Stock Market Factor Factor 1		Factor Factor 2	
Econ. Factors	P1	P2	P1	P2
a	-0.03	0.09	0.06	-0.30
b (IP:factor 1)				
t-value				
b (IP:factor 2)		0.15		
t-value		2.10**		
b (IP:factor 3)	-0.21			
t-value	-1.89*			
b (IP:factor 4)				
t-value				
b (IP:factor 5)				
t-value				
b (CP:factor 2)				-0.35
t-value				-1.83*
b (MS:factor 2)	0.19			
t-value	1.76*			
b (MS:factor 3)		0.15	0.43	
t-value		1.86*	2.62**	
b (TB:factor 1)		-0.33		0.44
t-value		-2.52**		1.96*
b (TB:factor 3)				
t-value				
b (TB:factor 4)		0.15		
t-value		1.75*		
b (TB:factor 5)				
t-value				
b (UN:factor 2)		-0.19		
t-value		-3.00**		
b (UN:factor 4)				
t-value				
b (UN:factor 5)	0.12	0.37	-0.16	-0.29
t-value	1.48	2.97**	-1.53	-1.39
b (IM:factor 1)		0.30		
t-value		3.53**		
b (IM:factor 2)				
t-value				
b (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 = 1984-1984. Factors = rotated

From the above 2 regressions, 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 given in Table 5.23 (derived from the previous factor analysis).

TABLE 5.23

COUNTRIES WHOSE INDICES DOMINANTLY ENTER INTO THE COMMON FACTORS

Factors (rotated)	Countries
MR: Factor 1	UK, US, AU, NW, FR, SA, SP, WG, JP
Factor 2	MY, SP, WG, FR, AU
IP: Factor 1	SA, NW, JP, FR, MY
Factor 2	WG, FR
Factor 3	AU, JP, MY
Factor 4	SP, UK, JP, NW
Factor 5	US, MY, SP, UK
CP: Factor 1	MY, SP, WG, FR
Factor 2	JP, UK, US, FR
Factor 3	AU, SA, NW
MS: Factor 1	AU, FR, US, JP, NW
Factor 2	WG, UK, JP, SA
Factor 3	SP, MY, NW
TB: Factor 1	WG, FR, SA, US
Factor 2	AU, SP
Factor 3	NW, US, JP
Factor 4	UK, FR, SP, US
Factor 5	MY, JP, SA
UNEMP:	
Factor 1	WG, NW, UK, US
Factor 2	SP, MY
Factor 3	SA, JP, US
Factor 4	FR, UK, US
Factor 5	AU, SA, JP
IMP:Factor 1	FR, WG, UK, NW, AU, JP
Factor 2	MY, JP, SA, AU, WG
Factor 3	US, SP, SA, AU
EXP:Factor 1	WG, FR, UK, JP, US, NW
Factor 2	SP, SA, AU, MY, US

Rotated factors are desired because they produce a meaningful patterning of variables and simplify the factor structure. Therefore, the economic indices from countries in the first column (see Table 5.23) are regressed against 2 rotated common factors of market returns. The regression results and the cases of significant relationship are presented in Appendix 5.18 and Table 5.24 respectively.

TABLE 5.24

CASES OF SIGNIFICANT RELATIONSHIP BETWEEN STOCK MARKET FACTOR & ECONOMIC VARIABLE INDICES

	Market Factors			
	multiple regression		stepwise regression	
Econ.Indices	Factor 1	Factor 2	Factor 1	Factor 2
IP: S.Africa		*		
W.Germany	**		**	
Singapore				**
U.States			**	
CP: Japan			**	
MS: Singapore	**		**	
TB: W.Germany	**		**	
Malaysia	*			*
UN: Singapore	*		**	
France	**		**	
Australia	**		**	
IM: France	**			
U.States	*			
EX: Singapore	**		**	

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

It appears that there are a number of economic indices which have a significant relationship with the common factors of market returns. However, the previous studies such as Ripley (1973), Gehr (1978), Roll and Ross (1980) and Cho, Eun and Senbet (1986) claim that there are about three or four factors which influence the movement of stock markets. This

study, therefore, constrains the number of economic indices to the number identified by other researchers. These factors are: (1) the US industrial production (IP-US), (2) French unemployment (UN-FR), (3) Australian unemployment (UN-AU) and (4) Singaporean exports (EX-SP). Besides these 4 factors, this study also adds another factor in the analysis, namely Japanese money supply (MS-JP). As shown in factor analysis (see p.106), it is strongly believed that the Japanese factor becomes extremely important in the worldwide economic development which, in turn, gives a substantial effect to the movement of international stock markets.

Results from testing H6,0: The stock markets examined in this study are influenced by similar common underlying factors

The results of the first-pass time series regression are presented in Appendix 5.19. By and large, there is a relationship of the 5 economic indicators with these 10 stock markets. Then, cross-sectional analyses are performed by regressing 5 measures of beta from Appendix 5.19 (IP-US, MS-JP, UN-FR, UN-AU and EX-SP) against the mean return of each stock market. The results of the cross-sectional regression are given in Appendix 5.20.

To test the hypothesis, the estimated beta coefficients derived from the cross-sectional regression are, then, transformed into an average value. The average results are reported in Table 5.25.

From Table 5.25, it appears that the average beta of the American industrial production, the Japanese money supply, the French and the Australian unemployment and the Singaporean exports are mostly significant at the 5 percent level. This implies that these economic variables could act as a reasonably good proxy for common factor measures for the 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. Therefore, the findings support the hypothesis: that stock markets in this study are influenced by similar common underlying factors.

TABLE 5.25

THE AVERAGE OF MONTH-BY-MONTH BETAS COEFFICIENTS & t STATISTICS[13]

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.

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 market in this study. Many

[13]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.

other studies, specifically Ripley (1973) observed that more than 50 percent of a country's stock index may be explained by non-domestic factors.

5.7. Summary and Conclusion

This chapter presents the description and discussion of the results of this study. The evidence shows that there is some degree, form and stability in the relationship of international stock markets. The US and UK stock markets appear to have strong correlation with each other. The results suggest that these two markets form a core of international stock markets. They act as central markets into which other major equity markets are linked. A strong relationship is also shown between stock markets in Continental Europe. Another significant relationship feature is found between equity markets in the English-speaking countries, i.e. the US, the UK and Australia. There are relatively weaker ties between markets in the Pacific basin, except Malaysia-Singapore pair. This study seems to support that the comovement characteristics of international stock markets are stable in the short period.

More interestingly, this study reveals that the structural relationship between identical economic variables are similar to those of equity markets. Many similar economic activities between developed countries, namely the US, the UK, West Germany, France and Japan are strongly related. The degree of relationship between similar economic activities within European countries are greater than those in Asian-Pacific countries. South Africa seems to have close relationship with Asian-Pacific countries. This study also finds that most correlations between similar economic variables are stable over the short period.

With regard to an investigation of the joint movement between inter-country equity markets and similar economic activities, this study shows the comovements of equity markets

and economic variables between these countries are consistent. The similar underlying factors of equity markets and economic variables are significantly related.

Based on the APT model, this study seems to suggest that the behaviour of international stock returns are influenced by similar common underlying factors. Therefore, it can be concluded that the findings of this study are as expected. The results are largely consistent with the earlier works.

APPENDIX 5.0

THE COVARIANCE MATRICES OF EQUITY RETURNS FROM 10 SELECTED STOCK MARKETS FOR FOUR EQUAL LENGTH PERIODS

COUNTRY	PERIOD 1	PERIOD 2	PERIOD 3	PERIOD 4
US - US	23.0559	16.1065	10.9525	54.5117
UK	14.2813	4.2189	6.4230	48.5883
WG	8.4728	1.8898	4.6779	36.3401
FR	13.7417	4.1961	9.4974	39.9645
NW	13.0728	13.3384	8.2311	51.7031
JP	3.1783	4.2074	5.7171	24.0351
SP	13.8848	12.7304	0.9400	62.5730
MY	16.0150	14.9242	0.9073	63.1910
AU	23.4202	8.4155	5.9548	51.8249
SA	4.2024	14.5965	1.1454	41.9807
UK - UK	36.5224	12.5865	17.4832	61.4303
WG	11.2472	0.1922	5.7687	37.0283
FR	19.0178	2.9978	15.3660	41.3847
NW	15.6806	8.9147	11.9343	48.4000
JP	9.4795	3.4766	10.7865	26.7027
SP	7.2072	8.9195	1.5564	69.1625
MY	-19.3648	8.8814	1.1350	79.4739
AU	23.6497	10.1954	8.4638	58.5621
SA	7.6051	9.2235	6.9455	43.2427
WG - WG	10.3528	21.3398	21.6932	78.5610
FR	4.6475	-0.0990	7.8402	51.0454
NW	11.8421	3.5799	4.5745	48.9926
JP	6.2310	3.1440	5.7575	18.7335
SP	11.1843	4.2357	6.2113	33.1316
MY	17.9473	5.3700	6.3079	25.9952
AU	11.3661	-4.3763	5.4697	58.1187
SA	1.9758	-2.5412	4.2385	35.7126
FR - FR	64.2458	25.9957	34.7843	65.8807
NW	27.6928	27.1807	12.0725	37.1890
JP	1.3086	4.1883	7.3914	33.6825
SP	4.1783	12.4437	1.4239	36.6958
MY	-41.6852	10.5251	1.1933	29.3723
AU	23.0139	16.8668	0.9807	55.2537
SA	17.5294	12.5439	15.7446	35.6444
NW - NW	39.9925	78.8327	44.0360	81.0145
JP	7.5641	5.1086	4.3312	22.9045
SP	1.1326	28.1080	14.4148	78.1077
MY	-21.2033	29.8941	14.0246	75.6113
AU	9.8483	40.4603	14.2514	69.5830
SA	-0.9682	25.7097	4.2796	58.1303
JP - JP	7.3969	7.8766	22.7242	35.9233
SP	7.4647	8.4153	3.1980	24.7275
MY	6.2329	8.6545	3.4662	24.4884
AU	7.0469	5.4419	7.6910	19.6189
SA	-1.4568	3.3487	4.7242	20.7402
SP - SP	90.8819	25.6607	18.9066	136.8381
MY	176.0443	26.8692	17.6715	137.9147
AU	31.7448	14.6920	6.7109	82.4733
SA	7.2001	10.8134	-5.0284	66.7656

MY - MY	202.3914	34.1395	20.0373	162.1606
AU	30.5460	19.6498	7.0257	80.3775
SA	-5.8463	18.2060	1.1994	66.1045
AU - AU	53.0943	47.3729	20.3740	97.6188
SA	18.3344	20.76201	-0.7236	57.8729
SA - SA	24.7391	51.05774	48.2020	55.8513

Notes: Period 1 = January 1980 to December 1981
Period 2 = January 1982 to December 1983
Period 3 = January 1984 to December 1985
Period 4 = January 1986 to December 1987

APPENDIX 5.1

PARAMETERS OF COINTEGRATING REGRESSIONS & TESTS FOR A UNIT ROOT IN THE COINTEGRATING RESIDUALS

$$\ln Ri = a + b \ln Rj + e$$

	Period 1					Period 2				
	a	b	R2	ADF	DW	a	b	R2	ADF	DW
				US: Dependent Variable						
UK	0.72	0.65	69.3	-1.86	0.27	-1.49	0.96	97.0	-1.58	0.91*
WG	-1.32	0.95	68.2	-3.65*	0.35	0.32	0.71	67.2	1.42	0.15
FR	2.93	0.43	18.7	-2.03	0.12	1.71	0.68	92.8	-1.52	0.52*
NW	2.68	0.48	63.3	-3.14*	0.25	-0.38	1.00	76.8	-0.32	0.28
JP	-0.91	0.93	61.8	-1.80	0.24	0.70	0.67	94.0	-1.16	0.80*
SP	1.71	0.50	59.6	-1.26	0.25	2.65	0.42	14.2	1.21	0.04
MY	3.53	0.30	16.3	-0.29	0.09	5.34	0.03	0.1	0.82	0.06
AU	2.11	0.50	22.8	-1.64	0.09	0.69	0.68	97.1	-1.39	1.23*
SA	0.51	0.69	79.6	-1.73	0.58*	0.29	0.74	89.2	-1.40	0.44*
				UK: Dependent Variable						
US	1.25	1.07	69.3	-1.32	0.25	1.73	1.01	97.0	-1.51	0.92*
WG	-1.08	1.16	61.2	-2.07	0.24	1.96	0.73	67.5	0.38	0.18
FR	5.46	0.2	43.4	-1.38	0.07	3.46	0.69	90.5	-1.47	0.43*
NW	3.98	0.54	49.2	-2.27	0.16	1.06	1.07	82.0	0.20	0.42*
JP	-2.08	1.37	81.0	-2.14	0.32	2.39	0.69	93.0	-0.70	0.74*
SP	2.14	0.67	66.5	-0.82	0.38*	4.59	0.40	12.3	0.44	0.05
MY	6.83	-0.04	0.2	0.11	0.11	7.20	0.02	0.0	0.16	0.07
AU	6.12	0.07	0.3	-0.56	0.07	2.41	0.70	95.1	-1.75	0.70*
SA	1.22	0.83	69.4	-1.81	0.37	2.07	0.74	85.1	-1.43	0.33
				WG: Dependent Variable						
US	3.05	0.72	68.2	-2.58	0.38*	2.10	0.95	67.2	1.56	0.16
UK	3.14	0.52	61.2	-1.43	0.27	0.56	0.93	67.5	1.34	0.17
FR	4.34	0.48	30.6	-1.02	0.22	3.38	0.71	75.1	0.17	0.18
NW	4.27	0.49	87.6	-3.00	1.07*	0.93	1.09	67.5	-0.51	0.26
JP	1.58	0.80	60.0	-1.05	0.22	3.00	0.61	56.7	1.94	0.15
SP	4.44	0.33	35.1	-0.60	0.18	8.19	-0.13	1.0	0.96	0.08
MY	5.83	0.16	5.1	0.36	0.10	9.57	-0.48	18.6	0.03	0.16
AU	5.12	0.24	8.2	-0.16	0.12	2.71	0.66	66.6	2.34	0.14
SA	3.26	0.52	59.7	-1.90	0.43*	2.87	0.63	48.4	0.35	0.12
				FR: Dependent Variable						
US	2.58	0.43	18.7	-1.74	0.26	-1.94	1.37	92.8	-2.13	0.50*
UK	3.79	0.14	3.4	-1.27	0.23	-4.00	1.31	90.5	-1.82	0.40*
WG	0.53	0.64	30.6	-1.84	0.35	-2.19	1.06	75.1	-0.52	0.15
NW	2.93	0.37	38.9	-1.95	0.28	-2.17	1.32	66.2	-0.23	0.25
JP	4.04	0.11	0.9	-1.18	0.24	-1.08	0.94	89.8	-3.77*	0.33

SP	4.55	0.03	0.2	-1.06	0.24	2.86	0.40	6.4	0.32	0.04
MY	3.64	0.21	7.5	0.60	0.28	6.33	-0.17	1.5	-0.21	0.05
AU	1.50	0.51	28.9	-1.52	0.28	-0.96	0.93	89.3	-2.62	0.42*
SA	3.26	0.23	8.6	-1.50	0.23	-1.43	0.99	80.2	-1.45	0.21

NW: Dependent Variable

US	-1.79	1.32	63.3	-2.49	0.26	1.64	0.77	76.8	-0.00	0.38
UK	-1.18	0.91	49.2	-1.81	0.18	0.24	0.77	82.0	0.47	0.51*
WG	-7.07	1.79	87.6	-3.25*	1.07*	1.32	0.62	67.5	-1.17	0.36
FR	-0.12	1.04	38.9	-1.31	0.14	3.05	0.50	66.2	0.26	0.37
JP	-4.41	1.46	54.7	-1.31	0.20	2.21	0.51	70.8	1.11	0.51*
SP	0.93	0.59	30.1	-0.94	0.16	4.31	0.22	5.4	1.00	0.13
MY	2.91	0.39	7.8	-0.02	0.10	6.02	-0.04	0.2	0.69	0.18
AU	1.10	0.58	13.6	-0.36	0.09	2.07	0.54	78.9	-0.15	0.40*
SA	-1.59	0.99	58.8	-1.79	0.30	1.96	0.55	65.3	-0.29	0.32

JP: Dependent Variable

US	3.01	0.66	61.8	-1.35	0.20	-0.55	1.40	94.0	-1.50	0.77*
UK	2.43	0.59	81.0	-2.27	0.30	-2.72	1.35	93.0	-1.04	0.69*
WG	1.34	0.75	60.0	-1.87	0.17	0.27	0.93	56.7	1.74	0.11
FR	5.94	0.08	0.9	-0.65	0.06	1.76	0.96	89.8	-2.78	0.31
NW	4.51	0.37	54.7	-2.02	0.16	-0.99	1.39	70.8	1.32	0.37
SP	3.21	0.47	75.5	-1.62	0.38*	2.88	0.62	15.3	0.35	0.05
MY	5.74	0.13	7.5	0.12	0.12	6.80	0.06	0.2	-0.05	0.03
AU	5.60	0.11	2.0	-0.43	0.05	0.35	0.97	93.1	-1.39	0.83*
SA	2.76	0.58	70.6	-1.70	0.41*	-0.36	1.06	89.0	-1.61	0.47*

SP: Dependent Variable

US	0.61	1.20	59.6	-2.15	0.28	4.90	0.34	14.2	0.21	0.17
UK	0.09	0.99	66.5	-2.04	0.43*	4.53	0.31	12.3	0.11	0.17
WG	-0.43	1.06	35.1	-2.86	0.20	7.35	-0.08	1.0	-0.89	0.21
FR	6.29	0.07	0.2	-2.34	0.13	5.87	0.16	6.4	-0.17	0.19
NW	4.12	0.51	30.1	-3.15	0.18	5.36	0.24	5.4	0.67	0.16
JP	-3.53	1.6	75.5	-2.94	0.45*	5.02	0.25	15.3	-0.05	0.22
MY	4.02	0.54	53.5	-0.38	0.13	3.04	0.79	83.2	-1.92	0.15
AU	3.81	0.43	8.8	-2.25	0.12	4.96	0.26	17.0	0.92	0.17
SA	6.65	0.92	58.1	-2.65	0.37	4.11	0.38	28.6	1.22	0.21

MY: Dependent Variable

US	2.20	0.54	16.3	-2.16	0.26	4.56	0.03	0.1	-0.81	0.16
UK	5.29	-0.06	0.2	-1.99	0.25	4.60	0.02	0.0	-0.82	0.16
WG	2.86	0.31	5.1	-2.34	0.25	7.58	-0.39	18.6	-3.52*	0.25
FR	3.27	0.35	7.5	-2.38	0.30	5.24	-0.09	1.5	-0.91	0.17
NW	3.94	0.20	7.8	-2.45	0.26	5.08	-0.06	0.2	-1.02	0.17
JP	1.25	0.58	7.3	-2.50	0.25	4.50	0.03	0.2	-0.81	0.16
SP	-1.69	0.99	53.5	-2.51	0.05	-2.42	1.06	83.2	-1.76	0.12
AU	-1.66	1.03	69.9	-2.45	0.80*	4.37	0.05	0.5	-0.67	0.15
SA	3.07	0.28	6.7	-2.38	0.26	3.47	0.18	4.8	-0.31	0.15

AU: Dependent Variable

US	3.86	0.51	22.8	-1.44	0.21	-0.78	1.42	97.1	-1.26	1.23*
UK	6.06	0.05	0.3	-1.36	0.21	-2.94	1.36	95.1	-1.81	0.69*
WG	4.07	0.35	8.2	-1.50	0.23	-0.40	1.01	66.6	1.38	0.13
FR	3.68	0.57	28.9	-1.66	0.26	1.66	0.96	89.3	-2.26	0.44*
NW	5.25	0.24	13.6	-1.48	0.20	-1.55	1.46	78.9	-0.56	0.30
JP	5.27	0.18	2.0	-1.36	0.21	0.14	0.96	93.1	-1.27	0.87*
SP	5.05	0.20	8.8	-1.38	0.20	2.55	0.65	17.0	1.43	0.04
MY	3.04	0.68	69.9	-1.65	0.73*	6.51	0.10	0.5	0.47	0.06
SA	4.67	0.26	10.3	-1.31	0.20	-0.55	1.07	91.2	-0.86	0.56*

SA: Dependent Variable

US	0.73	1.15	79.6	-2.21	0.60*	0.40	1.21	89.2	-1.50	0.44*
UK	0.96	0.84	69.4	-2.58	0.41*	-1.34	1.15	85.1	-1.53	0.32
WG	-1.13	1.15	59.7	-3.45*	0.44*	1.42	0.77	48.4	-0.85	0.11
FR	4.68	0.38	8.6	-2.28	0.11	2.55	0.81	80.2	-1.70	0.22

NW	3.61	0.60	58.8	-3.34*	0.32	0.11	1.19	65.3	-0.84	0.22
JP	-1.65	1.29	70.6	-2.53	0.47*	1.08	0.84	89.0	-1.62	0.50*
SP	2.30	0.63	58.1	-2.35	0.36	1.91	0.76	28.6	1.24	0.07
MY	5.36	0.24	6.7	-1.28	0.14	5.78	0.27	4.8	0.43	0.05
AU	3.98	0.39	10.3	-1.95	0.10	1.10	0.85	91.2	-1.08	0.56*

Notes: (1 Regression estimates are obtained by OLS, (2) ADF (Augmented Dickey-Fuller statistic) and DW statistic are used to test the null hypothesis of non-cointegration and (3) critical value for ADF and DW at the 5 % is 3.17 and 0.39 respectively.

APPENDIX 5.2

INTERMARKET BETA COEFFICIENTS FOR 2 SUB-PERIODS FOR 10 SELECTED MARKETS & F RATIOS (THE CHOW TEST)

Variables	Period 1	Period 2	Chow Test
Dep-Ind.	beta(1)	beta(2)	F-ratios
US-UK	0.38	0.69	2.32
WG	0.32	0.39	0.08
FR	0.20	0.49	2.53
NW	0.22	0.46	2.29
JP	0.49	0.51	0.35
SP	0.22	0.40	1.51
MY	0.19	0.35	1.34
AU	0.32	0.49	1.17
SA	0.25	0.41	0.72
UK-US	0.47	0.84	2.08
WG	0.36	0.42	-8.67*
FR	0.25	0.57	2.72
NW	0.21	0.47	2.23
JP	0.84	0.63	1.02
SP	0.13	0.44	3.12*
MY	0.01	0.43	7.30*
AU	0.34	0.57	1.86
SA	0.21	0.48	1.45
WG-US	0.27	0.62	1.24
UK	0.25	0.56	1.20
FR	0.07	0.60	5.90*
NW	0.14	0.45	2.44
JP	0.62	0.39	0.38
SP	0.11	0.23	0.33
MY	0.11	0.15	0.13
AU	0.07	0.53	5.16*
SA	0.02	0.37	2.52
FR-US	0.47	0.75	0.86
UK	0.46	0.72	0.96
WG	0.20	0.57	1.24
NW	0.47	0.39	0.36
JP	0.12	0.69	0.34
SP	0.12	0.24	0.53
MY	0.05	0.16	0.93
AU	0.40	0.48	0.19
SA	0.38	0.49	0.35
NW-US	0.69	0.91	0.29

UK	0.52	0.78	0.47
WG	0.53	0.56	0.01
FR	0.63	0.50	0.28
JP	0.84	0.43	0.53
SP	0.23	0.56	1.77
MY	0.19	0.46	1.42
AU	0.51	0.70	0.60
SA	0.31	0.59	0.72
JP-US	0.19	0.46	1.89
UK	0.26	0.47	2.90
WG	0.28	0.22	1.33
FR	0.06	0.40	5.51*
NW	0.10	0.20	1.61
SP	0.14	0.18	1.96
MY	0.10	0.16	1.28
AU	0.12	0.23	1.53
SA	0.03	0.25	2.69
SP-US	0.67	0.97	1.29
UK	0.31	0.88	2.75
WG	0.40	0.34	0.65
FR	0.16	0.37	1.18
NW	0.22	0.68	3.67*
JP	1.03	0.49	2.01
MY	0.85	0.86	0.49
AU	0.46	0.76	2.44
SA	0.25	0.60	1.79
MY-US	0.93	0.98	0.04
UK	0.04	1.00	4.36*
WG	0.45	0.27	0.12
FR	-0.08	0.29	0.96
NW	0.22	0.65	1.95
JP	0.88	0.50	0.43
SP	1.10	1.00	1.11
AU	0.52	0.75	0.62
SA	0.28	0.66	0.97
AU-US	0.81	0.88	0.33
UK	0.69	0.84	0.43
WG	0.21	0.60	1.09
FR	0.44	0.56	0.19
NW	0.42	0.64	1.08
JP	0.82	0.47	0.36
SP	0.39	0.57	1.26
MY	0.28	0.47	1.31
SA	0.51	0.55	0.08
SA-US	0.48	0.66	0.25
UK	0.34	0.63	0.83
WG	0.04	0.37	1.21
FR	0.31	0.51	0.60
NW	0.20	0.47	1.48
JP	0.13	0.44	0.39
SP	0.16	0.40	1.18
MY	0.14	0.37	1.26
AU	0.39	0.49	0.63

* statistically significant at the 5 % level

APPENDIX 5.3

RESULTS OF WHITE'S TESTS FOR DETECTING HETEROSKEDASTICITY IN RESIDUALS OF REGRESSION ANALYSIS OF STOCK MARKET RETURNS FOR PERIOD ONE (JAN 1980 TO DEC 1983) AND PERIOD TWO (JAN 1984 TO DEC 1987)

REG 1: $(ei)^2 = a + b\ (Rj)$
REG 2: $(ei)^2 = a + b1\ (Rj) + b2\ (Rj)^2$

(Note that the above two equations are suggested by White (1980) to detect whether errors, e, in the regression (Ri = a + b (Rj) + ei) have a common variance. Where, R is stock market returns from country i and j)

	D E P E N D E N T					V A R I A B L E				
	e1 (US)	e2 (UK)	e3 (WG)	e4 (FR)	e5 (NW)	e6 (JP)	e7 (SP)	e8 (MY)	e9 (AU)	e10 (SA)
					P e r i o d O n e					
					REG 1					
a		21.90	14.97	42.15	47.35	7.28	54.96	69.53	33.65	32.55
t		4.11	3.74	3.15	3.14	5.45	3.81	3.93	5.12	4.22
bUS		-2.57	-0.26	-2.07	2.68	-0.62	-6.97	-3.85	2.15	-0.12
t		-2.15*	-0.29	-0.69	0.79	-2.07*	-2.15*	-0.97	1.46	-0.07
R2		0.09	0.02	0.01	0.01	0.09	0.09	0.02	0.04	0.00
					REG 2					
a		17.99	16.39	49.79	46.98	6.51	46.34	72.20	26.01	34.34
t		2.75	3.30	3.01	2.50	3.95	2.61	3.29	3.29	3.59
bUS1		-2.88	-0.15	-1.47	2.65	-0.68	-7.65	-3.64	1.55	0.02
t		-2.33*	-0.16	-0.47	0.75	-2.19*	-2.28*	-0.88	1.04	0.01
bUS2		0.21	-0.08	-0.42	0.02	0.04	0.47	-0.15	0.42	-0.10
t		1.03	-0.49	-0.80	0.03	0.80	0.84	-0.21	1.66	-0.32
R2		0.11	0.01	0.02	0.01	0.10	0.11	0.02	0.10	0.00
					REG 1					
a	14.85		14.93	43.59	48.86	5.88	53.68	71.73	38.07	34.50
t	4.54		3.56	3.76	2.91	5.08	2.60	3.66	5.21	4.00
bUK	0.35		-0.16	-2.93	2.47	-0.11	0.10	-0.15	-0.72	-0.26
t	0.55		-0.19	-1.29	0.75	-0.50	0.03	-0.04	-0.50	-0.15
R2	0.01		0.00	0.04	0.01	0.01	0.00	0.00	0.01	0.00
					REG 2					
a	15.14		16.86	46.22	43.35	6.08	54.73	85.65	40.39	32.56
t	3.88		3.39	3.35	2.17	4.42	2.22	3.72	4.65	3.17
bUK1	0.33		-0.30	-3.13	2.89	-0.13	0.03	-1.20	-0.89	-0.11
t	0.50		-0.36	-1.32	0.84	-0.55	0.01	-0.30	-0.60	-0.06
bUK2	-0.01		-0.07	-0.09	0.19	-0.01	-0.04	-0.48	-0.08	0.07
t	-0.14		-0.74	-0.36	0.52	-0.28	-0.08	-1.14	-0.50	0.36
R2	0.01		0.00	0.04	0.02	0.01	0.00	0.03	0.01	0.00
					REG 1					
a	17.89	23.55		47.08	56.89	6.13	59.39	69.98	48.46	36.27
t	5.41	4.00		3.47	2.91	4.27	3.57	3.64	5.26	4.49
bWG	-0.92	-2.54		-4.20	-2.69	-0.08	-6.86	2.02	-1.28	0.53
t	-1.14	-1.77		-1.27	-0.56	-0.23	-1.69	0.43	-0.57	0.27
R2	0.03	0.07		0.03	0.01	0.00	0.06	0.00	0.01	0.00

REG 2

a	17.08	18.05		44.10	56.24	6.24	58.18	76.51	47.91	40.82
t	4.57	2.81		2.87	2.54	3.84	3.08	3.53	4.58	4.52
bWG1	-1.16	-4.16		-5.08	-2.88	-0.05	-7.21	3.94	-1.44	1.87
t	-1.22	-2.54*		-1.30	-0.51	-0.12	-1.50	0.71	-0.54	0.81
bWG2	0.06	0.41		0.22	0.05	-0.01	0.09	-0.49	0.04	-0.34
t	0.48	1.90		0.43	0.06	-0.15	0.14	-0.67	0.12	-1.11
R2	0.03	0.14		0.04	0.01	0.00	0.06	0.01	0.01	0.03

REG 1

a	17.30	21.42	15.62		39.50	7.34	52.48	66.59	37.99	33.17
t	5.54	3.14	4.08		3.63	4.43	2.75	4.02	4.33	5.15
bFR	-0.38	-0.82	0.32		2.60	-0.23	3.22	2.46	2.16	-0.96
t	-0.82	-0.80	0.56		1.60	-0.94	1.13	1.00	1.65	-1.00
R2	0.01	0.01	0.01		0.05	0.02	0.03	0.02	0.06	0.02

REG 2

a	18.40	24.63	14.96		31.72	8.35	44.47	53.78	20.24	35.46
t	5.10	3.14	3.38		2.56	4.40	2.02	2.86	2.36	4.77
bFR1	-0.49	-1.12	0.38		3.34	-0.33	3.98	3.68	3.85	-1.18
t	-0.98	-1.03	0.62		1.95*	-1.25	1.31	1.41	3.24*	-1.14
bFR2	-0.02	-0.07	0.01		0.16	-0.02	0.17	0.26	0.37	-0.05
t	-0.63	-0.84	0.30		1.28	-1.09	0.74	1.39	4.23*	-0.63
R2	0.02	0.03	0.01		0.09	0.05	0.04	0.06	0.33	0.03

REG 1

a	16.28	22.99	14.19	33.28		7.03	53.95	66.52	36.93	35.97
t	5.34	3.57	4.01	3.85		4.48	2.82	3.53	4.30	4.81
bNW	-0.27	-1.44	0.47	-1.53		-0.24	-0.46	3.55	0.61	-1.01
t	-0.70	-1.75	1.04	-1.39		-1.18	-0.19	1.47	0.55	-1.05
R2	0.01	0.06	0.02	0.04		0.03	0.00	0.05	0.01	0.02

REG 2

a	16.64	20.11	12.89	29.53		5.47	57.99	72.77	37.08	36.38
t	5.00	2.90	3.37	3.17		3.43	2.78	3.56	3.95	4.46
bNW1	-0.19	-2.13	0.16	-2.43		-0.61	0.50	5.04	0.65	-0.91
t	-0.38	-2.06*	0.28	-1.76		-2.58*	0.16	1.66	0.46	-0.75
bNW2	-0.01	0.06	0.03	0.08		0.03	-0.09	-0.14	0.00	-0.01
t	-0.28	1.11	0.91	1.07		2.61*	-0.52	-0.82	-0.04	-0.13
R2	0.01	0.09	0.04	0.07		0.16	0.01	0.06	0.01	0.02

REG 1

a	16.78	21.15	12.87	44.25	55.09		55.90	65.06	42.90	41.68
t	4.91	5.59	4.09	2.98	2.68		3.32	3.29	4.79	5.31
bJP	0.25	-3.21	0.50	-1.25	-1.22		-8.40	6.83	0.32	-5.59
t	0.21	-2.42*	0.45	-0.24	-0.17		-1.42	0.99	0.10	-2.03
R2	0.00	0.11	0.00	0.00	0.00		0.04	0.02	0.00	0.08

REG 2

a	16.25	14.42	11.34	52.23	53.22		61.77	73.18	41.93	44.62
t	3.96	3.48	3.02	2.96	2.16		3.06	3.10	3.90	4.75
bJP1	0.20	-3.84	0.35	-0.50	-1.39		-7.85	7.59	0.23	-5.32
t	0.16	-3.10*	0.31	-0.10	-0.19		-1.30	1.07	0.07	-1.89
bJP2	0.07	0.90	0.20	-1.06	0.25		-0.78	-1.08	0.13	-0.39
t	0.24	3.02*	0.76	-0.84	0.14		-0.54	-0.64	0.17	-0.58
R2	0.00	0.26	0.02	0.02	0.00		0.05	0.03	0.00	0.09

REG 1

a	15.08	23.12	14.90	47.12	55.11	6.18		73.65	38.48	36.77
t	4.35	2.93	3.74	3.24	3.21	3.77		4.22	4.76	4.56
bSP	0.46	-0.32	0.24	-1.99	0.52	0.07		-2.55	0.54	-0.78
t	1.02	-0.32	0.47	-1.06	0.24	0.31		-1.13	0.51	-0.75
R2	0.00	0.00	0.01	0.02	0.00	0.00		0.03	0.01	0.01

REG 2

a	14.18	21.94	16.33	47.61	50.13	6.33		78.67	32.32	36.76
t	3.50	2.38	3.52	2.80	2.50	3.30		3.86	3.49	3.90
bSP1	0.51	-0.26	0.17	-2.02	0.79	0.06		-2.82	0.86	-0.78
t	1.09	-0.24	0.31	-1.03	0.34	0.26		-1.20	0.81	-0.72
bSP2	0.01	0.02	-0.02	-0.01	0.07	0.00		-0.08	0.09	0.00
t	0.44	0.26	-0.62	-0.06	0.50	-0.16		-0.49	1.32	0.00
R2	0.03	0.00	0.01	0.02	0.01	0.00		0.03	0.04	0.01

REG 1

a	16.56	23.49	15.66	40.99	56.81	7.49	56.04		42.31	35.94
t	4.01	3.05	3.79	3.19	3.01	4.43	3.18		4.34	4.47
bMY	0.37	-0.08	0.27	0.76	1.46	-0.14	-1.46		1.30	0.31
t	0.76	-0.09	0.57	0.51	0.67	-0.72	-0.71		1.15	0.33
R2	0.01	0.00	0.01	0.01	0.01	0.01	0.01		0.03	0.00

REG 2

a	18.43	28.78	16.33	30.52	52.09	8.65	60.10		44.99	40.19
t	3.70	3.12	3.26	1.99	2.28	4.27	2.81		3.81	4.15
bMY1	0.30	-0.26	0.25	1.12	1.62	-0.18	-1.59		1.21	0.17
t	0.62	-0.28	0.51	0.74	0.72	-0.91	-0.76		1.04	0.17
bMY2	-0.02	-0.07	-0.01	0.13	0.06	-0.01	-0.05		-0.03	-0.05
t	-0.68	-1.04	-0.24	1.24	0.37	-1.03	-0.34		-0.41	-0.79
R2	0.02	0.02	0.01	0.04	0.01	0.04	0.01		0.03	0.02

REG 1

a	14.59	18.75	16.23	39.54	45.00	7.06	48.54	71.38		29.94
t	4.69	3.62	4.08	2.70	3.66	5.33	2.89	4.61		4.43
bAU	-0.58	-0.68	-0.35	-2.93	1.44	-0.46	-2.31	-4.97		-0.43
t	-1.31	-0.92	-0.61	-1.40	0.82	-2.42*	-0.97	-2.25*		-0.45
R2	0.04	0.02	0.01	0.04	0.02	0.12	0.02	0.10		0.00

REG 2

a	14.97	15.42	16.72	38.59	20.45	6.25	51.60	69.14		34.45
t	3.89	2.43	3.39	2.13	1.48	3.85	2.49	3.61		4.16
bAU1	-0.56	-0.85	-0.32	-2.98	0.19	-0.50	-2.16	-5.08		-0.20
t	-1.22	-1.11	-0.55	-1.36	0.12	-2.54*	-0.86	-2.21*		-0.20
bAU2	-0.01	0.07	-0.01	0.02	0.53	0.02	-0.07	0.05		-0.10
t	-0.17	0.91	-0.17	0.09	3.09*	0.86	-0.26	0.20		-0.94
R2	0.04	0.04	0.01	0.04	0.19	0.13	0.02	0.10		0.02

REG 1

a	17.28	21.59	16.48	40.79	48.93	7.48	52.05	77.07	38.48
t	4.61	2.61	3.95	3.12	3.34	4.28	2.59	4.15	4.97
bSA	-0.50	0.12	-0.27	-1.27	4.43	-0.12	1.23	-4.05	0.06
t	-0.84	0.09	-0.40	-0.60	1.89	-0.44	0.38	-1.36	0.05
R2	0.01	0.00	0.00	0.01	0.07	0.00	0.00	0.04	0.00

REG 2

a	19.33	24.01	19.73	49.29	31.21	7.80	58.38	93.55	40.69
t	4.14	2.32	3.82	3.03	1.75	3.56	2.32	4.08	4.20
bSA1	-0.48	0.14	-0.23	-1.18	4.26	-0.12	1.29	-3.88	0.08

t	-0.80	0.10	-0.35	-0.56	1.85	-0.43	0.40	-1.31	0.06	
bSA2	-0.05	-0.06	-0.08	-0.22	0.46	-0.01	-0.17	20.00	-0.06	
t	-0.74	-0.40	-1.06	-0.88	1.68	-0.25	-0.43	0.35	-0.39	
R2	0.03	0.00	0.03	0.03	0.13	0.01	0.01	0.07	0.00	

P e r i o d T w o

REG 1

a	16.66	33.59	30.92	36.93	21.44	46.50	88.26	35.87	38.16
t	7.07	3.00	5.17	5.13	4.28	5.02	3.19	4.55	4.96
bUS	-0.83	4.83	-0.46	-0.39	0.45	-0.25	-0.69	-4.20	-2.06
t	-1.99*	2.45*	-0.44	-0.31	0.51	-0.15	-0.14	-3.02*	-1.52
R2	0.08	0.11	0.00	0.00	0.01	0.00	0.00	0.16	0.05

REG 2

a	14.39	7.57	30.79	31.65	22.59	34.78	80.08	13.30	34.15
t	5.66	0.84	4.56	4.00	4.01	3.60	2.58	2.90	3.99
bUS1	-0.45	9.18	-0.44	0.49	0.26	1.71	0.68	-0.43	-1.38
t	-1.01	5.80*	-0.37	0.36	0.26	1.01	0.13	-0.54	-0.93
bUS2	0.06	0.69	0.00	0.14	-0.03	0.31	0.22	0.60	0.11
t	2.02*	6.50*	0.05	1.51	-0.46	2.75*	0.60	11.15*	1.06
R2	0.15	0.54	0.00	0.05	0.01	0.14	0.01	0.77	0.07

REG 1

a	13.10	37.85	28.66	40.69	19.58	48.77	88.54	34.11	37.05
t	6.05	4.15	5.40	4.88	5.68	3.86	3.25	5.73	5.13
bUK	0.04	0.38	0.02	-1.00	0.41	-1.74	-1.18	-3.78	-1.75
t	0.13	0.26	0.02	-0.76	0.75	-0.86	-0.27	-3.98*	-1.52
R2	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.25	0.05

REG 2

a	11.92	29.27	29.82	39.67	19.02	41.10	81.36	20.38	38.76
t	4.72	2.80	4.78	4.05	4.69	2.80	2.54	3.53	4.57
bUK1	0.28	2.11	-0.22	-0.80	0.53	-0.18	0.28	-1.00	-2.10
t	0.65	1.18	-0.20	-0.47	0.76	-0.07	0.05	-1.01	-1.44
bUK2	0.02	0.17	-0.02	0.02	0.01	0.15	0.14	0.26	-0.03
t	0.92	1.60	-0.36	0.20	0.27	1.02	0.44	4.65*	-0.39
R2	0.02	0.05	0.00	0.01	0.01	0.04	0.01	0.49	0.05

REG 1

a	27.63	32.45	33.01	49.69	26.94	78.48	89.48	43.57	45.71
t	3.56	4.83	4.76	5.75	4.55	4.17	3.29	3.70	5.71
bWG	-4.86	-4.23	-1.42	-3.48	-1.26	-10.52	-6.36	-6.50	-3.36
t	-4.46*	-4.48*	-1.45	-2.86*	-1.51	-3.98*	-1.66	-3.93*	-2.98*
R2	0.30	0.30	0.04	0.15	0.05	0.25	0.06	0.25	0.16

REG 2

a	13.88	13.76	27.82	34.34	25.56	24.41	86.71	7.76	27.28
t	1.75	2.63	3.54	3.90	3.74	1.74	2.76	0.97	3.72
bWG1	-4.02	-3.09	-1.10	-2.54	-1.17	-7.22	-6.19	-4.31	-2.24
t	-4.02*	-4.67*	-1.11	-2.28*	-1.36	-4.07*	-1.56	-4.26*	-2.41*
bWG2	0.26	0.35	0.10	0.29	0.03	1.02	0.05	0.67	0.35
t	3.58*	7.35*	1.36	3.59*	0.42	7.93*	0.18	9.22*	5.18*
R2	0.45*	0.68*	0.08	0.34	0.05	0.69*	0.06	0.74*	0.47*

REG 1

a	21.54	25.95	33.03	56.47	19.77	82.48	93.30	54.13	39.74
t	4.36	5.03	4.02	5.93	4.17	4.31	3.35	4.08	5.44
bFR	-1.12	-2.20	-0.03	-3.87	0.47	-8.40	-3.65	-8.03	-1.40
t	-1.61	-3.04*	-0.03	-2.90*	0.71	-3.13*	-0.93	-4.31*	-1.36
R2	0.05	0.17	0.00	0.15	0.01	0.17	0.02	0.28	0.04

REG 2

a	11.71	13.17	24.49	31.75	20.48	27.37	95.20	9.65	23.63
t	2.28	2.69	2.60	3.62	3.66	1.68	2.89	1.05	3.23
bFR1	-0.77	-1.75	0.27	-3.00	0.45	-6.46	-3.71	-6.47	-0.83
t	-1.24	-2.96*	0.23	-2.82*	0.66	-3.28*	-0.93	-5.79*	-0.93
bFR2	0.18	0.24	0.16	0.46	-0.01	1.03	-0.04	0.83	0.30
t	3.68*	5.02*	1.74	5.41*	-0.24	6.51*	-0.11	9.27*	4.23*
R2	0.27	0.46*	0.06	0.48*	0.01	0.57*	0.02	0.75*	0.31

REG 1

a	19.82	26.87	38.77	41.11	26.06	49.85	86.73	37.86	35.64
t	4.47	6.00	4.87	5.07	4.78	4.77	3.15	5.33	3.65
bNW	-1.12	-2.19	-0.94	-1.60	-0.06	-1.95	0.64	-5.03	0.46
t	-2.02*	-3.93*	-0.95	-1.58	-0.09	-1.50	0.19	-5.68*	0.38
R2	0.08	0.25	0.02	0.05	0.00	0.05	0.00	0.41	0.00

REG 2

a	15.60	16.73	35.13	38.24	27.48	35.85	90.70	14.39	17.36
t	3.00	3.63	3.69	3.93	4.19	2.99	2.74	2.56	1.63
bNW1	-0.61	-0.98	-0.51	-1.25	-0.23	-0.28	0.16	-2.23	2.64
t	-0.96	-1.73	-0.43	-1.05	-0.28	-0.19	0.04	-3.22*	2.02*
bNW2	0.06	0.13	0.05	0.04	-0.02	0.18	-0.05	0.31	0.24
t	1.49	4.05*	0.70	0.54	-0.40	2.15*	-0.22	7.70*	3.17*
R2	0.12	0.45	0.03	0.06	0.00	0.14	0.00	0.74*	0.18

REG 1

a	29.87	36.05	46.94	40.12	72.20	86.48	90.16	78.15	58.03
t	3.76	3.63	3.57	5.18	4.23	3.48	3.23	3.01	4.63
bJP	-2.58	-4.13	-0.54	-2.33	-6.73	-7.81	-2.91	-12.48	-6.06
t	-1.87	-2.40*	-0.24	-1.74	-2.27*	-1.81	-0.60	-2.78*	-2.79*
R2	0.07	0.11	0.00	0.06	0.10	0.07	0.01	0.14	0.14

REG 2

a	18.24	25.16	31.48	31.71	58.44	53.61	85.70	44.17	48.33
t	2.27	2.39	2.28	3.86	3.14	2.09	2.73	1.65	3.52
bJP1	-5.12	-6.51	-3.92	-4.17	-9.73	-15.00	-3.88	-19.92	-8.18
t	-3.49*	-3.37*	-1.55	-2.77*	-2.86*	-3.20*	-0.68	-4.07*	-3.26*
bJP2	0.52	0.49	0.69	0.38	0.61	1.47	0.20	1.52	0.43
t	3.32*	2.36*	2.56*	2.34*	1.69	2.93*	0.32	2.90*	1.62
R2	0.25	0.21	0.13	0.16	0.15	0.21	0.01	0.27	0.19

REG 1

a	19.15	23.39	46.21	44.30	38.94	25.79	84.89	32.42	38.22
t	5.18	4.61	4.44	5.31	5.91	4.25	3.12	4.32	4.36
bSP	-0.91	-1.03	-1.46	-2.57	-1.01	0.02	0.71	-2.79	-1.46
t	-2.13*	-1.77	-1.22	-2.69*	-1.33	0.03	0.23	-3.24*	-1.45
R2	0.09	0.06	0.03	0.14	0.04	0.00	0.00	0.18	0.04

REG 2

a	16.56	15.95	29.79	35.00	35.82	25.70	89.24	15.84	34.60
t	4.25	3.41	3.22	4.21	5.06	3.88	3.01	3.30	3.67
bSP1	-0.56	-0.02	0.76	-1.31	-0.58	0.03	0.12	-0.54	-0.97
t	-1.21	-0.04	0.70	-1.34	-0.70	0.04	0.03	-0.96	-0.87
bSP2	0.03	0.10	0.21	0.12	0.04	0.00	-0.06	0.22	0.05
t	1.77	4.26*	4.75*	3.00*	1.18	0.04	-0.39	9.23*	1.03
R2	0.15	0.33	0.35	0.28	0.07	0.00	0.01	0.71*	0.06

REG 1

a	31.43	37.09	47.26	47.61	61.78	27.11	72.59		54.29	48.49
t	2.40	2.10	3.10	3.52	2.80	4.45	2.56		1.68	3.00
bMY	0.13	-1.56	-2.13	-1.71	-1.62	0.05	-2.54		-4.32	-1.59
t	0.09	-0.83	-1.31	-1.19	-0.69	0.08	-0.84		-1.25	-0.92
R2	0.00	0.01	0.04	0.03	0.01	0.00	0.01		0.03	0.02

REG 2

a	27.99	38.18	44.59	47.40	67.45	26.68	72.85		59.44	53.33
t	1.92	1.93	2.62	3.13	2.74	3.92	2.30		1.65	2.97
bMY1	0.31	-1.62	-1.99	-1.70	-1.92	0.08	-2.56		-4.59	-1.84
t	0.21	-0.83	-1.18	-1.14	-0.79	0.11	-0.81		-1.28	-1.04
bMY2	0.04	-0.01	0.03	0.00	-0.07	0.01	0.00		-0.06	-0.06
t	0.55	-0.13	0.37	0.03	-0.54	0.15	-0.02		-0.33	-0.63
R2	0.01	0.01	0.04	0.03	0.02	0.00	0.01		0.03	0.03

REG 1

a	18.20	20.16	33.29	34.80	34.36	24.32	43.75	85.02		37.66
t	3.58	6.71	4.42	5.27	4.65	4.89	4.51	3.04		4.03
bAU	-0.26	-0.19	0.44	0.53	0.13	0.63	-0.25	1.27		-0.66
t	-0.39	-0.49	0.44	0.61	0.13	0.98	-0.20	0.35		-0.54
R2	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00		0.01

REG 2

a	19.76	19.12	34.95	33.10	37.57	22.31	44.60	90.05		39.38
t	3.35	5.48	3.99	4.31	4.39	3.87	3.94	2.77		3.62
bAU1	-0.61	0.04	0.06	0.91	-0.59	1.08	-0.45	0.15		-1.05
t	-0.65	0.07	0.05	0.74	-0.44	1.18	-0.25	0.03		-0.61
bAU2	-0.02	0.01	-0.02	0.02	-0.04	0.02	-0.01	-0.06		-0.02
t	-0.53	0.60	-0.38	0.45	-0.75	0.70	-0.15	-0.31		-0.32
R2	0.01	0.01	0.01	0.01	0.01	0.03	0.00	0.01		0.01

REG 1

a	25.06	29.87	45.62	39.00	53.83	24.51	63.68	82.95	51.87
t	4.61	5.41	4.91	5.23	5.87	4.42	4.83	3.04	4.23
bSA	-1.55	-2.27	-1.75	-1.82	-5.83	0.54	-3.88	2.26	-7.13
t	-2.06*	-2.97*	-1.36	-1.76	-4.59*	0.71	-2.13*	0.60	-4.19*
R2	0.08	0.16	0.04	0.06	0.31	0.01	0.09	0.01	0.27

REG 2

a	15.03	16.17	35.31	37.91	43.14	24.74	34.43	88.27	11.24
t	2.68	3.24	3.39	4.35	4.22	3.82	2.72	2.77	1.46
bSA1	-0.72	-1.14	-0.90	-1.73	-4.95	0.52	-1.47	1.82	-3.77
t	-1.01	-1.80	-0.68	-1.57	-3.82*	0.64	-0.91	0.45	-3.87*
bSA2	0.17	0.23	0.17	0.02	0.18	0.00	0.49	-0.09	0.69
t	3.58*	5.47*	1.98	0.25	2.09*	-0.07	4.61*	-0.33	10.58*
R2	0.29	0.49	0.11	0.06	0.37	0.01	0.38	0.01	0.79

Notes: (1) * Statistically significant at the 5 percent level (2) Only a small number of t statistics are significant at the 5 percent leve, but almost all R-squares (adj) are not significant, indicating that the errors are homoskedastic.

APPENDIX 5.4

BETA COEFFICIENTS OF EIGHT SIMILAR ECONOMIC VARIABLES FOR 10 SELECTED COUNTRIES FOR PERIOD JANUARY 1980 TO DECEMBER 1987

$$Ei = a + b(Ej) + e \quad \text{and} \quad Ej = a + b(Ei) + e$$

(Where E is a similar economic variable in country i and j and a and b are regression parameters and e, error term)

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
			US = Dependent Variable					
UK	_0.05	0.13	0.26*	0.15*	0.18*	0.38*	0.26*	0.29*
WG	_0.14	0.03	0.73*	0.09	0.19	0.46*	0.14	0.35*
FR	0.01	0.05	0.47*	0.13*	0.27	_0.23	0.04	0.26*
NW	_0.00	0.01	0.22*	0.03*	_0.18*	_0.10*	_0.00	0.29*
JP	_0.23	0.07	0.21*	0.09*	_0.44	0.22*	_0.01	0.23*
SP	0.01	0.04	0.26*	0.02	_0.21*	0.01	_0.23*	0.20*
MY	0.00	0.14	0.18*	0.12*	0.04	0.01	0.04	0.26*
AU	0.21	0.04	0.31*	0.35*	0.09	0.03	0.13*	0.01
SA	_0.04	0.02	0.01	0.05	0.25*	0.26*	0.12*	0.09*
			UK = Dependent Variable					
US	_0.55	0.19*	0.66*	0.30*	0.13	0.08*	0.26*	0.75*
WG	_0.55	_0.01	0.73*	0.23*	_0.02	0.24*	0.73*	0.91*
FR	0.01	_0.03	0.75*	0.16*	_0.05	0.40*	0.39*	0.61*
NW	_0.02	_0.01	0.07	0.01	0.03	0.10*	0.34*	0.45*
JP	_1.53*	_0.11	0.33*	0.20*	0.20	0.14*	0.40*	0.44*
SP	0.02	_0.11*	0.28*	0.03	0.01	_0.01	0.15*	0.31*
MY	0.02	_0.01	0.01	_0.13*	0.10	_0.00	0.18*	0.29*
AU	0.55	0.01	0.15	_0.10	0.05	_0.01	0.28*	_0.04
SA	0.15	_0.06	0.06	0.08*	0.00	0.03	0.16*	_0.33*
			WG = Dependent Variable					
US	0.12	0.17	0.50*	0.29*	0.10	0.56*	0.13	0.83*
UK	0.05	_0.03	0.20*	0.36*	_0.02	1.38*	0.70*	0.82*
FR	0.28*	_0.72*	0.44*	_0.01	_0.34*	0.49*	0.47*	0.66*
NW	0.01	0.03	0.23*	_0.02	0.02	0.37*	0.28*	0.46*
JP	0.13	0.10	0.09*	0.20*	0.19	0.23*	0.61*	0.46*
SP	_0.01	_0.05	0.24*	0.01	0.01	0.01	0.17*	0.28*
MY	_0.03	_0.02	0.20*	_0.10	_0.03	0.01	0.24*	0.25*
AU	0.01	_0.03	0.10	_0.00	_0.07	0.27	0.28*	_0.10
SA	_0.03	0.00	_0.10*	0.14*	0.29*	0.16*	0.10*	_0.21*
			FR = Dependent Variable					
US	0.01	0.16	0.52*	1.20*	0.11*	_0.07	0.10	1.01*
UK	0.00	_0.05	0.33*	0.72*	0.03	_0.54*	1.05*	0.90*
WG	0.38*	_0.35*	0.71*	_0.02	0.29*	0.12*	1.32*	1.06*
NW	0.02*	0.06*	0.23*	_0.06	0.04	0.03	0.45*	0.60*
JP	_0.04	0.21*	0.15*	0.63*	0.06	0.06	0.47*	0.63*
SP	_0.04	_0.06	0.31*	_0.03	0.12*	_0.01	0.12	0.25*
MY	_0.01	_0.01	0.29*	_0.07	0.10	_0.00	0.17*	0.20
AU	_0.04	_0.13*	0.19*	1.19*	0.04	_0.02	0.24*	_0.14
SA	_0.02	0.19*	0.00	0.23*	0.10	_0.04	_0.03	_0.16*

NW = Dependent Variable

US	_0.07	1.10	0.52*	1.36*	_0.27*	0.42*	_0.01	0.85*
UK	_0.54	0.33	0.07	0.36	_0.06	2.08*	_1.05*	0.51*
WG	3.10	0.42	0.77*	0.38	0.06	1.33*	0.87*	0.57*
FR	5.48*	1.85*	0.49*	0.34	0.14	0.52	0.49*	0.47*
JP	7.13	0.27	0.16*	0.56*	-0.04	0.32*	0.52*	0.28*
SP	_0.19	_0.24	0.10	_0.42	_0.07	0.01	_0.03	0.16
MY	_0.61	_0.12	0.31*	_0.67*	_0.04	0.01	0.11	0.33*
AU	_0.90	_0.40	0.30*	1.03*	0.02	0.46	0.38*	_0.06
SA	0.50	1.23*	0.04	0.46	0.03	0.07	0.16*	0.12

JP = Dependent Variable

US	0.09	0.14	0.53*	0.72*	_0.09*	0.23*	_0.01	0.87*
UK	0.06*	_0.16	0.34*	0.84*	0.05	0.69*	0.33*	0.66*
WG	0.06	0.03	0.34*	0.54*	0.08	0.20*	0.53*	0.76*
FR	_0.01	0.14*	0.34*	0.57*	0.03	0.22	0.15*	0.64*
NW	0.01	0.01	0.18*	0.09*	-0.01	0.08*	0.15*	0.37*
SP	_0.01	0.04	0.02	0.05	_0.01	_0.01	0.15*	0.01
MY	0.02	0.01	_0.03	_0.10	0.07	_0.00	0.31*	0.31*
AU	0.01	_0.10*	0.05	0.76*	0.06*	_0.09	0.22*	_0.28*
SA	-0.00	0.22*	0.07	0.32*	0.02	0.24*	0.16*	_0.02

SP = Dependent Variable

US	0.66	0.16	0.57*	0.10	0.36*	0.72	0.36*	0.36*
UK	0.09	_0.33*	0.25*	0.11	0.02	_1.84	0.23*	0.21*
WG	_0.75	_0.03	0.77*	0.03	0.03	0.64	0.27*	0.20*
FR	-1.60	_0.08	0.61*	_0.03	0.48*	_1.52	0.07	0.11*
NW	_0.02	_0.01	0.09	_0.04	-0.08	0.18	-0.01	0.09
JP	_0.36	0.10	0.02	0.04	_0.05	_0.08	0.28*	0.00
MY	0.23	0.00	0.56*	0.50*	_0.04	0.57*	0.26*	0.22*
AU	_0.39	0.07	0.23*	0.10	_0.30*	1.99	0.21*	0.13*
SA	-1.04*	0.11	_0.14	_0.13	_0.20	0.45	0.12*	0.23*

MY = Dependent Variable

US	0.01	1.18	0.36*	0.44*	0.01	1.43	0.09	0.51*
UK	0.07	0.34	0.01	_0.24*	0.04	_0.59	0.42*	0.21*
WG	1.10	_0.25	0.59*	_0.12	_0.02	1.41	0.58*	0.20*
FR	0.32	_0.09	0.52*	0.03	0.07	_1.34	0.15*	0.10
NW	_0.02	_0.10	0.26*	_0.05*	-0.01	0.26	0.09	0.21*
JP	1.56	0.32	_0.02	_0.04	0.11	0.65	0.85*	0.15*
SP	0.16	0.03	0.52*	0.27*	_0.01	0.98*	0.39*	0.24*
AU	_0.03	_0.57*	0.22*	0.32*	0.01	4.42	0.38*	0.08
SA	_0.43*	_0.48	_0.19*	_0.03	0.08	0.64	0.23*	0.15*

AU = Dependent Variable

US	0.37*	0.36	0.36*	0.69*	0.11	0.01	0.28*	0.02
UK	0.09	0.04	0.07	0.10	0.08	0.02	0.64*	_0.05
WG	0.01	0.04	0.17	0.00	0.18	0.07	0.65*	_0.14
FR	_0.06	0.36*	0.20*	0.26*	0.12	0.02	0.20*	_0.12
NW	_0.01	_0.04	0.15*	0.04*	0.01	0.03	0.29*	_0.07
JP	0.05	_0.40*	0.02	0.19*	0.39	_0.03	0.59*	_0.24*
SP	_0.02	0.15	0.12*	0.03	_0.21*	0.00	0.31*	_0.24*
MY	_0.00	_0.06*	0.12*	0.17*	0.03	0.01	0.37*	0.13
SA	0.08	_0.03	0.13*	0.03	_0.27*	0.09*	0.30*	0.01

SA = Dependent Variable

US	-0.50	0.13	0.02	0.23	0.13*	0.42*	0.54*	0.40*
UK	0.17	_0.28	0.05	0.18	0.00	0.24	0.70*	0.55*
WG	_0.36	0.00	_0.31*	0.20*	0.32*	0.22*	0.47*	0.38*
FR	0.23	0.46*	_0.00	0.11*	0.13	_0.22	-0.04	0.18*
NW	0.02	0.09*	_0.03	0.04	0.01	_0.02	0.24*	0.17
JP	_0.03	0.76*	0.06	0.18*	0.05	0.38*	0.81*	_0.03
SP	_0.27*	0.19	_0.13	_0.08	0.06	0.00	0.35*	_0.58*
MY	_0.16*	_0.04	_0.20*	_0.04	0.15	0.00	0.43*	0.34*
AU	0.53	_0.02	0.24*	0.07	_0.19*	0.46*	0.59*	0.01

* statistically significant at the 5 percent level.

APPENDIX 5.5

RESULTS OF MULTIPLE REGRESSION FOR 8 SIMILAR ECONOMIC VARIABLES FROM 10 SELECTED COUNTRIES

$$Ei = a + bi\ Ej1 + \ldots\ldots\ldots + bi\ Ej9 + e$$

(Where E is the similar economic variable from country i and countries j1 through j9 and a b are multiple regression parameters and e error term)

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
			US = Dependent Variable					
a	0.72	0.12	0.01	0.21	-1.17	-0.33	0.49	-0.24
bUK	-0.14	0.06	0.07	0.12	0.20	-0.17	0.32	-0.11
ts	-1.78*	0.67	1.12	1.52	1.88*	-0.67	2.02*	-1.03
bWG	0.18	0.02	0.48	0.09	0.10	0.68	0.15	0.18
ts	0.74	0.34	3.88*	1.59	0.68	5.76*	0.66	1.40
bFR	0.09	-0.01	0.05	0.06	0.15	-0.42	-0.08	0.06
ts	0.40	-0.13	0.54	1.53	0.90	-2.37*	-0.70	0.68
bNW	-0.01	0.02	0.04	0.02	-0.19	-0.13	-0.11	0.14
ts	-0.50	1.47	0.70	1.19	-2.37*	-2.32*	-1.47	2.52*
bJP	0.34	0.12	0.12	-0.04	-0.56	0.09	-0.24	0.11
ts	0.77	1.24	2.36*	-0.83	-2.61*	1.11	-1.58	1.81*
bSP	0.01	0.04	0.09	0.04	0.16	0.00	0.18	0.09
ts	0.25	0.66	1.33	0.84	2.05*	-0.21	2.15*	1.41
bMY	-0.08	0.02	-0.01	0.08	-0.01	0.00	-0.05	0.12
ts	-1.05	1.33	-0.20	1.52	-0.03	0.31	-0.69	1.89*
bAU	0.32	0.06	0.20	0.23	0.18	-0.14	0.03	0.04
ts	1.85*	1.36	2.63*	2.99*	1.91*	-0.90	0.41	0.93
bSA	-0.08	-0.01	0.03	0.01	0.21	0.13	0.09	0.03
ts	-0.79	-0.28	0.52	0.33	1.55	1.82*	1.58	0.55
R2	0.29	0.09	0.52	0.36	0.25	0.42	0.22	0.45
R2′	0.00	0.00	0.47	0.29	0.16	0.36	0.13	0.39
F	0.80	0.84	10.13*	5.06*	3.05*	6.82*	2.59*	7.61*
DW	1.38	1.11	1.16	2.08	1.98	2.11	3.01	2.67
			UK = Dependent Variable					
a	-0.25	0.13	0.09	0.95	-0.01	0.36	-0.29	-0.25
bUS	-1.15	0.09	0.21	0.25	0.20	-0.03	0.14	-0.11
ts	-1.78*	0.67	1.12	1.52	1.88*	-0.67	2.02*	-1.03
bWG	0.63	-0.04	0.26	0.15	-0.08	0.18	0.31	0.74
ts	0.91	-0.58	1.09	1.79*	-0.54	3.16*	2.17	7.38*
bFR	0.23	-0.01	0.59	0.12	0.02	0.27	0.16	0.04
ts	0.43	-0.12	3.52*	1.94*	0.10	3.67*	2.24*	0.47
bNW	-0.03	0.01	-0.15	-0.01	0.07	0.02	0.16	0.05
ts	-0.92	0.81	-1.42	-0.57	0.84	0.95	3.51*	0.92
bJP	1.11	-0.01	0.19	0.08	0.28	0.08	-0.06	0.11
ts	0.89	-0.08	2.07*	1.25	1.26	1.99*	-0.62	1.84*
bSP	0.08	-0.11	0.14	0.03	-0.01	0.0	0.01	-0.01
ts	0.60	-1.59	1.14	0.51	-0.18	-0.78	0.23	-0.15
bMY	-0.32	0.01	-0.27	-0.15	0.08	0.00	0.02	0.01
ts	-1.48	0.37	-2.22*	-1.87*	0.49	0.39	0.47	0.10
bAU	0.85	0.01	-0.01	-0.16	0.01	-0.05	0.04	0.07
ts	1.67*	0.10	-0.09	-1.30	0.11	-0.72	0.75	1.60
bSA	-0.09	-0.03	0.04	0.02	-0.03	0.01	0.08	0.18
ts	-0.33	-0.43	0.40	0.25	-0.21	0.17	2.08*	4.13*
R2	0.36	0.06	0.39	0.29	0.06	0.49	0.65	0.80
R2′	0.02	0.00	0.32	0.21	0.00	0.44	0.62	0.78
F	1.05	0.55	6.02*	3.60*	0.60	9.07*	17.75*	37.83*
DW	2.28	2.17	1.74	2.69	2.28	1.00	2.30	2.62
			WG = Dependent Variable					
a	0.49	0.09	0.02	0.06	-0.89	0.11	-0.33	-0.08
bUS	0.18	0.09	0.31	0.34	0.06	0.41	0.03	0.12

ts	0.74	0.34	3.88*	1.59	0.68	5.76*	0.66	1.40
bUK	0.07	0.12	0.05	0.25	-0.04	0.58	0.17	0.53
ts	0.91	-0.58	1.09	1.79*	-0.54	3.16*	2.17*	7.38*
bFR	0.20	0.86	0.17	-0.24	0.31	0.24	0.33	0.29
ts	0.93	5.38*	2.21*	-3.05*	2.71*	1.70*	8.21*	4.96*
bNW	0.01	-0.01	0.12	0.00	0.01	0.26	0.01	0.00
ts	0.53	-0.39	2.69*	-0.10	0.20	7.41*	0.23	0.07
bJP	-0.04	0.04	-0.03	0.27	0.16	-0.04	0.32	0.00
ts	-0.10	0.19	-0.73	3.45*	0.99	-0.62	4.90*	0.02
bSP	-0.02	0.03	0.08	-0.01	-0.04	0.00	0.01	0.04
ts	-0.42	0.21	1.39	-0.11	-0.71	0.12	0.30	0.75
bMY	0.04	-0.03	0.01	-0.06	-0.11	0.00	0.03	0.01
ts	0.47	-1.00	0.11	-0.60	-0.85	0.34	0.66	0.25
bAU	-0.05	-0.12	-0.07	-0.03	0.07	0.09	0.05	-0.04
ts	-0.29	-1.30	-1.06	-0.18	0.96	0.82	1.42	-1.10
bSA	-0.04	-0.14	-0.09	0.07	0.27	0.03	0.00	-0.04
ts	_0.42	_1.17	_2.05*	0.82	2.78*	0.54	0.14	_0.93
R2	0.20	0.31	0.55	0.26	0.21	0.71	0.80	0.84
R2′	0.00	0.23	0.50	0.18	0.13	0.68	0.78	0.83
F	0.46	3.69*	11.54*	3.21*	2.50*	23.47*	38.10*	50.60*
DW	2.52	2.71	1.34	2.11	1.75	1.40	2.86	2.84

FR = Dependent Variable

a	2.50	-0.07	0.21	-0.27	0.18	0.25	1.05	0.47
bUS	0.10	-0.02	0.06	0.43	0.07	-0.15	-0.07	0.09
ts	0.40	-0.13	0.54	1.53	0.90	-2.37*	-0.70	0.68
bUK	0.04	-0.02	0.21	0.36	0.01	0.51	0.35	0.07
ts	0.43	-0.12	3.52*	1.94*	0.10	3.67*	2.24*	0.47
bWG	0.24	0.33	0.31	-0.42	0.26	0.14	1.33	0.76
ts	0.93	5.38*	2.21*	-3.05*	2.71*	1.70*	8.21*	4.96*
bNW	0.02	0.04	0.08	-0.02	0.06	-0.06	0.06	0.15
ts	1.45	2.55*	1.24	-0.69	1.06	-1.64*	0.85	2.01*
bJP	-0.30	0.16	0.02	0.50	0.04	0.03	-0.33	0.21
ts	-0.62	1.16	0.40	5.18*	0.26	0.50	-2.28*	2.73*
bSP	-0.04	-0.09	0.07	-0.09	0.14	0.00	0.00	0.02
ts	-0.82	-1.13	0.97	-0.78	2.69*	-0.06	0.03	0.19
bMY	0.05	0.02	0.16	-0.04	0.11	0.0	-0.03	-0.14
ts	0.54	1.14	2.16*	_0.30	0.94	_0.14	_0.34	_1.68*
bAU	-0.06	0.18	0.02	0.69	0.06	0.04	-0.08	0.01
ts	-0.27	3.19*	0.28	3.48*	0.94	0.38	-1.00	0.18
bSA	0.01	0.12	0.05	0.06	0.00	_0.05	_0.14	_0.03
ts	0.08	1.69*	0.88	0.51	0.01	_1.03	_2.50*	_0.42
R2	0.26	0.47	0.50	0.58	0.21	0.29	0.72	0.75
R2′	0.00	0.40	0.45	0.53	0.13	0.22	0.69	0.72
F	0.66	7.22*	9.48*	12.18*	2.48*	3.89*	24.30*	28.40*
DW	1.34	2.47	1.02	2.46	2.16	0.83	2.87	2.71

NW = Dependent Variable

a	-28.31	0.79	0.22	-0.19	-1.16	-0.56	1.17	0.53
bUS	-2.32	1.49	0.14	1.13	-0.34	-0.46	-0.23	0.48
ts	-0.50	1.47	0.70	1.19	-2.37*	-2.32*	-1.47	2.52*
bUK	-1.44	0.68	-0.16	-0.36	0.12	0.44	0.79	0.19
ts	-0.92	0.81	-1.42	-0.57	0.84	0.95	3.51*	0.92
bWG	2.48	-0.18	0.65	-0.05	0.04	1.51	0.07	0.02
ts	0.53	-0.39	2.69*	-0.10	0.20	7.41*	0.23	0.07
bFR	5.82	1.80	0.23	-0.26	0.23	-0.55	0.14	0.30
ts	1.45	2.55*	1.24	-0.69	1.06	-1.64*	0.85	2.01*
bJP	9.76	_1.99	0.09	0.43	_0.24	0.09	0.12	_0.14
ts	1.20	_2.39*	0.94	1.18	_0.80	0.54	0.55	_1.29
bSP	0.53	-0.18	-0.25	-0.27	-0.04	0.00	-0.15	-0.08
ts	0.57	_0.38	_2.00*	_0.72	_0.37	0.29	_1.16	_0.62
bMY	-0.77	-0.08	0.22	-0.84	-0.07	-0.01	-0.14	0.17
ts	-0.50	-0.72	1.77*	-1.87*	-0.30	-0.44	-1.24	1.40
bAU	_0.06	_0.76	0.15	0.93	0.04	0.16	0.16	_0.05
ts	_0.02	_2.08*	1.04	1.34	0.30	0.54	1.33	_0.62
bSA	0.66	1.34	0.09	0.31	0.09	_0.13	0.05	_0.05
ts	0.35	3.12*	0.90	0.86	0.50	_0.96	0.55	_0.54

R2	0.23	0.30	0.29	0.14	0.08	0.54	0.42	0.38
R2′	0.00	0.22	0.22	0.05	0.00	0.49	0.35	0.31
F	0.56	3.53*	3.96*	1.52	0.81	11.24*	6.73*	5.75*
DW	1.84	2.72	2.17	1.83	2.20	2.36	2.80	2.67

JP = Dependent Variable

a	1.52	0.17	-0.13	-0.77	-0.86	-0.17	-0.35	1.09
bUS	0.1	0.17	0.51	-0.24	-0.14	0.14	-0.12	0.35
ts	0.77	1.24	2.36*	-0.83	-2.61*	1.11	-1.58	1.81*
bUK	0.04	-0.01	0.25	0.23	0.07	0.58	-0.07	0.36
ts	0.89	-0.08	2.07*	1.25	1.26	1.99*	-0.62	1.84*
bWG	-0.01	0.01	-0.20	0.47	0.07	-0.10	0.69	0.01
ts	-0.1	0.19	-0.73	3.45*	0.99	-0.62	4.90*	0.02
bFR	-0.08	0.11	0.08	0.49	0.02	0.11	-0.18	0.39
ts	-0.62	1.16	0.4	5.18*	0.26	0.50	-2.28*	2.73*
bNW	0.01	-0.04	0.11	0.04	-0.03	0.04	0.03	-0.14
ts	1.20	-2.39*	0.94	1.18	-0.80	0.54	0.55	-1.29
bSP	-0.04	0.00	-0.14	0.07	-0.03	0.01	0.02	-0.13
ts	-1.64	0.07	-0.99	0.60	0.77	0.47	0.30	-1.03
bMY	-0.04	0.01	-0.04	-0.05	0.06	-0.01	0.16	0.21
ts	-0.86	0.65	-0.27	-0.33	0.75	-0.56	2.88*	1.80*
bAU	0.04	-0.10	-0.14	0.18	0.08	-0.19	0.00	-0.22
ts	0.40	-2.14*	-0.86	0.84	1.75*	-0.99	-0.08	-2.63*
bSA	-0.07	0.22	0.02	0.12	0.04	0.22	0.07	-0.22
ts	-1.33	3.98*	0.14	1.13	0.58	2.63*	1.63*	-2.63*
R2	0.27	0.28	0.19	0.52	0.12	0.19	0.51	0.54
R2′	0.00	0.19	0.11	0.47	0.03	0.11	0.46	0.48
F	0.71	3.24*	2.35*	9.76*	1.31	2.35*	9.92*	10.95*
DW	2.02	2.64	2.24	2.26	2.01	1.89	2.51	2.54

SP = Dependent Variable

a	10.84	0.29	-0.10	0.13	-0.45	5.48	0.50	0.34
bUS	0.31	0.16	0.23	0.24	0.29	-0.28	0.28	0.24
ts	0.25	0.66	1.33	0.84	2.05*	-0.21	2.15*	1.41
bUK	0.25	-0.31	0.11	0.09	-0.03	-2.41	0.06	-0.03
ts	0.60	-1.59*	1.14	0.51	-0.18	-0.78	0.23	-0.15
bWG	-0.51	0.02	0.30	-0.02	-0.14	0.20	0.08	0.15
ts	-0.42	0.21	1.39	-0.11	-0.71	0.12	0.30	0.75
bFR	-0.90	-0.20	0.16	-0.09	0.56	-0.14	0.00	0.02
ts	-0.82	-1.13	0.97	-0.78	2.69*	-0.06	0.03	0.19
bNW	0.04	-0.01	-0.18*	-0.02	-0.04	0.21	-0.11	-0.06
ts	0.57	-0.38	-2.00*	-0.72	-0.37	0.29	-1.16	-0.62
bJP	-3.36	0.01	-0.08	0.07	0.23	0.52	0.06	-0.09
ts	-1.64*	0.07	-0.99	0.60	0.77	0.47	0.30	-1.03
bMY	-0.58	0.02	0.45	0.41	-0.14	0.57	0.18	0.09
ts	-1.53	0.58	4.56*	3.17*	-0.61	10.39*	1.85*	0.94
bAU	0.47	0.10	0.05	0.01	-0.36	-0.60	0.09	0.10
ts	0.50	1.17	0.42	0.03	-3.02*	-0.35	0.88	1.39
bSA	-1.28	0.16	-0.02	-0.06	-0.01	0.12	0.01	0.17
ts	-3.30*	1.50	-0.25	-0.58	-0.08	0.13	0.20	2.35*
R2	0.49	0.09	0.44	0.17	0.21	0.57	0.20	0.23
R2′	0.22	0.00	0.38	0.07	0.13	0.52	0.12	0.15
F	1.82	0.90	7.29*	1.79	2.48*	12.41*	2.37*	2.77*
DW	2.81	0.70	1.61	2.20	2.26	2.47	3.28	3.11

MY = Dependent Variable

a	3.70	0.16	0.12	0.47	-0.09	5.52	0.95	0.27
bUS	-0.75	1.39	-0.03	0.35	0.00	0.54	-0.10	0.33
ts	-1.05	1.33	-0.20	1.52	-0.03	0.31	-0.69	1.89*
bUK	-0.35	0.32	-0.20	-0.28	0.03	1.56	-0.11	0.02
ts	-1.48	0.37	-2.22*	-1.87*	0.49	0.39	0.47	0.10
bWG	0.34	-0.47	0.02	-0.07	-0.08	0.77	0.20	0.05
ts	0.47	-1.00	0.11	-0.60	-0.85	0.34	0.66	0.25
bFR	0.36	1.07	0.33	-0.03	0.09	-0.42	-0.05	-0.22
ts	0.54	1.41	2.16*	-0.30	0.94	-0.14	-0.34	-1.68*
bNW	-0.02	-0.09	0.16	-0.05	-0.02	-0.41	0.12	0.14
ts	-0.5	-0.72	1.77*	-1.87*	-0.30	-0.44	-1.24	1.40

bJP	-1.12	0.58	-0.02	-0.03	0.11	-0.82	0.57	0.17
ts	-0.86	0.65	-0.27	-0.33	0.75	-0.56	2.88*	1.80*
bSP	-0.21	0.29	0.43	0.27	-0.03	0.98	0.22	0.11
ts	-1.53	0.58	4.56*	3.17*	-0.61	10.39*	1.85*	0.94
bAU	0.84	-0.86	0.08	0.28	0.00	2.42	0.16	0.09
ts	1.58*	-2.26*	0.63	1.67*	0.03	0.97	1.49	1.19
bSA	-0.77	-0.88	-0.13	0.07	0.09	-0.12	0.06	0.10
ts	-3.31*	-1.89*	-1.57	0.74	1.08	-0.10	0.71	1.29
R2	0.52	0.14	0.42	0.29	0.04	0.57	0.36	0.23
R2′	0.27	0.04	0.36	0.21	0.00	0.53	0.29	0.14
F	2.05*	1.36	6.79*	3.58*	0.38	12.67*	5.21*	2.79*
DW	2.09	2.74	1.82	2.48	1.21	2.38	2.81	2.87
		AU = Dependent Variable						
a	0.41	0.08	0.25	0.39	1.31	0.07	0.41	1.86
bUS	0.52	0.42	0.38	0.43	0.24	-0.07	0.06	0.23
ts	1.85*	1.36	2.63*	2.99*	1.91*	-0.90	0.41	0.93
bUK	0.17	0.03	-0.01	-0.13	0.01	-0.12	0.17	0.39
ts	1.67*	0.10	-0.09	-1.30	0.11	-0.72	0.75	1.60
bWG	-0.09	-0.18	-0.20	-0.01	0.17	0.08	0.42	-0.32
ts	-0.29	-1.30	-1.06	-0.18	0.96	0.82	1.42	-1.10
bFR	-0.08	0.68	0.04	0.19	0.18	0.05	-0.15	0.03
ts	-0.27	3.19*	0.28	3.48*	0.94	0.38	-1.00	0.18
bNW	0.00	-0.07	0.08	0.02	0.03	0.02	0.13	-0.08
ts	-0.02	-2.08*	1.04	1.34	0.30	0.54	1.33	-0.62
bJP	0.23	-0.55	-0.00	0.05	0.45	-0.06	-0.02	-0.34
ts	0.40	-2.14*	-0.86	0.84	1.75*	-0.99	-0.08	-2.63*
bSP	0.03	0.17	0.04	0.00	-0.28	0.00	0.10	0.21
ts	0.50	1.17	0.42	0.03	-3.02*	-0.35	0.88	1.39
bMY	0.15	-0.08	0.06	0.12	0.01	0.01	0.16	0.17
ts	1.58	-2.26*	0.63	1.67*	0.03	0.97	1.49	1.19
bSA	0.19	-0.02	0.13	-0.05	-0.36	0.11	0.16	-0.16
ts	1.63*	-0.15	1.64*	-0.81	-2.26*	2.21*	2.03*	-1.46
R2	0.33	0.23	0.18	0.46	0.19	0.10	0.35	0.16
R2′	0.00	0.14	0.09	0.39	0.11	0.01	0.28	0.07
F	0.92	2.47*	2.07*	7.53*	2.27*	1.06	5.14*	1.73
DW	2.34	2.53	1.10	1.55	1.96	2.09	2.63	2.84
		SA = Dependent Variable						
a	5.47	-0.17	0.96	1.62	1.47	0.92	1.76	1.32
bUS	-0.46	-0.07	0.11	0.09	0.13	0.28	0.32	0.13
ts	-0.79	-0.28	0.52	0.33	1.55	1.82*	1.58*	0.55
bUK	-0.07	-0.09	0.05	0.05	-0.02	0.06	0.63	0.95
ts	-0.33	-0.43	0.4	0.25	-0.21	0.17	2.08*	4.13*
bWG	-0.25	-0.14	-0.53	0.12	0.31	0.11	0.06	-0.28
ts	-0.42	-1.17	-2.05*	0.82	2.78*	0.54	0.14	-0.93
bFR	0.04	0.31	0.17	0.06	0.00	-0.27	-0.51	-0.08
ts	0.08	1.69*	0.88	0.51	-0.01	-1.03	-2.50*	-0.42
bNW	0.01	0.09	0.10	0.03	0.03	-0.08	0.08	-0.07
ts	0.35	3.12*	0.90	0.86	0.50	-0.96	0.55	-0.54
bJP	-1.37	0.79	0.01	0.13	0.10	0.34	0.46	-0.34
ts	-1.33	3.98*	0.14	1.13	0.58	2.63*	1.63*	-2.63*
bSP	-0.31	0.18	-0.03	-0.07	-0.01	0.00	0.03	0.35
ts	-3.30*	1.50	-0.25	-0.58	-0.08	0.13	0.20	2.35*
bMY	-0.51	-0.05	-0.21	0.1	0.15	0.00	0.11	0.19
ts	-3.31*	-1.89*	-1.57	0.74	1.08	-0.10	0.71	1.29
bAU	0.70	-0.01	0.24	-0.17	-0.16	0.49	0.30	-0.16
ts	1.63*	-0.15	1.64*	-0.81	-2.26*	2.21*	2.03*	-1.46
R2	0.63	0.38	0.14	0.09	0.18	0.22	0.36	0.36
R2′	0.44	0.31	0.05	0.00	0.09	0.14	0.29	0.29
F	3.24*	5.14*	1.52	0.94	1.98*	2.73*	5.28*	5.37*
DW	2.16	2.29	1.88	2.17	1.48	1.65	2.98	2.28

Notes: ts = value of t statistic, R2 = R-square, R2′ = adjusted R-square, F = F-ratios and * = statistically significant at 5 percent level

APPENDIX 5.6

RESULTS OF STEPWISE REGRESSION

US = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	1.62	0.14	0.05	0.24	-1.29	-0.39	0.38	0.02
bUK	-0.12		0.08	0.16	0.20		0.32	
t	-1.7		1.66	2.57	1.89		2.56	
bWG			0.49			0.67		0.24
t			4.22			6.08		3.98
bFR						-0.45		
t						-2.86		
bNW		0.02			-0.18	-0.14		0.15
t		1.65			-2.28	-2.50		2.70
bJP			0.12		-0.54		-0.22	0.10
t			2.45		-2.55		-2.90	1.87
bSP					0.19		0.18	0.11
t					2.15		2.22	1.71
bMY		0.02		0.08				0.12
t		1.5		1.65				2.01
bAU	0.34	0.06	0.21	0.30	0.20			
t	2.19	1.52	2.87	4.79	2.26			
bSA					0.26	0.14	0.10	
t					2.03	2.11	2.02	
R2	0.15	0.08	0.51	0.31	0.23	0.40	0.19	0.40
R2′	0.70		0.48	0.29	0.18	0.38	0.15	0.38
F	1.96		22.33	13.12	4.34	15.15	5.12	20.10
DW	1.30		1.10	2.04	2.01	2.27	3.08	2.64

UK = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	1.4	0.13	0.11	1.00	-0.02	0.32	-0.22	-0.24
bUS	-0.91				0.20		0.16	
t	-1.57				2.03		2.36	
bWG				0.22		0.20	0.31	0.77
t				2.97		5.81	2.72	10.36
bFR			0.62	0.16		0.28	0.16	
t			3.92	3.76		4.20	2.42	
bNW							0.16	
t							3.71	
bJP			0.18			0.08		0.11
t			2.00			2.15		2.17
bSP		-0.11	0.19					
t		-1.78	2.01					
bMY	-0.28		-0.28	-0.13				
t	-1.8		-2.34	-1.88				
bAU	0.81							0.07
t	1.84							1.65
bSA							0.09	0.17
t							2.48	4.39
R2	0.25	0.04	0.35	0.25	0.03	0.47	0.62	0.78
R2′	0.12	0.02	0.33	0.22	0.02	0.46	0.61	0.77
F	2.21	3.05	12.33	7.18	2.59	27.16	37.17	166.80
DW	2.06	0.02	1.75	2.72	2.22	0.99	2.42	2.69

WG = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	0.49	0.11	0.01	0.11	-1.03	0.23	-0.26	-0.17
bUS			0.30	0.30		0.42		0.13
t			4.10	1.65		6.31		1.72
bUK				0.29		0.55	0.20	0.51
t				2.18		3.14	2.97	8.40
bFR	0.29	0.84	0.20	-0.25	0.30	0.23	0.33	0.31
t	1.70	5.80	2.89	-3.49	2.82	1.69	8.93	6.15
bNW			0.11			0.26		
t			2.52			7.74		
bJP				0.29			0.34	
t				3.80			6.02	
bSP			0.08					
t			1.69					
bMY								
t								
bAU							0.07	
t							1.90	
bSA			-0.10		0.28			
t			-2.33		3.02			
R2	0.10	0.27	0.52	0.25	0.17	0.71	0.80	0.84
R2′	0.06	0.26	0.51	0.22	0.15	0.69	0.79	0.83
F	2.75	30.82	24.52	7.23	9.34	53.94	89.08	157.51
DW	2.47	2.73	1.33	2.13	1.83	1.56	2.86	2.83

FR = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	2.52	-0.07	0.29	-0.22	0.11	0.23	1.01	0.48
bUS						-0.15		
t						-2.44		
bUK			0.24	0.38		0.52	0.36	
t			4.23	2.15		4.03	2.62	
bWG		0.34	0.23	-0.41	0.29	0.14	1.31	0.83
t		5.67	2.57	-3.07	3.29	1.74	8.37	8.98
bNW	0.02	0.04	0.10			-0.05		0.17
t	1.68	2.51	1.65			-1.63		2.39
bJP				0.50			-0.34	0.22
t				5.44			-2.56	3.35
bSP					0.13			
t					2.78			
bMY			0.15					0.12
t			2.09					1.64
bAU		0.16		0.65				
t		2.96		3.45				
bSA		0.14					-0.16	
t		2.36					-3.29	
R2	0.10	0.43	0.49	0.56	0.17	0.26	0.71	0.74
R2′	0.07	0.40	0.46	0.54	0.16	0.24	0.70	0.73
F	2.81	15.06	21.02	27.07	9.41	15.74	55.25	86.42
DW	1.64	2.55	1.08	2.37	2.07	0.89	2.82	2.69

NW = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	-27.11	0.79	0.38	0.31	-0.91	-0.58	1.21	0.39
bUS					-0.27	-0.47	-0.25	0.52
t					-2.11	-2.45	-1.64	3.05
bUK							1.01	
t							6.34	
bWG			0.77			1.52		
t			4.08			7.72		
bFR	5.6	1.66				-0.54		0.32
t	1.72	2.88				-1.65		3.78
bJP	7.4	-2.10						
t	1.16	-2.58						
bSP								
t								
bMY				-0.90				
t				-2.27				
bAU		-0.72	0.22	1.31				
t		-2.08	1.66	2.49				
bSA		1.39						
t		3.49						
R2	0.15	0.27	0.20	0.11	0.05	0.53	0.37	0.34
R2′	0.08	0.23	0.18	0.08	0.04	0.51	0.35	0.33
F	2.10	7.14	11.28	3.57	4.50	50.35	26.82	24.23
DW	1.54	2.80	2.31	2.01	2.11	2.48	2.67	2.62

JP = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	1.55	0.17	-0.10	-0.40	-0.88	-0.27	-0.31	1.01
bUS			0.46		-0.09		-0.13	0.35
t			2.66		-1.97		-1.86	1.84
bUK			0.26			0.62		0.37
t			2.46			2.96		2.43
bWG				0.55			0.67	
t				4.42			5.24	
bFR		0.13		0.58			-0.18	0.39
t		1.63		8.02			-2.57	3.18
bNW		-0.04						
t		-2.58						
bSP	-0.04							
t	-1.68							
bMY							0.16	0.21
t							3.07	1.81
bAU		-0.11			0.07			
t		-2.51			1.71			
bSA		0.21				0.23	0.06	-0.22
t		4.16				2.93	1.70	-2.67
R2	0.26	0.27	0.16	0.49	0.06	0.17	0.48	0.45
R2′		0.24	0.14	0.47	0.04	0.15	0.46	0.44
F		6.94	8.65	41.58	3.11	9.49	28.04	25.32
DW		2.50	2.25	2.28	1.85	1.99	2.52	2.67

SP = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	8.39	0.29	-0.05	0.09	-0.51	4.19	0.43	0.28
bUS					0.27		0.33	0.27
t					2.13		2.82	2.16
bUK		-0.33						
t		-1.71						
bWG			0.36					
t			1.83					
bFR					0.51			
t					2.65			
bNW			-0.18					
t			-2.06					
bJP	-3.00							
t	-1.7							
bMY	-0.75		0.50	0.41		0.57	0.25	0.12
t	-2.5		5.45	3.58		10.94	3.22	1.81
bAU					-0.35			
t					-3.20			
bSA	-1.35	0.15						0.21
t	-4.14	1.66						3.41
R2	0.35	0.04	0.41	0.14	0.20	0.56	0.18	0.17
R2′	0.32	0.02	0.38	0.13	0.17		0.16	0.16
F	7.00	3.05	15.50	14.66	7.30		9.79	9.75
DW	2.79	0.65	1.61	2.21	2.19		3.24	3.06

MY = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	5.02	0.38	0.14	0.62	-0.01	6.89	0.84	0.28
bUS								0.37
t								2.20
bUK			-0.21	-0.33				
t			-2.54	-2.51				
bWG								
t								
bFR			0.33					-0.18
t			2.33					-1.82
bNW			0.16	-0.05				
t			2.02	-1.96				
bJP	-1.9				0.11		0.68	0.18
t	-1.72				0.86		4.39	1.90
bSP	-0.3		0.44	0.27		0.98	0.24	
t	-2.5		5.03	3.25		10.94	2.16	
bAU		-0.9		0.24			0.18	
t		-2.52		1.67			1.91	
bSA	-0.84	-0.72			0.08			0.13
t	-4.04	-1.77			0.97			2.03
R2	0.35	0.13	0.40	0.25		0.56	0.34	0.13
R2′	0.29	0.04	0.37	0.22		0.55	0.31	0.12
F	6.34	3.72	14.89	7.36		119.58	15.31	14.29
DW	1.95	2.75	1.82	2.58		2.47	2.79	2.86

AU = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	0.46	0.13	0.27	0.17	1.13	0.14	0.36	1.79
bUS	0.53		0.32	0.39	0.27			
t	2.16		2.97	2.86	2.29			
bUK	0.15						0.34	
t	2.00						2.05	
bWG								
t								
bFR		0.66		0.20				
t		3.20		4.74				
bNW		-0.07						
t		-2.34						
bJP		-0.55			0.51			-0.24
t		-2.41			2.05			-2.62
bSP					-0.26			0.24
t					-2.99			1.76
bMY	0.14	-0.07		0.14			0.19	
t	1.62	-2.32		2.20			1.94	
bSA	0.18		0.15		-0.30	0.10	0.21	
t	1.80		2.02		-2.01	2.06	3.11	
R2	0.31	0.22	0.14	0.43	0.17	0.04	0.31	0.09
R2′		0.17	0.12	0.40	0.13	0.03	0.29	0.07
F		4.26	7.50	21.11	4.50	3.91	13.65	4.96
DW		2.50	1.02	1.58	1.91	2.17	2.66	2.91

SA = Dependent Variable

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP
a	4.89	-0.19	1.00	1.77	1.36	0.85	1.94	1.09
bUS						0.34	0.31	
t						2.78	1.67	
bUK							0.71	0.69
t							2.69	4.95
bWG			-0.40		0.32			
t			-1.87		3.12			
bFR		0.30	0.24				-0.48	
t		1.78	1.38				-3.34	
bNW		0.09						
t		3.29						
bJP	-1.55	0.80		0.19		0.31	0.56	-0.33
t	-1.79	3.98		2.45		2.64	2.58	-2.98
bSP	-0.32							0.36
t	-4.14							2.53
bMY	-0.51	-0.05	-0.23					
t	-4.04	-2.05	-2.03					
bAU			0.29		-0.15	0.48	0.34	
t			2.08		-2.34	2.23	2.46	
R2	0.51	0.34	0.08	0.06	0.14	0.21	0.33	0.32
R2′	0.47	0.31	0.06	0.05	0.12	0.18	0.30	0.29
F	12.68	13.55	4.26	6.00	7.19	7.88	11.19	14.10
DW	2.21	2.28	1.84	2.26	1.48	1.69	2.98	2.36

Notes: t = t-statistics; and R2 = R-square

APPENDIX 5.7

ESTIMATION OF RELATIONSHIP BETWEEN INTERNATIONAL ECONOMIC INDEX AND INDIVIDUAL COUNTRY ECONOMIC INDEX

$$Ei = a + b(\dot{W}) + e$$

(Where E is economic variable from country I, W is an average of individual economic variables and a and b are regression parameters and e, error term)

	GNP	IP	CP	MS	TB	UNEMP	IMP	EXP	ARP
				E(US)= Dependent Variable					
bW	0.03	0.20	1.07	0.40	1.43	0.05	0.42	0.71	0.54
t	0.27*	3.00	10.36	5.86	5.08	1.48*	3.46	9.02	4.82
R2	0.30	9.90	53.60	27.90	22.10	2.30	11.40	46.70	21.77
R2′	0.00	8.80	53.10	27.10	21.30	1.20	10.40	46.10	21.00
DW	1.16	1.11	1.36	2.07	1.63	1.84	3.17	2.71	1.88
				E(UK) = Dependent Variable					
bW	0.14	0.09	1.36	0.42	1.07	0.01	0.95	1.42	0.68
t	0.43*	1.02*	7.05	3.94	4.10	0.6*	11.93	15.64	5.58
R2	0.7	1.2	34.8	14.8	15.6	0.3	60.5	72.4	25.03
R2′	0.0	0.0	34.1	13.9	14.6	0.0	60.1	72.2	24.36
DW	1.89	2.25	1.68	2.58	2.37	0.97	2.35	2.92	2.13
				E(WG) = Dependent Variable					
bW	0.11	0.49	0.80	0.45	1.00	0.07	0.94	1.34	0.65
t	1.15*	2.82	8.54	3.23	4.91	1.95	12.27	15.16	6.25
R2	5.1	8.9	44.0	10.5	21.0	3.9	61.8	71.2	28.30
R2′	1.3	7.7	43.4	9.5	20.1	2.9	61.4	70.9	27.15
DW	2.55	2.81	1.30	2.33	1.89	0.82	2.85	3.08	2.20
				E(FR) = Dependent Variable					
bW	0.18	0.61	1.13	1.51	1.09	-0.00	1.18	1.60	0.91
t	1.73*	5.56	10.50	7.55	6.26	-0.11*	6.98	12.44	6.36
R2	10.9	27.4	54.3	39.0	30.1	0.0	34.4	62.5	32.32
R2′	7.3	26.5	53.8	38.3	29.3	0.0	33.7	62.1	31.37
DW	1.81	2.69	0.97	2.65	2.22	0.78	2.91	2.94	2.12
				E(NW) = Dependent Variable					
bW	9.02	4.53	1.22	3.90	1.15	0.10	1.26	1.14	2.79
t	14.21	8.99	6.30	8.93	3.11	1.40*	7.12	7.97	7.25
R2	89.0	49.6	29.9	47.3	9.7	2.1	35.3	40.6	37.93
R2′	88.5	49.0	29.2	46.7	8.7	1.0	34.6	39.4	37.13
DW	2.29	2.75	2.30	1.99	2.04	1.67	2.90	2.66	2.33
				E(JP) = Dependent Variable					
bW	0.06	0.18	1.08	1.57	0.30	0.02	0.70	1.22	0.64
t	1.00*	1.90	5.09	9.01	2.11	0.5*	7.61	7.18	4.30
R2	3.8	4.2	21.8	47.7	4.7	0.3	38.4	35.7	19.57
R2′	0.0	3.0	21.0	47.1	3.6	0.0	37.7	35.0	18.42
DW	1.87	2.82	1.99	2.36	1.82	1.77	2.57	2.93	2.27

			E(SP) = Dependent Variable						
bW	0.47	0.18	1.25	0.29	1.66	4.09	0.66	0.61	1.15
t	0.77*	1.22*	6.90	1.60*	4.42	20.41	4.65	4.79	5.60
R2	2.3	1.8	33.9	2.8	17.7	81.8	18.9	19.8	22.37
R2′	0.0	0.6	33.2	1.7	16.8	81.6	18.0	19.0	21.36
DW	3.93	0.75	1.64	2.36	2.01	2.24	3.21	3.14	2.41
			E(MY) = Dependent Variable						
bW	-0.11	2.97	1.03	0.17	0.38	5.60	1.09	0.69	1.48
t	-0.29*	5.10	5.59	1.06*	2.19	27.23	6.88	5.27	6.63
R2	0.3	24.1	25.2	1.2	5.0	88.9	33.7	23.0	25.17
R2′	0.0	23.1	24.4	0.1	4.0	88.7	33.0	22.2	24.44
DW	2.30	2.89	1.62	2.27	1.13	2.29	2.79	2.88	2.27
			E(AU) = Dependent Variable						
bW	0.06	0.06	0.68	0.63	1.07	0.03	1.26	0.21	0.50
t	0.46*	0.27*	4.66	6.32	3.13	1.47*	8.97	1.10*	3.30
R2	0.8	0.1	18.9	31.0	9.7	2.3	46.4	1.3	13.78
R2′	0.0	0.0	18.0	30.2	8.8	1.2	45.8	0.2	13.02
DW	1.97	2.76	1.13	1.84	1.86	2.00	2.51	2.97	2.13
			E(SA) = Dependent Variable						
bW	0.05	0.70	0.39	0.66	0.85	0.05	1.54	1.06	0.66
t	0.14*	3.95	1.79*	4.01	3.82	1.13*	7.21	5.42	3.43
R2	0.1	16.0	3.3	15.3	13.8	1.4	35.8	24.0	13.71
R2′	0.0	14.9	2.3	14.4	12.9	0.3	35.2	23.2	12.90
DW	2.66	2.55	1.70	2.20	1.36	1.43	2.96	2.51	2.17

Notes: (1) W, a proxy for an individual international economic variable index, is calculated using a simple average of the similar economic variables of 10 countries; (2) ARP = an average of regression parameters and (3) * not statistically significant at the 5 percent level

APPENDIX 5.8

IMPORTS AND EXPORTS RELATIONSHIP IN A COUNTRY PAIR.

Regression 1: Mi = a + b(Xj) + e R1
Regression 2: Xi = a + b(Mj) + e R2

(Where M and X represent the percentage change in imports and exports respectively from countries i and j, a and b are regression parameters and e is error term)

	R1	R2
	Beta Coefficients	Beta Coefficients
	US = Dependent Variable	
UK	-0.06	0.38*
WG	0.03	0.46*
FR	-0.00	0.21*
NW	0.01	0.02*
JP	-0.15	0.37*
SP	0.08	0.15*

MY	0.10	0.23*
AU	0.16*	0.11*
SA	0.02	0.05

UK = Dependent Variable

US	0.06*	-0.09
WG	0.50*	1.12*
FR	0.35*	0.58*
NW	0.27*	0.40*
JP	0.07	0.78*
SP	0.16*	0.16
MY	0.18*	0.33*
AU	0.03	0.39*
SA	0.27*	0.09

WG = Dependent Variable

US	0.65*	0.04
UK	0.61*	0.80*
FR	0.47*	0.63*
NW	0.31*	0.34*
JP	0.28*	0.72*
SP	0.26*	0.14
MY	0.22*	3.35*
AU	-0.05	0.38*
SA	0.20*	0.09

FR = Dependent Variable

US	0.84*	-0.00
UK	0.89*	0.92*
WG	1.05*	1.27*
NW	0.63*	0.31*
JP	0.44*	0.66*
SP	0.25*	0.03
MY	0.10	0.29*
AU	-0.11	0.26*
SA	0.15	-0.06

NW = Dependent Variable

US	0.88*	0.02
UK	0.67*	0.55*
WG	0.62*	0.66*
FR	0.35*	0.47*
JP	0.14	0.41*
SP	0.27*	0.21*
MY	0.19	0.23*
AU	0.29*	0.18*
SA	0.26*	-0.09

JP = Dependent Variable

US	0.45*	-0.40*
UK	0.37*	0.17

WG	0.37*	0.77*
FR	0.21*	0.43*
NW	0.17*	0.12
SP	0.27*	-0.29*
MY	0.36*	0.34*
AU	-0.02	0.08
SA	0.17*	-0.15*

SP = Dependent Variable

US	0.34*	0.09
UK	0.14	0.19*
WG	0.14	0.32*
FR	0.02	0.11*
NW	0.16*	0.11*
JP	-0.17*	0.38*
MY	0.40*	0.23*
AU	0.06	0.19*
SA	0.30*	0.14*

MY = Dependent Variable

US	0.78*	0.13
UK	0.42*	0.23*
WG	0.51*	0.31*
FR	0.26*	0.05
NW	0.26*	3.09
JP	0.30*	0.56*
SP	0.45*	0.35*
AU	-0.09	0.22*
SA	0.26*	0.13*

AU = Dependent Variable

US	0.36*	0.36*
UK	0.50*	0.07
WG	0.53*	-0.12
FR	0.22*	-0.09
NW	0.20*	0.22*
JP	0.07	-0.05
SP	0.35*	0.08
MY	0.38*	-0.09
SA	0.43*	0.17*

SA = Dependent Variable

US	0.33*	0.06
UK	0.24*	0.79*
WG	0.25	0.64*
FR	-0.11	0.16*
NW	-0.19	0.27*
JP	-0.25*	0.60*
SP	0.51*	0.58*
MY	0.42*	0.34*
AU	0.33*	0.56*

* significant at the 5 percent level

APPENDIX 5.9

UNIT ROOT TESTS FOR 8 ECONOMIC VARIABLES FROM 10 SELECTED COUNTRIES FOR PERIODS 1 (1980-83) & 2 (1984-87)

	VALUE LEVELS		PERCENTAGE CHANGE	
	P1	P2	P1	P2
1. GNP				
US	-0.70	-1.16	-2.61	-4.65
UK	-1.05	0.14	-3.73	-3.68
WG	0.60	-0.42	-3.50	-6.06
FR	-0.61	-1.70	-3.38	-3.09
NW	-2.27	-1.19	-3.89	-1.42
JP	-3.21	-1.24	-2.88	-4.72
SP	-0.12	-3.99	-5.40	-6.39
MY	-3.17	-0.94	-3.91	-1.78
AU	-1.66	-0.40	-3.12	-4.76
SA	-0.94	-0.31	-5.99	-4.24
2. IP				
US	-0.40	0.44	-3.42	-7.51
UK	-2.07	0.55	-6.97	-8.82
WG	-2.59	-2.88	-9.35	-11.43
FR	-4.22	-3.49	-9.85	-12.84
NW	-3.97	-4.81	-13.98	-11.69
JP	-0.87	-1.23	-11.10	-9.93
SP	-2.86	-1.05	-3.37	-2.35
MY	-1.97	-3.10	-7.74	-14.52
AU	-1.69	-2.84	-8.77	-11.50
SA	-2.37	-2.90	-7.67	-10.47
3. CP				
US	-6.09	-0.68	-3.32	-3.94
UK	-4.05	-1.59	-4.38	-5.93
WG	-2.96	-2.45	-5.00	-4.87
FR	-3.66	-5.18	-3.84	-4.13
NW	-2.77	0.46	-7.31	-7.69
JP	-2.88	-2.53	-6.12	-7.24
SP	-2.90	-1.90	-4.99	-6.68
MY	-2.06	-1.52	-5.32	-7.56
AU	-2.21	-0.65	-6.55	-3.29
SA	-2.01	-0.31	-4.63	-7.75
4. MS				
US	0.27	-0.19	-8.00	-7.29
UK	0.07	-0.25	-9.88	-9.44
WG	-1.10	-0.45	-7.41	-7.05
FR	-0.90	-1.54	-11.16	-9.72
NW	-0.64	0.09	-10.06	-2.71
JP	-2.17	-2.04	-8.31	-9.60
SP	-0.94	-1.31	-7.04	-10.00
MY	-0.92	-1.15	-7.56	-9.66
AU	0.18	1.25	-4.50	-7.31
SA	-1.31	-0.56	-9.44	-6.58

5. TB					
	US	-1.60	-1.09	-5.76	-5.92
	UK	-1.01	-2.20	-7.94	-7.10
	WG	-0.65	-0.83	-5.23	-5.32
	FR	-1.67	-1.61	-6.77	-5.56
	NW	-1.88	-1.64	-1.47	-7.84
	JP	-0.93	0.28	-6.66	-5.45
	SP	-1.55	-1.12	-6.43	-7.24
	MY	-3.32	-0.90	-4.72	-4.26
	AU	-4.33	-1.53	-6.67	-4.84
	SA	-2.02	-1.69	-4.94	-4.75
6. UNEMP					
	US	-1.58	-2.02	-5.62	-6.75
	UK	-3.37	0.73	-3.61	-6.15
	WG	-0.36	-2.73	-3.48	-3.81
	FR	-0.54	-1.45	-3.36	-3.41
	NW	-0.45	-1.59	-5.67	-5.79
	JP	-1.71	-2.45	-5.91	-6.34
	SP	0.11	-2.32	-7.12	-9.10
	MY	-0.70	-1.87	-7.48	-9.34
	AU	-3.57	-7.22	-6.10	-10.55
	SA	-4.27	-7.15	-4.97	-4.64
7. IMP					
	US	-5.25	-2.69	-15.08	-12.34
	UK	-1.95	-3.61	-9.43	-9.27
	WG	-3.66	-4.68	-9.42	-10.66
	FR	-2.97	-5.99	-10.14	-9.77
	NW	-4.74	-3.26	-11.16	-10.15
	JP	-3.90	-1.48	-8.43	-11.23
	SP	-5.38	-2.86	-14.07	-15.16
	MY	-3.60	-4.28	-10.07	-12.13
	AU	-2.73	-3.42	-9.64	-12.92
	SA	-3.48	-4.67	-12.66	-13.06
8. EXP					
	US	-3.44	-2.06	-8.96	-9.23
	UK	-2.87	-5.30	-9.29	-10.49
	WG	-3.43	-6.22	-9.43	-11.61
	FR	-2.94	-6.14	-8.98	-9.49
	NW	-2.38	-3.01	-9.52	-8.66
	JP	-6.05	-4.29	-10.97	-12.31
	SP	-4.94	-2.74	-12.13	-15.16
	MY	-2.13	-2.92	-11.26	-12.48
	AU	-5.48	-1.88	-11.12	-11.60
	SA	-4.52	-2.51	-11.37	-9.25

Notes: Non-augmented Dickey-Fuller statistics are used for all the tests. The critical value at the 5 percent level is -2.89 (Fuller, 1976)

APPENDIX 5.10

PARAMETERS OF COINTEGRATING REGRESSIONS & TESTS FOR A UNIT ROOT IN THE COINTEGRATING RESIDUALS (INDEX LEVEL)

$$\ln Ei = a + b \ln Ej + e$$

	Period one					Period two				
	a	b	R2	DW	ADF	a	b	R2	DW	ADF
GNP										
US: DEPENDENT VARIABLE										
UK	5.12	0.70	0.90	1.36	-2.01	5.16	0.70	0.92	1.64	-0.99
WG	-4.88	1.75	0.93	0.48	-0.91	-1.71	1.33	0.96	1.40	-2.16
FR	3.47	0.56	0.92	0.57	-2.67	0.55	0.92	0.98	0.57	-3.40
NW	8.89	-0.19	0.17	0.17	1.43	5.26	0.64	0.75	1.17	-2.65
JP	-7.97	1.28	0.96	0.86	-4.13	-7.25	1.23	0.98	1.21	-1.06
SP	-1.66	0.97	0.58	0.75	-1.71	5.29	0.30	0.06	0.15	-1.52
MY	11.60	-0.44	0.04	0.13	-0.48	7.74	0.06	0.72	0.66	-2.17
AU	4.22	0.76	0.97	1.17	-2.05	5.08	0.60	0.99	1.29	-1.50
SA	2.07	0.53	0.90	1.33	-1.73	3.78	0.39	0.98	1.81	-2.21
UK: DEPENDENT VARIABLE										
US	-6.23	1.30	0.90	1.44	-1.21	-6.42	1.31	0.92	1.72	-2.78
WG	-13.1	2.35	0.89	1.35	-4.10	-9.06	1.80	0.94	1.69	-2.37
FR	-2.03	0.77	0.92	1.53	-3.64	-5.81	1.22	0.92	1.50	-2.44
NW	5.06	-0.20	0.09	0.27	1.47	0.14	0.91	0.91	0.62	1.45
JP	-17.5	1.74	0.95	1.99	-0.23	-16.3	1.64	0.94	1.50	-0.54
SP	-9.44	1.36	0.61	0.58	-1.64	1.10	0.34	0.04	0.25	-1.63
MY	10.80	0.81	0.08	0.21	-0.12	3.74	0.08	0.71	0.76	-1.62
AU	-0.99	1.03	0.96	1.81	-2.06	0.21	0.79	0.93	1.80	-2.20
SA	-3.98	0.73	0.91	2.14	-0.48	-1.59	0.52	0.94	1.65	-2.02
WG: DEPENDENT VARIABLE										
US	3.10	0.53	0.93	0.47	-0.65	1.53	0.72	0.96	1.43	-1.83
UK	5.76	0.38	0.89	1.27	-1.26	5.19	0.52	0.94	1.63	-1.80
FR	4.78	0.32	0.98	0.89	-3.33	1.83	0.67	0.98	1.49	-1.42
NW	7.58	-0.05	0.04	0.10	1.60	5.35	0.46	0.69	0.91	-0.00
JP	1.32	0.70	0.94	0.55	-0.76	-3.80	0.89	0.96	1.23	-2.44
SP	1.56	0.58	0.69	0.96	-1.46	5.96	0.16	0.03	0.15	-0.93
MY	7.98	-0.08	0.04	0.08	0.01	7.11	0.05	0.77	1.02	-1.68
AU	5.29	0.41	0.95	0.76	-1.35	5.19	0.43	0.97	1.59	-1.79
SA	4.04	0.30	0.93	1.97	-1.56	4.21	0.28	0.97	2.42	-1.58
FR:DEPENDENT VARIABLE										
US	-5.08	1.64	0.92	0.54	-2.65	-0.44	1.07	0.98	0.56	-3.40
UK	3.08	1.20	0.92	1.41	-2.93	5.05	0.76	0.92	1.40	-1.62
WG	-14.50	3.07	0.98	0.88	-2.73	-2.47	1.45	0.98	1.45	-1.68
NW	8.90	-0.18	0.05	0.09	-9.77	4.88	0.75	0.74	0.98	-1.41
JP	-19.30	2.19	0.97	0.66	-1.15	-8.38	1.33	0.99	1.15	-1.75
SP	-8.50	1.66	0.58	0.78	-1.55	6.29	0.22	0.03	0.10	-1.41
MY	11.40	-0.41	0.01	0.08	0.03	7.83	0.07	0.79	0.86	-2.17
AU	1.61	1.29	0.96	0.73	-2.52	5.00	0.64	0.98	0.68	-1.12
SA	-2.33	0.93	0.95	1.81	-2.07	3.57	0.42	0.98	1.40	-1.61

NW: DEPENDENT VARIABLE

US	11.70	-0.89	0.17	0.84	0.91	-5.01	1.18	0.75	1.43 -16.1
UK	6.54	-0.49	0.09	0.85	0.23	0.29	1.00	0.91	0.76 0.27
WG	10.10	-0.76	0.04	0.79	0.52	-6.57	1.51	0.69	1.08 -0.94
FR	6.84	-0.29	0.05	0.79	0.36	-3.54	0.98	0.74	1.27 -4.05
JP	17.10	-1.01	0.13	0.84	0.38	-12.6	1.37	0.80	1.42 -7.30
SP	4.21	0.03	0.00	0.75	0.14	8.26	-0.35	0.06	0.49 -4.01
MY	-11.20	1.94	0.18	1.11	-1.24	4.31	0.05	0.42	0.62 -2.58
AU	7.32	-0.56	0.11	0.85	0.44	0.70	0.76	0.77	1.50 -5.08
SA	7.65	-0.28	0.05	0.80	0.34	-0.60	0.46	0.75	1.2 -203.5

JP: DEPENDENT VARIABLE

US	6.44	0.75	0.96	0.84	-4.17	6.00	0.80	0.98	1.21 -1.20
UK	10.20	0.55	0.95	1.89	-0.82	10.10	0.57	0.94	1.42 -1.39
WG	2.55	1.35	0.93	0.55	-1.93	4.57	1.08	0.96	1.20 -2.67
FR	8.90	0.44	0.97	0.67	-1.21	6.38	0.74	0.98	1.16 -1.82
NW	13.00	-0.13	0.13	0.16	-0.01	9.87	0.58	0.80	1.14 -11.8
SP	5.31	0.72	0.54	0.63	-1.13	10.77	0.19	0.03	0.13 -1.90
MY	15.30	-0.35	0.05	0.13	-0.85	12.20	0.05	0.74	0.63 -2.24
AU	9.52	0.59	0.99	1.71	-1.47	10.10	0.48	0.97	1.19 -0.91
SA	7.83	0.41	0.94	1.86	0.23	9.01	0.31	0.98	1.21 -1.58

SP: DEPENDENT VARIABLE

US	5.18	0.60	0.58	1.23	-1.14	8.53	0.19	0.06	2.15 -1.11
UK	8.12	0.45	0.62	0.97	-2.21	9.59	0.11	0.04	2.17 -1.13
WG	1.26	1.19	0.69	1.46	-1.61	8.73	0.18	0.03	2.13 -1.09
FR	7.15	0.35	0.59	1.29	-1.85	9.11	0.12	0.03	2.12 -1.06
NW	10.00	0.00	0.00	0.56	0.57	10.90	-0.17	0.06	2.55 -0.58
JP	0.55	0.76	0.54	1.12	-1.57	7.80	0.18	0.04	2.13 -1.06
MY	8.80	0.15	0.08	0.56	0.66	10.00	0.01	0.02	2.08 -1.10
AU	7.71	0.46	0.57	1.15	-1.63	9.55	0.10	0.05	2.16 -1.11
SA	6.44	0.32	0.53	1.51	-2.11	9.55	0.05	0.02	2.15 -1.05

MY: DEPENDENT VARIABLE

US	8.94	-0.10	0.05	1.54	-1.76	-89.0	11.80	0.73	0.84 -2.03
UK	8.54	-0.09	0.08	1.53	-1.31	-29.2	8.54	0.71	0.86 -1.69
WG	8.55	-0.06	0.04	1.50	-2.36	-115	16.45	0.77	1.17 -1.83
FR	8.38	-0.03	0.01	1.51	-2.09	-87.1	11.37	0.79	1.05 -1.96
NW	7.70	0.10	0.18	1.85	-2.31	-31.9	8.60	0.42	0.62 -3.72
JP	9.82	-0.14	0.05	1.55	-1.63	-177	14.74	0.74	0.81 -1.91
SP	7.58	0.06	0.08	1.49	-2.70	-12.5	2.16	0.02	0.25 -1.17
AU	8.57	-0.09	0.06	1.54	-1.51	-28.7	7.01	0.71	0.94 -1.75
SA	8.88	-0.07	0.06	1.47	-1.31	-45.6	4.66	0.75	0.94 -1.84

AU: DEPENDENT VARIABLE

US	-5.24	1.28	0.97	1.16	-1.91	-8.38	1.66	0.99	1.30 -0.93
UK	1.12	0.93	0.96	1.71	-2.55	0.12	1.17	0.93	1.72 -0.26
WG	11.90	2.29	0.95	0.76	-2.69	-11.3	2.22	0.97	1.57 -2.31
FR	-1.03	0.75	0.97	0.75	-2.67	-7.49	1.52	0.98	0.69 -1.07
NW	5.93	-0.20	0.11	0.17	0.91	0.52	1.02	0.77	1.26 -12.3
JP	-16.00	1.69	0.99	1.72	-1.81	-20.4	2.03	0.97	1.19 -0.60
SP	-7.41	1.24	0.57	0.66	-1.26	0.91	0.45	0.05	0.16 -0.93
MY	10.30	-0.65	0.06	0.12	-0.37	4.48	0.10	0.71	0.76 -1.87
SA	-2.94	0.71	0.96	1.99	-0.38	-2.15	0.64	0.98	1.99 -1.81

SA: DEPENDENT VARIABLE

US	-2.51	1.71	0.91	1.39	-1.44	-9.38	2.54	0.98	1.82	-2.42
UK	5.96	1.26	0.91	2.11	0.27	3.55	1.82	0.94	1.58	-1.22
WG	-11.90	3.15	0.93	2.05	-2.21	-14.2	3.44	0.97	2.40	-2.01
FR	2.91	1.03	0.95	1.96	-2.16	-8.18	2.36	0.98	1.42	-1.54
NW	12.10	-0.19	0.05	0.19	1.51	3.86	1.65	0.75	0.92	-1.32
JP	-17.10	2.27	0.94	1.93	1.26	-28.1	3.15	0.98	1.22	-1.35
SP	-5.31	1.65	0.53	1.09	-1.33	6.78	0.49	0.02	0.15	-1.29
MY	18.90	-0.95	0.06	0.13	-0.09	10.30	0.16	0.75	0.77	-1.90
AU	4.41	1.36	0.96	2.06	0.02	3.50	1.53	0.98	1.99	-1.59

I P

US: INDEPENDENT VARIABLE

UK	3.88	0.17	0.02	0.08	-1.80	1.61	0.69	0.75	0.39	-1.55
WG	0.89	0.83	0.34	0.28	-1.81	2.61	0.48	0.43	0.47	-0.38
FR	2.39	0.50	0.03	0.12	-1.72	-0.18	1.08	0.54	1.04	-2.28
NW	3.53	0.25	0.11	0.22	-1.76	4.02	0.17	0.32	0.60	-0.57
JP	2.27	0.52	0.10	0.12	-1.54	0.97	0.81	0.81	0.96	-1.69
SP	3.33	0.29	0.14	0.11	-1.47	4.62	0.04	0.02	0.10	-1.08
MY	4.10	0.13	0.25	0.19	-0.80	3.85	0.21	0.55	1.03	-2.04
AU	3.27	0.31	0.15	0.14	-1.47	3.20	0.35	0.30	0.21	-0.51
SA	4.88	-0.04	0.00	0.09	-1.73	4.60	0.05	0.00	0.04	0.83

UK: DEPENDENT VARIABLE

US	4.12	0.10	0.02	0.16	-1.05	-0.56	1.09	0.75	0.45	-2.04
WG	3.76	0.18	0.03	0.18	-0.82	1.40	0.71	0.59	1.05	-1.03
FR	1.29	0.72	0.12	0.38	-0.67	-1.35	1.31	0.49	1.02	-2.28
NW	3.26	0.29	0.26	0.63	-1.88	3.68	0.21	0.32	0.72	-1.26
JP	1.29	0.72	0.35	0.48	-2.15	0.35	0.91	0.64	0.69	-1.76
SP	4.96	-0.08	0.02	0.18	-0.25	4.68	0.00	0.00	0.15	-1.13
MY	4.82	-0.05	0.07	0.20	-1.44	3.71	0.21	0.35	0.51	-2.58
AU	5.94	-0.29	0.24	0.26	-1.27	2.34	0.51	0.39	0.45	-1.38
SA	5.87	-0.28	0.22	0.20	-1.40	5.29	-0.13	0.02	0.11	0.03

WG: DEPENDENT VARIABLE

US	2.67	0.41	0.34	0.55	-2.02	0.34	0.89	0.43	0.99	-1.88
UK	3.87	0.16	0.03	0.38	-1.48	0.74	0.84	0.59	1.52	-2.13
FR	-1.27	1.27	0.45	0.93	-1.41	-1.22	1.27	0.39	0.66	-2.12
NW	4.61	-0.01	0.00	0.36	-1.63	3.75	0.19	0.21	0.95	-1.80
JP	4.78	-0.04	0.00	0.37	-1.62	0.70	0.83	0.45	1.21	-1.66
SP	4.49	0.02	0.00	0.47	-1.84	5.02	-0.08	0.02	0.63	-1.56
MY	4.13	0.10	0.30	0.65	-2.28	3.99	0.14	0.14	0.83	-2.11
AU	3.11	0.32	0.34	0.73	-2.18	2.11	0.55	0.39	1.16	-2.55
SA	4.92	-0.07	0.02	0.37	-1.58	6.88	-0.48	0.18	0.84	-0.36

FR: DEPENDENT VARIABLE

US	4.27	0.07	0.03	0.96	-2.55	2.23	0.50	0.54	1.95	-3.71
UK	3.82	0.17	0.12	1.15	-1.89	2.86	0.38	0.49	1.88	-2.68
WG	2.98	0.35	0.45	1.49	-2.18	3.18	0.31	0.39	1.05	-1.18
NW	4.58	0.00	0.00	0.93	-2.57	4.06	0.12	0.34	1.26	-1.04
JP	4.61	-0.00	0.00	0.93	-2.57	2.78	0.39	0.40	1.61	-2.60
SP	4.84	-0.05	0.05	1.31	-3.07	4.54	0.02	0.00	1.80	-1.62
MY	4.48	0.03	0.08	0.99	-2.55	4.13	0.11	0.31	1.89	-2.09
AU	4.27	0.07	0.06	0.95	-2.56	3.69	0.20	0.21	1.18	-1.02
SA	5.07	-0.10	0.13	1.05	-2.10	3.96	0.14	0.06	0.85	-0.92

NW: DEPENDENT VARIABLE

US	2.56	0.44	0.11	1.24	-0.81	-4.51	1.93	0.32	1.91	-2.79
UK	0.57	0.88	0.26	1.57	-1.74	-2.31	1.52	0.32	1.97	-3.15
WG	4.72	-0.02	0.00	1.11	-0.58	-0.54	1.15	0.21	1.73	-2.17
FR	4.50	0.03	0.00	1.11	-0.55	-8.81	2.95	0.34	1.65	-2.57
JP	-1.22	1.26	0.36	1.84	-2.45	-2.25	1.48	0.23	1.79	-2.31
SP	4.87	-0.06	0.00	1.10	-0.19	1.87	0.62	0.15	1.77	-1.41
MY	5.14	-0.12	0.12	1.19	-0.60	3.09	0.37	0.15	1.79	-2.42
AU	6.65	-0.45	0.18	1.27	-1.38	0.58	0.92	0.18	1.82	-2.20
SA	5.49	-0.19	0.03	1.18	-0.65	2.90	0.41	0.02	1.27	-1.73

JP: DEPENDENT VARIABLE

US	3.65	0.21	0.11	0.34	-0.17	-0.06	1.00	0.81	1.11	-2.28
UK	2.37	0.49	0.35	0.62	-0.49	1.45	0.71	0.64	0.79	-1.75
WG	4.78	-0.03	0.00	0.31	-0.30	2.23	0.55	0.45	0.84	-0.46
FR	4.67	-0.01	0.00	0.31	-0.22	-0.05	1.04	0.40	0.85	-2.67
NW	3.30	0.29	0.36	1.04	-1.65	4.01	0.16	0.23	0.64	-0.98
SP	3.84	0.17	0.12	0.27	0.93	4.88	-0.03	0.01	0.37	-4.05
MY	4.86	-0.05	0.11	0.41	-0.86	3.84	0.20	0.40	0.85	-2.39
AU	5.44	-0.18	0.13	0.34	-1.33	3.06	0.37	0.27	0.54	-0.98
SA	4.30	0.07	0.02	0.29	-0.01	5.11	-0.07	0.01	0.23	0.45

SP: DEPENDENT VARIABLE

US	2.39	0.48	0.14	0.17	-2.20	2.40	0.48	0.02	0.12	-2.63
UK	6.01	-0.29	0.02	0.14	-2.21	4.72	0.00	0.00	0.12	-2.66
WG	4.28	0.08	0.00	0.15	-2.42	5.57	-0.18	0.02	0.13	-2.51
FR	8.68	-0.88	0.05	0.20	-1.74	3.58	0.25	0.00	0.13	-2.28
NW	4.88	-0.05	0.00	0.14	-2.18	3.60	0.24	0.15	0.39	-2.35
JP	1.43	0.69	0.12	0.18	-1.67	5.60	-0.18	0.01	0.12	-2.69
MY	4.59	0.01	0.00	0.15	-2.32	3.69	0.22	0.08	0.25	-2.56
AU	3.07	0.35	0.12	0.18	-2.38	3.80	0.20	0.02	0.13	-2.26
SA	1.20	0.74	0.47	0.36	-1.74	1.28	0.74	0.18	0.29	-2.38

MY: DEPENDENT VARIABLE

US	-4.55	1.93	0.25	0.43	-1.04	-7.99	2.63	0.55	1.73	-2.56
UK	10.40	-1.29	0.07	0.37	-1.75	-3.08	1.66	0.35	1.16	-2.12
WG	-9.41	3.03	0.30	0.63	-2.00	0.24	0.96	0.14	1.01	-0.96
FR	-8.69	2.87	0.08	0.39	-1.49	-8.74	2.90	0.31	1.67	-1.54
NW	9.04	-0.99	0.12	0.42	-1.44	2.75	0.40	0.15	1.19	-0.94
JP	13.60	-1.98	0.11	0.43	-1.75	-4.98	2.02	0.40	1.40	-1.88
SP	3.91	0.12	0.00	0.33	-1.34	2.87	0.38	0.08	1.51	-1.63
AU	-3.38	1.72	0.32	0.68	-2.04	-0.12	1.04	0.21	1.19	-0.27
SA	6.75	-0.49	0.03	0.33	-1.28	2.21	0.53	0.03	0.84	-0.18

AU: DEPENDENT VARIABLE

US	2.25	0.49	0.15	0.29	-0.71	0.52	0.85	0.30	0.70	-2.41
UK	8.27	-0.81	0.24	0.33	-1.53	0.99	0.77	0.39	0.89	-2.81
WG	-0.22	1.04	0.34	0.61	-0.87	1.32	0.71	0.39	1.13	-3.43
FR	0.79	0.82	0.06	0.26	-1.15	-0.27	1.06	0.21	0.76	-2.42
NW	6.42	-0.40	0.18	0.40	-1.56	3.69	0.19	0.18	1.01	-2.42
JP	7.89	-0.72	0.13	0.27	-1.66	1.18	0.72	0.27	0.88	-2.47
SP	2.96	0.34	0.12	0.27	-1.12	4.04	0.12	0.02	0.51	-1.59
MY	3.73	0.18	0.32	0.59	-1.60	3.68	0.19	0.21	0.98	-2.56
SA	2.68	0.41	0.17	0.39	-0.90	5.74	-0.24	0.04	0.60	-2.15

SA: DEPENDENT VARIABLE

US	4.99	-0.07	0.00	0.20	-1.96	4.29	0.07	0.00	0.68	-1.87
UK	8.31	-0.79	0.22	0.23	-2.09	5.17	-0.12	0.02	0.70	-1.38
WG	5.80	-0.25	0.02	0.21	-2.05	6.31	-0.36	0.18	0.96	-0.55
FR	10.40	-1.26	0.13	0.35	-2.00	2.58	0.44	0.06	0.58	-2.23
NW	5.47	-0.18	0.03	0.37	-2.00	4.38	0.05	0.02	0.61	-1.88
JP	3.28	0.30	0.02	0.18	-1.81	5.02	-0.08	0.01	0.72	-1.44
SP	1.72	0.63	0.47	0.45	-0.81	3.48	0.25	0.18	0.88	-3.06
MY	4.89	-0.05	0.03	0.20	-1.87	4.35	0.06	0.03	0.78	-2.03
AU	2.70	0.43	0.17	0.32	-1.80	5.28	-0.14	0.04	0.74	-1.66

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US: DEPENDENT VARIABLE

UK	0.99	0.79	0.99	0.53	-2.67	1.56	0.66	0.97	0.31	-1.68
WG	-1.52	1.33	0.98	0.11	-1.64	-7.60	2.66	0.60	0.07	-0.91
FR	1.92	0.59	0.97	0.09	-1.32	1.08	0.77	0.96	0.10	-1.10
NW	1.79	0.61	0.97	0.16	-1.54	2.68	0.42	0.95	0.11	-2.34
JP	-4.48	1.97	0.98	1.01	-2.13	-5.90	2.28	0.71	0.38	-0.04
SP	-1.78	1.38	0.95	0.24	-2.25	11.80	-1.56	0.09	0.05	-0.60
MY	-0.25	1.05	0.98	0.48	-3.04	-11.4	3.47	0.76	0.76	-2.64
AU	-0.05	0.78	0.94	0.06	-1.23	1.77	0.47	0.98	0.20	-2.29
SA	2.44	0.48	0.96	0.09	-1.02	3.75	0.19	0.97	0.14	-2.17

UK: DEPENDENT VARIABLE

US	-1.21	1.26	0.99	0.53	-2.58	-2.16	1.47	0.97	0.31	-1.77
WG	-3.18	1.69	0.98	0.32	-2.64	-14.3	4.11	0.64	0.10	-1.08
FR	1.18	0.75	0.98	0.18	-1.14	-0.72	1.16	0.98	0.44	-2.56
NW	1.01	0.78	0.98	0.37	-1.54	1.75	0.62	0.94	0.26	-1.59
JP	-6.89	2.50	0.97	0.92	-2.26	-11.5	3.50	0.75	0.48	-0.80
SP	-3.44	1.73	0.94	0.21	-1.50	17.60	-2.81	0.14	0.07	-0.95
MY	-1.53	1.32	0.98	0.58	-2.37	-19.0	5.13	0.74	0.73	-2.60
AU	-1.34	0.99	0.95	0.14	-1.04	0.39	0.69	0.97	0.29	-1.42
SA	1.84	0.62	0.97	0.17	-1.30	3.32	0.28	0.97	0.24	-1.72

WG: DEPENDENT VARIABLE

US	1.22	0.74	0.98	0.10	-1.32	3.57	0.22	0.60	0.12	-2.08
UK	1.93	0.58	0.99	0.32	-2.31	3.88	0.16	0.64	0.14	-2.11
FR	2.59	0.44	0.99	0.30	-2.40	3.73	0.19	0.69	0.15	-2.22
NW	2.49	0.46	0.99	0.50	-2.50	4.22	0.08	0.44	0.09	-2.28
JP	-2.06	1.45	0.95	0.52	-1.83	1.38	0.69	0.78	0.77	-2.30
SP	-0.06	1.01	0.92	0.13	-1.80	4.85	-0.06	0.00	0.06	-2.27
MY	0.98	0.78	0.99	0.35	-2.54	1.80	0.61	0.27	0.18	-2.05
AU	1.08	0.59	0.98	0.16	-1.25	4.00	0.09	0.51	0.12	-2.15
SA	2.98	0.37	0.99	0.28	-1.79	4.42	0.04	0.51	0.11	-2.19

FR: DEPENDENT VARIABLE

US	-3.03	1.65	0.97	0.09	-1.04	-1.18	1.25	0.96	0.10	-1.45
UK	-1.46	1.31	0.98	0.18	-0.87	0.68	0.85	0.98	0.44	-2.92
WG	-5.78	2.25	0.99	0.30	-2.40	-12.3	3.68	0.70	0.10	-1.47
NW	-0.20	1.04	0.99	0.48	-2.56	2.20	0.52	0.91	0.05	-1.76
JP	-10.40	3.26	0.94	0.46	-1.30	-9.55	3.08	0.78	0.57	-1.08
SP	-5.83	2.24	0.89	0.10	-1.25	15.20	-2.29	0.13	0.06	-1.38
MY	-3.53	1.75	0.98	0.16	-1.37	-15.0	4.25	0.69	0.57	-2.82
AU	-3.43	1.34	0.98	0.19	-1.55	1.04	0.59	0.95	0.10	-1.52
SA	0.87	0.82	0.99	0.29	-1.97	3.52	0.23	0.95	0.07	-1.84

NW: DEPENDENT VARIABLE

US	-2.72	1.59	0.97	0.16	-1.33	-5.94	2.30	0.95	0.10	-2.14
UK	-1.19	1.26	0.98	0.37	-1.36	-2.42	1.53	0.94	0.19	-1.24
WG	-5.34	2.15	0.99	0.50	-2.57	-20.0	5.37	0.44	0.04	-1.13
FR	0.22	0.96	0.99	0.48	-2.63	-3.44	1.75	0.91	0.05	-1.33
JP	-9.84	3.14	0.95	0.56	-1.55	-17.8	4.87	0.38	0.22	-0.24
SP	-5.39	2.15	0.90	0.14	-1.75	28.80	-5.26	0.20	0.09	0.07
MY	-3.21	1.68	0.98	0.24	-1.28	-34.0	8.38	0.80	1.04	-2.58
AU	-3.08	1.28	0.98	0.28	-1.33	-2.05	1.10	0.98	0.29	-2.20
SA	1.05	0.79	0.99	0.49	-2.26	2.59	0.44	0.99	0.24	-1.81

JP: DEPENDENT VARIABLE

US	2.32	0.49	0.97	1.03	-2.51	3.17	0.31	0.71	0.54	-1.08
UK	2.81	0.39	0.98	0.94	-2.59	3.62	0.21	0.75	0.64	-1.38
WG	1.58	0.65	0.95	0.55	-2.61	-0.57	1.12	0.79	0.88	-1.80
FR	3.27	0.29	0.94	0.48	-1.94	3.43	0.26	0.78	0.74	-1.40
NW	3.21	0.30	0.95	0.58	-2.18	4.05	0.12	0.58	0.39	-1.33
SP	1.47	0.67	0.91	0.47	-1.58	6.75	-0.47	0.06	0.19	-1.57
MY	2.22	0.52	0.95	0.75	-3.06	0.39	0.91	0.38	0.40	-1.83
AU	2.29	0.39	0.93	0.39	-1.49	3.76	0.14	0.64	0.47	-1.31
SA	3.53	0.24	0.94	0.45	-1.64	4.34	0.06	0.66	0.48	-1.31

SP: DEPENDENT VARIABLE

US	1.45	0.69	0.95	0.25	-2.36	4.89	-0.06	0.09	0.35	-1.56
UK	2.13	0.54	0.94	0.21	-1.76	4.83	-0.05	0.14	0.37	-1.65
WG	0.42	0.91	0.92	0.14	-2.11	4.72	-0.03	0.00	0.31	-1.47
FR	2.80	0.40	0.89	0.11	-1.64	4.86	-0.06	0.13	0.37	-1.61
NW	2.71	0.42	0.90	0.15	-1.99	4.78	-0.04	0.20	0.39	-1.49
JP	-1.60	1.36	0.91	0.45	-1.64	5.23	-0.14	0.06	0.34	-1.64
MY	1.26	0.73	0.95	0.22	-2.05	5.56	-0.21	0.07	0.46	-1.43
AU	1.51	0.52	0.84	0.08	-1.78	4.82	-0.04	0.15	0.37	-1.54
SA	3.17	0.33	0.87	0.11	-1.56	4.68	-0.02	0.20	0.39	-1.52

MY: DEPENDENT VARIABLE

US	0.29	0.94	0.98	0.48	-2.76	3.61	0.22	0.76	1.01	-2.16
UK	1.22	0.74	0.98	0.57	-2.29	3.94	0.14	0.74	0.97	-1.74
WG	-1.20	1.27	0.99	0.35	-2.85	2.54	0.45	0.27	0.37	-0.46
FR	2.07	0.56	0.97	0.17	-1.64	3.86	0.16	0.69	0.81	-1.59
NW	1.94	0.59	0.98	0.24	-1.49	4.17	0.09	0.79	1.28	-2.87
JP	-3.87	1.85	0.95	0.72	-2.18	2.67	0.42	0.38	0.49	-0.65
SP	-1.40	1.30	0.94	0.21	-1.92	6.11	-0.33	0.07	0.40	-0.09
AU	0.19	0.74	0.95	0.13	-1.40	3.96	0.11	0.81	1.27	-2.57
SA	2.57	0.46	0.96	0.18	-1.34	4.42	0.04	0.78	1.16	-2.43

AU: DEPENDENT VARIABLE

US	0.41	1.21	0.94	0.06	-0.95	-3.59	2.09	0.98	0.20	-2.09
UK	1.56	0.97	0.95	0.14	0.72	-0.38	1.40	0.97	0.29	-1.06
WG	-1.65	1.66	0.97	0.16	-1.18	-18.0	5.23	0.52	0.07	-0.86
FR	2.61	0.74	0.98	0.19	-1.53	-1.34	1.61	0.95	0.10	-0.91
NW	2.45	0.77	0.98	0.28	-1.21	1.93	0.89	0.98	0.29	-2.24
JP	-5.07	2.40	0.93	0.36	-0.90	-15.1	4.60	0.64	0.31	-0.31
SP	-1.51	1.61	0.84	0.07	-1.38	24.7	-4.04	0.15	0.07	-0.14
MY	0.04	1.29	0.95	0.13	-1.07	-29.0	7.62	0.81	1.02	-2.67
SA	3.23	0.62	0.99	0.45	-1.74	4.22	0.39	0.98	0.24	-2.27

SA: DEPENDENT VARIABLE

US	-4.65	1.98	0.96	0.08	-0.71	-19.5	5.23	0.96	0.13	-2.04
UK	-2.76	1.57	0.96	0.16	-1.04	-11.6	3.52	0.97	0.24	-1.47
WG	-7.96	2.70	0.98	0.28	-1.77	-55.6	13.10	0.51	0.06	-1.04
FR	-1.04	1.20	0.99	0.29	-1.97	-14.0	4.05	0.95	0.06	-1.44
NW	-1.29	1.25	0.99	0.49	-2.17	-5.77	2.25	0.98	0.24	-1.90
JP	-13.60	3.92	0.93	0.42	-1.08	-49.3	11.70	0.66	0.31	-0.35
SP	-7.89	2.66	87.20	0.10	-1.16	59.80	-12.0	0.20	0.09	-0.17
MY	-5.25	2.10	96.80	0.18	-1.06	-82.2	18.90	0.78	0.91	-2.49
AU	-5.21	1.61	0.99	0.45	-1.78	_10.5	2.51	0.98	0.24	_2.30

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US: DEPENDENT VARIABLE

UK	1.62	0.65	0.96	0.93	-3.40	2.07	0.56	0.97	0.89	-1.79
WG	-1.14	1.26	0.80	0.96	-1.71	-1.24	1.29	0.91	0.88	-1.58
FR	2.55	0.51	0.94	1.77	-2.90	-2.20	1.56	0.90	1.64	-1.81
NW	1.33	0.71	0.93	1.16	-1.54	2.45	0.49	0.67	0.28	0.24
JP	-0.61	1.14	0.65	0.76	-2.77	-1.12	1.27	0.82	1.43	-2.36
SP	1.42	0.69	0.90	0.76	-2.05	-0.26	1.06	0.70	0.68	-1.58
MY	1.65	0.70	0.92	0.66	-1.77	-1.65	1.45	0.54	0.33	-1.90
AU	-0.20	1.14	0.77	0.30	-2.04	0.51	0.98	0.86	0.18	-1.49
SA	3.57	0.30	0.93	0.59	-0.76	1.88	0.69	0.53	0.11	-1.38

UK: DEPENDENT VARIABLE

US	-2.22	1.48	0.96	0.92	-3.11	-3.42	1.73	0.97	0.88	-1.69
WG	-3.91	1.87	0.77	0.71	-1.56	-5.86	2.30	0.93	1.04	-2.69
FR	1.48	0.78	0.95	1.52	-3.45	-7.35	2.73	0.89	1.92	-1.54
NW	-0.34	1.07	0.93	1.35	-1.65	0.54	0.90	0.70	0.41	-2.12
JP	3.60	1.79	0.69	0.78	-2.18	-5.57	2.25	0.82	1.46	-2.49
SP	-0.22	1.05	0.90	0.91	-2.19	-4.23	1.90	0.73	0.71	-1.72
MY	0.16	1.05	0.91	0.77	-2.59	-6.43	2.54	0.54	0.40	-2.16
AU	-2.20	1.61	0.68	0.24	-2.26	-2.82	1.76	0.89	0.47	-2.16
SA	3.05	0.45	0.93	0.47	-1.66	-0.72	1.32	0.62	0.12	-1.40

WG: DEPENDENT VARIABLE

US	1.66	0.63	0.80	1.13	-1.51	1.30	0.71	0.91	0.96	-1.43
UK	2.69	0.41	0.77	0.88	-1.47	2.70	0.41	0.93	1.12	-2.87
FR	3.29	0.32	0.74	1.21	-1.12	-0.36	1.13	0.85	1.66	-1.86
NW	2.63	0.42	0.66	0.95	-0.98	2.88	0.37	0.66	0.55	-1.67
JP	1.40	0.69	0.48	0.59	-1.85	0.35	0.93	0.80	1.21	-3.53
SP	2.71	0.41	0.62	0.75	-1.23	0.79	0.81	0.75	0.96	-1.76
MY	2.83	0.42	0.65	0.71	-1.27	-0.24	1.10	0.57	0.63	-2.28
AU	1.73	0.68	0.54	0.63	-1.36	1.48	0.73	0.88	0.91	-2.04
SA	3.96	0.18	0.67	0.58	-0.87	2.44	0.53	0.56	0.26	-1.18

FR: DEPENDENT VARIABLE

US	-4.45	1.84	0.94	1.85	-2.83	1.74	0.58	0.89	1.87	-2.57
UK	-1.60	1.23	0.95	1.61	-3.72	2.91	0.32	0.88	2.15	-2.81
WG	-6.46	2.30	0.74	1.12	-1.38	0.95	0.75	0.85	1.81	-2.75
NW	-2.13	1.34	0.92	1.92	-2.23	3.02	0.31	0.66	0.79	-2.41
JP	-6.65	2.33	0.75	0.72	-2.83	0.88	0.78	0.82	1.05	-2.78
SP	-1.99	1.31	0.89	1.55	-3.79	1.72	0.58	0.57	1.04	-1.80
MY	-1.51	1.31	0.90	1.56	-3.05	0.95	0.80	0.45	0.61	-2.22
AU	-4.89	2.12	0.74	0.32	-2.06	2.00	0.57	0.79	0.90	-1.79
SA	2.10	0.57	0.91	1.27	-2.08	2.73	0.42	0.52	0.52	-1.24

NW: DEPENDENT VARIABLE

US	-1.42	1.31	0.93	1.20	-1.68	-1.64	1.38	0.68	0.40	-1.90
UK	0.63	0.87	0.93	1.41	-2.07	1.16	0.78	0.70	0.53	-3.00
WG	-2.47	1.56	0.66	0.83	-1.48	-3.33	1.77	0.66	0.59	-2.10
FR	1.85	0.69	0.92	1.89	-2.61	-4.79	2.18	0.66	0.65	-2.30
JP	2.33	1.52	0.62	0.95	-2.98	-2.72	1.65	0.50	0.52	-2.31
SP	0.30	0.94	0.89	0.98	-3.43	-0.69	1.19	0.34	0.53	-1.86
MY	0.63	0.94	0.91	1.02	-4.07	-4.05	2.02	0.38	0.37	-2.19
AU	1.73	1.51	0.73	0.49	-2.84	-1.61	1.49	0.75	0.46	-1.88
SA	3.20	0.41	0.95	1.55	-1.93	0.03	1.15	0.57	0.36	-1.04

JP: DEPENDENT VARIABLE

US	2.00	0.57	0.65	1.12	-2.76	1.60	0.64	0.82	1.76	-2.78
UK	2.81	0.39	0.70	1.16	-2.70	2.90	0.37	0.82	1.80	-3.09
WG	1.48	0.69	0.48	0.79	-2.17	0.66	0.86	0.80	1.48	-4.03
FR	3.31	0.32	0.75	1.01	-3.09	-0.09	1.06	0.82	1.16	-2.68
NW	2.73	0.40	0.62	1.27	-3.08	3.24	0.30	0.50	0.74	-2.32
SP	2.60	0.44	0.72	1.55	-3.48	1.10	0.75	0.69	1.64	-1.51
MY	2.82	0.42	0.68	1.35	-2.82	0.40	0.96	0.47	0.94	-2.06
AU	1.83	0.66	0.52	0.70	-1.95	1.78	0.66	0.78	1.43	-2.05
SA	4.00	0.18	0.66	1.11	-3.12	2.56	0.50	0.55	0.73	-1.27

SP: DEPENDENT VARIABLE

US	-1.35	1.30	0.89	0.79	-2.21	1.69	0.66	0.70	0.93	-1.38
UK	0.66	0.86	0.90	0.95	-3.24	2.99	0.38	0.73	0.96	-1.64
WG	-2.29	1.52	0.62	0.62	-1.77	0.52	0.93	0.75	1.12	-1.90
FR	1.88	0.68	0.89	1.51	-4.00	0.46	0.98	0.57	1.06	-1.47
NW	0.23	0.95	0.89	0.97	-3.36	3.54	0.28	0.34	0.70	-1.30
JP	-2.92	1.65	0.72	1.22	-3.60	0.55	0.92	0.69	1.59	-1.03
MY	0.46	0.98	0.95	1.44	-2.72	-0.99	1.30	0.70	1.05	-2.49
AU	-1.75	1.51	0.72	0.44	-1.90	1.63	0.74	0.77	1.31	-2.14
SA	3.23	0.14	0.90	0.89	-2.79	2.50	0.55	0.54	0.72	-1.43

MY: DEPENDENT VARIABLE

US	-1.83	1.32	0.92	0.67	-2.04	2.74	0.37	0.54	0.60	-1.61
UK	0.24	0.87	0.91	0.79	-2.99	3.51	0.21	0.53	0.68	-1.97
WG	-2.86	1.56	0.65	0.55	-1.79	2.10	0.52	0.57	0.82	-2.23
FR	1.47	0.69	0.90	1.49	-3.33	2.03	0.56	0.45	0.65	-1.82
NW	-0.20	0.96	0.90	0.99	-4.12	3.64	0.19	0.38	0.49	-1.81
JP	-3.11	1.60	0.68	1.00	-2.84	2.25	0.49	0.47	0.87	-1.71
SP	-0.28	0.98	0.95	1.42	-2.73	1.93	0.54	0.70	1.07	-2.82
AU	-2.42	1.58	0.79	0.43	-2.03	2.60	0.44	0.67	0.81	-2.41
SA	2.82	0.41	0.93	0.91	-2.51	3.34	0.28	0.34	0.47	-1.66

AU: DEPENDENT VARIABLE

US	1.12	0.68	0.77	0.38	-2.45	0.19	0.88	0.86	0.21	-1.34
UK	2.31	0.42	0.68	0.33	-2.82	1.92	0.51	0.89	0.50	-2.17
WG	0.59	0.80	0.54	0.54	-2.27	-1.20	1.20	0.87	0.86	-2.10
FR	2.84	0.35	0.74	0.32	-2.53	-1.81	1.39	0.79	0.69	-1.45
NW	2.01	0.49	0.73	0.53	-3.69	1.98	0.50	0.74	0.36	-1.19
JP	0.62	0.79	0.52	0.41	-2.42	-1.06	1.17	0.78	1.11	-1.69
SP	2.04	0.48	0.72	0.48	-2.38	-0.66	1.05	0.77	1.09	-2.05
MY	2.14	0.50	0.78	0.49	-2.49	-2.40	1.52	0.66	0.56	-2.55
SA	3.51	0.21	0.78	0.52	-2.89	1.06	0.78	0.75	0.33	-1.20

SA: DEPENDENT VARIABLE

US	-10.80	3.10	0.93	0.57	-1.20	0.74	0.76	0.53	0.16 -1.46
UK	-5.96	2.05	0.93	0.46	-2.25	2.08	0.47	0.62	0.18 -1.55
WG	-13.50	3.71	0.67	0.40	-1.74	-0.59	1.06	0.56	0.24 -1.68
FR	-3.06	1.61	0.91	1.18	-2.66	-1.20	1.25	0.52	0.35 -1.59
NW	-7.18	2.30	0.95	1.49	-2.54	1.95	0.50	0.57	0.30 -1.16
JP	-13.50	3.70	0.66	0.72	-3.62	-0.70	1.09	0.55	0.44 -1.77
SP	-6.82	2.22	0.90	0.83	-3.08	-0.30	0.97	0.54	0.53 -2.17
MY	-6.07	2.25	0.93	0.87	-2.80	-0.97	1.20	0.34	0.26 -2.44
AU	-12.10	3.67	0.78	0.42	-2.48	0.15	0.96	0.75	0.37 -1.82

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US: DEPENDENT VARIABLE

UK	0.72	0.67	0.29	0.34	-2.91	1.44	0.22	0.02	0.08 -1.63
WG	0.90	0.72	0.53	0.48	-3.02	0.83	0.77	0.72	0.49 -2.62
FR	0.30	0.80	0.21	0.30	-1.45	-0.43	1.07	0.80	0.57 -2.18
NW	3.95	-0.63	0.06	0.32	-0.99	11.10	-3.56	0.66	0.67 -3.00
JP	1.58	0.46	0.02	0.27	-1.62	1.23	0.54	0.62	0.25 -1.72
SP	0.69	0.76	0.58	0.61	-2.68	0.92	0.64	0.87	1.23 -2.21
MY	4.15	-1.16	0.26	0.31	-2.58	1.23	0.52	0.47	0.20 -2.23
AU	3.06	-0.37	0.21	0.53	-2.00	1.54	0.23	0.34	0.30 -1.74
SA	1.29	0.44	0.10	0.27	-1.18	3.10	-0.44	0.16	0.14 -0.63

UK: DEPENDENT VARIABLE

US	1.46	0.43	0.29	0.22	-3.36	2.16	0.08	0.02	0.42 -1.68
WG	1.53	0.47	0.35	0.24	-2.56	2.05	0.18	0.11	0.47 -2.06
FR	1.74	0.29	0.04	0.13	-1.60	2.18	0.06	0.01	0.42 -1.60
NW	5.52	-1.21	0.38	0.27	-1.38	2.25	0.01	0.00	0.42 -1.50
JP	-0.27	1.59	0.45	0.33	-1.96	2.06	0.19	0.21	0.52 -2.50
SP	1.35	0.52	0.41	0.29	-2.79	2.31	0.01	0.00	0.42 -1.53
MY	4.92	-1.58	0.74	0.45	-1.66	2.06	0.18	0.16	0.49 -2.23
AU	3.22	-0.39	0.37	0.73	-1.72	2.18	0.07	0.10	0.48 -2.15
SA	2.30	0.08	0.01	0.12	-1.44	1.44	0.34	0.27	0.60 -1.81

WG: DEPENDENT VARIABLE

US	0.31	0.74	0.53	0.32	-2.36	-0.36	0.94	0.71	0.46 -2.26
UK	0.22	0.73	0.35	0.20	-2.21	0.04	0.62	0.11	0.11 -1.59
FR	-1.24	1.26	0.51	0.24	-1.29	-1.05	1.14	0.73	0.32 -1.30
NW	2.69	-0.25	0.01	0.08	-1.21	10.90	-3.69	0.58	0.50 -2.50
JP	0.73	0.77	0.07	0.09	-1.89	0.57	0.67	0.78	0.28 -2.18
SP	0.65	0.64	0.40	0.23	-1.63	0.54	0.57	0.58	0.35 -2.75
MY	3.65	-1.04	0.20	0.10	-1.40	0.46	0.73	0.74	0.42 -1.73
AU	2.56	-0.27	0.11	0.24	-1.42	0.89	0.31	0.51	0.36 -1.70
SA	0.44	0.65	0.23	0.17	-1.77	2.14	-0.26	0.05	0.08 -0.25

FR: DEPENDENT VARIABLE

US	1.99	0.26	0.21	0.31	-2.31	0.76	0.75	0.80	0.53 -2.61
UK	2.25	0.15	0.04	0.26	-2.45	1.96	0.11	0.01	0.04 -2.06
WG	1.78	0.40	0.51	0.41	-2.28	1.27	0.64	0.73	0.30 -1.97
NW	1.08	0.61	0.19	0.27	-1.95	9.16	-2.70	0.55	0.43 -3.40
JP	3.29	-0.39	0.05	0.26	-2.11	1.67	0.42	0.53	0.09 -1.80
SP	2.32	0.13	0.05	0.24	-2.41	1.47	0.46	0.67	0.34 -2.91
MY	2.59	0.01	0.00	0.24	-2.32	1.67	0.40	0.39	0.09 -2.30
AU	2.54	0.04	0.01	0.25	-2.35	1.97	0.14	0.17	0.13 -1.96
SA	1.41	0.48	0.39	0.59	-2.91	3.17	-0.36	0.16	0.10 -1.38

NW: DEPENDENT VARIABLE

US	2.74	-0.10	0.06	0.13	-1.01	2.93	-0.19	0.66	0.82	-3.21
UK	3.27	-0.31	0.38	0.24	-1.04	2.56	0.00	0.00	0.23	-1.16
WG	2.58	-0.04	0.01	0.09	-0.97	2.80	-0.16	0.58	0.67	-3.18
FR	1.68	0.31	0.19	0.12	-1.34	3.02	-0.20	0.55	0.61	-3.09
JP	4.16	-0.96	0.56	0.45	-0.14	2.72	-0.11	0.50	0.50	-2.00
SP	3.01	-0.23	0.32	0.27	-0.46	2.76	-0.12	0.60	0.78	-2.67
MY	1.36	0.74	0.63	0.35	-2.05	2.73	-0.12	0.44	0.45	-2.00
AU	2.10	0.22	0.41	0.79	-0.51	2.67	-0.05	0.36	0.46	-1.87
SA	1.84	0.26	0.23	0.22	-1.12	2.28	0.11	0.20	0.33	-0.72

JP: DEPENDENT VARIABLE

US	1.61	0.05	0.02	0.22	-2.56	-0.90	1.14	0.62	0.19	-0.96
UK	1.03	0.28	0.45	0.40	-2.42	-1.22	1.10	0.21	0.12	-1.03
WG	1.56	0.09	0.07	0.20	-2.86	-0.37	1.16	0.78	0.25	-1.85
FR	2.10	-0.14	0.05	0.20	-1.47	-1.47	1.26	0.53	0.07	-0.72
NW	3.18	-0.58	0.56	0.57	1.48	12.80	-4.48	0.50	0.29	-1.19
SP	1.33	0.18	0.28	0.33	-2.82	0.14	0.73	0.55	0.23	-1.70
MY	2.53	-0.52	0.44	0.35	-2.22	-0.05	0.99	0.81	0.37	-1.88
AU	1.98	-0.13	0.23	0.65	-1.81	0.48	0.46	0.66	0.45	-1.52
SA	1.91	-0.07	0.02	0.19	-1.26	1.12	0.08	0.00	0.02	-0.24

SP: DEPENDENT VARIABLE

US	0.40	0.76	0.58	0.60	-2.46	-1.06	1.37	0.87	1.28	-2.55
UK	0.24	0.79	0.41	0.39	-2.27	1.54	0.03	0.00	0.14	-1.40
WG	0.94	0.62	0.40	0.38	-1.81	0.14	1.01	0.57	0.42	-3.26
FR	1.18	0.40	0.05	0.22	-1.10	-1.57	1.43	0.67	0.44	-2.75
NW	5.74	-1.41	0.32	0.44	-1.16	14.40	-4.98	0.61	0.69	-2.79
JP	-0.49	1.56	0.28	0.37	-1.94	0.62	0.75	0.55	0.34	-2.42
MY	4.40	-1.43	0.39	0.41	-1.95	0.66	0.68	0.37	0.27	-2.58
AU	2.98	-0.42	0.27	0.82	-1.90	1.01	0.33	0.34	0.37	-1.83
SA	2.24	0.01	0.00	0.22	-0.99	3.52	-0.73	0.21	0.19	-0.30

MY: DEPENDENT VARIABLE

US	2.06	-0.22	0.26	0.12	-3.30	-0.36	0.89	0.46	0.18	-2.35
UK	2.69	-0.47	0.74	0.38	-1.97	-0.63	0.87	0.16	0.13	-1.58
WG	1.93	-0.19	0.20	0.07	-1.97	-0.10	1.02	0.74	0.42	-1.91
FR	1.52	0.01	0.00	0.04	-1.21	-0.79	0.98	0.39	0.11	-1.96
NW	-0.59	0.85	0.63	0.30	-1.35	11.10	-3.79	0.44	0.28	-1.90
JP	3.01	-0.85	0.44	0.21	-1.73	0.30	0.81	0.81	0.41	-2.52
SP	2.14	-0.28	0.39	0.22	-2.67	0.50	0.55	0.37	0.19	-2.77
AU	1.09	0.24	0.46	1.08	-2.61	0.58	0.44	0.74	0.88	-2.56
SA	1.19	0.14	0.05	0.06	-0.54	1.45	-0.02	0.00	0.06	-1.18

AU: DEPENDENT VARIABLE

US	3.18	-0.56	0.20	1.46	-2.14	-1.06	1.47	0.34	0.45	-1.21
UK	4.15	-0.93	0.36	1.77	-1.93	-1.31	1.35	0.10	0.30	-1.23
WG	2.67	-0.40	-0.11	1.33	-1.85	-0.58	1.64	0.51	0.54	-1.52
FR	1.40	0.17	0.01	1.17	-1.29	-0.98	1.26	0.17	0.33	-1.07
NW	-2.97	1.92	0.41	1.74	-0.89	18.90	-6.65	0.35	0.47	-1.35
JP	4.87	-1.75	0.23	1.63	-2.30	-0.07	1.42	0.66	0.67	-1.87
SP	3.26	-0.64	0.27	1.77	-2.60	0.19	1.00	0.34	0.47	-1.15
MY	-1.13	1.93	0.46	2.21	-2.17	-0.48	1.66	0.74	1.06	-2.47
SA	1.20	0.25	0.02	1.22	-0.97	1.84	-0.00	0.00	0.24	-0.48

SA: DEPENDENT VARIABLE

US	1.93	0.24	0.10	0.41	-1.13	3.33	-0.37	0.16	0.23	-1.18
UK	2.34	0.07	0.01	0.38	-1.25	0.73	0.80	0.27	0.36	-1.60
WG	1.79	0.35	0.22	0.47	-1.89	2.86	-0.18	0.05	0.19	-1.15
FR	0.38	0.81	0.39	0.72	-2.27	3.59	-0.45	0.16	0.23	-1.36
NW	0.31	0.88	0.23	0.52	-0.60	-1.99	1.79	0.20	0.28	-0.99
JP	3.09	-0.34	0.02	0.39	-0.81	2.55	0.03	0.00	0.18	-1.41
SP	2.52	-0.01	0.00	0.37	-1.11	3.07	-0.29	0.21	0.23	-0.54
MY	1.89	0.40	0.06	0.40	-0.83	2.61	-0.01	0.00	0.18	-1.35
AU	2.34	0.09	0.02	0.43	-0.93	2.60	-0.00	0.00	0.18	-1.36

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US: DEPENDENT VARIABLE

UK	5.34	0.48	0.61	0.28	-1.53	0.36	1.08	0.46	0.66	-2.46
WG	6.25	0.39	0.75	0.34	-1.70	4.00	0.65	0.30	0.37	-0.27
FR	3.25	0.78	0.54	0.32	-1.63	15.10	-0.78	0.32	0.58	-1.46
NW	8.04	0.30	0.61	0.37	-1.80	8.32	0.18	0.45	0.59	-1.22
JP	1.98	0.99	0.56	0.42	-1.60	8.33	0.09	0.01	0.36	0.51
SP	8.09	0.53	0.50	0.25	-1.28	7.28	0.81	0.27	0.53	-0.34
MY	6.38	0.27	0.28	0.13	-2.04	9.89	-0.08	0.11	0.43	0.02
AU	7.67	0.31	0.40	0.50	-1.36	8.87	0.03	0.02	0.37	0.53
SA	8.32	0.21	0.32	0.52	-1.78	8.88	0.03	0.03	0.37	0.47

UK: DEPENDENT VARIABLE

US	-3.69	1.26	0.61	0.19	-1.96	4.13	0.43	0.46	0.40	-1.19
WG	2.88	0.66	0.83	0.12	-1.97	5.78	0.29	0.15	0.09	0.58
FR	-4.23	1.60	0.87	0.23	-3.54	8.87	-0.11	0.02	0.12	-0.54
NW	5.96	0.50	0.65	0.14	-1.57	7.81	0.06	0.11	0.10	-0.93
JP	-4.03	1.64	0.59	0.26	-2.66	7.66	0.05	0.00	0.10	0.07
SP	6.40	0.70	0.34	0.03	-3.71	7.92	0.05	0.00	0.11	-0.07
MY	5.90	0.18	0.05	0.02	-4.27	7.82	0.02	0.02	0.11	0.36
AU	5.45	0.50	0.39	0.50	-2.09	8.00	0.01	0.00	0.11	-0.05
SA	6.59	0.30	0.26	0.40	-2.13	8.02	0.00	0.00	0.11	0.01

WG: DEPENDENT VARIABLE

US	-10.00	1.90	0.75	0.27	-1.57	3.51	0.46	0.30	0.45	-2.98
UK	-2.40	1.25	0.83	0.14	-1.20	3.53	0.52	0.15	0.43	-2.95
FR	-8.98	2.17	0.86	0.37	-2.13	7.62	0.01	0.00	0.45	-3.38
NW	4.41	0.81	0.90	0.14	-1.34	7.30	0.11	0.23	0.43	-3.50
JP	-10.50	2.47	0.72	0.54	-1.98	6.27	0.19	0.04	0.45	-2.64
SP	4.80	1.28	0.61	0.11	-2.40	7.16	0.26	0.04	0.47	-3.28
MY	1.52	0.57	0.26	0.05	-2.31	8.08	-0.03	0.03	0.46	-3.53
AU	4.08	0.70	0.40	0.54	-1.52	7.66	0.01	0.01	0.43	-3.41
SA	5.70	0.42	0.26	0.40	-1.62	7.69	0.01	0.00	0.44	-3.38

FR: DEPENDENT VARIABLE

US	1.21	0.69	0.54	0.26	-1.77	11.60	-0.42	0.33	0.38	-4.26
UK	3.25	0.54	0.87	0.26	-3.25	8.97	-0.14	0.02	0.18	-3.25
WG	4.60	0.39	0.86	0.38	-2.65	7.74	0.01	0.00	0.16	-2.85
NW	6.40	0.31	0.71	0.33	-1.92	8.23	-0.11	0.31	0.29	-4.44
JP	1.15	0.88	0.50	0.27	-2.85	6.85	0.13	0.02	0.16	-2.95
SP	6.64	0.44	0.39	0.09	-2.74	9.18	-0.65	0.32	0.31	-2.58
MY	6.13	0.13	0.08	0.06	-2.16	6.75	0.09	0.31	0.25	-3.13
AU	6.32	0.25	0.29	0.44	-1.75	7.85	-0.01	0.00	0.17	-2.77
SA	6.92	0.15	0.18	0.34	-1.83	7.88	-0.02	0.02	0.20	-2.72

NW: DEPENDENT VARIABLE

US	-14.70	2.01	0.60	0.35	-1.84	-18.6	2.49	0.45	0.32	-1.93
UK	-6.50	1.30	0.65	0.21	-0.89	-12.1	1.98	0.11	0.08	-1.59
WG	-4.56	1.11	0.90	0.46	-1.18	-12.4	2.09	0.23	0.07	-1.25
FR	-13.80	2.32	0.71	0.38	-1.45	25.9	2.83	0.31	0.22	-1.59
JP	-17.50	2.94	0.74	0.75	-3.12	13.1	-1.26	0.08	0.15	-0.86
SP	0.29	1.68	0.76	0.42	-2.83	-5.51	4.40	0.57	0.39	-1.04
MY	-5.27	0.88	0.45	0.19	-3.03	11.80	-0.73	0.68	0.29	-0.30
AU	0.04	0.76	0.35	0.50	-1.72	3.75	0.01	0.00	0.09	-0.83
SA	1.99	0.41	0.19	0.38	-1.61	3.66	0.03	0.00	0.09	-0.84

JP: DEPENDENT VARIABLE

US	2.03	0.56	0.56	0.51	-1.96	6.84	0.06	0.01	0.51	-1.86
UK	4.38	0.36	0.59	0.44	-2.52	6.72	0.08	0.00	0.51	-1.92
WG	5.05	0.29	0.72	0.69	-2.73	5.97	0.18	0.04	0.52	-1.67
FR	2.91	0.57	0.50	0.41	-3.13	6.10	0.17	0.02	0.52	-2.15
NW	6.28	0.25	0.74	0.85	-4.36	7.64	-0.06	0.08	0.58	-2.17
SP	6.34	0.43	0.59	0.55	-3.00	7.33	0.04	0.00	0.52	-1.93
MY	4.79	0.24	0.38	0.29	-2.58	6.88	0.05	0.06	0.54	-2.14
AU	6.16	0.22	0.35	0.61	-2.21	7.39	0.00	0.00	0.52	-1.94
SA	6.72	0.12	0.19	0.48	-1.97	7.39	0.00	0.00	0.52	-1.94

SP: DEPENDENT VARIABLE

US	-6.75	0.95	0.50	0.17	0.01	-0.87	0.33	0.27	0.35	-2.08
UK	-1.83	0.48	0.34	0.04	-2.36	1.70	0.05	0.00	0.19	-2.11
WG	-1.54	0.47	0.61	0.10	-1.87	0.95	0.15	0.04	0.21	-2.06
FR	-4.77	0.89	0.39	0.07	-2.24	5.96	-0.49	0.32	0.34	-1.83
NW	0.32	0.45	0.76	0.36	-2.24	1.62	0.13	0.57	0.49	-2.03
JP	-7.88	1.37	0.59	0.38	-1.68	1.96	0.02	0.00	0.18	-1.98
MY	-4.17	0.61	0.80	0.23	-1.72	3.47	-0.12	0.66	0.57	-2.31
AU	0.29	0.36	0.28	0.37	0.31	2.12	-0.00	0.00	0.19	-1.96
SA	1.20	0.19	0.15	0.23	-0.41	2.09	0.01	0.00	0.18	-1.98

MY: DEPENDENT VARIABLE

US	0.42	1.05	0.28	0.08	-1.27	23.90	-1.43	0.11	0.09	-2.18
UK	7.86	0.27	0.05	0.06	-2.14	4.10	0.85	0.02	0.02	-2.59
WG	6.66	0.46	0.26	0.07	-2.50	17.10	0.80	0.03	0.04	-2.39
FR	5.55	0.59	0.08	0.07	-2.09	-14.2	3.22	0.31	0.11	-1.57
NW	8.19	0.51	0.45	0.15	-3.27	14.50	-0.94	0.68	0.23	-1.21
JP	-1.63	1.62	0.38	0.15	-1.91	1.76	1.24	0.06	0.05	-2.28
SP	7.47	1.31	0.80	0.26	-2.08	22.30	-5.38	0.66	0.41	-2.01
AU	8.23	0.39	0.15	0.15	-1.39	10.80	0.03	0.00	0.03	-2.79
SA	9.32	0.18	0.06	0.12	-1.60	11.10	-0.03	0.00	0.03	-2.56

AU: DEPENDENT VARIABLE

US	-6.97	1.27	0.40	1.13	-2.03	-3.29	0.91	0.02	2.14	-3.19
UK	-1.45	0.78	0.39	1.23	-2.30	1.10	0.47	0.00	2.14	-3.40
WG	0.36	0.58	0.40	1.24	-3.39	0.48	0.57	0.01	2.12	-3.27
FR	-4.09	1.16	0.29	1.14	-2.76	8.36	-0.44	0.00	2.15	-3.54
NW	2.95	0.46	0.35	1.15	-3.29	4.81	0.02	0.00	2.14	-3.43
JP	-6.66	1.57	0.35	1.16	-2.98	3.84	0.14	0.00	2.14	-3.43
SP	3.04	0.80	0.28	1.09	-2.62	5.17	-0.13	0.00	2.14	-3.47
MY	0.56	0.40	0.15	0.83	-2.51	4.31	0.05	0.00	2.14	-3.44
SA	2.34	0.59	0.64	1.76	-2.33	1.12	0.93	0.92	2.07	-2.92

SA: DEPENDENT VARIABLE

US	-10.10	1.53	0.32	1.48	-3.24	-5.65	1.08	0.03	2.13	-3.21
UK	-2.92	0.86	0.26	1.46	-2.95	2.90	0.15	0.00	2.12	-3.24
WG	-0.81	0.63	0.27	1.44	-3.50	1.64	0.32	0.00	2.11	-3.20
FR	-5.51	1.24	0.19	1.36	-3.22	13.10	-1.16	0.02	2.16	-3.68
NW	2.18	0.45	0.19	1.36	-3.12	3.73	0.09	0.00	2.12	-3.29
JP	-7.48	1.57	0.19	1.35	-2.90	3.18	0.12	0.00	2.12	-3.24
SP	2.26	0.79	0.15	1.28	-2.66	3.04	0.49	0.00	2.11	-3.32
MY	0.34	0.34	0.06	1.13	-2.49	4.69	-0.05	0.00	2.12	-3.34
AU	-1.14	1.07	0.64	2.08	-2.99	-0.80	0.99	0.92	2.05	-2.94

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US: DEPENDENT VARIABLE

UK	9.36	0.07	0.02	1.51	-2.45	4.56	0.65	0.42	1.20	-1.43
WG	9.42	0.17	0.03	1.62	-2.53	11.40	-0.29	0.06	0.85	-0.22
FR	9.97	0.00	0.00	1.52	-2.42	8.82	0.14	0.02	0.54	-0.52
NW	9.95	0.00	0.00	1.52	-2.42	7.05	0.35	0.33	1.39	-1.29
JP	10.70	-0.08	0.01	1.54	-2.46	12.60	-0.29	0.40	1.11	-1.09
SP	9.19	0.10	0.02	1.50	-2.44	6.30	0.47	0.28	0.70	-1.40
MY	9.62	0.05	0.01	1.54	-2.36	9.60	0.09	0.01	0.59	-0.21
AU	9.26	0.09	0.03	1.51	-2.21	7.20	0.39	0.46	1.46	-0.63
SA	9.26	0.10	0.06	1.47	-2.57	7.38	0.38	0.44	1.48	-1.25

UK: DEPENDENT VARIABLE

US	5.61	0.28	0.02	0.34	-0.95	2.21	0.64	0.42	1.38	-2.15
WG	4.11	1.26	0.46	0.45	-1.70	8.09	0.22	0.03	0.56	-0.81
FR	1.25	0.65	0.59	0.57	-2.54	3.71	0.46	0.26	0.60	-1.19
NW	2.65	0.64	0.34	0.55	-1.63	5.12	0.40	0.44	0.88	-2.03
JP	8.92	-0.06	0.00	0.36	-0.76	10.10	-0.16	0.12	1.04	-1.30
SP	4.55	0.46	0.09	0.53	-0.83	5.02	0.45	0.26	0.96	-2.19
MY	4.06	0.56	0.30	0.80	-1.36	7.18	0.22	0.07	0.67	-1.44
AU	4.63	0.50	0.24	0.47	-1.47	6.13	0.34	0.35	0.84	-2.13
SA	7.48	0.13	0.03	0.35	-0.96	6.66	0.29	0.25	0.88	-1.95

WG: DEPENDENT VARIABLE

US	1.61	0.18	0.03	1.07	-0.99	5.58	-0.19	0.06	1.57	-1.62
UK	0.38	0.36	0.46	1.06	-2.15	2.24	0.15	0.03	1.09	-1.21
FR	-0.86	0.39	0.74	1.13	-1.18	-2.41	0.53	0.50	1.02	-0.63
NW	-0.05	0.39	0.43	1.33	-1.35	3.71	-0.01	0.00	1.33	-1.40
JP	1.40	0.26	0.05	0.84	-0.63	1.58	0.26	0.45	1.80	-2.35
SP	0.36	0.36	0.21	1.39	-0.89	3.71	-0.02	0.00	1.31	-1.39
MY	0.97	0.32	0.33	1.53	-2.09	2.30	0.16	0.06	1.15	-1.40
AU	1.18	0.29	0.30	1.24	-2.34	3.95	-0.05	0.01	1.42	-1.41
SA	2.02	0.19	0.21	1.22	-1.19	4.48	-0.12	0.06	1.62	-1.55

FR: DEPENDENT VARIABLE

US	10.90	0.01	0.00	0.63	-0.76	9.55	0.16	0.02	1.74	-2.60
UK	3.36	0.90	0.59	0.86	-2.83	6.28	0.56	0.26	1.61	-2.33
WG	4.51	1.88	0.74	0.79	-1.17	7.89	0.94	0.50	1.50	-1.43
NW	2.15	0.98	0.57	1.47	-1.38	9.32	0.21	0.09	1.76	-2.33
JP	9.98	0.12	0.00	0.62	-0.76	10.40	0.11	0.05	1.79	-2.72
SP	4.15	0.80	0.22	1.22	-0.89	9.28	0.23	0.06	1.81	-2.73
MY	4.74	0.80	0.44	1.49	-2.03	10.60	0.09	0.01	1.75	-2.80
AU	6.04	0.65	0.30	0.97	-1.98	10.80	0.05	0.01	1.75	-2.73
SA	8.66	0.31	0.12	0.82	-1.02	11.70	-0.06	0.01	1.80	-2.63

NW: DEPENDENT VARIABLE

US	8.80	0.01	0.00	1.31	-1.61	-0.39	0.94	0.33	1.63	-2.08
UK	4.50	0.53	0.34	1.51	-2.93	-0.27	1.08	0.44	0.94	-1.82
WG	5.15	1.11	0.43	1.67	-2.22	9.53	-0.06	0.00	0.86	-0.98
FR	2.55	0.58	0.57	2.14	-2.95	4.19	0.46	0.09	0.80	-1.11
JP	6.85	0.27	0.02	1.27	-1.67	12.80	0.45	0.35	1.58	-1.71
SP	6.27	0.32	0.06	1.59	-1.87	7.48	0.22	0.02	0.83	-1.29
MY	5.76	0.41	0.20	1.88	-2.40	10.90	-0.19	0.02	0.95	-0.72
AU	6.08	0.38	0.17	1.66	-2.55	3.84	0.68	0.52	1.25	-2.47
SA	7.28	0.23	0.10	1.47	-1.76	5.08	0.55	0.34	1.39	-2.06

JP: DEPENDENT VARIABLE

US	8.62	-0.07	0.01	1.04	-2.96	21.60	-1.34	0.40	0.69	-1.43
UK	7.99	-0.01	0.00	1.04	-2.98	14.20	-0.74	0.12	0.44	-1.22
WG	7.15	0.21	0.05	0.90	-3.04	1.52	1.72	0.45	0.67	-1.34
FR	7.64	0.02	0.00	1.01	-2.98	3.06	0.41	0.05	0.18	-1.01
NW	7.18	0.07	0.02	0.99	-3.06	15.00	-0.78	0.36	0.92	-1.16
SP	7.62	0.03	0.00	1.01	-3.04	8.16	-0.06	0.00	0.17	-1.32
MY	7.98	-0.01	0.00	1.05	-2.93	2.65	0.64	0.14	0.14	-1.15
AU	7.93	-0.01	0.00	1.04	-2.94	13.00	-0.66	0.29	0.78	-1.50
SA	7.16	0.10	0.07	0.97	-3.66	12.60	-0.64	0.27	0.91	-1.11

SP: DEPENDENT VARIABLE

US	6.80	0.17	0.02	1.44	-2.47	2.36	0.59	0.28	0.87	-0.42
UK	6.67	0.21	0.10	1.64	-3.07	3.42	0.57	0.26	0.94	-0.28
WG	6.45	0.59	0.21	1.88	-3.12	8.63	-0.03	0.00	0.76	0.28
FR	5.48	0.27	0.22	2.04	-3.17	5.81	0.24	0.06	0.78	0.43
NW	6.85	0.18	0.06	1.74	-2.59	7.57	0.10	0.02	0.76	0.28
JP	8.01	0.05	0.00	1.44	-2.50	8.64	-0.02	0.00	0.76	0.76
MY	4.95	0.45	0.42	2.22	-3.01	4.33	0.54	0.36	1.28	0.17
AU	5.62	0.38	0.29	2.33	-2.84	7.12	0.17	0.07	0.66	-0.02
SA	6.24	0.31	0.33	2.17	-2.03	6.90	0.21	0.10	0.79	0.07

MY: DEPENDENT VARIABLE

US	6.00	0.17	0.01	0.82	-1.46	6.29	0.15	0.01	1.19	-1.40
UK	3.23	0.53	0.30	1.26	-2.78	4.79	0.34	0.07	1.08	-1.63
WG	4.13	1.05	0.33	1.37	-2.33	6.49	0.38	0.06	1.04	-1.47
FR	1.68	0.55	0.44	1.66	-3.05	6.56	0.11	0.01	1.15	-1.53
NW	3.46	0.48	0.20	1.37	-1.86	8.94	-0.12	0.02	1.30	-1.29
JP	8.18	-0.06	0.00	0.82	-1.26	6.12	0.22	0.14	1.16	-1.45
SP	-0.08	0.92	0.42	1.58	-1.46	2.11	0.67	0.36	1.71	-1.98
AU	3.23	0.59	0.36	1.42	-1.15	7.53	0.04	0.00	1.14	-1.40
SA	4.85	0.39	0.27	1.02	0.92	7.04	0.10	0.02	1.12	-1.37

AU: DEPENDENT VARIABLE

US	4.12	0.34	0.03	0.55	-2.04	-4.02	1.16	0.46	1.60	-2.48
UK	3.47	0.48	0.24	0.69	-2.64	-1.07	1.02	0.35	0.79	-1.99
WG	4.12	1.00	0.30	0.84	-3.06	8.74	-0.20	0.01	0.84	-1.75
FR	2.56	0.46	0.30	0.90	-3.08	6.57	0.13	0.01	0.69	-1.68
NW	3.55	0.45	0.17	0.91	-2.62	0.89	0.76	0.52	1.14	-3.01
JP	7.80	-0.03	0.00	0.57	-2.05	11.30	-0.43	0.29	1.34	-2.20
SP	0.96	0.78	0.29	1.44	-1.99	4.51	0.41	0.07	0.63	-2.08
MY	2.86	0.61	0.36	1.18	-2.10	7.44	0.07	0.00	0.68	-1.68
SA	3.84	0.51	0.44	1.10	-2.06	2.50	0.72	0.51	1.34	-2.22

SA: DEPENDENT VARIABLE

US	1.16	0.62	0.06	0.67	-1.76	-4.05	1.14	0.44	2.16	-3.10
UK	5.51	0.21	0.03	0.72	-1.63	0.10	0.86	0.25	1.37	-1.95
WG	3.55	1.10	0.21	0.97	-2.10	9.54	-0.51	0.06	1.58	-1.54
FR	3.24	0.37	0.12	0.91	-1.95	9.31	-0.14	0.01	1.29	-1.22
NW	3.23	0.46	0.10	0.88	-1.77	2.01	0.61	0.34	1.84	-2.77
JP	2.00	0.67	0.06	0.66	-2.17	10.90	-0.42	0.27	2.02	-2.05
SP	-1.73	1.07	0.33	1.44	-1.81	3.50	0.50	0.10	1.30	-1.92
MY	2.06	0.67	0.27	0.94	-1.50	6.18	0.19	0.02	1.20	-1.35
AU	0.80	0.86	0.44	1.26	-1.59	2.00	0.71	0.51	1.89	-2.12

E X P

US: DEPENDENT VARIABLE

UK	11.30	-0.18	0.07	1.12	-1.52	6.02	0.44	0.27	0.70	-0.48
WG	9.83	-0.01	0.00	0.79	-1.15	8.29	0.41	0.16	0.51	0.35
FR	10.40	-0.06	0.02	0.90	-1.35	5.66	0.37	0.18	0.52	0.57
NW	10.80	-0.11	0.05	1.02	-1.57	10.70	-0.09	0.02	0.65	0.69
JP	9.12	0.09	0.02	0.68	-0.99	11.40	-0.19	0.07	0.81	0.31
SP	9.18	0.08	0.00	0.73	-1.09	5.51	0.52	0.45	1.41	-1.71
MY	12.40	-0.33	0.18	1.20	-1.79	6.15	0.46	0.42	0.77	-1.50
AU	11.20	-0.19	0.07	0.98	-1.52	7.68	0.27	0.23	0.78	-1.20
SA	12.40	-0.35	0.17	1.42	-1.45	8.71	0.14	0.19	0.66	-0.67

UK: DEPENDENT VARIABLE

US	12.30	-0.40	0.07	1.05	-0.21	2.68	0.61	0.27	1.48	-2.27
WG	5.03	0.96	0.82	0.82	-0.59	4.90	1.02	0.69	1.19	-1.82
FR	1.84	0.61	0.79	1.64	-2.18	-0.49	0.82	0.63	1.48	-2.57
NW	2.77	0.62	0.69	1.93	-2.17	5.65	0.33	0.18	1.32	-1.34
JP	3.72	0.59	0.43	0.99	-0.42	7.07	0.21	0.06	1.15	-1.46
SP	-0.55	1.09	0.39	1.10	-0.90	6.12	0.31	0.12	1.50	-2.48
MY	3.01	0.69	0.35	1.09	-1.53	5.74	0.37	0.19	1.57	-2.37
AU	5.05	0.45	0.18	1.10	-0.53	6.70	0.26	0.15	1.72	-2.19
SA	4.27	0.56	0.20	0.61	-0.50	7.55	0.15	0.15	1.39	-2.10

WG: DEPENDENT VARIABLE

US	3.66	-0.02	0.00	0.82	-0.86	-0.02	0.39	0.16	1.69	-1.95
UK	-3.66	0.85	0.82	0.92	-1.33	-2.12	0.67	0.68	1.58	-1.99
FR	-2.80	0.58	0.83	1.39	-1.60	-3.96	0.69	0.67	1.58	-2.52
NW	-1.58	0.55	0.64	1.71	-1.46	1.74	0.21	0.12	1.62	-1.89
JP	-1.48	0.63	0.55	1.22	-1.90	2.12	0.20	0.09	1.51	-1.78
SP	-4.55	0.98	0.36	1.28	-1.67	2.86	0.11	0.02	1.72	-2.26
MY	0.50	0.39	0.12	0.91	-1.50	2.47	0.16	0.06	1.71	-2.14
AU	1.17	0.31	0.09	1.09	-1.20	2.43	0.17	0.09	2.04	-2.60
SA	1.71	0.24	0.04	0.73	-1.07	2.87	0.11	0.13	1.87	-2.68

FR: DEPENDENT VARIABLE

US	13.60	-0.28	0.02	0.75	-0.82	6.39	0.49	0.18	1.77	-1.81
UK	0.14	1.31	0.79	1.56	-2.87	4.50	0.76	0.63	1.94	-2.63
WG	5.85	1.42	0.83	1.21	-1.34	7.54	0.97	0.67	1.66	-2.84
NW	2.18	0.95	0.76	2.11	-2.53	7.91	0.35	0.22	1.80	-2.25
JP	3.42	0.93	0.50	0.88	-1.42	8.52	0.33	0.17	1.52	-1.95
SP	-1.34	1.48	0.34	1.21	-1.35	9.98	0.14	0.03	1.81	-2.72
MY	4.47	0.82	0.23	0.97	-1.76	9.46	0.21	0.07	1.83	-2.70
AU	6.78	0.54	0.12	1.00	-0.98	10.40	0.10	0.02	1.87	-2.80
SA	8.01	0.38	0.04	0.61	-0.94	10.80	0.05	0.02	1.79	-2.77

NW: DEPENDENT VARIABLE

US	13.60	-0.46	0.05	0.81	-0.90	11.60	-0.22	0.02	0.81	-2.25
UK	-0.29	1.12	0.69	1.79	-2.61	4.63	0.55	0.18	0.70	-2.08
WG	5.11	1.14	0.64	1.47	-0.96	7.39	0.54	0.12	0.62	-2.04
FR	0.48	0.79	0.75	2.05	-1.94	2.41	0.63	0.22	0.72	-2.21
JP	3.85	0.66	0.30	0.86	-1.25	5.44	0.49	0.21	0.86	-3.04
SP	-0.56	1.18	0.25	1.00	-1.74	10.20	-0.09	0.01	0.71	-2.21
MY	2.85	0.80	0.26	0.91	-2.08	7.90	0.19	0.03	0.64	-2.25
AU	5.67	0.46	0.10	0.90	-0.96	10.00	-0.07	0.01	0.71	-2.29
SA	6.20	0.39	0.06	0.61	-0.89	10.40	-0.12	0.06	0.81	-2.36

JP: DEPENDENT VARIABLE

US	5.61	0.23	0.02	1.13	-1.00	11.80	-0.39	0.07	1.24	-1.22
UK	1.78	0.73	0.43	1.51	-2.04	5.44	0.30	0.06	0.80	-0.67
WG	4.83	0.88	0.55	1.64	-2.91	6.37	0.44	0.09	0.77	-0.73
FR	2.11	0.54	0.50	1.48	-2.38	2.29	0.51	0.17	0.71	-0.64
NW	3.78	0.45	0.30	1.52	-2.48	4.04	0.42	0.21	1.12	-1.56
SP	-1.51	1.15	0.35	2.09	-1.81	10.60	-0.30	0.08	1.03	-1.17
MY	4.84	0.39	0.09	1.35	-1.86	7.95	0.01	0.00	0.96	-0.78
AU	7.44	0.06	0.00	1.28	-1.34	10.20	-0.27	0.11	1.05	-1.52
SA	6.71	0.16	0.01	1.20	-1.30	9.52	-0.18	0.16	1.12	-1.49

SP: DEPENDENT VARIABLE

US	7.66	0.05	0.00	1.34	-1.81	-0.27	0.88	0.45	1.62	-1.47
UK	5.16	0.36	0.39	1.78	-3.13	5.08	0.37	0.12	0.92	0.28
WG	6.92	0.37	0.36	1.86	-3.39	7.64	0.19	0.02	0.74	0.66
FR	5.74	0.23	0.34	1.97	-3.36	6.27	0.18	0.03	0.77	0.61
NW	6.24	0.22	0.25	1.82	-3.91	9.02	-0.07	0.01	0.75	0.99
JP	5.77	0.31	0.35	2.25	-3.05	10.40	-0.25	0.08	0.79	0.38
MY	5.57	0.34	0.25	1.47	-2.71	2.91	0.67	0.54	0.21	-1.15
AU	6.66	0.21	0.11	1.52	-2.36	5.91	0.31	0.18	0.91	-0.62
SA	7.14	0.14	0.04	1.28	-2.05	7.23	0.14	0.12	0.75	0.67

MY: DEPENDENT VARIABLE

US	13.10	-0.54	0.18	0.99	0.01	-0.89	0.91	0.42	0.99	-1.73
UK	3.48	0.51	0.35	0.94	-0.97	3.49	0.52	0.19	1.01	-0.12
WG	6.66	0.32	0.12	0.66	-0.25	6.79	0.34	0.05	0.76	0.22
FR	4.75	0.28	0.23	0.90	-0.79	4.43	0.33	0.07	0.80	0.26
NW	4.79	0.33	0.26	0.90	-1.41	6.58	0.16	0.03	0.69	0.78
JP	5.92	0.24	0.09	0.68	0.52	7.99	0.01	0.00	0.75	0.60
SP	1.59	0.75	0.25	0.64	-0.23	1.42	0.79	0.54	2.23	-1.75
AU	4.73	0.41	0.20	0.95	-0.21	5.50	0.33	0.17	0.95	-0.51
SA	4.38	0.46	0.18	0.76	-0.05	6.99	0.14	0.09	0.78	0.05

AU: DEPENDENT VARIABLE

US	11.00	-0.36	0.07	1.81	-2.12	-0.51	0.85	0.24	0.61	-2.72
UK	4.09	0.39	0.18	2.00	-2.21	2.91	0.57	0.15	0.77	-1.71
WG	6.32	0.31	0.09	1.89	-1.71	5.76	0.56	0.09	0.70	-1.64
FR	5.01	0.22	0.12	1.98	-1.93	5.20	0.24	0.02	0.45	-1.65
NW	5.37	0.22	0.10	1.94	-2.10	8.79	-0.09	0.01	0.38	-1.45
JP	7.06	0.04	0.00	1.66	-1.26	11.20	-0.41	0.11	0.44	-2.11
SP	2.88	0.55	0.11	1.74	-1.69	3.10	0.57	0.18	0.53	-2.46
MY	3.61	0.49	0.20	2.00	-2.31	3.77	0.51	0.17	0.50	-2.13
SA	5.56	0.25	0.04	1.73	-1.72	4.47	0.43	0.57	1.31	-3.38

SA: DEPENDENT VARIABLE

US	12.20	-0.49	0.17	1.88	-2.49	5.51	1.37	0.19	0.48	-2.27
UK	4.38	0.36	0.20	1.14	-2.19	-0.92	1.02	0.15	0.43	-1.71
WG	6.78	0.17	0.04	1.15	-1.91	3.63	1.17	0.13	0.52	-1.72
FR	6.17	0.11	0.04	1.22	-2.05	4.20	0.34	0.02	0.37	-1.82
NW	6.12	0.14	0.05	1.28	-2.12	12.90	-0.51	0.06	0.47	-2.01
JP	6.72	0.08	0.01	1.20	-1.79	15.20	-0.88	0.16	0.51	-2.43
SP	5.11	0.27	0.04	1.12	-1.85	1.14	0.82	0.19	0.38	-2.08
MY	4.29	0.40	0.18	1.43	-2.44	2.60	0.67	0.09	0.38	-1.87
AU	6.04	0.18	0.05	1.36	-2.03	-2.55	1.34	0.57	1.31	-2.96

Notes: 1) All coefficient estimates are derived from ordinary least squares.
2) The co-integrating regression Durbin Watson (CRDW) and augmented Dickey-Fuller (ADF) statistics are employed to test the null hypothesis of non-cointegration. The critical values at 5 % level are 0.386 (CRDW) and -3.17 (ADF).

APPENDIX 5.11

THE COVARIANCE MATRICES OF ECONOMIC VARIABLES FOR 10 SELECTED COUNTRIES FOR PERIOD (P1) JANUARY 1980-DECEMBER 1981 (P2) JANUARY 1982-DECEMBER 1983 (P3) JANUARY 1984-DECEMBER 1985 (P4) JANUARY 1986-DECEMBER 1987

COUNTRY		P1	P2 G	P2 N	P2 P	P3	P4
US -	US	3.09	1.22		0.67	0.32	
	UK	-0.82	-0.09		-2.08	-0.46	
	WG	0.31	0.57		0.14	-0.30	
	FR	-1.28	0.58		0.09	-0.01	
	NW	-13.2	0.67		-1.79	10.64	
	JP	0.28	-0.08		0.07	-0.05	
	SP	0.51	-1.39		2.28	2.19	
	MY	-0.19	-0.97		1.71	0.87	
	AU	-0.06	0.50		0.85	0.36	
	SA	-4.17	2.01		-0.55	-0.60	
UK -	UK	12.02	15.94		11.53	17.45	
	WG	0.09	-0.57		2.20	0.97	
	FR	2.43	-2.70		0.26	-0.79	
	NW	3.19	14.15		11.32	-125	
	JP	0.87	0.14		-0.06	1.89	
	SP	4.49	13.25		-6.17	-6.24	
	MY	0.24	-11.8		-2.16	20.33	
	AU	0.69	4.78		-2.43	1.64	
	SA	-4.04	3.47		-0.01	9.81	
WG -	WG	0.43	0.67		2.55	0.93	
	FR	0.41	0.61		0.66	0.33	
	NW	6.30	-0.36		1.85	23.60	
	JP	-0.08	-0.07		0.01	0.46	
	SP	1.48	-0.89		1.94	-5.78	
	MY	0.63	2.02		1.54	0.46	
	AU	-0.17	-0.02		1.01	-0.75	
	SA	-1.25	-0.87		-2.19	2.50	

FR -	FR	1.89	1.87	0.31	0.32
	NW	13.32	-3.33	0.11	25.91
	JP	-0.43	-0.17	0.00	0.10
	SP	2.36	-7.22	-1.92	-1.81
	MY	1.38	3.33	0.82	0.69
	AU	-0.12	-0.43	0.79	-0.45
	SA	0.52	1.03	0.37	0.22
NW -	NW	294.8	17.21	11.99	2462
	JP	-1.53	-0.06	0.03	11.06
	SP	15.72	9.50	-4.44	-123
	MY	24.97	-17.9	-0.85	-66.9
	AU	3.91	4.29	-2.55	-31.5
	SA	4.72	5.31	-0.15	51.87
JP -	JP	0.44	0.25	0.07	0.98
	SP	-0.06	0.94	-0.97	-0.31
	MY	-0.55	0.31	0.95	4.05
	AU	0.19	0.25	0.03	-0.69
	SA	-1.20	-0.92	-0.11	1.63
SP -	SP	10.21	50.11	94.08	87.48
	MY	0.69	5.32	-19.0	48.51
	AU	-1.20	2.05	-7.13	2.14
	SA	-9.34	-14.8	-18.9	-24.7
MY -	MY	4.15	38.62	17.82	100.5
	AU	0.85	-5.08	4.46	0.18
	SA	0.97	-23.6	-2.77	-1.72
AU -	AU	0.70	2.13	4.10	1.78
	SA	0.70	2.73	1.04	-0.06
SA -	SA	15.43	24.27	12.62	13.21

		I	P		
US -	US	1.37	1.25	0.39	0.36
	UK	0.09	0.28	-0.06	0.14
	WG	0.22	0.17	-0.20	0.27
	FR	-0.24	0.13	0.13	0.45
	NW	0.44	0.37	-0.02	2.83
	JP	-0.14	0.50	-0.01	0.09
	SP	0.22	0.54	0.17	-0.11
	MY	0.22	2.90	2.25	-1.43
	AU	-0.10	0.35	-0.01	1.02
	SA	0.00	-0.00	-0.09	0.86
UK -	UK	1.64	1.11	1.55	0.71
	WG	0.47	-0.70	-1.38	1.30
	FR	-0.34	-0.45	-0.62	1.04
	NW	-0.95	-0.02	-0.98	3.25
	JP	0.01	-0.52	-0.34	-0.04
	SP	-0.43	-0.07	-0.30	-0.75
	MY	-0.25	1.26	0.42	0.34
	AU	-0.20	-0.31	0.25	0.54
	SA	-0.68	-0.68	-0.34	0.51
WG -	WG	1.57	3.92	12.89	3.84
	FR	0.33	1.21	3.58	2.53
	NW	0.76	-0.96	0.42	8.93
	JP	-0.04	0.91	0.33	-0.56
	SP	0.07	-0.11	0.56	-1.40
	MY	0.73	0.10	-2.66	-4.04

	AU	-0.83	-0.17	0.43	1.33
	SA	-0.02	0.23	-0.46	0.53
FR -	FR	1.73	2.23	2.90	3.91
	NW	0.87	-1.61	1.69	18.80
	JP	0.19	0.62	0.60	0.06
	SP	0.13	-0.33	0.30	-1.24
	MY	-1.39	3.73	0.43	-3.94
	AU	0.46	0.98	0.41	2.00
	SA	0.01	-0.16	1.70	3.35
NW -	NW	49.71	12.16	7.04	269.9
	JP	0.02	0.69	0.51	0.65
	SP	-1.21	-0.84	0.09	-2.43
	MY	-4.62	-15.82	11.22	-25.51
	AU	-6.82	0.30	1.55	-7.73
	SA	3.50	0.84	0.17	27.14
JP -	JP	2.35	1.46	1.50	2.17
	SP	-0.04	0.50	0.29	0.03
	MY	1.51	1.50	-1.98	1.23
	AU	-0.55	-0.76	-0.76	-0.89
	SA	1.58	1.09	1.73	1.34
SP -	SP	4.25	2.67	1.82	7.34
	MY	0.33	-0.90	1.59	-0.02
	AU	-0.52	1.13	-0.08	2.09
	SA	0.28	1.23	0.28	0.16
MY -	MY	16.42	110.99	89.72	76.89
	AU	-4.30	-4.80	5.63	-14.97
	SA	4.41	-7.31	-6.17	-2.92
AU -	AU	3.67	8.05	2.63	16.71
	SA	-2.02	0.14	-0.64	1.61
SA -	SA	3.94	6.10	6.26	8.56

		C	P		
US -	US	0.11	0.13	0.01	0.08
	UK	0.03	0.05	0.01	0.00
	WG	0.03	0.06	0.00	0.02
	FR	0.00	-0.00	0.01	0.02
	NW	0.08	0.00	0.01	0.05
	JP	0.06	0.04	0.01	0.03
	SP	0.01	-0.00	0.02	0.04
	MY	-0.01	-0.01	0.03	0.01
	AU	0.04	0.02	0.01	0.05
	SA	0.03	-0.03	0.01	0.01
UK -	UK	0.53	0.21	0.26	0.12
	WG	0.05	0.01	0.01	0.01
	FR	0.02	0.06	0.05	0.01
	NW	-0.01	-0.00	-0.02	-0.03
	JP	0.20	0.04	0.00	0.06
	SP	0.10	-0.02	-0.01	-0.01
	MY	-0.15	-0.02	-0.03	0.00
	AU	-0.04	0.01	0.06	-0.02
	SA	-0.10	0.06	0.08	0.02
WG -	WG	0.08	0.07	0.05	0.04
	FR	0.01	0.00	0.01	0.02
	NW	0.08	0.04	0.04	0.01
	JP	0.02	-0.01	0.01	-0.00

	SP	0.03	0.03	0.02	0.02
	MY	0.03	0.02	0.01	0.01
	AU	0.03	-0.01	-0.01	-0.01
	SA	-0.04	-0.03	0.01	-0.01
FR -	FR	0.06	0.08	0.04	0.04
	NW	0.00	0.06	0.01	0.03
	JP	-0.01	0.01	0.03	0.00
	SP	0.06	-0.02	0.03	0.02
	MY	0.01	0.02	0.03	-0.01
	AU	0.00	0.01	0.01	-0.01
	SA	0.05	0.01	-0.00	0.01
NW -	NW	0.37	0.45	0.12	0.25
	JP	0.12	-0.05	0.06	0.01
	SP	-0.03	-0.00	-0.02	0.01
	MY	0.12	0.12	-0.02	-0.02
	AU	0.07	0.04	-0.01	0.03
	SA	-0.02	0.02	-0.03	0.09
JP -	JP	0.41	0.39	0.31	0.22
	SP	-0.11	-0.01	-0.02	0.00
	MY	-0.12	-0.07	0.00	0.03
	AU	-0.02	0.04	-0.01	-0.01
	SA	-0.05	0.10	-0.01	0.05
SP -	SP	0.36	0.23	0.25	0.08
	MY	0.05	0.05	0.28	0.02
	AU	0.08	-0.06	0.02	0.03
	SA	-0.04	-0.12	0.01	0.00
MY -	MY	0.26	0.15	0.41	0.11
	AU	-0.00	-0.02	0.04	0.05
	SA	-0.04	-0.08	-0.05	-0.01
AU -	AU	0.23	0.12	0.08	0.18
	SA	0.02	0.06	0.04	0.04
SA -	SA	0.26	0.24	0.34	0.29

		M	S		
US -	US	3.36	2.90	2.41	3.36
	UK	2.59	0.93	0.09	-0.01
	WG	-0.20	0.29	1.82	1.49
	FR	3.96	3.18	4.19	3.33
	NW	2.19	1.59	2.87	9.94
	JP	0.31	1.71	3.88	2.72
	SP	2.71	-0.14	0.39	-1.58
	MY	1.91	1.57	1.76	0.09
	AU	2.52	1.65	1.84	2.30
	SA	2.83	0.11	0.14	-0.13
UK -	UK	6.78	4.17	8.51	3.76
	WG	-0.07	1.77	4.39	2.26
	FR	8.90	6.92	1.18	1.00
	NW	-0.85	1.96	-1.14	10.22
	JP	3.01	4.84	8.14	3.72
	SP	0.40	-0.32	0.53	1.90
	MY	-0.95	1.72	-4.67	-1.45
	AU	2.43	1.05	-1.57	0.29
	SA	1.98	0.71	1.96	0.31
WG -	WG	11.85	7.74	7.95	9.39
	FR	-6.02	0.11	4.90	0.04

	NW	-6.01	-1.77	0.29	25.74
	JP	2.69	2.84	7.46	6.66
	SP	-2.32	-2.39	4.23	1.47
	MY	-0.83	-0.80	1.44	-4.16
	AU	-0.43	-1.39	1.60	0.21
	SA	2.61	3.20	-0.15	1.87
FR -	FR	45.95	33.32	18.80	11.87
	NW	0.65	7.65	7.17	26.18
	JP	15.67	17.16	20.21	9.19
	SP	-0.50	2.92	-0.57	-4.96
	MY	0.68	1.17	1.43	-0.83
	AU	10.40	8.60	4.56	5.28
	SA	3.77	4.09	1.63	1.51
NW -	NW	17.17	11.23	13.38	664.21
	JP	-7.44	3.82	11.59	54.11
	SP	3.87	3.57	-2.91	-32.84
	MY	3.07	2.86	1.93	-41.88
	AU	0.39	2.93	4.25	21.70
	SA	5.34	3.09	0.20	19.39
JP -	JP	16.66	19.39	38.98	22.74
	SP	-0.81	1.71	-2.09	4.71
	MY	-1.33	1.08	1.52	-5.64
	AU	2.90	5.98	4.83	4.31
	SA	1.61	6.65	4.74	4.03
SP -	SP	16.37	8.90	8.47	48.56
	MY	6.52	2.96	3.88	8.51
	AU	0.43	3.01	-0.41	-1.14
	SA	2.56	-3.76	1.16	-7.62
MY -	MY	9.84	7.54	16.61	10.64
	AU	2.53	2.51	1.95	0.57
	SA	2.04	-4.23	1.61	-1.69
AU -	AU	5.03	7.61	5.69	5.23
	SA	2.07	-0.23	-1.37	1.14
SA -	SA	9.78	18.30	10.88	12.90

		T	B		
US -	US	198.61	68.14	23.14	45.87
	UK	8.42	7.51	14.26	13.70
	WG	31.69	2.88	3.81	-8.95
	FR	29.79	3.39	0.92	1.96
	NW	-88.80	-3.03	2.28	-3.41
	JP	-36.46	1.05	0.00	4.39
	SP	65.80	18.50	9.21	26.69
	MY	-7.13	1.56	-0.15	7.99
	AU	4.92	30.83	2.46	-3.67
	SA	6.73	14.45	11.93	3.93
UK -	UK	54.14	35.97	118.05	35.60
	WG	-7.70	-11.82	6.92	6.70
	FR	-4.43	3.99	0.90	6.69
	NW	-5.90	1.12	19.71	-1.51
	JP	2.23	-0.25	0.00	8.82
	SP	31.25	-7.01	-1.90	-14.79
	MY	-3.34	-1.43	1.68	14.94
	AU	-2.17	6.44	-9.50	14.48
	SA	6.38	-12.04	10.13	-2.31

WG -	WG	68.74	26.19	26.39	38.19
	FR	39.95	2.49	-3.05	5.21
	NW	19.69	-2.49	0.30	1.82
	JP	-0.85	0.60	0.00	10.67
	SP	26.97	-6.68	-10.62	-2.17
	MY	-0.66	-0.01	-3.27	-0.95
	AU	10.63	7.55	1.67	5.89
	SA	21.27	18.26	5.03	-3.42
FR -	FR	93.73	18.76	9.20	16.67
	NW	24.84	-0.45	0.16	2.56
	JP	-5.36	0.68	0.00	8.78
	SP	40.48	13.08	1.04	14.21
	MY	-2.85	2.93	1.75	5.47
	AU	-7.18	14.95	4.05	5.34
	SA	16.63	-6.40	-3.01	3.16
NW -	NW	504.68	2.66	9.80	1.89
	JP	-0.18	-0.12	0.00	0.83
	SP	-37.85	-7.51	-3.74	2.86
	MY	1.79	-0.57	-0.25	-0.99
	AU	7.50	2.02	0.42	-1.28
	SA	25.10	-3.60	3.07	-0.13
JP -	JP	24.32	3.68	0.00	32.57
	SP	4.18	-1.76	0.00	-6.90
	MY	0.53	0.05	0.00	4.70
	AU	-1.72	2.94	0.00	14.86
	SA	-5.93	0.55	0.00	1.99
SP -	SP	160.00	119.25	102.89	190.39
	MY	-3.49	8.97	4.29	-14.78
	AU	-3.19	-74.52	0.23	-40.90
	SA	16.57	8.09	1.48	8.22
MY -	MY	6.48	1.80	2.65	85.18
	AU	1.54	1.40	-2.89	3.51
	SA	-3.83	0.83	3.61	4.72
AU -	AU	15.79	227.13	68.95	64.73
	SA	1.63	-36.44	-6.67	-9.28
SA -	SA	29.12	71.54	34.23	11.87

U N E M P

US -	US	39.43	27.16	26.62	33.68
	UK	-2.79	3.30	3.42	2.58
	WG	18.61	17.06	16.88	16.44
	FR	-5.59	-2.42	-0.60	-1.12
	NW	-1.21	15.10	19.15	16.03
	JP	-2.98	12.47	11.66	7.76
	SP	79.30	10.87	36.84	-0.58
	MY	79.31	61.13	78.57	-0.57
	AU	-3.63	1.49	2.92	-0.37
	SA	15.77	23.71	6.67	11.62
UK -	UK	9.33	3.75	2.98	3.61
	WG	12.13	8.48	5.82	6.43
	FR	5.84	2.60	2.33	1.57
	NW	24.90	11.19	6.68	8.33
	JP	4.75	5.91	3.02	4.61
	SP	-3.24	-2.15	11.81	23.29
	MY	-3.24	62.93	-11.46	23.29

	AU	0.13	0.28	-0.47	0.65
	SA	2.45	7.54	2.56	1.34
WG -	WG	66.90	32.57	23.96	29.44
	FR	7.54	3.98	2.10	3.16
	NW	89.35	42.85	33.85	36.03
	JP	1.99	13.13	7.38	7.86
	SP	1.63	14.31	26.02	109.40
	MY	1.65	149.84	2.42	109.39
	AU	6.35	1.73	-0.06	1.19
	SA	10.65	22.06	5.60	0.56
FR -	FR	13.52	9.88	7.72	5.45
	NW	8.40	1.67	-0.75	8.38
	JP	1.44	1.16	3.23	2.34
	SP	-27.83	-24.31	-10.28	28.37
	MY	-27.83	-1.03	-23.21	28.37
	AU	0.45	0.49	-0.46	0.60
	SA	-1.77	-1.06	-1.95	-0.78
NW -	NW	235.00	139.81	88.94	86.88
	JP	8.09	13.90	1.79	16.46
	SP	51.53	10.60	88.35	45.31
	MY	51.54	-19.33	112.71	45.30
	AU	9.56	-3.56	2.02	2.77
	SA	2.23	17.84	-4.15	1.04
JP -	JP	28.88	40.12	31.91	32.45
	SP	11.08	18.09	33.03	-50.86
	MY	11.10	-95.28	60.04	-50.87
	AU	-7.83	-0.20	2.70	0.41
	SA	2.82	23.39	17.06	4.49
SP -	SP	774.70	1062	2940	19500
	MY	774.66	1042	2866	19500
	AU	-34.12	-3.31	-32.80	164.91
	SA	49.55	98.81	35.84	-6.72
MY -	MY	774.63	18406	4733	19500
	AU	-34.12	34.87	-7.25	164.91
	SA	49.55	111.03	-2.88	-6.70
AU -	AU	9.86	14.68	4.51	6.35
	SA	0.29	14.14	0.76	0.64
SA -	SA	35.79	78.40	43.69	17.52

		I	M	P	
US -	US	46.05	125.13	112.76	33.67
	UK	4.20	32.49	18.06	26.55
	WG	-4.21	-2.56	12.14	36.65
	FR	-17.59	-26.57	37.91	37.74
	NW	-3.61	15.99	-32.71	17.85
	JP	-1.82	1.30	-18.80	16.88
	SP	1.71	35.83	72.41	4.62
	MY	-1.30	9.22	-2.04	25.22
	AU	13.32	37.17	27.21	8.30
	SA	-8.88	108.69	34.63	37.70
UK -	UK	62.95	88.71	105.98	60.33
	WG	46.11	46.70	51.31	77.04
	FR	72.23	86.23	74.05	102.26
	NW	32.72	114.55	118.96	52.74
	JP	14.66	12.86	43.29	34.48

	SP	-6.96	14.58	59.62	6.85
	MY	15.39	-1.49	93.17	26.57
	AU	32.40	19.77	111.57	39.64
	SA	13.32	39.78	116.12	49.72
WG -	WG	64.13	56.04	55.22	128.41
	FR	98.63	80.28	55.68	167.03
	NW	46.93	76.58	36.18	103.92
	JP	23.64	32.66	41.83	62.85
	SP	22.82	14.74	31.06	12.61
	MY	24.22	19.45	84.69	46.90
	AU	35.52	17.59	80.70	64.73
	SA	13.13	35.92	53.66	38.12
FR -	FR	220.69	169.59	166.46	303.36
	NW	68.12	173.34	39.15	138.72
	JP	20.58	21.82	20.91	61.27
	SP	10.04	-10.18	40.86	18.58
	MY	48.91	2.54	38.05	36.97
	AU	55.62	-5.80	34.25	90.60
	SA	-18.16	-8.63	-0.12	-9.45
NW -	NW	148.80	314.38	284.01	191.68
	JP	32.48	23.00	35.88	46.77
	SP	-20.50	-32.67	68.82	-29.38
	MY	-16.84	-6.57	75.99	26.94
	AU	13.56	-1.58	185.29	68.59
	SA	-11.04	52.23	159.47	24.41
JP -	JP	54.35	52.26	88.03	69.37
	SP	17.93	29.81	23.31	3.76
	MY	23.30	38.14	117.06	44.88
	AU	14.12	11.62	91.91	40.95
	SA	22.58	68.74	84.12	38.94
SP -	SP	223.74	70.56	149.66	50.28
	MY	85.95	24.30	66.63	17.25
	AU	-17.45	12.70	133.59	19.85
	SA	3.51	70.93	113.12	-18.82
MY -	MY	83.59	218.83	297.72	130.94
	AU	15.62	24.10	177.50	55.07
	SA	-12.75	145.24	118.05	58.13
AU -	AU	116.06	111.36	360.16	125.99
	SA	33.78	71.48	218.65	98.53
SA -	SA	188.41	341.06	412.55	445.59

E X P

US -	US	63.96	57.79	48.08	45.48
	UK	28.78	59.15	24.55	49.98
	WG	36.70	64.41	29.58	48.72
	FR	52.10	68.23	40.40	59.01
	NW	73.23	34.81	33.82	44.80
	JP	65.00	57.93	27.43	40.08
	SP	19.20	44.34	15.36	-3.59
	MY	-4.75	33.61	51.85	28.12
	AU	-6.29	7.78	-9.83	14.36
	SA	9.58	30.58	44.66	2.62
UK -	UK	90.61	136.27	138.32	197.23
	WG	91.04	115.20	96.70	161.55
	FR	111.57	113.15	86.73	193.77

	NW	63.19	82.24	61.77	80.06
	JP	56.51	118.78	76.11	117.72
	SP	43.83	46.27	-8.63	36.62
	MY	8.26	40.32	23.15	47.81
	AU	-8.26	33.77	-50.43	-2.69
	SA	41.29	96.71	105.68	66.12
WG -	WG	121.86	116.23	111.14	163.40
	FR	154.15	117.86	100.80	173.45
	NW	77.24	76.36	59.60	80.22
	JP	98.45	111.69	69.96	106.92
	SP	30.04	44.16	-5.33	36.09
	MY	-8.02	41.52	27.80	42.66
	AU	-27.62	11.17	-51.13	-2.10
	SA	15.32	85.87	78.98	15.21
FR -	FR	258.92	180.73	173.25	220.86
	NW	110.09	99.10	73.12	104.56
	JP	159.57	134.29	110.27	123.86
	SP	12.44	53.14	-6.49	33.76
	MY	-20.16	23.88	22.78	57.41
	AU	-6.34	-54.20	-47.88	9.62
	SA	-1.76	86.90	13.48	52.81
NW -	NW	232.54	127.51	87.85	199.49
	JP	56.70	88.97	18.00	72.86
	SP	20.07	27.00	25.69	-12.69
	MY	6.01	16.58	64.09	50.33
	AU	-23.90	-28.77	-18.56	28.45
	SA	-14.14	63.98	91.74	-29.77
JP -	JP	262.95	209.14	200.85	163.33
	SP	-9.93	72.44	-79.07	19.48
	MY	-20.74	45.52	18.89	86.90
	AU	-51.65	-85.90	-54.68	-2.52
	SA	-15.63	95.18	-88.83	-7.23
SP -	SP	65.20	86.45	139.17	83.53
	MY	29.06	42.94	19.35	-0.58
	AU	3.22	59.95	52.52	-26.79
	SA	41.66	38.47	133.87	5.95
MY -	MY	59.58	77.57	138.58	142.41
	AU	-15.89	58.98	-28.37	37.34
	SA	10.42	32.45	59.06	39.83
AU -	AU	76.04	435.02	101.58	90.11
	SA	5.87	1.98	-0.44	-4.19
SA -	SA	105.89	160.88	346.12	322.32

APPENDIX 5.12

THE BETA COEFFICIENTS OF 8 SIMILAR ECONOMIC VARIABLES IN 10 SELECTED COUNTRIES FOR 2 SUB-PERIODS (JAN 1980-DEC 1983 & JAN 1984-DEC 1987) AND THE CHOW TEST (F')

	b(P1)	b(P2)	F'	b(P1)	b(P2)	F'
	G N P			I P		
US-UK	-0.02	-0.09	0.35	0.18	0.03	0.95
WG	0.76	-0.05	1.76	0.09	0.01	1.02
FR	-0.11	0.21	0.31	-0.02	0.08	1.01
NW	-0.04	0.01	2.18	0.02	0.01	0.67
JP	0.43	0.08	0.25	0.10	0.02	0.80
SP	-0.01	0.02	0.26	0.07	0.01	0.47
MY	-0.04	0.02	0.41	0.02	0.01	0.92
AU	0.23	0.21	0.18	0.01	0.05	0.79
SA	-0.04	-0.04	0.08	-0.02	0.05	1.15
UK-US	-0.10	-2.47	1.45	0.20	0.10	0.42
WG	-0.55	0.91	0.59	-0.02	-0.01	0.54
FR	-0.10	-0.67	0.19	-0.19	0.06	2.05
NW	0.05	-0.03	0.59	-0.01	0.01	0.71
JP	1.55	1.50	0.08	-0.13	-0.11	0.60
SP	0.30	-0.07	1.79	-0.11	-0.11	0.02
MY	-0.29	0.15	1.93	0.01	0.00	0.49
AU	1.89	-0.13	2.84	-0.06	0.04	1.13
SA	0.01	0.38	0.69	-0.17	0.02	2.40
WG-US	0.20	-0.16	0.40	0.17	0.10	0.12
UK	-0.02	0.11	0.88	-0.05	-0.03	0.16
FR	0.26	1.26	4.65	0.40	0.89	1.79
NW	0.02	0.01	0.29	0.00	0.03	0.54
JP	-0.23	0.38	0.66	0.24	-0.06	0.49
SP	0.01	-0.02	0.15	-0.03	-0.05	0.08
MY	0.06	0.02	0.21	0.01	-0.04	0.50
AU	-0.08	0.04	0.13	-0.09	0.09	0.64
SA	-0.05	0.01	0.26	0.01	0.00	0.15
FR-US	-0.10	0.16	6.64	-0.03	0.77	1.74
UK	-0.01	-0.02	6.40	-0.26	0.19	1.29
WG	0.89	0.28	10.38	0.28	0.37	0.19
NW	0.02	0.01	4.62	-0.01	0.07	1.95
JP	-0.46	0.22	7.54	0.22	0.18	0.10
SP	-0.08	-0.02	7.59	-0.04	-0.07	0.03
MY	0.09	0.01	8.19	0.02	-0.02	0.63
AU	-0.11	0.06	6.58	0.12	0.13	0.08
SA	0.04	0.03	6.67	-0.02	0.34	4.31
NW-US	-3.05	10.70	1.73	0.34	3.67	0.94
UK	0.49	-2.22	1.13	-0.27	1.03	0.34
WG	5.10	2.84	0.45	-0.03	0.56	0.23
FR	1.92	24.70	3.36	-0.19	3.01	4.28
JP	-3.83	22.20	2.90	0.19	0.32	0.05
SP	0.35	-0.48	0.58	-0.29	-0.15	0.07
MY	0.21	-1.95	0.91	-0.16	-0.09	0.14
AU	1.57	-2.09	0.56	-0.54	-0.32	0.13
SA	0.20	1.33	0.53	0.38	1.83	2.19
JP-US	0.09	0.10	0.00	0.14	0.12	0.06

UK	0.05	0.06	0.02	-0.16	-0.17	0.19
WG	-0.19	0.13	0.60	0.16	-0.01	0.91
FR	-0.11	0.34	0.98	0.21	0.10	0.27
NW	-0.01	0.01	1.17	0.01	0.00	0.12
SP	0.02	-0.01	0.28	0.05	0.03	0.05
MY	-0.02	0.03	0.75	0.02	-0.01	0.43
AU	0.23	-0.11	1.81	-0.11	-0.09	0.20
SA	-0.05	0.07	1.44	0.25	0.20	0.30
SP-US	-0.18	4.07	0.95	0.21	0.04	0.53
UK	0.65	-0.43	1.03	-0.3	-0.35	0.39
WG	0.30	-1.09	0.11	-0.04	-0.02	0.42
FR	-1.40	-5.51	0.97	-0.07	-0.07	0.41
NW	0.07	-0.04	0.26	-0.03	0.00	0.57
JP	1.34	-1.54	0.26	0.13	0.08	0.46
MY	0.11	0.26	0.04	0.00	0.01	0.47
AU	0.44	-0.87	0.23	0.08	0.07	0.44
SA	-0.60	-1.70	1.84	0.19	0.05	0.84
MY-US	-0.44	2.15	0.84	1.10	1.11	0.21
UK	0.48	0.63	2.02	0.25	0.31	0.28
WG	2.55	0.59	0.60	0.13	-0.40	0.53
FR	1.14	1.04	0.78	0.61	-0.52	0.83
NW	0.03	-0.03	0.42	-0.34	-0.05	1.02
JP	-1.02	3.47	1.36	0.78	-0.20	0.58
SP	0.09	0.18	0.36	-0.06	0.19	0.36
AU	-1.68	0.76	1.50	-0.75	-0.48	0.49
SA	-0.62	-0.21	0.75	-0.26	-0.61	0.41
AU-US	-0.18	1.20	1.85	0.06	1.35	1.57
UK	0.22	-0.03	1.77	-0.22	0.35	0.73
WG	-0.22	0.07	0.23	-0.19	0.11	0.64
FR	-0.10	0.48	0.43	0.36	0.35	0.07
NW	0.02	-0.01	0.30	-0.11	-0.02	0.65
JP	0.85	-0.51	1.76	-0.35	-0.45	0.19
SP	0.02	-0.03	0.31	0.14	0.16	0.01
MY	-0.12	0.04	1.49	-0.07	-0.06	0.21
SA	0.10	0.04	0.16	-0.15	0.07	0.54
SA-US	-0.34	-1.04	0.15	-0.09	0.98	1.31
UK	0.02	0.34	0.47	-0.58	0.11	1.18
WG	-1.88	0.08	0.84	0.01	0.00	0.04
FR	0.45	1.00	0.35	-0.05	0.76	3.55
NW	0.03	0.02	0.19	0.07	0.09	0.21
JP	-2.02	1.40	1.54	0.69	0.84	0.24
SP	-0.38	-0.24	0.49	0.28	0.09	0.28
MY	-0.53	-0.04	2.36	-0.02	-0.06	0.17
AU	1.14	0.17	0.51	-0.14	0.05	0.50

	C	P		M	S	
US-UK	0.26	0.07	6.21	0.32	0.01	2.39
WG	0.88	0.32	3.61	0.01	0.19	1.28
FR	0.39	0.44	0.23	0.09	0.25	2.80
NW	0.17	0.16	5.82	0.13	0.02	1.70
JP	0.21	0.11	7.46	0.06	0.11	0.26
SP	0.21	0.18	5.03	0.10	-0.02	0.99
MY	0.09	0.08	5.88	0.20	0.07	0.83
AU	0.23	0.26	6.55	0.33	0.37	0.06
SA	0.09	0.02	9.13	0.10	0.00	0.52

UK-US	0.63	0.27	1.78	0.56	0.02	2.58
WG	0.74	0.33	1.28	0.09	0.39	2.51
FR	0.96	0.72	0.52	0.20	0.07	2.00
NW	0.07	-0.18	5.06	0.04	0.01	0.50
JP	0.39	0.14	4.34	0.22	0.19	0.77
SP	0.32	-0.05	4.11	0.00	0.05	0.76
MY	-0.23	-0.05	5.65	0.05	-0.22	2.14
AU	-0.05	0.18	4.57	0.27	-0.10	2.33
SA	0.04	0.17	5.38	0.08	0.10	0.87
WG-US	0.40	0.36	7.79	0.02	0.57	1.21
UK	0.14	0.09	12.18	0.16	0.54	2.31
FR	0.21	0.47	2.79	-0.07	0.16	1.59
NW	0.19	0.11	13.01	-0.27	0.04	3.46
JP	0.04	0.05	15.57	0.15	0.23	0.19
SP	0.17	0.17	11.38	-0.19	0.10	1.90
MY	0.19	0.03	12.84	-0.10	-0.09	0.00
AU	0.08	-0.07	16.54	-0.15	0.17	0.75
SA	-0.12	0.00	16.46	0.20	0.08	0.28
FR-US	0.19	0.49	37.61	1.12	1.30	0.55
UK	0.19	0.21	41.86	1.42	0.18	5.71
WG	0.22	0.48	28.31	-0.30	0.29	1.72
NW	0.12	0.08	43.18	0.30	0.05	0.95
JP	0.05	0.10	47.30	0.91	0.48	3.71
SP	0.15	0.19	40.58	0.11	-0.10	0.66
MY	0.17	0.05	39.53	0.11	0.02	0.36
AU	0.07	0.00	46.80	1.50	0.87	2.26
SA	0.18	0.01	55.88	0.29	0.13	0.36
NW-US	0.37	0.61	1.35	0.60	2.40	0.73
UK	0.06	-0.18	4.01	0.11	0.62	0.15
WG	0.91	0.37	1.10	-0.39	1.25	2.00
FR	0.55	0.27	0.29	0.11	0.95	1.27
JP	0.12	0.13	3.01	-0.09	0.95	2.09
SP	0.04	-0.06	3.28	0.29	-1.06	2.05
MY	0.62	-0.10	7.34	0.34	-1.39	2.57
AU	0.35	0.06	3.21	0.27	1.92	1.36
SA	0.05	0.11	3.94	0.29	0.68	0.15
JP-US	0.48	0.58	0.14	0.32	1.14	1.03
UK	0.36	0.19	0.59	0.71	0.96	0.29
WG	0.20	0.26	0.44	0.28	0.81	1.41
FR	0.22	0.47	0.14	0.42	0.96	5.64
NW	0.12	0.18	0.88	-0.12	0.10	0.66
SP	-0.04	-0.07	1.51	0.04	0.05	0.01
MY	-0.34	0.08	3.35	-0.01	-0.15	0.10
AU	0.07	-0.11	1.57	0.71	0.82	0.04
SA	0.15	0.06	1.74	0.30	0.37	0.11
SP-US	0.42	0.59	1.85	0.40	-0.20	0.66
UK	0.27	-0.04	4.44	0.00	0.22	0.22
WG	0.74	0.53	0.77	-0.24	0.33	1.81
FR	0.63	0.55	0.00	0.03	-0.18	0.64
NW	0.04	-0.05	4.71	0.26	-0.05	3.08
JP	-0.04	-0.04	5.13	0.03	0.04	0.05
MY	0.41	0.59	1.48	0.54	0.46	0.04
AU	0.08	0.24	4.35	0.28	-0.10	0.53
SA	-0.21	0.01	5.11	-0.04	-0.25	0.44
MY-US	0.12	0.39	4.98	0.55	0.32	0.48
UK	-0.11	-0.07	7.97	0.07	-0.49	2.16

WG	0.49	0.15	3.13	-0.09	-0.16	0.30
FR	0.41	0.23	1.04	0.02	0.02	11.53
NW	0.33	-0.14	8.51	0.21	-0.06	2.49
JP	-0.18	0.08	8.92	-0.01	-0.07	0.34
SP	0.24	0.91	10.95	0.38	0.22	0.72
AU	-0.07	0.36	7.78	0.40	0.24	0.50
SA	-0.19	-0.10	6.42	-0.08	0.00	0.37
AU-US	0.21	0.68	1.92	0.66	0.72	0.06
UK	-0.02	0.12	2.29	0.31	-0.09	1.93
WG	0.17	-0.16	2.00	-0.10	0.11	0.81
FR	0.14	0.00	0.68	0.24	0.32	0.88
NW	0.15	0.04	1.57	0.12	0.04	0.46
JP	0.03	-0.06	2.44	0.25	0.15	0.56
SP	0.04	0.19	1.89	0.14	-0.02	0.94
MY	-0.05	0.18	2.44	0.29	0.09	0.96
SA	0.19	0.14	3.21	0.10	0.00	0.18
SA-US	0.14	0.13	1.64	0.44	0.00	1.25
UK	0.02	0.28	2.46	0.22	0.19	0.89
WG	-0.36	-0.01	0.68	0.29	0.10	1.01
FR	0.52	0.07	3.42	0.11	0.10	0.55
NW	0.03	0.18	1.81	0.29	0.03	2.53
JP	0.09	0.08	1.54	0.24	0.14	0.96
SP	-0.14	0.02	1.04	-0.04	-0.11	0.80
MY	-0.22	-0.12	0.58	-0.13	0.00	0.87
AU	0.28	0.34	2.19	0.15	0.00	0.82

	T	B		U	N	E	M	P
US-UK	0.19	0.18	0.14	0.12	0.84	1.04		
WG	0.37	-0.08	1.19	0.37	0.62	1.19		
FR	0.30	0.11	0.15	-0.32	-0.13	0.73		
NW	-0.18	-0.10	0.02	0.04	0.20	1.46		
JP	-1.24	0.12	4.89	0.14	0.30	0.79		
SP	0.29	0.12	0.69	0.05	0.00	1.98		
MY	-0.59	0.09	0.55	0.01	0.00	0.61		
AU	0.15	-0.01	0.44	-0.12	0.23	0.82		
SA	0.23	0.34	0.09	0.28	0.25	0.92		
UK-US	0.07	0.40	1.58	0.03	0.10	7.81		
WG	-0.17	0.21	1.36	0.22	0.23	7.07		
FR	0.02	0.24	0.51	0.40	0.31	8.23		
NW	-0.02	1.59	6.53	0.09	0.08	6.18		
JP	0.08	0.34	0.63	0.14	0.12	8.37		
SP	0.08	-0.06	0.79	0.00	0.00	7.79		
MY	-0.50	0.18	1.07	0.00	0.00	8.05		
AU	0.03	0.09	0.35	-0.08	-0.02	8.36		
SA	-0.02	0.17	0.55	0.02	0.09	9.02		
WG-US	0.14	-0.08	0.94	0.54	0.55	0.67		
UK	-0.18	0.09	1.44	1.34	1.71	0.68		
FR	0.39	0.08	0.81	0.50	0.40	0.91		
NW	0.02	0.18	0.34	0.35	0.40	0.23		
JP	0.01	0.29	0.51	0.22	0.24	1.07		
SP	0.06	-0.04	0.71	0.01	0.01	1.30		
MY	0.02	-0.05	0.28	0.01	0.00	1.28		
AU	0.09	0.05	0.29	0.26	0.10	0.83		
SA	0.42	0.04	1.59	0.23	0.09	1.75		
FR-US	0.13	0.04	0.35	-0.11	-0.03	0.82		

UK	0.02	0.04	0.28	0.58	0.57	0.48
WG	0.45	0.03	2.82	0.12	0.10	0.18
NW	0.04	0.22	0.46	0.02	0.04	0.28
JP	-0.15	0.20	0.87	0.03	0.09	0.50
SP	0.19	0.05	1.14	-0.03	0.00	2.18
MY	0.09	0.08	0.17	-0.01	0.00	0.43
AU	0.04	0.04	0.26	0.00	0.00	0.38
SA	0.13	0.00	0.22	-0.04	-0.03	0.35
NW-US	-0.34	-0.02	0.99	0.20	0.58	1.70
UK	-0.08	0.12	0.61	2.08	2.02	0.00
WG	0.09	0.03	0.44	1.31	1.31	0.50
FR	0.17	0.09	0.46	0.39	0.57	1.41
JP	-0.05	0.04	0.40	0.32	0.28	1.51
SP	-0.15	0.00	0.69	0.03	0.01	1.80
MY	0.03	-0.01	0.38	0.00	0.01	1.65
AU	0.02	0.00	0.40	0.27	0.46	1.22
SA	0.10	0.06	0.52	0.18	-0.07	1.92
JP-US	-0.13	0.06	2.74	0.14	0.32	0.38
UK	0.02	0.08	1.26	0.61	1.09	0.86
WG	0.00	0.17	1.68	0.15	0.29	0.22
FR	-0.04	0.27	2.53	0.10	0.43	0.35
NW	0.00	0.11	1.30	0.06	0.10	0.07
SP	0.01	-0.02	1.09	0.02	0.00	0.23
MY	0.08	0.05	0.83	0.00	0.00	0.11
AU	0.01	0.16	2.68	-0.27	0.26	0.90
SA	-0.04	0.04	1.15	0.22	0.31	0.36
SP-US	0.31	0.52	0.24	1.32	0.59	1.40
UK	0.24	-0.10	0.63	-0.37	1.24	1.13
WG	0.18	-0.20	0.51	0.16	2.52	1.8
FR	0.46	0.57	0.04	-2.20	0.78	1.34
NW	-0.08	-0.07	0.00	0.17	0.88	1.51
JP	0.08	-0.18	0.15	0.43	-0.43	1.31
MY	0.65	-0.12	0.44	0.09	0.93	105.53
AU	-0.32	-0.26	0.08	-1.36	13.50	5.22
SA	0.20	0.21	0.01	1.14	-1.20	1.71
MY-US	-0.02	0.11	1.80	1.92	1.28	0.41
UK	-0.05	0.10	2.07	1.96	-1.64	0.40
WG	0.00	-0.07	1.45	1.45	2.08	0.46
FR	0.01	0.28	2.05	-1.61	-0.14	0.32
NW	0.00	-0.11	1.26	0.12	1.00	0.48
JP	0.02	0.12	1.24	-1.15	0.00	0.36
SP	0.02	-0.04	1.56	0.99	0.99	0.16
AU	0.01	0.00	1.35	0.93	15.70	2.54
SA	-0.02	0.18	1.52	1.72	-1.57	0.83
AU-US	0.15	-0.02	0.19	-0.05	0.04	2.80
UK	0.07	0.08	0.01	-0.14	-0.04	2.88
WG	0.22	0.12	0.06	0.07	0.02	2.23
FR	0.09	0.23	0.06	0.00	0.00	2.47
NW	0.01	0.02	0.01	0.02	0.03	2.13
JP	0.06	0.65	0.71	-0.10	0.05	3.54
SP	-0.29	-0.14	0.41	-0.02	0.01	4.47
MY	0.43	-0.01	0.17	0.00	0.01	3.31
SA	-0.28	-0.34	0.14	0.16	-0.01	4.86
SA-US	0.09	0.23	6.94	0.55	0.31	1.24
UK	-0.02	0.05	6.80	0.15	0.91	1.47
WG	0.47	0.03	9.42	0.30	0.12	0.94

FR	0.12	0.01	6.53	-0.23	-0.15	0.29
NW	0.03	0.25	6.63	0.07	-0.03	0.66
JP	-0.17	0.06	6.90	0.41	0.35	0.51
SP	0.08	0.03	6.68	-0.08	0.00	3.28
MY	-0.21	0.10	6.40	0.01	-0.01	0.97
AU	-0.12	-0.10	6.80	0.78	-0.05	2.22

	I	M	P	E	X	P
US-UK	0.25	0.27	0.09	0.39	0.22	1.08
WG	-0.06	0.27	1.25	0.43	0.29	0.90
FR	-0.12	0.16	2.58	0.28	0.25	0.23
NW	0.03	-0.03	0.22	0.30	0.27	0.19
JP	-0.01	-0.01	0.11	0.26	0.18	0.60
SP	0.13	0.38	1.34	0.42	0.06	2.90
MY	0.03	0.05	0.14	0.21	0.29	0.17
AU	0.23	0.08	0.59	-0.01	0.03	0.07
SA	0.19	0.08	0.73	0.15	0.07	0.30
UK-US	0.22	0.30	0.10	0.72	0.79	0.03
WG	0.77	0.70	0.40	0.87	0.94	0.25
FR	0.41	0.38	0.22	0.51	0.71	1.63
NW	0.32	0.36	0.10	0.41	0.49	0.14
JP	0.26	0.49	0.78	0.37	0.53	0.72
SP	0.03	0.33	1.79	0.59	0.13	1.78
MY	0.04	0.28	1.68	0.36	0.25	0.08
AU	0.23	0.31	0.17	0.05	-0.28	1.27
SA	0.10	0.19	0.51	0.52	0.26	1.42
WG-US	-0.04	0.33	1.80	0.84	0.83	0.07
UK	0.61	0.77	0.93	0.91	0.77	0.97
FR	0.46	0.47	0.04	0.62	0.70	0.42
NW	0.27	0.29	0.17	0.43	0.49	0.06
JP	0.53	0.67	0.26	0.45	0.49	0.10
SP	0.13	0.22	0.20	0.49	0.14	1.11
MY	0.14	0.31	0.88	0.25	0.25	0.02
AU	0.23	0.30	0.31	-0.03	-0.28	0.79
SA	0.09	0.11	0.05	0.38	0.14	1.19
FR-US	-0.26	0.51	2.71	0.99	1.05	0.25
UK	1.04	1.06	0.14	0.99	0.84	0.57
WG	1.49	1.21	0.76	1.14	1.00	0.61
NW	0.52	0.37	0.44	0.58	0.62	0.05
JP	0.40	0.52	0.05	0.62	0.64	0.01
SP	0.00	0.30	0.59	0.44	0.12	0.62
MY	0.17	0.18	0.01	0.03	0.29	0.45
AU	0.21	0.26	0.08	-0.12	-0.20	0.13
SA	-0.05	-0.01	0.04	0.32	0.10	0.71
NW-US	0.07	-0.10	0.17	0.88	0.82	0.18
UK	0.98	1.03	0.03	0.64	0.42	0.68
WG	1.03	0.76	0.50	0.65	0.51	0.27
FR	0.63	0.38	0.95	0.48	0.45	0.02
JP	0.52	0.53	0.13	0.31	0.25	0.06
SP	-0.18	0.20	0.90	0.31	0.06	0.50
MY	-0.08	0.24	0.95	0.17	0.41	0.50
AU	0.05	0.52	1.94	-0.10	0.05	0.28
SA	0.08	0.21	0.35	0.19	0.09	0.24
JP-US	0.00	-0.01	26.03	1.02	0.70	0.85
UK	0.18	0.47	1.68	0.77	0.58	0.79
WG	0.47	0.57	0.33	0.89	0.64	0.97

FR	0.11	0.18	0.33	0.67	0.59	0.30
NW	0.12	0.17	0.40	0.41	0.32	0.30
SP	0.17	0.14	0.22	0.42	-0.27	2.79
MY	0.20	0.38	1.48	0.18	0.37	0.53
AU	0.11	0.27	1.21	-0.27	-0.30	0.27
SA	0.17	0.14	0.27	0.30	-0.14	2.42
SP-US	0.22	0.52	0.76	0.52	0.14	1.04
UK	0.05	0.40	0.97	0.40	0.09	1.79
WG	0.31	0.24	0.04	0.31	0.11	0.70
FR	0.00	0.13	0.32	0.15	0.07	0.21
NW	-0.11	0.08	0.86	0.13	0.04	0.19
JP	0.45	0.17	0.51	0.14	-0.17	2.43
MY	0.36	0.20	0.49	0.52	0.07	2.57
AU	-0.02	0.31	1.76	0.12	0.14	0.02
SA	0.14	0.11	0.03	0.30	0.20	0.24
MY-US	0.05	0.15	0.08	0.24	0.85	2.68
UK	0.09	0.72	2.32	0.22	0.21	0.02
WG	0.36	0.72	0.67	0.14	0.26	0.22
FR	0.13	0.16	0.02	0.01	0.20	0.92
NW	-0.05	0.22	1.10	0.06	0.40	2.22
JP	0.58	1.03	1.11	0.05	0.29	1.45
SP	0.37	0.42	0.04	0.48	0.09	1.63
AU	0.18	0.47	1.14	0.09	0.05	0.04
SA	0.26	0.21	0.08	0.16	0.15	0.01
AU-US	0.29	0.25	0.16	0.00	0.05	0.02
UK	0.34	0.91	2.24	0.12	-0.16	0.69
WG	0.44	0.79	1.07	-0.07	-0.19	0.13
FR	0.13	0.27	0.53	-0.14	-0.10	0.03
NW	0.03	0.53	5.01	-0.15	0.03	0.34
JP	0.24	0.84	2.21	-0.30	0.16	0.30
SP	-0.02	0.76	5.70	0.43	0.12	0.58
MY	0.13	0.54	2.62	0.34	0.03	0.59
SA	0.20	0.37	0.97	0.04	-0.01	0.03
SA-US	0.59	0.48	0.03	0.33	0.48	0.31
UK	0.35	1.00	1.27	0.61	0.51	0.43
WG	0.41	0.50	0.02	0.43	0.34	0.40
FR	-0.07	-0.02	0.01	0.20	0.17	0.36
NW	0.09	0.39	0.71	0.14	0.22	0.37
JP	0.87	0.78	0.04	0.17	-0.26	2.23
SP	0.26	0.48	0.19	0.53	0.61	0.30
MY	0.45	0.41	0.00	0.32	0.35	0.27
AU	0.47	0.65	0.24	0.02	-0.03	0.30

Notes: 1) b(P1) and b(P2) represent betas for period one and two respectively
2) F′ denotes the Chow F-ratios

APPENDIX 5.13

THE RESULTS OF WHITE'S TEST FOR DETECTING HETEROSKEDASTICITY IN RESIDUALS OF ECONOMIC VARIABLES IN PERIOD 1980-1983 AND 1984-1987

REG 1: $ei^2 = a + b\ (Ej)$
REG 2: $ei^2 = a + b1\ (Ej) + b2\ (Ej)^2$

(the above two regression models are suggested by White (1980) to examine whether errors in the regression (Ei = a + b (Ej) + ei) have a common variance. Where, ei is the residuals and E represents the percentage change in economic variables from country i and j)

	Dependent Variable = error									
	US (GNP)	UK (GNP)	WG (UNEMP)	FR (IP)	NW (CP)	JP (MS)	SP (TB)	MY (GNP)	AU (IMP)	SA (EXP)
				Period one						
					REG 1					
a		9.18	37.71	1.93	0.40	17.68	121.11	38.32	102.58	123.90
t		1.54	5.42	4.24	1.98	5.34	3.94	2.39	6.24	4.63
bUS		1.81	0.70	-0.22	-0.02	-0.95	3.66	-9.40	-1.93	-4.15
t		0.71	0.57	-0.55	-0.08	-0.53	1.34	-1.38	-1.07	-1.19
R2		0.04	0.01	0.01	0.00	0.01	0.04	0.13	0.03	0.03
					REG 2					
a		5.84	40.31	1.47	0.30	20.61	98.69	40.64	104.97	109.71
t		0.75	4.79	2.41	1.43	5.05	2.53	1.91	4.66	3.28
bUS1		7.23	1.30	-0.20	0.84	-0.61	4.39	-13.15	-1.89	-5.75
t		0.88	0.79	-0.51	1.19	-0.34	1.54	-0.59	-1.02	-1.38
bUS2		-1.27	-0.09	0.35	-0.78	-0.92	0.18	0.88	-0.03	0.25
t		-0.70	-0.56	1.14	-1.33	-1.22	0.94	0.18	-0.16	0.71
R2		0.08	0.01	0.04	0.04	0.04	0.06	0.13	0.03	0.04
					REG 1					
a	2.45		27.22	1.82	0.40	14.73	126.90	23.90	100.38	87.29
t	3.67		3.87	4.15	2.25	6.21	3.49	2.69	6.41	5.23
bUK	-0.20		3.62	-0.01	0.01	-0.05	-3.94	-2.21	-0.03	0.29
t	-1.36		1.70	-0.04	0.08	-0.05	-0.73	-1.12	-0.02	0.18
R2	0.12		0.06	0.00	0.00	0.00	0.01	0.08	0.00	0.00
					REG 2					
a	2.53		27.36	2.40	0.26	13.87	124.66	23.91	108.09	102.23
t	3.52		3.86	4.42	1.06	5.41	2.73	2.48	5.53	4.76
bUK1	-0.11		6.02	-0.08	0.39	-0.56	-4.14	-2.20	0.34	0.30
t	-0.39		1.42	-0.23	0.83	-0.50	-0.69	-0.58	0.18	0.19
bUK2	-0.02		-0.40	-0.40	-0.13	0.22	0.05	0.00	-0.11	-0.13
t	-0.39		-0.65	-1.74	-0.86	0.90	0.08	0.00	-0.67	-1.10
R2	0.14		0.07	0.07	0.02	0.02	0.01	0.08	0.01	0.03
					REG 1					
a	2.10	14.85		1.68	0.16	18.57	131.45	20.03	99.03	105.43
t	1.99	2.46		4.83	1.14	7.01	3.67	1.29	6.74	4.91
bWG	-0.47	-2.30		-0.21	0.46	-3.59	-1.82	-2.47	-1.42	1.39
t	-0.56	-0.47		-1.00	1.66	-4.21	-0.35	-0.20	-0.74	0.70
R2	0.02	0.02		0.02	0.06	0.28	0.00	0.00	0.01	0.01
					REG 2					
a	2.35	2.23		1.73	0.17	14.76	126.00	57.00	107.84	109.74
t	1.29	0.24		4.25	0.97	5.89	3.00	2.44	5.99	4.01

bWG1	-1.09	28.55		-0.22	0.38	-6.50	-2.58	-92.82	-0.92	1.52
t	-0.30	1.51		-1.02	0.51	-6.19	-0.43	-1.98	-0.45	0.73
bWG2	0.25	-12.29		-0.02	0.08	0.56	0.11	35.99	-0.16	-0.04
t	0.17	-1.68		-0.25	0.12	3.91	0.25	1.98	-0.85	-0.26
R2	0.03	0.20		0.02	0.06	0.47	0.00	0.25	0.03	0.01

REG 1

a	3.81	16.04	42.42		0.15	11.03	122.36	22.73	106.50	117.90
t	3.18	1.78	5.33		0.42	5.53	3.56	0.92	6.96	4.94
bFR	-0.64	-1.13	2.35		0.26	-0.19	-1.22	-1.38	-0.24	0.91
t	-1.76	-0.41	1.04		0.70	-0.61	-0.26	-0.18	-0.22	0.56
R2	0.19	0.01	0.02		0.01	0.01	0.00	0.00	0.00	0.01

REG 2

a	4.10	-0.33	40.05		-0.31	11.70	117.30	-9.51	118.61	108.26
t	1.77	-0.02	4.51		-0.44	5.52	3.16	-0.20	6.82	3.66
bFR1	-0.89	12.68	0.48		1.44	-0.02	-3.14	25.80	0.49	0.72
t	-0.53	1.05	0.12		0.88	-0.06	-0.46	0.76	0.41	0.43
bFR2	0.04	-2.35	0.34		-0.67	-0.02	0.10	-4.62	-0.07	0.05
t	0.15	-1.18	0.62		-0.74	-0.94	0.39	-0.82	-1.41	0.56
R2	0.19	0.11	0.03		0.02	0.03	0.01	0.05	0.04	0.01

REG 1

a	1.65	12.38	21.78	1.90		16.53	120.92	20.58	110.71	127.28
t	2.94	3.69	4.76	4.23		4.94	3.27	1.95	7.16	4.97
bNW	0.01	0.03	1.32	0.01		0.68	1.41	-0.01	-1.34	-1.30
t	0.20	0.11	3.96	0.17		0.77	0.58	-0.01	-1.30	-0.67
R2	0.00	0.00	0.26	0.00		0.01	0.01	0.00	0.04	0.01

REG 2

a	2.35	12.56	15.62	2.11		17.64	117.35	29.30	109.32	105.56
t	3.36	2.74	2.92	4.34		4.31	3.08	2.12	5.50	3.59
bNW1	-0.17	-0.02	0.83	0.02		0.98	6.68	-2.29	-1.38	-2.67
t	-1.37	-0.02	2.06	0.19		0.90	0.60	-0.91	-1.25	-1.25
bNW2	-0.01	0.00	0.04	-0.01		-0.10	0.06	-0.07	0.01	0.14
t	-1.55	-0.06	2.05	-1.12		-0.48	0.49	-0.97	0.11	1.45
R2	0.17	0.00	0.32	0.03		0.02	0.01	0.07	0.04	0.05

REG 1

a	0.27	11.48	44.10	1.85	0.39		132.55	27.40	108.40	119.97
t	0.21	1.80	5.35	4.37	2.99		3.67	1.13	7.57	4.75
bJP	1.11	0.14	2.78	-0.15	0.05		-3.72	-5.07	-4.22	0.67
t	1.39	0.03	1.95	-0.49	0.27		-0.37	-0.32	-2.11	0.40
R2	0.13	0.00	0.07	0.01	0.00		0.00	0.01	0.09	0.00

REG 2

a	-0.39	20.24	46.12	2.19	0.42		138.87	-12.72	94.02	103.68
t	-0.19	1.95	4.71	4.37	2.87		3.60	-0.33	4.55	3.49
bJP1	2.33	-16.02	3.27	-0.09	0.16		0.49	68.99	-5.13	0.46
t	0.74	-1.02	1.71	-0.29	0.55		0.04	1.18	-2.32	0.28
bJP2	-0.44	5.87	-0.07	-0.19	-0.13		-0.40	-26.88	0.29	0.07
t	-0.40	1.06	-0.39	-1.24	-0.50		-0.50	-1.31	0.97	1.04
R2	0.14	0.08	0.08	0.04	0.01		0.01	0.13	0.11	0.03

REG 1

a	1.93	10.20	48.65	1.78	0.34	15.75		19.30	109.93	107.92
t	3.31	3.28	6.04	3.79	2.47	4.69		2.01	6.89	4.72
bSP	-0.04	0.00	-0.22	0.44	0.18	1.68		1.56	-1.03	0.43
t	-0.39	0.00	-0.84	1.83	0.95	1.80		0.86	-0.76	0.16
R2	0.01	0.00	0.01	0.07	0.02	0.07		0.05	0.01	0.00

REG 2

a	2.55	10.44	54.38	1.97	0.34	16.36		20.39	110.70	127.38
t	3.71	2.61	5.62	3.36	2.40	4.37		1.65	6.01	4.21
bSP1	0.00	0.02	-0.06	0.50	0.21	1.95		1.63	-0.99	0.90
t	-0.04	0.03	-0.18	1.87	0.76	1.66		0.84	-0.71	0.33
bSP2	-0.02	-0.01	-0.01	-0.06	-0.03	-0.07		-0.04	-0.01	-0.27
t	-1.53	-0.10	-1.07	-0.55	-0.14	-0.38		-0.15	-0.09	-0.98
R2	0.17	0.00	0.04	0.08	0.02	0.07		0.06	0.01	0.02

REG 1

a	1.84	10.84	48.24	1.89	0.17	15.45	119.93		108.10	123.54
t	3.52	2.77	5.94	4.07	1.73	4.58	3.19		6.64	4.86
bMY	-0.12	-0.18	-0.08	0.04	0.33	1.96	13.73		-0.98	-2.04
t	-1.06	-0.20	-0.92	0.65	2.33	1.77	0.80		-0.74	-0.66
R2	0.08	0.00	0.01	0.01	0.11	0.07	0.01		0.01	0.01

REG 2

a	1.66	15.05	48.26	1.90	0.18	10.66	118.05		108.87	134.21
t	2.49	3.28	5.87	3.79	1.88	2.85	3.13		5.74	4.31
bMY1	-0.16	0.74	-0.05	0.04	0.11	-0.36	-4.13		-0.98	-1.62
t	-1.11	0.73	-0.18	0.51	0.42	-0.26	-0.16		-0.73	-0.51
bMY2	0.01	-0.20	0.00	0.00	0.19	0.76	3.66		-0.01	-0.16
t	0.47	-1.56	-0.11	-0.07	0.96	2.48	0.96		-0.08	-0.60
R2	0.09	0.17	0.02	0.01	0.13	0.18	0.03		0.01	0.02

REG 1

a	2.33	4.21	48.64	1.83	0.40	15.18	120.45	32.50		129.13
t	1.87	0.97	5.85	4.75	1.72	4.88	3.14	2.44		4.93
bAU	-0.20	1.26	-2.03	-0.10	-0.02	-1.25	1.63	-6.35		-0.53
t	-0.45	0.81	-0.90	-0.63	-0.07	-1.03	0.46	-1.33		-0.32
R2	0.02	0.05	0.01	0.01	0.00	0.02	0.01	0.12		0.00

REG 2

a	1.12	-0.06	51.26	2.04	0.18	15.33	121.45	35.20		137.08
t	0.67	-0.01	5.63	4.47	0.47	4.71	2.77	1.89		5.04
bAU1	1.26	6.39	-0.28	-0.13	0.57	-1.02	1.65	-9.60		0.70
t	0.88	1.29	-0.08	-0.78	0.71	-0.56	0.46	-0.61		0.35
bAU2	-0.32	-1.11	-0.32	-0.04	-0.28	-0.05	-0.01	0.70		-0.04
t	-1.08	-1.09	-0.72	-0.89	-0.79	-0.17	-0.05	0.22		-1.05
R2	0.10	0.13	0.03	0.03	0.01	0.02	0.00	0.12		0.03

REG 1

a	2.47	14.51	44.82	1.84	0.77	18.31	129.73	17.81	100.35
t	3.69	3.15	5.77	4.14	2.74	5.08	3.21	2.73	6.59
bSA	-0.17	-0.53	-1.05	0.28	-0.34	-0.95	0.50	-1.12	-0.59
t	-1.39	-0.63	-1.08	1.45	-1.43	-1.16	0.10	-0.94	-0.63
R2	0.13	0.03	0.02	0.05	0.04	0.03	0.00	0.06	0.01

REG 2

a	2.63	15.53	35.23	2.04	1.18	19.75	142.54	15.41	105.53
t	3.64	3.12	3.40	3.79	1.91	5.24	3.07	2.25	5.53
bSA1	-0.07	0.14	-1.97	0.30	-1.11	0.30	0.85	-2.71	-0.33
t	-0.33	0.10	-1.68	1.51	-1.03	0.23	0.17	-1.44	-0.30
bSA2	-0.02	-0.11	0.16	-0.04	0.30	-0.23	-0.22	0.27	-0.02
t	-0.68	-0.64	1.38	-0.67	0.74	-1.24	-0.58	1.09	-0.46
R2	0.16	0.06	0.06	0.05	0.06	0.06	0.01	0.15	0.01

P e r i o d t w o

REG 1

a		13.62	16.88	2.96	0.09	25.67	136.48	2.41	239.73	306.51
t		1.94	5.49	3.55	1.72	6.21	2.98	0.03	3.66	4.79
bUS		-2.14	0.22	0.34	0.31	0.40	6.89	28.24	-7.37	5.49
t		-0.57	0.39	0.27	2.13	0.18	0.87	0.66	-0.96	0.58
R2		0.02	0.00	0.00	0.09	0.00	0.02	0.03	0.02	0.01

REG 2

a		5.81	15.77	3.08	0.05	27.59	138.13	-154.00	231.91	391.49
t		0.40	3.89	3.61	1.06	5.74	2.74	-0.97	2.96	5.32
bUS1		6.45	0.03	1.04	0.04	1.69	6.27	200.10	-8.42	16.02
t		0.44	0.04	0.67	0.20	0.60	0.58	1.27	-0.88	1.55
bUS2		-2.04	0.03	-0.73	0.86	-0.87	-0.06	-40.90	0.13	-2.04
t		-0.61	0.43	-0.77	2.04	-0.79	-0.08	-1.13	0.19	-2.12
R2		0.05	0.01	0.01	0.17	0.01	0.02	0.12	0.02	0.09

REG 1

a	0.47		15.95	3.35	0.20	31.64	140.49	43.14	168.98	270.75
t	2.37		5.72	4.63	3.86	6.21	2.96	1.39	3.29	4.94
bUK	-0.05		1.81	-0.54	-0.06	-4.94	-3.40	2.42	-0.52	6.89
t	-1.15		1.21	-0.80	-0.66	-2.78	-0.62	0.32	-0.09	1.60
R2	0.08		0.03	0.01	0.01	0.14	0.01	0.01	0.00	0.05

REG 2

a	0.45		16.82	2.01	0.19	29.25	152.45	62.86	199.25	262.63
t	1.65		4.83	2.37	3.31	6.33	2.77	1.49	3.02	3.75
bUK1	-0.06		1.90	-0.68	0.02	-10.63	-0.80	10.75	1.30	6.65
t	-0.70		1.25	-1.06	0.11	-4.67	-0.10	0.77	0.21	1.47
bUK2	0.00		-0.24	1.20	-0.06	1.35	-0.17	-2.18	-0.40	0.05
t	0.11		-0.42	2.68	-0.50	3.50	-0.44	-0.71	-0.74	0.19
R2	0.09		0.04	0.15	0.01	0.33	0.01	0.04	0.01	0.05

REG 1

a	0.07	9.26		2.17	0.19	25.46	128.11	44.00	178.33	299.16
t	0.21	2.63		4.68	4.35	6.19	2.70	1.07	3.16	4.72
bWG	0.33	1.89		0.19	-0.12	-2.39	-9.22	7.70	1.40	7.10
t	1.70	0.90		1.18	-0.65	-1.71	-1.11	0.32	0.23	1.29
R2	0.17	0.05		0.03	0.01	0.06	0.03	0.01	0.00	0.04

REG 2

a	-0.06	9.51		2.02	0.19	26.81	133.14	53.48	232.20	249.99
t	-0.19	2.48		4.18	3.65	5.95	2.31	1.22	3.20	2.98
bWG1	0.11	2.32		0.15	-0.13	-1.96	-9.17	23.71	1.61	6.61
t	0.42	0.79		0.89	-0.65	-1.29	-1.09	0.71	0.27	1.19
bWG2	0.14	-0.26		0.02	0.09	-0.18	-0.15	-9.81	-0.61	0.37
t	1.28	-0.22		1.07	0.17	-0.75	-0.16	-0.71	-1.17	0.90
R2	0.26	0.06		0.05	0.01	0.07	0.03	0.04	0.03	0.05

REG 1

a	-0.56	22.11	24.43		0.17	15.89	149.37	48.57	216.89	308.96
t	-0.96	3.00	4.72		2.34	5.72	3.23	0.52	3.53	5.00
bFR	0.59	-5.68	0.42		0.03	0.38	19.01	2.60	0.91	5.76
t	1.82	-1.38	0.20		0.17	0.53	1.49	0.05	0.22	1.29
R2	0.19	0.12	0.00		0.00	0.01	0.05	0.00	0.00	0.04

REG 2

a	0.98	19.28	25.17		0.16	17.66	138.81	-175.40	245.19	282.40
t	0.72	1.05	4.23		1.88	5.67	2.70	-0.79	3.62	3.70
bFR1	-1.47	-1.90	0.91		0.13	0.60	20.36	302.00	2.84	5.50
t	-0.87	-0.08	0.33		0.28	0.81	1.55	1.10	0.63	1.22
bFR2	0.61	-1.11	-0.14		-0.14	-0.13	0.87	-88.21	-0.14	0.14
t	1.24	-0.17	-0.26		-0.23	-1.23	0.48	-1.11	-0.98	0.60
R2	0.27	0.12	0.00		0.00	0.04	0.05	0.08	0.02	0.04

REG 1

a	0.54	10.83	13.10	2.58	28.19	139.45	13.13	162.93	309.34
t	1.53	5.27	5.80	4.32	5.89	2.86	2.78	4.01	4.75
bNW	0.00	0.08	0.61	-0.04	0.14	4.78	0.11	2.35	6.45
t	0.33	1.10	2.52	-0.68	0.50	0.23	0.69	0.89	1.17
R2	0.01	0.11	0.12	0.01	0.01	0.00	0.04	0.02	0.03

REG 2

a	0.69	11.70	10.90	2.64	29.70	151.02	15.11	142.65	248.30
t	1.72	5.02	3.42	4.28	5.89	2.97	2.83	2.85	3.20
bNW1	-0.06	-0.31	0.69	-0.02	-0.18	23.89	-0.78	1.51	4.17
t	-0.78	-0.66	2.70	-0.26	-0.42	0.77	-0.72	0.51	0.73
bNW2	0.00	0.00	0.03	0.00	0.00	-2.80	-0.01	0.10	0.46
t	-0.84	-0.83	0.98	-0.45	-0.96	-0.83	-0.83	0.70	1.41
R2	0.08	0.17	0.14	0.01	0.03	0.02	0.11	0.03	0.07

REG 1

a	0.06	10.53	23.51	3.39	0.19	152.82	44.21	182.45	309.78
t	0.13	1.97	5.73	4.11	4.13	2.97	0.78	3.74	4.68
bJP	0.28	0.70	1.39	-0.47	-0.09	9.13	1.96	4.69	0.34
t	0.91	0.20	1.88	-0.78	-1.03	0.79	0.05	0.84	0.07
R2	0.05	0.00	0.07	0.01	0.02	0.01	0.00	0.02	0.00

REG 2

a	0.11	8.91	19.20	4.23	0.16	153.38	38.09	195.16	369.49
t	0.20	1.50	3.96	4.51	3.01	2.95	0.60	2.90	4.54
bJP1	0.11	6.52	0.96	0.35	-0.15	19.49	24.03	4.48	-1.75
t	0.13	0.71	1.24	0.47	-1.41	0.31	0.24	0.78	-0.33
bJP2	0.08	-2.64	0.14	-0.60	0.13	0.71	-10.03	-0.17	-0.33
t	0.22	-0.68	1.61	-1.77	1.03	0.17	-0.24	-0.28	-1.24
R2	0.06	0.04	0.12	0.08	0.05	0.01	0.01	0.02	0.03

REG 1

a	0.41	11.88	25.99	3.64	0.19	29.77	44.21	175.10	269.19
t	1.75	7.31	4.68	4.16	4.26	6.19	2.04	4.22	4.68
bSP	0.00	0.32	-0.02	0.60	0.04	-0.37	4.92	3.05	10.13
t	-0.05	1.79	-0.48	1.36	0.35	-0.41	2.05	0.72	1.84
R2	0.00	0.19	0.01	0.05	0.00	0.00	0.23	0.01	0.07

REG 2

a	0.69	13.26	26.36	2.26	0.20	31.17	-0.50	157.79	331.03
t	2.05	5.59	4.65	2.26	3.97	6.34	-0.02	3.11	4.25
bSP1	0.01	0.36	0.01	-0.08	0.05	0.34	3.65	2.79	12.97
t	0.25	1.92	0.13	-0.16	0.46	0.31	1.67	0.66	2.17
bSP2	0.00	-0.02	0.00	0.37	-0.07	-0.07	0.57	0.18	-0.60
t	-1.15	-0.81	-0.44	2.45	-0.49	-1.23	2.25	0.60	-1.17
R2	0.09	0.22	0.01	0.18	0.01	0.04	0.45	0.02	0.09

REG 1

a	0.40	11.30	26.45	3.30	0.19	29.12	142.11	172.18	300.34
t	1.79	4.63	4.75	4.09	4.35	6.53	2.87	3.35	4.91
bMY	0.02	0.11	-0.03	-0.04	-0.01	0.36	2.76	2.04	4.03
t	0.56	0.34	-0.67	-0.47	-0.16	0.30	0.37	0.57	0.77
R2	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01

REG 2

a	0.49	12.92	26.91	3.80	0.19	24.38	149.05	218.01	335.43
t	2.05	5.53	4.72	3.92	4.10	4.64	2.87	3.64	4.95
bMY1	0.05	0.83	0.00	0.01	-0.01	-0.17	1.64	5.64	7.72
t	1.17	1.82	0.05	0.13	-0.11	-0.14	0.20	1.30	1.27
bMY2	0.00	-0.05	0.00	-0.01	-0.01	0.37	-0.18	-0.24	-0.29
t	-1.05	-2.06	-0.46	-0.93	-0.12	1.63	-0.49	-1.44	-1.18
R2	0.10	0.25	0.01	0.02	0.00	0.06	0.01	0.05	0.04

REG 1

a	-0.07	11.69	25.46	3.12	0.13	25.52	137.13	32.42	334.87
t	-0.33	2.41	4.64	3.85	1.74	5.46	2.98	0.53	5.10
bAU	0.15	0.34	-0.19	0.06	0.11	0.51	-2.10	6.98	-7.12
t	2.12	0.23	-0.08	0.21	0.94	0.27	-0.39	0.37	-1.06
R2	0.24	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.02

REG 2

a	0.17	7.26	28.50	3.43	0.13	26.51	143.38	1.50	294.31
t	0.74	1.37	4.48	3.85	1.75	4.98	2.53	0.02	3.40
bAU1	-0.20	6.55	0.29	-0.03	0.17	1.05	-1.30	50.37	-7.91
t	-1.12	1.62	0.12	-0.12	0.98	0.45	-0.19	0.93	-1.16
bAU2	0.07	-1.24	-0.51	-0.03	-0.08	-0.24	-0.09	-8.70	0.44
t	2.09	-1.65	-0.94	-0.84	-0.47	-0.40	-0.19	-0.85	0.72
R2	0.43	0.17	0.02	0.02	0.02	0.01	0.00	0.06	0.03

REG 1

a	0.59	11.29	24.72	2.45	0.22	30.36	138.89	74.26	173.09
t	1.70	3.72	4.61	4.43	2.05	5.80	2.78	1.59	3.62
bSA	-0.04	-0.06	0.35	-0.13	-0.03	-1.61	-0.56	-5.21	2.07
t	-0.59	-0.10	0.40	-0.64	-0.39	-1.14	-0.05	-0.59	0.89
R2	0.02	0.00	0.00	0.01	0.00	0.03	0.00	0.02	0.02

REG 2

a	0.51	11.57	25.17	2.15	0.31	33.82	150.44	58.51	190.93
t	1.36	3.49	4.34	3.11	1.47	5.92	2.70	1.18	3.54
bSA1	0.08	-0.45	0.53	-0.18	-0.16	-0.59	-0.63	17.08	3.18
t	0.43	-0.28	0.43	-0.83	-0.58	-0.38	-0.06	0.71	1.14
bSA2	-0.01	0.05	-0.02	0.04	0.04	-0.36	-0.49	-2.68	-0.05
t	-0.69	0.26	-0.21	0.73	0.49	-1.43	-0.49	-1.00	-0.73
R2	0.06	0.00	0.00	0.02	0.01	0.07	0.01	0.09	0.03

APPENDIX 5.14

THE RESULTS OF CANONICAL CORRELATION ANALYSIS

MR VS GNP

No	Eigen-value	Canon. correl.	Wilks Lambda	Chi-square	D.F	Sign. Level
1	0.7791	0.8827	0.0048	82.790	100	0.8938
2	0.6726	0.8201	0.0217	59.381	81	0.9660
3	0.5981	0.7734	0.0662	42.072	64	0.9845
4	0.5630	0.7504	0.1648	27.944	49	0.9933
5	0.4468	0.6684	0.3772	15.112	36	0.9991
6	0.1574	0.3967	0.6818	5.936	25	1.0000
7	0.1314	0.3625	0.8092	3.282	16	0.9997
8	0.0454	0.2132	0.9316	1.099	9	0.9992
9	0.0235	0.1533	0.9759	0.378	4	0.9842
10	0.0006	0.0245	0.9994	0.009	1	0.9230

Coefficients for Canonical Variables of the First Set (MR)

	1	2	3	4	5	6	7	8	9	10
US	0.923	-0.409	-0.524	-0.485	0.355	0.015	-0.232	-0.078	-0.444	0.080
UK	-0.500	0.592	-0.016	-0.227	-0.249	0.598	-0.488	0.608	0.112	0.227
WG	-0.682	-0.269	-0.721	0.028	0.226	0.192	0.836	0.251	0.047	-0.242
FR	-0.316	0.887	-0.156	-0.183	0.485	-0.188	0.127	-0.693	0.194	0.271
NW	0.136	-0.294	0.492	-0.677	-0.343	0.062	-0.079	-0.075	-0.436	-0.491
JP	-0.170	-0.771	0.549	-0.134	0.506	-0.385	-0.392	0.189	0.068	0.146
SP	0.308	-0.523	0.013	-0.160	-1.160	0.357	0.675	-0.476	0.495	0.747
MY	-0.934	1.248	-0.007	-0.018	1.161	-0.232	0.171	0.889	-0.703	-0.013
AU	0.393	0.009	0.714	0.662	-0.088	0.651	0.050	-0.483	0.401	-0.241
SA	-0.287	-0.160	0.118	0.508	-0.117	-0.026	-0.533	-0.340	-0.597	-0.264

Coefficients for Canonical Variables of the Second Set (GNP)

	1	2	3	4	5	6	7	8	9	10
US	-0.147	0.052	0.097	-0.504	-0.084	0.883	-0.339	0.272	-0.002	0.396
UK	0.030	-0.135	-0.414	0.254	-0.252	0.876	-0.48	-0.012	0.070	-0.472
WG	-0.188	-0.135	0.551	-0.125	0.654	-0.046	0.256	0.157	0.074	-0.584
FR	0.215	0.403	-0.128	0.083	-0.529	0.119	0.846	0.197	0.250	0.040
NW	-0.350	-0.661	-0.561	-0.270	-0.032	-0.144	-0.342	0.253	0.378	0.015
JP	0.181	0.358	0.618	-0.203	-0.552	-0.394	-0.194	-0.263	0.394	-0.262
SP	0.634	-0.660	0.548	-0.469	-0.491	0.007	0.453	-0.349	-0.053	-0.157
MY	-0.673	-0.471	0.283	-0.161	-0.729	0.455	-0.114	-0.708	-0.125	-0.173
AU	-0.054	-0.174	0.173	0.507	-0.128	-0.634	0.123	0.764	-0.376	0.067
SA	0.035	-0.738	0.921	0.028	-0.339	0.549	0.153	-0.747	0.524	0.212

MP VS IP

No	Eigen-value	Canon. Correl.	Wilks Lambda	Chi-square	D.F	Sign. Level
1	0.3187	0.5645	0.3066	85.718	100	0.8450
2	0.2266	0.4760	0.4500	57.898	81	0.9756
3	0.1875	0.4330	0.5818	39.267	64	0.9937
4	0.1252	0.3538	0.7160	24.216	49	0.9989
5	0.0961	0.3100	0.8185	14.519	36	0.9995
6	0.0608	0.2465	0.9056	7.193	25	0.9998
7	0.0225	0.1499	0.9641	2.648	16	0.9999
8	0.0090	0.0950	0.9863	1.000	9	0.9994
9	0.0041	0.0639	0.9953	0.343	4	0.9869
10	0.0006	0.0253	0.9994	0.046	1	0.8293

Coefficients for Canonical Variables of the First Set (MR)

	1	2	3	4	5	6	7	8	9	10
US	0.465	-0.361	-0.401	-0.213	-0.434	0.544	-0.068	-0.180	-0.507	0.425
UK	-0.317	-0.523	0.201	0.040	0.153	0.425	0.645	0.457	0.612	-0.139
WG	-0.313	0.079	0.249	-0.132	0.407	0.383	0.172	-0.306	-0.562	-0.495

FR	0.364	-0.384	0.050	0.313	0.642	-0.515	0.205	-0.562	0.074	0.316
NW	0.289	0.439	-0.634	-0.465	0.282	-0.154	0.123	0.483	0.068	-0.315
JP	0.399	0.427	0.618	-0.559	-0.100	-0.140	-0.565	0.051	0.239	0.071
SP	-0.613	0.193	-0.147	-0.289	0.079	-0.102	0.172	-0.697	0.380	0.244
MY	0.179	-0.473	0.132	-0.154	-0.183	-0.435	0.560	-0.235	-0.106	-0.618
AU	-0.066	0.556	0.436	0.375	-0.309	-0.209	0.297	0.313	-0.469	0.531
SA	-0.623	-0.374	0.001	-0.333	0.116	-0.247	-0.500	0.361	-0.324	0.021

Coefficients for Canonical Variables of the Second Set (IP)

	1	2	3	4	5	6	7	8	9	10
US	-0.212	0.202	-0.014	-0.527	0.363	-0.186	-0.121	0.578	0.201	0.425
UK	-0.165	0.202	0.082	-0.265	0.123	-0.010	-0.721	-0.352	-0.072	-0.506
WG	-0.108	-0.077	0.735	0.015	0.118	-0.176	-0.009	-0.660	0.509	0.384
FR	-0.004	0.127	-0.369	-0.833	-0.438	0.644	0.401	0.172	-0.294	-0.380
NW	0.614	0.035	0.644	0.246	0.029	-0.276	-0.045	0.132	-0.683	0.101
JP	0.820	0.466	-0.138	0.262	-0.220	0.230	-0.423	-0.094	0.128	0.330
SP	-0.341	0.438	0.020	-0.089	-0.729	-0.409	-0.087	-0.130	-0.259	0.029
MY	-0.227	0.021	-0.205	0.189	0.433	0.115	0.124	-0.554	-0.565	0.436
AU	0.622	-0.055	-0.311	0.017	0.340	-0.659	0.099	-0.500	-0.013	0.045
SA	-0.573	0.431	-0.027	0.336	0.692	-0.082	0.482	-0.152	0.305	-0.403

MR VS CP

No	Eigen-value	Canon. Correl.	Wilks Lambda	Chi-square	D.F	Sign. Level
1	0.2758	0.5252	0.2792	106.54	100	0.3085
2	0.2296	0.4791	0.3855	79.60	81	0.5232
3	0.1940	0.4404	0.5003	57.82	64	0.6932
4	0.1693	0.4115	0.6207	39.82	49	0.8223
5	0.1342	0.3664	0.7473	24.33	36	0.9305
6	0.0657	0.2563	0.8631	12.29	25	0.9841
7	0.0408	0.2019	0.9238	6.62	16	0.9800
8	0.0289	0.1701	0.9631	3.14	9	0.9584
9	0.0082	0.0905	0.9918	0.69	4	0.9525
10	0.0000	0.0070	1.0000	0.00	1	0.9488

Coefficients for Canonical Variables of the First Set (MR)

	1	2	3	4	5	6	7	8	9	10
US	0.013	0.295	0.490	-0.336	0.168	-0.886	0.245	-0.448	0.646	0.574
UK	-0.260	0.148	0.351	0.235	-0.586	0.584	-1.157	-0.066	-0.018	0.218
WG	-0.015	-0.017	0.556	0.050	0.010	0.634	0.639	-0.171	-0.471	0.242
FR	0.239	0.327	0.157	-0.689	0.074	0.307	-0.021	0.040	0.316	-0.977
NW	0.461	0.296	-0.153	0.972	-0.078	0.068	0.165	0.557	0.441	0.044
JP	-0.117	-0.734	0.053	0.318	0.861	-0.191	-0.060	0.206	0.040	-0.114
SP	-0.903	0.274	-0.369	0.178	0.023	0.207	0.303	-0.371	0.040	-0.605
MY	-0.177	0.034	0.013	-0.413	-0.150	0.615	0.100	0.548	0.444	0.330
AU	0.704	-0.452	-0.932	-0.330	0.340	0.079	-0.086	-0.589	-0.264	0.348
SA	-0.072	-0.814	0.143	0.091	-0.743	-0.312	0.312	0.119	-0.079	-0.162

Coefficients for Canonical Variables of the Second Set (CP)

	1	2	3	4	5	6	7	8	9	10
US	0.217	0.001	-0.855	0.804	0.161	-0.069	-0.165	0.311	0.314	-0.626
UK	-0.134	0.128	-0.301	-0.796	0.443	0.074	0.246	-0.136	-0.516	-0.573
WG	0.459	0.451	0.176	-0.451	-0.098	0.706	-0.760	-0.441	-0.014	0.539
FR	-0.351	0.407	0.713	0.538	-0.433	0.230	0.273	0.751	-0.140	-0.121
NW	-0.846	-0.434	0.131	-0.108	0.051	-0.342	-0.432	-0.253	0.072	-0.329
JP	0.335	-0.833	0.286	-0.214	-0.222	0.437	0.147	0.127	0.164	0.083
SP	-0.376	-0.589	-0.121	0.511	-0.082	0.079	0.211	-0.572	-0.662	0.425
MY	0.066	0.197	-0.021	-0.349	0.828	0.246	0.481	-0.003	0.756	-0.022
AU	-0.037	0.200	-0.122	-0.362	-0.805	0.044	0.403	-0.388	0.258	0.003
SA	0.447	0.115	0.541	0.289	0.341	0.029	-0.024	-0.611	0.013	-0.277

MR VS MS

No	Eigen-value	Canon. Correl.	Wilks Lambda	Chi-square	D.F	Sign. Level
1	0.2974	0.5453	0.3074	93.766	100	0.6566
2	0.2280	0.4775	0.4376	65.707	81	0.8913
3	0.1741	0.4172	0.5668	45.136	64	0.9646
4	0.1351	0.3676	0.6863	29.930	49	0.9856
5	0.0942	0.3069	0.7935	18.388	36	0.9935
6	0.0629	0.2507	0.8760	10.522	25	0.9950
7	0.0317	0.1781	0.9348	5.361	16	0.9936
8	0.0214	0.1464	0.9654	2.797	9	0.9718
9	0.0132	0.1148	0.9866	1.075	4	0.8982
10	0.0003	0.0161	0.9997	0.021	1	0.8860

Coefficients for Canonical Variables of the First Set (MR)

	1	2	3	4	5	6	7	8	9	10
US	0.553	-0.627	0.517	0.085	-0.526	0.896	-0.038	-0.266	0.054	-0.524
UK	0.032	0.661	-0.874	-0.005	0.593	0.330	-0.143	-0.696	-0.326	-0.199
WG	-0.299	-0.403	-0.888	-0.312	-0.354	0.053	0.022	0.529	0.135	0.347
FR	0.614	0.533	0.199	-0.526	0.152	-0.027	0.672	0.576	-0.053	-0.096
NW	-0.715	0.600	0.299	-0.261	-0.662	-0.135	-0.460	-0.102	-0.224	-0.223
JP	0.067	-0.252	0.194	0.714	-0.230	-0.560	0.005	0.147	-0.658	-0.194
SP	0.026	0.516	0.139	0.562	0.176	0.403	0.087	0.529	0.086	0.773
MY	0.325	0.120	-0.167	-0.390	0.218	0.021	-0.741	0.448	-0.125	-0.264
AU	-0.742	-0.825	0.442	-0.210	0.856	-0.246	0.353	0.018	-0.086	-0.026
SA	0.389	-0.235	0.043	-0.213	-0.256	-0.422	-0.282	-0.498	-0.156	0.782

Coefficients for Canonical Variables of the Second Set (MS)

	1	2	3	4	5	6	7	8	9	10
US	0.759	-0.742	-0.425	0.258	-0.314	0.008	0.080	0.110	-0.050	0.255
UK	-0.517	0.051	-0.084	0.297	-0.051	0.608	0.084	-0.350	-0.702	0.188
WG	-0.257	0.033	0.074	0.001	-0.016	0.334	-0.246	-0.165	0.993	0.309
FR	-0.378	-0.258	0.023	-0.068	0.290	0.454	0.697	0.474	0.806	-0.695
NW	-0.348	-0.229	0.336	-0.204	-0.784	-0.048	-0.040	-0.206	-0.002	-0.420
JP	1.020	0.734	0.017	-0.454	-0.229	0.054	-0.147	-0.146	-0.444	-0.019
SP	-0.075	-0.388	0.469	-0.704	0.250	-0.022	0.351	-0.143	-0.055	0.340
MY	-0.152	-0.014	0.055	-0.045	-0.068	0.600	-0.826	0.320	-0.170	-0.435
AU	-0.136	0.111	0.301	0.417	0.620	-0.448	-0.326	-0.915	-0.097	-0.021
SA	0.067	0.012	0.761	0.506	0.057	-0.116	0.087	0.403	-0.103	0.256

MR VS TB

No	Eigen-value	Canon. Correl.	Wilks Lambda	Chi-square	D.F	Sign. Level
1	0.4319	0.6572	0.2097	127.32	100	0.0339
2	0.2808	0.5299	0.3691	81.24	81	0.4717
3	0.2116	0.4600	0.5131	54.38	64	0.7989
4	0.1351	0.3675	0.6508	35.00	49	0.9341
5	0.1068	0.3267	0.7525	23.18	36	0.9515
6	0.0684	0.2614	0.8424	13.98	25	0.9622
7	0.0519	0.2279	0.9042	8.21	16	0.9425
8	0.0365	0.1911	0.9538	3.86	9	0.9205
9	0.0100	0.1001	0.9899	0.83	4	0.9347
10	0.0001	0.0090	0.9999	0.01	1	0.9353

Coefficients for Canonical Variables of the First Set (MR)

	1	2	3	4	5	6	7	8	9	10
US	-0.373	0.858	0.312	0.694	-0.221	-0.117	-0.551	0.262	-0.254	0.577
UK	0.248	0.227	0.081	-0.588	0.796	0.299	-0.221	-0.510	-0.756	-0.531
WG	0.179	0.026	-0.483	0.495	-0.349	0.207	0.097	-0.820	0.152	-0.249
FR	-0.196	0.103	0.664	-0.653	-0.022	-0.565	0.579	-0.386	0.068	0.274
NW	0.388	-0.307	-0.695	-0.189	-0.297	0.349	0.043	-0.319	0.542	0.871
JP	-0.263	0.006	-0.097	0.261	0.069	-0.720	0.316	0.148	0.640	-0.123
SP	-0.389	-0.811	0.398	-0.183	-0.039	0.168	-0.513	-0.451	0.441	0.162
MY	0.479	0.287	0.147	0.001	0.315	0.690	0.327	-0.245	0.200	-0.352
AU	-0.666	-0.342	-0.171	0.409	-0.107	0.374	0.736	0.817	-0.238	-0.498
SA	-0.017	0.362	-0.641	-0.477	-0.205	0.103	-0.401	0.275	0.614	-0.239

Coefficients for Canonical Variables of the Second Set (TB)

	1	2	3	4	5	6	7	8	9	10
US	-0.252	-0.303	0.199	0.137	-0.337	0.699	0.621	-0.036	0.074	0.347
UK	-0.132	0.135	-0.328	0.467	0.055	-0.208	-0.125	-0.520	-0.598	0.106
WG	-0.501	-0.737	-0.272	-0.057	-0.257	-0.409	-0.364	-0.017	0.158	0.084
FR	0.312	0.093	-0.309	-0.043	0.767	0.079	0.089	0.316	-0.034	0.600
NW	-0.020	-0.286	0.040	-0.095	-0.044	-0.307	0.861	0.141	-0.243	-0.277
JP	0.575	-0.262	-0.462	0.259	-0.255	0.384	0.253	-0.090	0.248	-0.231
SP	0.007	0.156	0.132	-0.385	-0.020	-0.473	0.123	-0.799	0.441	-0.069
MY	0.431	-0.092	0.353	-0.018	-0.546	-0.403	-0.064	0.092	-0.121	0.481
AU	0.245	-0.129	0.222	-0.773	0.140	0.145	-0.233	-0.448	-0.422	-0.215
SA	0.303	-0.186	0.661	0.353	0.562	0.066	-0.171	-0.194	-0.069	-0.363

MR VS UNEMP

No	Eigen-value	Canon. Correl.	Wilks Lambda	Chi-square	D.F	Sign. Level
1	0.2551	0.5051	0.3922	78.146	100	0.9481
2	0.2039	0.4516	0.5266	53.556	81	0.9920
3	0.1760	0.4195	0.6614	34.515	64	0.9991
4	0.0764	0.2764	0.8027	18.35	49	1.0000
5	0.0626	0.2502	0.8691	11.715	36	1.0000
6	0.0479	0.2189	0.9271	6.319	25	0.9999
7	0.0154	0.1240	0.9738	2.218	16	1.0000
8	0.0079	0.0886	0.9890	0.924	9	0.9996
9	0.0027	0.0515	0.9968	0.265	4	0.9919
10	0.0005	0.0228	0.9995	0.043	1	0.8350

Coefficients for Canonical Variables of the First Set (MR)

	1	2	3	4	5	6	7	8	9	10
US	0.121	-0.510	-0.676	0.749	-0.455	-0.758	-0.357	0.126	-0.129	-0.218
UK	-0.759	-0.143	0.255	-0.165	-0.359	0.312	0.756	0.747	0.537	0.150
WG	-0.396	-0.049	0.058	0.249	0.054	0.090	0.539	-0.930	-0.192	-0.037
FR	-0.310	0.448	0.376	0.360	0.322	0.243	-0.395	0.420	-0.743	0.539
NW	0.197	0.721	-0.202	-0.418	0.325	-0.779	0.507	0.155	0.125	0.288
JP	0.067	0.351	0.143	0.219	0.049	-0.025	-0.541	-0.282	0.455	0.727
SP	-0.580	-0.193	-0.132	-0.475	0.711	0.115	-0.578	-0.190	0.165	-0.516
MY	-0.262	-0.267	0.781	-0.141	-0.044	-0.498	0.225	0.053	-0.386	0.066
AU	1.052	0.096	0.514	0.100	-0.383	0.325	-0.253	-0.342	0.511	-0.536
SA	-0.116	0.133	-0.330	-0.654	-0.690	0.213	-0.158	-0.291	-0.410	0.265

Coefficients for Canonical Variables of the Second Set (UNEMP)

	1	2	3	4	5	6	7	8	9	10
US	-0.015	-0.433	-0.119	-0.808	-0.389	0.388	-0.333	-0.561	-0.359	0.083
UK	-0.787	-0.599	0.339	0.534	-0.502	-0.074	0.110	-0.025	-0.547	-0.094
WG	0.466	-0.075	0.426	0.589	0.952	-0.414	0.468	-0.496	1.088	0.062
FR	0.545	0.311	-0.275	-0.239	-0.664	0.479	0.389	-0.094	0.203	0.103
NW	0.075	-0.171	-0.822	-0.314	-0.400	0.045	-0.534	0.765	-0.225	0.544
JP	-0.503	0.189	0.166	-0.472	0.414	0.370	0.323	0.389	0.357	0.122
SP	-0.095	-0.080	0.531	-0.468	-0.774	-0.814	-0.181	0.194	0.601	-0.317
MY	0.333	-0.273	-0.507	0.066	0.708	0.360	0.746	0.172	-0.821	-0.021
AU	-0.570	0.053	-0.610	-0.062	-0.042	-0.027	0.037	-0.299	0.262	-0.495
SA	0.069	0.559	-0.092	0.126	-0.200	-0.576	0.227	-0.147	-0.381	0.595

MR VS IMP

No	Eigen-value	Canon. Correl.	Wilks Lambda	Chi-square	D.F	Sign. Level
1	0.2916	0.5400	0.3662	83.878	100	0.8770
2	0.2119	0.4604	0.5170	55.087	81	0.9878
3	0.1699	0.4122	0.6560	35.200	64	0.9987
4	0.0959	0.3097	0.7903	19.653	49	0.9999
5	0.0533	0.2308	0.8741	11.234	36	1.0000
6	0.0411	0.2027	0.9233	6.662	25	0.9999
7	0.0151	0.1229	0.9629	3.159	16	0.9998
8	0.0132	0.1148	0.9776	1.889	9	0.9931
9	0.0091	0.0951	0.9907	0.781	4	0.9410
10	0.0003	0.0162	0.9997	0.022	1	0.8823

Coefficients for Canonical Variables of the First Set (MR)

	1	2	3	4	5	6	7	8	9	10
US	-0.212	-0.300	0.814	0.028	0.372	-0.761	0.357	0.589	0.510	0.084
UK	-0.181	0.266	-0.783	-0.930	0.115	0.287	0.693	0.247	-0.296	0.192
WG	-0.089	-0.467	-0.271	-0.311	-0.528	0.156	-0.302	0.052	0.534	-0.597
FR	-0.131	0.688	-0.541	0.690	-0.184	-0.572	0.086	0.072	-0.058	-0.423
NW	1.072	0.098	0.302	0.073	-0.385	0.444	0.301	0.294	-0.156	0.101
JP	-0.014	0.413	0.640	-0.306	0.447	-0.130	-0.507	-0.465	-0.062	0.358
SP	0.043	-0.063	0.070	-0.050	0.241	-0.187	0.001	-0.517	-0.675	-0.932
MY	-0.122	-0.137	-0.307	0.003	-0.372	-0.057	-0.264	0.796	-0.499	-0.032
AU	0.134	0.225	-0.131	0.119	0.880	0.250	1.035	-0.058	0.438	0.379
SA	-0.669	0.007	0.433	0.292	-0.183	0.836	0.172	-0.054	0.014	-0.070

Coefficients for Canonical Variables of the Second Set (IMP)

	1	2	3	4	5	6	7	8	9	10
US	-0.240	0.379	0.088	0.083	0.197	0.452	0.552	0.117	0.655	0.254
UK	0.309	-1.196	0.706	-0.312	-0.253	0.448	-0.228	0.513	0.145	-0.389
WG	-0.210	0.794	0.936	-1.027	0.228	0.104	0.231	-1.157	-0.979	0.105
FR	-0.349	0.269	-1.078	0.203	-0.378	-0.729	0.062	0.878	0.686	-0.501
NW	0.748	0.522	-0.050	0.579	0.578	0.037	0.035	-0.327	0.186	-0.250
JP	0.179	-0.746	-0.512	0.024	0.458	-0.357	0.663	0.313	0.285	0.487
SP	-0.267	-0.314	-0.057	0.596	-0.033	-0.063	0.323	-0.383	-0.344	-0.587
MY	-0.359	0.168	0.406	0.212	0.308	-0.269	0.783	-0.144	0.615	0.029
AU	0.288	0.074	0.119	0.315	-0.956	-0.342	0.179	-0.028	0.088	0.518
SA	-0.078	0.077	-0.891	-0.427	-0.214	0.258	-0.368	-0.467	0.131	-0.291

MR VS EXP

No	Eigen-value	Canon. Correl.	Wilks Lambda	Chi-square	D.F	Sign. Level
1	0.2651	0.5148	0.3557	86.310	100	0.8337
2	0.2282	0.4778	0.4840	60.594	81	0.9562
3	0.1806	0.4249	0.6271	38.960	64	0.9943
4	0.0989	0.3145	0.7653	22.331	49	0.9996
5	0.0756	0.2749	0.8494	13.631	36	0.9997
6	0.0512	0.2262	0.9188	7.069	25	0.9998
7	0.0230	0.1516	0.9684	2.683	16	0.9999
8	0.0060	0.0772	0.9912	0.741	9	0.9998
9	0.0028	0.0530	0.9971	0.243	4	0.9932
10	0.0001	0.0098	0.9999	0.008	1	0.9285

Coefficients for Canonical Variables of the First Set (MR)

	1	2	3	4	5	6	7	8	9	10
US	0.299	0.460	-0.082	0.102	-0.501	-0.746	0.898	-0.244	-0.495	-0.083
UK	0.109	-0.713	0.494	0.406	0.298	-0.170	-0.627	0.268	-0.777	0.397
WG	-0.208	0.085	-0.155	0.696	0.521	0.518	0.427	-0.237	0.119	0.332
FR	0.200	-0.461	0.153	-0.144	-0.852	0.369	0.186	0.081	0.537	0.553
NW	0.483	0.081	-0.362	-0.638	0.689	-0.336	-0.303	-0.379	0.202	0.496
JP	-0.865	0.040	-0.649	-0.215	-0.007	-0.419	-0.103	0.178	0.230	-0.121
SP	0.051	-0.803	0.264	0.192	0.071	-0.067	0.138	-0.230	0.700	-0.533
MY	0.165	0.302	0.198	0.578	-0.191	-0.142	-0.505	-0.317	0.318	0.534
AU	-0.069	0.287	-0.692	-0.134	-0.487	0.757	-0.463	-0.145	-0.489	-0.653
SA	-0.686	0.344	0.725	0.837	0.239	0.128	0.077	-0.352	-0.060	0.053

Coefficients for Canonical Variables of the First Set (EXP)

	1	2	3	4	5	6	7	8	9	10
US	0.128	-0.162	0.919	-0.373	0.162	-0.034	-0.404	0.109	0.603	0.458
UK	1.295	0.184	-0.138	-1.071	0.906	-0.302	0.188	0.025	0.473	-0.975
WG	-1.399	-0.532	-0.956	0.402	-0.359	-0.727	-0.587	0.959	-0.268	1.021
FR	-0.451	0.254	0.301	0.048	-0.155	0.402	0.970	-1.454	0.579	-0.253
NW	0.415	0.832	-0.132	0.467	-0.519	-0.317	-0.308	0.068	-0.190	-0.031
JP	0.673	-0.722	0.059	0.391	-0.764	0.205	0.159	0.298	-0.534	-0.014
SP	-0.116	0.151	-0.059	0.223	-0.251	0.518	0.131	0.609	0.411	-0.559
MY	-0.361	0.379	0.091	-0.593	-0.020	0.047	0.614	0.101	-0.510	0.098
AU	0.314	-0.098	-0.553	-0.147	-0.351	0.464	-0.143	-0.220	0.038	0.579
SA	0.216	-0.108	0.095	-0.408	0.282	0.100	0.391	-0.064	-0.207	0.713

APPENDIX 5.15

RESULTS OF FACTOR ANALYSIS FOR MARKET RETURNS (MR), GROSS NATIONAL PRODUCT (GNP), INDUSTRIAL PRODUCTION (IP), CONSUMER PRICE (IP), MONEY SUPPLY (MS), TREASURY BILL RATE (TB), UNEMPLOYMENT (UNEMP), IMPORTS (IMP) & EXPORTS (EXP)

M R

Principal Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.55757	1	4.49199	44.9	44.9
UK	0.57399	2	1.24684	12.5	57.4
WG	0.30425	3	.86736	8.7	66.1
FR	0.45033	4	.73338	7.3	73.4
NW	0.44919	5	.62234	6.2	79.6
JP	0.33279	6	.53337	5.3	85.0
SP	0.41186	7	.44248	4.4	89.4
MY	0.18368	8	.39274	3.9	93.3
AU	0.57420	9	.38567	3.9	97.2
SA	0.33010	10	.28385	2.8	100.0

	Factor Matrix			Final Varimax Rot. Factor Matrix	
V'ble	1	2	Estimated Communal.	1	2
US	0.81411	0.07270	0.66806	0.80814	0.12233
UK	0.80583	-0.08854	0.65720	0.80974	-0.03912
WG	0.59526	-0.38270	0.50079	0.61754	-0.34559
FR	0.68784	-0.35759	0.60100	0.70842	-0.31487
NW	0.73266	-0.10456	0.54773	0.73769	-0.05958
JP	0.57482	0.04886	0.33280	0.57076	0.08390
SP	0.65056	0.37997	0.56761	0.62612	0.41903
MY	0.10022	0.87394	0.77382	0.04661	0.87844
AU	0.80417	0.15195	0.66978	0.79338	0.20083
SA	0.63657	0.12171	0.42004	0.62794	0.16040

G N P

Principle Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.29697	1	1.84383	18.4	18.4
UK	0.35661	2	1.69502	17.0	35.4
WG	0.19543	3	1.49812	15.0	50.4
FR	0.25749	4	1.19290	11.9	62.3
NW	0.22929	5	1.09722	11.0	73.3
JP	0.27380	6	.88313	8.8	82.1
SP	0.49046	7	.73571	7.4	89.5
MY	0.52002	8	.56466	5.6	95.1
AU	0.32692	9	.30363	3.0	98.1
SA	0.63174	10	.18579	1.9	100.0

	Factor Matrix					Estimat.
	1	2	3	4	5	Communal
US	-0.11772	0.19373	-0.59315	0.45410	-0.39759	0.76749
UK	0.33366	-0.29275	-0.45586	-0.41728	0.56082	0.89349
WG	-0.09754	0.62204	-0.28202	-0.18748	0.35538	0.63743
FR	0.13582	0.75133	0.10130	-0.09824	0.21864	0.65066
NW	0.27606	0.53636	-0.03213	-0.41536	-0.39490	0.69340
JP	0.28988	0.16973	-0.56122	-0.12449	-0.32351	0.54797
SP	-0.55332	-0.38992	-0.34411	-0.40568	-0.09833	0.75086
MY	-0.64635	0.37257	0.10691	0.33184	0.29597	0.76572
AU	0.28270	-0.07777	-0.56266	0.50794	0.30296	0.75234
SA	0.85241	-0.08343	0.29368	0.21693	0.02943	0.86773

	Final Varimax Rotated Factor Matrix				
	1	2	3	4	5
US	0.15839	0.00074	-0.26841	0.80273	0.16118
UK	0.05254	0.04829	0.94159	-0.00069	0.04263
WG	0.13823	0.76152	0.15350	0.10017	0.06931
FR	-0.23753	0.74543	-0.09245	-0.09159	0.14711
NW	-0.07333	0.32359	-0.15062	-0.11153	0.74039
JP	0.04494	0.04069	0.15359	0.42889	0.58031
SP	0.80985	-0.24573	0.17929	-0.04385	0.02366
MY	0.26357	0.47374	-0.38073	0.08072	-0.56600
AU	-0.23996	0.01973	0.37507	0.71016	-0.22216
SA	-0.88322	-0.20308	0.16083	-0.05254	0.13334

I P

Principle Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.09281	1	2.05744	20.6	20.6
UK	0.06287	2	1.36700	13.7	34.2
WG	0.30987	3	1.31814	13.2	47.4
FR	0.46740	4	1.15716	11.6	59.0
NW	0.30059	5	1.10573	11.1	70.1
JP	0.28276	6	.87898	8.8	78.8
SP	0.09831	7	.74033	7.4	86.2
MY	0.14197	8	.68323	6.8	93.1
AU	0.23128	9	.37590	3.8	96.8
SA	0.38480	10	.31609	3.2	100.0

	Factor Matrix					Estimat.
	1	2	3	4	5	Communal
US	0.28395	0.13060	0.12873	-0.44637	0.64179	0.72539
UK	-0.06654	0.02325	0.61766	0.20004	0.42396	0.60623
WG	0.56244	-0.27537	0.20642	-0.34350	-0.45475	0.75957
FR	0.77920	-0.27833	0.19024	-0.20908	-0.15695	0.78916
NW	0.58443	-0.00456	0.24849	0.39070	0.25653	0.62177
JP	0.45363	0.60617	-0.18467	-0.07028	-0.12777	0.62859
SP	0.06459	0.10264	-0.68959	-0.27263	0.26449	0.63452
MY	-0.13946	0.48645	0.33715	-0.58194	-0.00604	0.70843
AU	0.07718	-0.71592	-0.24985	-0.22277	0.33779	0.74466
SA	0.68701	0.26255	-0.30625	0.36878	0.12821	0.78715

Final Varimax Rotated Factor Matrix

	1	2	3	4	5
US	0.11064	0.05723	-0.05927	-0.00066	0.84045
UK	0.08598	-0.17218	-0.03921	-0.69524	0.29034
WG	-0.02026	0.86981	0.02337	0.01949	-0.04088
FR	0.30353	0.81831	-0.08459	-0.03172	0.13866
NW	0.67589	0.17970	-0.02704	-0.34289	0.11980
JP	0.35358	0.14394	0.59939	0.32021	0.14510
SP	0.10039	-0.18265	-0.11925	0.70980	0.27028
MY	-0.45134	0.06807	0.51945	-0.06124	0.47593
AU	-0.02910	0.15413	-0.80399	0.19417	0.18961
SA	0.83618	0.08679	0.16791	0.22725	0.02408

C P
Principle Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.51748	1	3.43364	34.3	34.3
UK	0.38912	2	1.46209	14.6	49.0
WG	0.54992	3	1.17085	11.7	60.7
FR	0.50081	4	.95862	9.6	70.3
NW	0.29549	5	.72789	7.3	77.5
JP	0.19911	6	.69358	6.9	84.5
SP	0.43562	7	.52952	5.3	89.8
MY	0.41833	8	.39025	3.9	93.7
AU	0.17942	9	.33478	3.3	97.0
SA	0.13852	10	.29878	3.0	100.0

	Factor Matrix			Estimat.	Final Varimax Rotated Factor Matrix		
	1	2	3	Communal	1	2	3
US	0.78247	-0.20464	0.03223	0.65518	0.44459	0.58427	0.34081
UK	0.56627	-0.42129	-0.39343	0.65295	0.12431	0.79829	-0.01484
WG	0.79688	0.09225	-0.13991	0.66311	0.64810	0.48615	0.08208
FR	0.79125	-0.0458	-0.07132	0.63326	0.55387	0.53793	0.19268
NW	0.51459	-0.04322	0.34822	0.38793	0.36494	0.16824	0.47586
JP	0.35415	-0.56349	-0.31414	0.54164	-0.12552	0.72380	0.04465
SP	0.64000	0.41392	-0.02539	0.58158	0.75110	0.13135	0.01346
MY	0.54989	0.59432	0.19021	0.69177	0.81254	-0.14187	0.10686
AU	0.36175	-0.15808	0.69131	0.63376	0.18658	-0.01534	0.77377
SA	-0.08081	-0.60265	0.50565	0.62540	-0.44591	0.09297	0.64647

M S
Principal Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.35995	1	2.80436	28.0	28.0
UK	0.28549	2	1.70834	17.1	45.1
WG	0.26296	3	1.16858	11.7	56.8
FR	0.57504	4	.96297	9.6	66.4
NW	0.14413	5	.87848	8.8	75.2
JP	0.52033	6	.70507	7.1	82.3
SP	0.16617	7	.64768	6.5	88.8
MY	0.28483	8	.48092	4.8	93.6
AU	0.45540	9	.38291	3.8	97.4
SA	0.09483	10	.26070	2.6	100.0

	Factor Matrix			Estimat.	Final Varimax Rotated Factor Matrix		
	1	2	3	Communal	1	2	3
US	0.66562	-0.31699	0.01725	0.54383	0.66062	0.21824	0.24450
UK	0.53733	0.35714	0.34226	0.53342	0.18335	0.70034	-0.09657
WG	0.34258	0.37804	0.61232	0.63521	-0.10084	0.78874	0.05415
FR	0.78712	-0.09347	-0.25978	0.69578	0.80184	0.20505	-0.10386
NW	0.36203	0.27216	-0.41342	0.37606	0.38355	0.04846	-0.47602
JP	0.78559	0.17848	0.07710	0.65496	0.56487	0.56706	-0.11969
SP	0.06116	-0.61190	0.48886	0.61714	0.05710	0.06650	0.78068
MY	0.04695	-0.80086	0.19178	0.68035	0.23544	-0.23627	0.75438
AU	0.67749	-0.40404	-0.33243	0.73275	0.84776	-0.05625	0.10438
SA	0.35002	0.20902	0.21351	0.21179	0.13156	0.43819	-0.04966

T B

Principal Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.24844	1	1.77024	17.7	17.7
UK	0.06091	2	1.41881	14.2	31.9
WG	0.21349	3	1.22483	12.2	44.1
FR	0.21174	4	1.09654	11.0	55.1
NW	0.08069	5	1.03429	10.3	65.4
JP	0.12418	6	.98502	9.9	75.3
SP	0.21220	7	.90065	9.0	84.3
MY	0.03926	8	.61779	6.2	90.5
AU	0.19732	9	.51180	5.1	95.6
SA	0.17667	10	.44002	4.4	100.0

	Factor Matrix					Estimat.
	1	2	3	4	5	Communal
US	0.58210	-0.22321	0.57588	-0.11786	0.06009	0.73780
UK	0.17376	0.19423	0.40404	0.44931	-0.43201	0.61968
WG	0.59434	0.38863	-0.21756	-0.35853	0.20071	0.72043
FR	0.66817	0.19492	-0.07465	-0.11548	-0.32830	0.61114
NW	-0.10491	0.27627	-0.51628	-0.10475	-0.57746	0.69831
JP	0.05791	0.58012	-0.12795	0.37143	0.03419	0.49539
SP	0.50734	-0.48383	-0.05854	0.16044	-0.35858	0.64924
MY	0.13863	0.20869	-0.01772	0.68211	0.26615	0.59920
AU	-0.05111	0.67126	0.48897	-0.2972	0.01133	0.78075
SA	0.55491	-0.03388	-0.38898	0.10295	0.40225	0.63278

	Final Varimax Rotated Factor Matrix				
	1	2	3	4	5
US	0.31285	-0.05186	0.68318	0.35709	-0.20733
UK	-0.07130	0.04748	0.02840	0.74518	0.23717
WG	0.81501	0.17116	0.01095	-0.15777	0.04339
FR	0.66840	-0.10041	-0.09360	0.37775	-0.05339
NW	0.14247	-0.03035	-0.80789	0.11813	-0.10226
JP	0.14216	0.24368	-0.24071	0.12022	0.58601
SP	0.21309	-0.65883	0.09418	0.37179	-0.15058
MY	-0.03446	-0.08863	0.12961	0.09232	0.75155
AU	0.15087	0.8406	0.07593	0.21095	-0.03326
SA	0.53984	-0.34081	0.15806	-0.29984	0.33214

U N E M P

Principal Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.41917	1	2.69710	27.0	27.0
UK	0.48983	2	1.82826	18.3	45.3
WG	0.71305	3	1.40415	14.0	59.3
FR	0.29163	4	1.05597	10.6	69.9
NW	0.54348	5	1.00811	10.1	79.9
JP	0.19924	6	.66212	6.6	86.6
SP	0.56794	7	.52823	5.3	91.8
MY	0.57288	8	.38847	3.9	95.7
AU	0.10093	9	.24262	2.4	98.2
SA	0.22411	10	.18497	1.8	100.0

Factor Matrix

	1	2	3	4	5	Estimat. Communal
US	0.54155	-0.16869	-0.51882	0.03501	-0.34394	0.71043
UK	0.75222	0.24721	0.29802	0.14272	0.10031	0.74619
WG	0.88920	0.00033	0.04736	-0.17397	-0.23713	0.87942
FR	0.35755	0.29879	0.58346	0.18445	0.42638	0.77336
NW	0.72797	0.05475	0.18986	-0.29191	-0.29219	0.73957
JP	0.46546	0.08673	-0.30950	0.55896	0.30426	0.72498
SP	0.08006	-0.87559	0.25409	0.19822	-0.00828	0.87699
MY	0.11391	-0.87839	0.26866	0.13526	0.01339	0.87519
AU	0.18031	-0.25448	-0.05853	-0.71660	0.54768	0.91417
SA	0.34782	-0.18950	-0.65688	0.03650	0.40445	0.75329

Final Varimax Rotated Factor Matrix

	1	2	3	4	5
US	0.56557	0.05172	0.45963	-0.40746	-0.10297
UK	0.58328	-0.04118	0.19993	0.60029	-0.06293
WG	0.91070	0.05095	0.16161	0.12889	0.06869
FR	0.11050	-0.02624	-0.00632	0.87161	0.02690
NW	0.84142	0.00400	-0.08074	0.12984	0.09042
JP	0.09183	-0.00932	0.77156	0.28064	-0.20589
SP	0.00447	0.93578	0.01317	-0.03192	0.00939
MY	0.04088	0.93157	-0.00179	-0.01879	0.07310
AU	0.08162	0.07151	0.03518	0.02659	0.94892
SA	0.05218	0.01255	0.78177	-0.16729	0.33357

I M P

Principal Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.21497	1	3.86610	38.7	38.7
UK	0.65269	2	1.59882	16.0	54.6
WG	0.80134	3	1.13718	11.4	66.0
FR	0.72016	4	.95517	9.6	75.6
NW	0.41621	5	.62364	6.2	81.8
JP	0.51217	6	.54847	5.5	87.3
SP	0.20037	7	.46087	4.6	91.9
MY	0.35534	8	.42603	4.3	96.2
AU	0.35252	9	.25466	2.5	98.7
SA	0.35879	10	.12907	1.3	100.0

	Factor Matrix			Estimat.	Final Varimax Rotated Factor Matrix		
	1	2	3	Communal	1	2	3
US	0.25949	0.38972	-0.76504	0.80450	0.09380	-0.10469	0.88586
UK	0.82691	-0.22514	-0.23995	0.79205	0.81310	0.21651	0.28990
WG	0.86917	-0.27434	0.02192	0.83120	0.82831	0.37416	0.07150
FR	0.67472	-0.55623	-0.13498	0.78285	0.88440	0.01373	-0.02251
NW	0.61449	-0.42923	-0.04756	0.56410	0.74359	0.09988	-0.03469
JP	0.66200	0.16700	0.49483	0.71099	0.30986	0.77769	-0.10085
SP	0.36354	0.52610	-0.20175	0.44964	-0.01433	0.37208	0.55767
MY	0.5513	0.41590	0.43279	0.66421	0.08188	0.80882	0.05762
AU	0.64744	0.27654	0.01802	0.49597	0.31721	0.53783	0.32572
SA	0.48285	0.52273	-0.01306	0.50657	0.04428	0.55484	0.44358

E X P

Principal Components

V'ble	Communality	Factor	Eigenvalue	% Var	Cum %
US	0.44636	1	4.18865	41.9	41.9
UK	0.80021	2	1.54694	15.5	57.4
WG	0.84270	3	.99855	10.0	67.3
FR	0.75029	4	.85687	8.6	75.9
NW	0.37830	5	.67434	6.7	82.7
JP	0.53694	6	.64992	6.5	89.2
SP	0.22673	7	.46328	4.6	93.8
MY	0.22817	8	.31466	3.1	96.9
AU	0.15454	9	.20722	2.1	99.0
SA	0.36232	10	.09956	1.0	100.0

	Factor Matrix		Estimat.	Final Varimax Rotated Factor Matrix	
	1	2	Communal	1	2
US	0.71586	0.10954	0.52446	0.65110	0.31706
UK	0.87480	0.02510	0.76590	0.82794	0.28358
WG	0.90844	-0.10637	0.83657	0.89908	0.16803
FR	0.86269	-0.23555	0.79972	0.89373	0.03108
NW	0.66428	-0.04398	0.44320	0.64741	0.15514
JP	0.68760	-0.43854	0.66511	0.78677	-0.21472
SP	0.33420	0.66882	0.55901	0.12066	0.73787
MY	0.40175	0.40728	0.32728	0.26278	0.50816
AU	-0.11458	0.58832	0.35925	-0.28402	0.52781
SA	0.37568	0.56030	0.45507	0.19247	0.64655

APPENDIX 5.16

THE RELATIONSHIP BETWEEN THE COVARIATIONS OF BOTH MARKET RETURNS AND ECONOMIC VARIABLES

(i.e regressing market factors on economic variable factors)

	Market Factors			
	Without Rotation		Rotation	
Econ. Factors	Factor 1	Factor 2	Factor 1	Factor 2
GNP				
Constant (a)	0.047	0.101	0.101	-0.046
Factor 1 (b1)	-0.070	-0.135	0.063	-0.033
t-value	-0.578	-0.644	0.394	-0.181
Factor 2 (b2)	0.054	0.181	0.115	-0.062
t-value	0.445	0.864	0.724	-0.342
Factor 3 (b3)	0.014	0.120	-0.195	0.118
t-value	0.121	0.573	-1.226	0.648
Factor 4 (b4)	0.043	-0.041	-0.047	0.082
t-value	0.361	-0.198	-0.298	0.451
Factor 5 (b5)	-0.001	-0.102	0.000	-0.063
t-value	-0.016	-0.490	0.000	-0.349
R-square	0.031	0.077	0.097	0.040
R-square (adj.)	0.000	0.000	0.000	0.000
F-ratio	0.135	0.354	0.454	0.179
DW	1.238	2.169	1.562	2.221
OTHER FACTORS				
Constant (a)	0.035	-0.096	0.041	-0.093
IP				
factor 1 (b1)	0.079	-0.046	-0.037	-0.120
t-value	0.843	-0.300	-0.423	-0.842
factor 2 (b2)	-0.154	-0.114	0.118	0.023
t-value	-1.716*	-0.785	1.315	0.162
factor 3 (b3)	-0.104	-0.094	-0.166	-0.161
t-value	-1.130	-0.627	-1.717*	-1.038
factor 4 (b4)	-0.208	-0.189	0.142	0.134
t-value	-2.347**	-1.312	1.449	0.856
factor 5 (b5)	0.087	0.090	0.142	0.134
t-value	0.990	0.630	1.670*	0.992
CP				
factor 1 (b6)	0.154	0.138	0.136	0.102
t-value	1.491*	0.825	1.205	0.567
factor 2 (b7)	0.041	-0.006	0.055	0.157
t-value	0.345	-0.030	0.447	0.793
factor 3 (b8)	0.001	-0.139	0.036	-0.075
t-value	0.011	-0.895	0.428	-0.561
MS				
factor 1 (b9)	-0.007	0.084	0.018	0.084
t-value	-0.061	0.445	0.157	0.452
factor 2 (b10)	-0.228	-0.240	-0.038	0.040
t-value	-2.308**	-1.494	-0.384	0.254
factor 3 (b11)	0.117	0.167	0.235	0.305
t-value	1.214	1.070	2.351**	1.913*
TB				
factor 1 (b12)	-0.180	-0.037	-0.238	-0.026
t-value	-2.081**	-0.263	-2.791**	-0.191

factor 2 (b13)	-0.184	0.090	-0.016	0.041
t-value	-1.876*	0.565	-0.202	0.319
factor 3 (b14)	0.156	-0.058	0.053	-0.005
t-value	1.962**	-0.452	0.681	-0.044
factor 4 (b15)	-0.050	0.088	0.068	-0.088
t-value	-0.424	0.462	0.913	-0.734
factor 5 (b16)	-0.102	0.126	-0.208	0.149
t-value	-1.298	0.992	-1.519*	0.681
UNEMP				
factor 1 (b17)	-0.272	0.116	-0.281	0.053
t-value	-2.103**	0.556	-2.098**	0.251
factor 2 (b18)	0.116	-0.128	-0.211	0.115
t-value	1.201	-0.817	-2.177**	0.741
factor 3 (b19)	-0.171	-0.192	-0.005	0.251
t-value	-1.764*	-1.218	-0.045	1.391
factor 4 (b20)	-0.094	0.257	-0.102	-0.135
t-value	-1.069	1.790*	-1.263	-1.046
factor 5 (b21)	0.144	-0.126	0.137	-0.212
t-value	1.555*	-0.843	1.712*	-1.656*
IMP				
factor 1 (b22)	0.312	-0.163	0.296	-0.158
t-value	1.688*	-0.543	1.765*	-0.592
factor 2 (b23)	-0.092	0.056	0.161	0.002
t-value	-0.912	0.343	1.226	0.011
factor 3 (b24)	0.047	0.094	0.003	-0.086
t-value	0.533	0.651	0.039	-0.603
EXP				
factor 1 (b25)	-0.310	0.241	-0.274	0.243
t-value	-1.580*	0.756	-1.446	0.801
factor 2 (b26)	-0.125	-0.097	-0.210	-0.034
t-value	-1.270	-0.608	-1.811	-0.186
R-square	0.483	0.292	0.481	0.292
R-square (adj.)	0.225	0.000	0.221	0.000
F-ratio	1.872	0.827	1.852	0.815
DW	1.856	1.490	1.872	1.480

a) ** Statistically significant at the 5 percent level
b) * Statistically significant at the 10 percent level
c) Stock Market Factors = Dependent Variables
d) Economic Variable Factors = Independent Variables

APPENDIX 5.17

RESULTS OF REGRESSING MARKET FACTORS ON ECONOMIC VARIABLE FACTORS FOR 2 EQUAL SUBPERIODS

	Stock Market Factors							
	Non-rotated				Rotated			
	Factor One		Factor Two		Factor One		Factor Two	
	P1	P2	P1	P2	P1	P2	P1	P2
constant (a)	0.107	-0.001	0.014	-0.423	0.106	0.024	0.021	-0.422
IP FACTOR								
Factor 1 (b1)	-0.071	0.308	-0.133	-0.043	-0.202	0.074	-0.166	-0.005
t-value	-0.231	1.674*	-0.273	-0.108	-0.935	0.477	-0.485	-0.016
Factor 2 (b2)	0.059	0.128	0.366	-0.011	0.007	0.342	-0.168	0.068
t-value	0.279	0.447	1.085	-0.017	0.023	2.397**	-0.336	0.225
Factor 3 (b3)	-0.408	-0.004	-0.251	0.194	-0.017	0.244	0.287	0.113

t-value	-2.180**	-0.019	-0.853	0.431	-0.091	0.746	0.928	0.162
Factor 4 (b4)	-0.395	-0.132	-0.251	0.204	0.494	0.145	0.377	-0.217
t-value	-2.275**	-0.681	-0.917	0.487	2.615**	0.774	1.266	-0.544
Factor 5 (b5)	-0.025	-0.278	-0.011	-0.223	0.132	-0.017	0.159	-0.262
t-value	-0.141	-1.487	-0.038	-0.553	1.091	-0.079	0.831	-0.549
CP FACTOR								
Factor 1 (b6)	0.095	0.363	0.115	-0.390	0.249	0.196	-0.111	0.099
t-value	0.509	1.291	0.391	-0.642	1.312	0.859	-0.369	0.204
Factor 2 (b7)	0.246	-0.091	-0.293	0.544	-0.226	0.403	0.452	-0.729
t-value	1.159	-0.454	-0.876	1.245	-0.871	1.479	1.100	-1.251
Factor 3 (b8)	0.203	-0.169	-0.433	0.353	0.127	-0.003	-0.226	-0.013
t-value	0.903	-0.991	-1.218	0.955	0.783	-0.024	-0.879	-0.040
MS FACTOR								
Factor 1 (b9)	-0.138	0.465	-0.264	-0.182	0.038	0.367	-0.226	-0.057
t-value	-0.554	1.801*	-0.675	-0.327	0.172	1.535*	-0.648	-0.112
Factor 2 (b10)	-0.568	0.066	-0.211	-0.041	-0.255	0.305	-0.134	-0.196
t-value	-2.631**	0.409	-0.621	-0.119	-1.266	1.687*	-0.424	-0.509
Factor 3 (b11)	0.133	0.011	0.188	-0.139	0.520	-0.057	0.321	-0.048
t-value	0.782	0.066	0.701	-0.396	2.376**	-0.320	0.932	-0.127
TB FACTOR								
Factor 1 (b12)	-0.232	-0.318	-0.127	0.529	-0.250	-0.301	-0.105	0.982
t-value	-1.735*	-1.458	-0.605	1.122	-1.813*	-1.076	-0.484	1.643*
Factor 2 (b13)	-0.204	0.000	-0.351	0.650	0.017	-0.069	-0.044	0.010
t-value	-0.825	0.001	-0.899	1.137	0.132	-0.394	-0.212	0.027
Factor 3 (b14)	0.151	-0.175	0.051	-0.933	0.021	-0.583	0.192	-0.821
t-value	1.414	-0.403	0.303	-0.991	0.171	-1.021	1.001	-0.674
Factor 4 (b15)	-0.142	-0.048	-0.395	-0.319	0.036	0.339	-0.292	-0.223
t-value	-0.589	-0.195	-1.035	-0.601	0.259	1.914*	-1.326	-0.591
Factor 5 (b16)	-0.111	-0.726	0.150	-0.156	-0.262	-0.315	-0.451	0.148
t-value	-1.039	-1.877*	0.897	-0.187	-0.878	-1.272	-0.955	0.281
UNEMP FACTOR								
Factor 1 (b17)	-0.713	0.031	0.263	-0.667	-0.748	-0.058	0.230	-0.619
t-value	-3.165**	0.109	0.741	-1.087	-3.027**	-0.210	0.590	-1.046
Factor 2 (b18)	0.273	-0.169	0.188	-0.053	-0.379	0.154	-0.339	0.213
t-value	0.719	-0.988	0.315	-0.145	-0.971	0.763	-0.551	0.497
Factor 3 (b19)	-0.245	0.022	-0.637	0.334	-0.081	0.138	0.466	-0.324
t-value	-1.492	0.120	-2.464**	0.811	-0.496	0.656	1.807*	-0.721
Factor 4 (b20)	-0.051	0.005	0.132	0.488	-0.126	0.105	-0.401	0.075
t-value	-0.367	0.025	0.597	1.005	-0.941	0.685	-1.888	0.229
Factor 5 (b21)	0.298	0.257	-0.271	-0.132	0.131	0.214	-0.216	-0.518
t-value	1.778*	1.506*	-1.024	-0.359	1.245	1.011	-1.309	-1.146
IMP FACTOR								
Factor 1 (b22)	-0.063	0.363	-0.425	-0.075	-0.006	0.605	-0.372	0.008
t-value	-0.145	1.021	-0.616	-0.098	-0.017	1.717*	-0.679	0.011
Factor 2 (b23)	-0.071	-0.527	-0.008	0.051	0.012	-0.057	-0.074	-0.227
t-value	-0.501	-2.272**	-0.039	0.103	0.041	-0.274	-0.146	-0.505
Factor 3 (b24)	0.138	-0.001	0.293	-0.339	-0.143	-0.212	-0.361	0.257
t-value	0.746	-0.009	1.008	-0.852	-0.952	-0.950	-1.518*	0.540
EXP FACTOR								
Factor 1 (b25)	-0.209	-0.824	0.639	-0.152	-0.195	-0.796	0.713	-0.241
t-value	-0.542	-1.593*	1.053	-0.136	-0.540	-1.577*	1.247	-0.223
Factor 2 (b26)	-0.161	0.075	-0.381	0.155	-0.205	-0.178	-0.187	0.092
t-value	-0.929	0.439	-1.391	0.416	-0.947	-0.808	-0.547	0.196
R-square	0.722	0.786	0.603	0.521	0.717	0.796	0.608	0.507
R-sq. (adj.)	0.242	0.231	0.000	0.000	0.000	0.000	0.000	0.267
F-ratio	1.503	1.415	0.878	0.419	1.463	1.505	0.895	0.395
DW	1.807	1.434	1.645	1.279	1.818	1.423	1.641	1.281

* statistically significant at the 10 percent level
** statistically significant at the 5 percent level
P1 = Jan. 1980 to Dec. 1983
P2 = Jan. 1984 to Dec. 1987

APPENDIX 5.18

REGRESSION RESULTS

(i.e. regressing stock market factors on the related economic variable indices)

	Stock Market Factors			
	Multiple Regression		Stepwise Regression	
	Factor 1	Factor 2	Factor 1	Factor 2
a	0.036	-0.419	-0.023	-0.095
IP INDEX				
b1 (SA)	0.014	-0.109		
t-value	0.418	-1.873*		
b2 (WG)	0.114	-0.024	0.072	
t-value	2.833**	-0.344	2.397**	
b3 (AU)	0.043	0.012		
t-value	1.501	0.233		
b4 (SP)	0.064	0.121		0.114
t-value	1.426	1.567		2.065**
b5 (US)	0.129	0.024	0.244	
t-value	1.386	0.152	3.138**	
CP INDEX				
b6 (MY)	0.122	0.094		
t-value	0.696	0.319		
b7 (JP)	0.212	0.257	0.375	
t-value	1.245	0.888	2.866**	
b8 (AU)	-0.157	0.233		
t-value	-0.755	0.658		
MS INDEX				
b9 (AU)	-0.006	0.064		
t-value	-0.161	0.974		
b10 (WG)	-0.009	0.013		
t-value	-0.354	0.291		
b11 (SP)	0.062	0.050	0.068	
t-value	2.405**	1.155	2.911**	
TB INDEX				
b12 (WG)	-0.027	-0.018	-0.027	
t-value	-2.215**	-0.862	-2.352**	
b13 (AU)	-0.000	0.014		
t-value	-0.051	1.075		
b14 (NW)	-0.005	-0.008		
t-value	-0.681	-0.731		
b15 (UK)	0.001	-0.013		
t-value	0.072	-0.783		
b16 (MY)	-0.031	-0.042		-0.047
t-value	-1.604*	-1.275		-1.792*
UNEMP INDEX				
b17 (WG)	-0.004	0.007		
t-value	-0.163	0.173		
b18 (SP)	-0.002	0.002	-0.002	
t-value	-1.601*	0.981	-2.259**	
b19 (SA)	0.014	-0.004		
t-value	1.019	-0.178		
b20 (FR)	-0.103	-0.057	-0.076	
t-value	-2.962**	-0.975	-3.077**	

b21 (AU)	0.063	-0.053	0.056	
t-value	2.514**	-1.254	2.467**	
IMP INDEX				
b22 (FR)	0.029	-0.021		
t-value	2.321**	-0.986		
b23 (MY)	-0.007	-0.014		
t-value	-0.873	-1.068		
b24 (US)	-0.041	0.036		
t-value	-1.884*	0.972		
EXP INDEX				
b25 (WG)	-0.027	0.042		
t-value	-1.534	1.432		
b26 (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

APPENDIX 5.19

RESULTS OF THE FIRST-PASS REGRESSION

Regressing 10 market returns on 5 economic variables i.e US's Industrial Production (IP-US), Japanese money supply (MS-JP), French unemployment (UN-FR), Australian unemployment (UN-AU) and Singaporean exports (EX-SP)

	US	UK	WG	FR	NW	JP	SP	MY	AU	SA
			P E R I O D				O N E			
a(const.)	0.59	1.09	1.17	0.69	1.81	1.18	0.50	0.48	0.30	0.45
t-value	1.06	1.69	2.06	0.74	1.74	2.20	0.60	0.43	0.30	0.47
b1(IP-US)	0.27	0.36	0.74	0.77	2.02	0.86	2.10	0.36	1.30	0.98
t-value	0.52	0.59	1.37	0.88	2.05**	1.68*	2.50**	0.33	1.60*	1.08
b2(MS-JP)	0.16	0.10	-0.03	0.24	0.02	-0.01	0.10	0.10	0.00	0.22
t-value	1.54	0.80	-0.28	1.38	0.08	-0.11	0.70	0.46	-0.20	1.20
b3(UN-FR)	0.04	0.02	-0.30	0.04	-0.44	-0.05	-0.50	-0.23	0.10	0.18
t-value	0.26	0.09	-1.82	0.16	-1.49	-0.31	-2.0**	-0.70	0.40	0.65
b4(UN-AU)	0.23	0.18	0.26	0.09	0.35	0.09	0.40	-0.36	0.00	0.28
t-value	1.52	1.04	1.69*	0.37	1.25	0.63	1.80*	-1.18	0.00	1.08
b5(EX-SP)	-0.01	-0.03	-0.02	0.04	-0.14	-0.06	-0.10	0.02	0.00	-0.03
t-value	-0.27	-0.54	-0.32	0.49	-1.49	-1.32	-1.10	0.24	-0.50	-0.30
R-square	0.10	0.05	0.13	0.05	0.15	0.08	0.20	0.04	0.10	0.08
R-sq(adj)	0.02	0.00	0.05	0.00	0.08	0.00	0.10	0.00	0.00	0.00
F-ratio	1.20	0.53	1.57	0.59	1.97*	0.97	3.00**	0.45	0.60	0.89
D. Watson	2.00	2.46	1.91	1.87	1.86	2.16	1.60	1.53	1.80	1.83
			P E R I O D				T W O			
a(const.)	0.56	1.11	1.13	0.63	1.94	1.18	0.50	0.36	0.40	0.39
t-value	1.02	1.72	1.98	0.68	1.88	2.22	0.50	0.32	0.50	0.41
b1(IP-US)	0.16	0.33	0.71	0.84	2.22	0.92	2.10	0.19	1.40	0.87
t-value	0.31	0.54	1.30	0.94	2.23**	1.79*	2.40**	0.18	1.70*	0.94
b2(MS-JP)	0.16	0.10	-0.03	0.25	0.02	-0.01	0.10	0.09	0.00	0.21
t-value	1.49	0.78	-0.28	1.41	0.13	-0.07	0.60	0.43	-0.20	1.17
b3(UN-FR)	0.02	0.02	-0.31	0.04	-0.39	-0.04	-0.50	-0.27	0.10	0.15

t-value	0.14	0.10	-1.88*	0.15	-1.31	-0.26	-2.1**	-0.84	0.60	0.55
b4(UN-AU)	0.23	0.18	0.27	0.11	0.33	0.10	0.40	-0.34	0.00	0.29
t-value	1.56	1.00	1.75*	0.44	1.17	0.66	1.80*	-1.12	-0.10	1.13
b5(EX-SP)	0.00	-0.02	-0.02	0.02	-0.14	-0.07	-0.10	0.02	0.00	-0.02
t-value	-0.08	-0.40	-0.41	0.23	-1.50	-1.51	-1.00	0.23	-0.40	-0.26
R-square	0.10	0.04	0.13	0.06	0.16	0.10	0.20	0.04	0.10	0.07
R-sq(adj)	0.01	0.00	0.05	0.00	0.08	0.01	0.10	0.00	0.00	0.00
F-ratio	1.16	0.46	1.64	0.63	2.01*	1.14	3.00**	0.44	0.70	0.82
D. Watson	2.03	2.51	1.96	1.84	1.93	2.20	1.60	1.51	1.80	1.84

P E R I O D T H R E E

a(const)	0.54	1.12	1.17	0.66	1.93	1.17	0.50	0.42	0.40	0.38
t-value	0.98	1.74	2.01	0.72	1.87	2.20	0.60	0.37	0.50	0.39
b1(IP-US)	0.13	0.37	0.78	0.80	2.31	0.91	1.90	0.32	1.30	0.79
t-value	0.25	0.58	1.36	0.89	2.29**	1.74*	2.10**	0.29	1.50	0.84
b2(MS-JP)	0.15	0.10	-0.01	0.26	0.03	-0.01	0.10	0.13	0.00	0.20
t-value	1.39	0.85	-0.06	1.49	0.15	-0.12	0.70	0.60	-0.20	1.11
b3(UN-FR)	-0.02	0.06	-0.22	0.03	-0.31	-0.06	-0.70	-0.11	0.10	0.07
t-value	-0.12	0.28	-1.24	0.12	-1.00	-0.36	-2.5**	-0.31	0.20	0.24
b4(UN-AU)	0.24	0.17	0.25	0.10	0.32	0.10	0.40	-0.38	0.00	0.31
t-value	1.63*	0.95	1.57	0.41	1.15	0.70	1.80*	-1.23	-0.10	1.19
b5(EX-SP)	0.00	-0.03	-0.03	0.01	-0.14	-0.07	-0.10	0.01	0.00	-0.02
t-value	-0.02	-0.44	-0.53	0.17	-1.49	-1.48	-1.10	0.13	-0.40	-0.23
R-square	0.10	0.04	0.10	0.06	0.15	0.09	0.20	0.03	0.00	0.07
R-sq(adj)	0.01	0.00	0.02	0.00	0.08	0.01	0.20	0.00	0.00	0.00
F-ratio	1.14	0.49	1.23	0.64	1.95*	1.12	3.40**	0.38	0.50	0.75
D. Watson	2.01	2.48	1.96	1.87	1.92	2.20	1.70	1.40	1.90	1.83

P E R I O D F O U R

a(const.)	0.51	1.04	1.37	0.52	2.02	1.19	0.70	0.22	0.50	0.51
t-value	0.95	1.62	2.29	0.56	1.98	2.25	0.80	0.21	0.60	0.54
b1(IP-US)	0.09	0.39	0.64	0.93	2.15	0.87	1.70	0.15	1.20	0.75
t-value	0.16	0.62	1.09	1.03	2.14**	1.68*	2.00**	0.14	1.40	0.80
b2(MS-JP)	0.15	0.12	-0.04	0.29	0.01	-0.02	0.10	0.15	-0.10	0.18
t-value	1.46	0.97	-0.35	1.64*	0.05	-0.15	0.50	0.75	-0.40	1.01
b3(UN-FR)	-0.05	0.04	-0.22	0.04	-0.35	-0.07	-0.70	-0.24	0.10	0.09
t-value	-0.30	0.20	-1.16	0.14	-1.10	-0.42	-2.6**	-0.72	0.20	0.32
b4(UN-AU)	0.25	0.18	0.22	0.13	0.31	0.10	0.40	-0.36	0.00	0.29
t-value	1.68*	1.02	1.34	0.50	1.10	0.68	1.70*	-1.22	-0.20	1.12
b5(EX-SP)	-0.01	-0.03	-0.02	0.01	-0.14	-0.07	-0.10	-0.01	0.00	-0.01
t-value	-0.13	-0.53	-0.35	0.10	-1.50	-1.50	-1.10	-0.13	-0.30	-0.13
R-square	0.11	0.06	0.08	0.07	0.15	0.09	0.20	0.05	0.00	0.06
R-sq(adj)	0.02	0.00	0.00	0.00	0.07	0.01	0.20	0.00	0.00	0.00
F-ratio	1.28	0.63	0.91	0.84	1.89	1.13	3.20**	0.51	0.50	0.67
D. Watson	2.04	2.50	1.82	1.87	1.85	2.19	1.60	1.53	1.80	1.79

P E R I O D F I V E

a(const.)	0.52	1.07	1.53	0.50	2.10	1.16	0.50	0.05	0.50	0.39
t-value	0.98	1.67	2.48	0.55	2.10	2.21	0.60	0.04	0.60	0.42
b1(IP-US)	0.10	0.30	0.96	0.72	2.54	0.91	1.20	-0.11	1.00	0.39
t-value	0.19	0.45	1.53	0.77	2.49**	1.69*	1.40	-0.10	1.20	0.41
b2(MS-JP)	0.15	0.11	0.00	0.27	0.05	-0.02	0.00	0.11	-0.10	0.14
t-value	1.48	0.92	0.04	1.54	0.26	-0.15	0.20	0.54	-0.40	0.77
b3(UN-FR)	-0.05	0.02	-0.21	0.01	-0.31	-0.06	-0.70	-0.23	0.00	0.07
t-value	-0.30	0.10	-1.08	0.05	-1.00	-0.35	-2.8**	-0.69	0.20	0.24
b4(UN-AU)	0.25	0.21	0.19	0.17	0.24	0.08	0.50	-0.35	0.00	0.33
t-value	1.65*	1.17	1.11	0.66	0.87	0.58	2.1**	-1.14	-0.10	1.29
b5(EX-SP)	-0.01	-0.03	-0.03	0.02	-0.15	-0.07	-0.10	-0.01	0.00	0.00
t-value	-0.14	-0.46	-0.47	0.19	-1.65*	-1.52	-0.90	-0.08	-0.20	-0.02
R-square	0.11	0.06	0.09	0.07	0.17	0.09	0.20	0.04	0.00	0.05
R-sq(adj)	0.03	0.00	0.01	0.00	0.10	0.01	0.20	0.00	0.00	0.00
F-ratio	1.31	0.65	1.10	0.77	2.25**	1.11	3.20**	0.41	0.40	0.60
D. Watson	2.00	2.52	1.71	1.86	1.92	2.20	1.60	1.47	1.90	1.70

			P E R I O D				S I X			
a(const.)	0.51	1.10	1.44	0.71	2.08	1.13	0.40	-0.13	0.50	0.62
t-value	0.97	1.72	2.31	0.78	2.09	2.15	0.40	-0.12	0.60	0.67
b1(IP-US)	0.11	0.31	0.91	0.81	2.52	0.88	1.10	-0.20	1.00	0.49
t-value	0.21	0.47	1.43	0.86	2.48**	1.64*	1.20	-0.18	1.20	0.52
b2(MS-JP)	0.15	0.12	-0.03	0.34	0.04	-0.03	0.00	0.05	-0.10	0.21
t-value	1.51	1.01	-0.22	1.93*	0.22	-0.27	-0.20	0.25	-0.50	1.20
b3(UN-FR)	-0.06	0.02	-0.19	0.01	-0.30	-0.05	-0.70	-0.22	0.00	0.07
t-value	-0.39	0.11	-0.98	0.02	-0.97	-0.30	-2.6**	-0.62	0.20	0.24
b4(UN-AU)	0.22	0.21	0.22	0.15	0.26	0.10	0.60	-0.31	0.00	0.34
t-value	1.47	1.19	1.28	0.60	0.95	0.71	2.3**	-1.00	-0.10	1.32
b5(EX-SP)	-0.01	-0.03	-0.02	0.01	-0.15	-0.07	-0.10	0.01	0.00	-0.01
t-value	-0.29	-0.47	-0.28	0.07	-1.59	-1.41	-0.60	0.08	-0.20	-0.09
R-square	0.10	0.06	0.09	0.09	0.17	0.09	0.20	0.03	0.00	0.07
R-sq(adj)	0.02	0.00	0.00	0.01	0.09	0.00	0.10	0.00	0.00	0.00
F-ratio	1.21	0.70	1.02	1.07	2.23*	1.04	2.90**	0.30	0.40	0.84
D. Watson	2.00	2.53	1.87	1.86	1.92	2.17	1.60	1.39	1.80	1.79
			P E R I O D				S E V E N			
a(const.)	0.62	1.17	1.75	0.93	2.03	1.17	0.10	-0.51	0.50	0.72
t-value	1.16	1.86	2.65	1.00	2.03	2.23	0.20	-0.47	0.70	0.78
b1(IP-US)	0.15	0.27	0.97	0.84	2.48	0.89	1.00	-0.19	1.00	0.51
t-value	0.27	0.42	1.43	0.88	2.43**	1.66*	1.10	-0.17	1.20	0.54
b2(MS-JP)	0.11	0.10	-0.13	0.27	0.06	-0.04	0.00	0.16	-0.10	0.18
t-value	1.13	0.89	-1.03	1.55	0.32	-0.41	0.30	0.81	-0.70	1.03
b3(UN-FR)	-0.07	0.04	-0.20	0.00	-0.29	-0.05	-0.70	-0.23	0.10	0.06
t-value	-0.44	0.21	-0.98	0.01	-0.91	-0.31	-2.4**	-0.68	0.20	0.22
b4(UN-AU)	0.23	0.20	0.25	0.17	0.25	0.11	0.50	-0.31	0.00	0.35
t-value	1.55	1.12	1.35	0.65	0.88	0.73	2.1**	-1.01	-0.10	1.36
b5(EX-SP)	-0.02	-0.02	-0.02	0.01	-0.14	-0.07	0.00	0.00	0.00	-0.01
t-value	-0.34	-0.34	-0.30	0.07	-1.52	-1.40	-0.50	-0.01	-0.10	-0.11
R-square	0.08	0.05	0.10	0.07	0.16	0.09	0.20	0.04	0.00	0.06
R-sq(adj)	0.00	0.00	0.02	0.00	0.08	0.01	0.10	0.00	0.00	0.00
F-ratio	0.96	0.54	1.24	0.76	2.06*	1.07	2.50**	0.43	0.40	0.74
D. Watson	1.87	2.57	1.92	1.82	1.91	2.18	1.40	1.44	1.80	1.76
			P E R I O D				E I G H T			
a(const.)	0.80	1.23	1.81	1.21	2.05	1.12	-0.20	-0.92	1.00	0.96
t-value	1.55	1.97	2.75	1.33	2.06	2.13	-0.30	-0.85	1.20	1.05
b1(IP-US)	0.15	0.27	0.99	0.77	2.56	0.90	1.10	-0.07	0.80	0.47
t-value	0.29	0.43	1.48	0.83	2.55**	1.69*	1.20	-0.07	1.00	0.51
b2(MS-JP)	0.11	0.10	-0.13	0.26	0.06	-0.04	0.00	0.17	-0.10	0.18
t-value	1.19	0.89	-1.03	1.56	0.35	-0.41	0.30	0.84	-0.70	1.04
b3(UN-FR)	-0.10	0.03	-0.21	-0.04	-0.28	-0.04	-0.60	-0.16	0.00	0.03
t-value	-0.61	0.17	-1.02	-0.16	-0.89	-0.26	-2.3**	-0.49	-0.10	0.10
b4(UN-AU)	0.19	0.18	0.23	0.13	0.21	0.12	0.60	-0.25	-0.10	0.31
t-value	1.31	1.03	1.25	0.49	0.76	0.80	2.4**	-0.84	-0.30	1.21
b5(EX-SP)	-0.04	-0.03	-0.03	-0.02	-0.16	-0.06	0.00	0.03	0.00	-0.03
t-value	-0.85	-0.48	-0.46	-0.21	-1.69*	-1.24	0.00	0.28	-0.40	-0.37
R-square	0.09	0.05	0.10	0.06	0.17	0.09	0.20	0.03	0.00	0.06
R-sq(adj)	0.00	0.00	0.02	0.00	0.10	0.00	0.10	0.00	0.00	0.00
F-ratio	1.03	0.54	1.23	0.74	2.24*	1.04	2.80**	0.32	0.40	0.68
D. Watson	1.86	2.56	2.07	1.83	1.90	2.18	1.50	1.47	1.90	1.78
			P E R I O D				N I N E			
a(const.)	0.82	1.32	1.80	1.25	1.90	1.24	-0.25	-1.01	0.94	1.00
t-value	1.62	2.11	2.80	1.39	1.90	2.36	-0.30	-0.95	1.16	1.11
b1(IP-US)	0.06	0.12	1.00	0.71	2.70	0.79	0.95	0.02	0.85	0.39
t-value	0.11	0.19	1.60*	0.78	2.70**	1.49	1.11	0.02	1.04	0.43
b2(MS-JP)	0.11	0.12	-0.10	0.27	0.00	-0.01	0.03	0.14	-0.11	0.18
t-value	1.19	1.01	-1.00	1.61*	0.10	-0.14	0.19	0.75	-0.74	1.08
b3(UN-FR)	-0.10	0.02	-0.20	-0.05	-0.30	-0.06	-0.64	-0.15	-0.01	0.02
t-value	-0.65	0.09	-1.00	-0.18	-0.80	-0.36	-2.4**	-0.45	-0.05	0.07

b4(UN-AU)	0.19	0.17	0.20	0.12	0.20	0.10	0.59	-0.24	-0.07	0.30
t-value	1.31	0.96	1.30	0.47	0.90	0.67	2.5**	-0.79	-0.29	1.19
b5(EX-SP)	-0.06	-0.05	0.00	-0.02	-0.20	-0.07	-0.03	0.03	-0.03	-0.04
t-value	-1.17	-0.74	-0.30	-0.27	-1.70*	-1.24	-0.35	0.32	-0.41	-0.47
R-square	0.10	0.06	0.10	0.07	0.20	0.07	0.20	0.02	0.04	0.06
R-sq(adj)	0.02	0.00	0.00	0.00	0.10	0.00	0.13	0.00	0.00	0.00
F-ratio	1.21	0.63	1.30	0.77	2.30*	0.86	2.76**	0.27	0.43	0.71
D. Watson	1.89	2.53	2.00	1.83	1.90	2.13	1.56	1.43	1.85	1.76

P E R I O D T E N

a(const.)	0.83	1.49	1.80	1.47	1.90	1.35	-0.50	-1.44	0.82	0.79
t-value	1.61	2.28	2.70	1.54	1.90	2.31	-0.58	-1.36	1.02	0.88
b1(IP-US)	0.13	0.16	1.20	0.84	2.60	0.96	1.05	0.21	1.07	0.57
t-value	0.26	0.24	1.70*	0.86	2.60**	1.64*	1.21	0.20	1.31	0.63
b2(MS-JP)	0.12	0.12	-0.10	0.28	0.00	-0.01	0.03	0.14	-0.11	0.18
t-value	1.21	1.01	-1.00	1.58	0.10	-0.05	0.18	0.74	-0.72	1.10
b3(UN-FR)	-0.11	-0.02	-0.20	-0.10	-0.30	-0.09	-0.60	-0.08	-0.01	0.05
t-value	-0.69	-0.08	-1.00	-0.33	-0.80	-0.50	-2.2**	-0.25	-0.02	0.17
b4(UN-AU)	0.19	0.15	0.20	0.10	0.20	0.09	0.62	-0.18	-0.05	0.33
t-value	1.30	0.84	1.30	0.38	0.80	0.58	2.6**	-0.63	-0.21	1.31
b5(EX-SP)	-0.04	-0.02	0.00	0.03	-0.20	-0.02	-0.05	0.01	-0.01	-0.04
t-value	-0.88	-0.26	0.10	0.32	-1.80*	-0.33	-0.57	0.06	-0.13	-0.48
R-square	0.09	0.04	0.10	0.06	0.20	0.06	0.21	0.01	0.05	0.07
R-sq(adj)	0.01	0.00	0.00	0.00	0.10	0.00	0.13	0.00	0.00	0.00
F-ratio	1.09	0.45	1.50	0.72	2.30*	0.72	2.82**	0.19	0.55	0.82
D. Watson	1.79	2.36	2.00	1.69	1.90	1.88	1.60	1.42	1.88	1.81

P E R I O D E L E V E N

a(const.)	0.90	1.31	1.80	1.88	1.60	1.24	-0.70	-1.12	0.98	0.62
t-value	1.78	2.04	2.80	1.98	1.70	2.16	-0.83	-1.04	1.22	0.69
b1(IP-US)	0.18	0.16	1.10	0.80	2.70	0.97	1.05	0.08	1.00	0.62
t-value	0.35	0.25	1.70*	0.83	2.70**	1.65*	1.22	0.08	1.21	0.68
b2(MS-JP)	0.13	0.11	-0.10	0.29	0.00	-0.01	0.02	0.12	-0.12	0.19
t-value	1.42	0.94	-1.10	1.63*	0.20	-0.09	0.11	0.59	-0.81	1.13
b3(UN-FR)	-0.12	0.02	-0.20	-0.18	-0.20	-0.07	-0.56	-0.15	-0.04	0.08
t-value	-0.76	0.09	-1.10	-0.59	-0.60	-0.39	-2.1**	-0.45	-0.16	0.29
b4(UN-AU)	0.18	0.16	0.20	0.09	0.20	0.10	0.63	-0.18	-0.05	0.33
t-value	1.26	0.88	1.30	0.32	0.80	0.60	2.6**	-0.61	-0.20	1.31
b5(EX-SP)	-0.04	-0.01	0.00	0.00	-0.10	-0.01	-0.04	-0.02	-0.03	-0.03
t-value	-0.87	-0.10	0.00	0.04	-1.60*	-0.23	-0.45	-0.26	-0.35	-0.31
R-square	0.10	0.04	0.10	0.07	0.20	0.06	0.20	0.01	0.05	0.07
R-sq(adj)	0.02	0.00	0.00	0.00	0.10	0.00	0.13	0.00	0.00	0.00
F-ratio	1.23	0.41	1.50	0.80	2.10*	0.71	2.72**	0.21	0.54	0.82
D. Watson	1.86	2.41	2.00	1.60	1.80	2.11	1.61	1.43	1.84	1.79

P E R I O D T W E L V E

a(const.)	0.99	1.35	1.70	2.31	2.00	1.35	-0.34	-1.04	1.06	0.76
t-value	1.94	2.11	2.50	2.80	2.10	2.31	-0.36	-0.95	1.30	0.85
b1(IP-US)	0.17	0.24	1.20	1.11	2.80	0.95	0.89	-0.10	1.01	0.60
t-value	0.32	0.37	1.80*	1.33	2.80**	1.60*	0.94	-0.09	1.23	0.66
b2(MS-JP)	0.14	0.10	-0.20	0.24	0.00	0.00	0.08	0.17	-0.12	0.20
t-value	1.52	0.81	-1.30	1.57	0.20	0.01	0.48	0.84	-0.81	1.21
b3(UN-FR)	-0.13	0.02	-0.20	-0.19	-0.20	-0.09	-0.63	-0.19	-0.05	0.06
t-value	-0.84	0.11	-0.90	-0.74	-0.80	-0.48	-2.2**	-0.55	-0.19	0.22
b4(UN-AU)	0.15	0.13	0.30	-0.11	0.10	0.07	0.54	-0.18	-0.07	0.29
t-value	1.04	0.72	1.30	-0.45	0.30	0.41	2.0**	-0.57	-0.31	1.12
b5(EX-SP)	-0.03	-0.02	0.00	-0.03	-0.10	-0.01	0.01	0.01	-0.03	-0.02
t-value	-0.73	-0.28	-0.30	-0.33	-1.60*	-0.10	0.06	0.06	-0.35	-0.21
R-square	0.10	0.03	0.10	0.08	0.20	0.06	0.17	0.02	0.05	0.06
R-sq(adj)	0.01	0.00	0.10	0.00	0.10	0.00	0.09	0.00	0.00	0.00
F-ratio	1.15	0.32	1.60	0.99	2.30*	0.65	2.15*	0.28	0.56	0.72
D. Watson	1.82	2.41	2.00	2.04	1.90	2.13	1.59	1.21	1.86	1.79

	P E R I O D					T H I R T E E N				
a(const.)	1.00	1.37	1.60	2.27	2.00	1.36	-0.28	-1.03	1.00	0.75
t-value	2.00	2.14	2.30	2.77	2.10	2.34	-0.30	-0.99	1.24	0.85
b1(IP-US)	0.25	0.27	1.20	1.19	2.80	0.93	0.84	0.22	1.06	0.73
t-value	0.49	0.40	1.60*	1.41	2.80**	1.55	0.87	0.20	1.26	0.80
b2(MS-JP)	0.13	0.09	-0.10	0.25	0.00	0.00	0.07	0.14	-0.11	0.20
t-value	1.43	0.75	-1.00	1.63*	0.20	-0.01	0.39	0.74	-0.71	1.18
b3(UN-FR)	-0.11	0.03	-0.20	-0.17	-0.20	-0.09	-0.64	-0.09	-0.04	0.10
t-value	-0.69	0.15	-1.00	-0.65	-0.80	-0.50	-2.2**	-0.30	-0.15	0.35
b4(UN-AU)	0.22	0.17	0.10	-0.09	0.10	0.06	0.56	0.04	-0.09	0.38
t-value	1.51	0.89	0.70	-0.37	0.30	0.38	2.04**	0.16	-0.39	1.45
b5(EX-SP)	-0.03	-0.02	0.00	-0.02	-0.10	-0.01	-0.01	0.02	-0.02	-0.01
t-value	-0.67	-0.29	-0.20	-0.20	-1.60*	-0.15	-0.07	0.27	-0.22	-0.11
R-square	0.11	0.03	0.10	0.09	0.20	0.05	0.17	0.01	0.05	0.08
R-sq(adj)	0.02	0.00	0.00	0.00	0.10	0.00	0.09	0.00	0.00	0.00
F-ratio	1.29	0.36	1.20	1.01	2.30*	0.62	2.14*	0.16	0.55	0.90
D. Watson	1.88	2.44	1.90	1.84	1.80	2.14	1.58	1.47	1.84	1.85
	P E R I O D					F O U R T E E N				
a(const.)	0.89	1.29	1.60	2.05	1.70	1.40	-0.07	-0.44	1.12	0.83
t-value	1.69	1.97	2.30	2.65	1.80	2.38	-0.07	-0.46	1.41	0.93
b1(IP-US)	0.24	0.24	1.20	1.40	3.00	0.93	0.71	-0.07	0.91	0.73
t-value	0.45	0.36	1.60*	1.76*	3.00**	1.54	0.75	-0.07	1.11	0.79
b2(MS-JP)	0.12	0.07	-0.10	0.29	0.00	0.01	0.05	0.12	-0.14	0.20
t-value	1.19	0.59	-1.10	2.02**	0.30	0.06	0.31	0.69	-0.93	1.22
b3(UN-FR)	-0.16	-0.01	-0.20	-0.21	-0.30	-0.07	-0.58	0.08	-0.02	0.13
t-value	-0.97	-0.04	-1.00	-0.88	-1.10	-0.40	-2.03**	0.28	-0.09	0.46
b4(UN-AU)	0.25	0.19	0.20	-0.09	0.10	0.05	0.55	-0.01	-0.08	0.36
t-value	1.63*	0.99	0.70	-0.42	0.40	0.32	2.0**	-0.04	-0.36	1.39
b5(EX-SP)	-0.04	-0.03	0.00	0.00	-0.10	0.00	-0.01	0.01	-0.03	0.00
t-value	-0.82	-0.43	-0.30	0.07	-1.60*	-0.09	-0.16	0.19	-0.43	-0.06
R-square	0.11	0.03	0.10	0.12	0.20	0.05	0.15	0.01	0.05	0.08
R-sq(adj)	0.03	0.00	0.00	0.04	0.10	0.00	0.07	0.00	0.00	0.00
F-ratio	1.36	0.37	1.20	1.52	2.70**	0.57	1.91*	0.12	0.56	0.88
D. Watson	1.81	2.39	1.90	2.06	1.90	2.11	1.62	1.50	1.88	1.83
	P E R I O D					F I F T E E N				
a(const.)	1.04	1.31	1.80	2.11	1.80	1.52	0.39	-0.49	1.22	0.82
t-value	1.95	1.99	2.40	2.68	1.80	2.51	0.45	-0.50	1.51	0.92
b1(IP-US)	0.06	0.29	1.00	1.42	3.00	0.83	0.08	-0.06	0.82	0.79
t-value	0.12	0.43	1.20	1.73*	3.00**	1.32	0.09	-0.07	0.98	0.85
b2(MS-JP)	0.11	0.06	-0.20	0.28	0.00	0.00	0.05	0.13	-0.14	0.19
t-value	1.15	0.50	-1.10	1.88*	0.20	-0.02	0.33	0.74	-0.95	1.18
b3(UN-FR)	0.00	-0.03	0.00	-0.20	-0.30	0.03	-0.03	0.06	0.07	0.09
t-value	0.02	-0.15	-0.20	-0.78	-1.10	0.16	-0.11	0.20	0.26	0.29
b4(UN-AU)	0.23	0.22	0.20	-0.07	0.20	0.06	0.47	-0.02	-0.09	0.38
t-value	1.49	1.11	0.70	-0.29	0.50	0.31	1.81*	-0.08	-0.37	1.47
b5(EX-SP)	-0.04	-0.03	0.00	0.00	-0.20	-0.01	0.00	0.02	-0.03	-0.01
t-value	-0.76	-0.53	-0.30	-0.03	-1.70*	-0.12	0.00	0.23	-0.43	-0.12
R-square	0.09	0.04	0.10	0.11	0.20	0.03	0.06	0.01	0.05	0.08
R-sq(adj)	0.00	0.00	0.00	0.03	0.10	0.00	0.00	0.00	0.00	0.00
F-ratio	1.01	0.43	0.70	1.36	2.60**	0.38	0.72	0.12	0.52	0.91
D. Watson	2.01	2.10	1.80	1.97	1.90	1.94	1.57	1.60	1.89	1.85
	P E R I O D					S I X T E E N				
a(const.)	1.03	1.51	1.80	2.01	1.80	1.57	0.26	-0.12	1.41	0.82
t-value	1.91	2.63	2.40	2.49	1.90	2.63	0.30	-0.12	1.79	0.92
b1(IP-US)	-0.17	-0.22	0.70	1.29	2.90	0.59	0.13	0.05	0.61	0.94
t-value	-0.30	-0.37	0.90	1.52	2.90**	0.94	0.14	0.05	0.73	0.99
b2(MS-JP)	0.11	0.05	-0.20	0.28	0.00	-0.01	0.06	0.11	-0.15	0.20
t-value	1.13	0.44	-1.10	1.86*	0.10	-0.06	0.37	0.59	-1.05	1.18
b3(UN-FR)	0.04	0.11	0.00	-0.21	-0.30	0.09	-0.07	0.14	0.15	0.06
t-value	0.22	0.55	0.00	-0.77	-1.00	0.43	-0.25	0.40	0.59	0.21
b4(UN-AU)	0.25	0.25	0.20	-0.05	0.20	0.07	0.47	-0.04	-0.07	0.37

t-value	1.59	1.49	0.80	-0.22	0.60	0.42	1.80*	-0.13	-0.32	1.42
b5(EX-SP)	-0.04	-0.03	0.00	0.00	-0.20	0.00	0.00	0.02	-0.03	-0.01
t-value	-0.72	-0.48	-0.30	-0.03	-1.70*	-0.07	-0.03	0.24	-0.38	-0.13
R-square	0.09	0.06	0.10	0.10	0.20	0.02	0.06	0.01	0.05	0.08
R-sq(adj)	0.01	0.00	0.00	0.02	0.10	0.00	0.00	0.00	0.00	0.00
F-ratio	1.12	0.72	0.60	1.18	2.30*	0.26	0.73	0.10	0.53	0.92
D. Watson	2.06	2.45	2.10	2.06	1.90	2.08	1.72	1.45	1.94	1.84

P E R I O D S E V E N T E E N

a(const.)	1.01	1.53	1.73	2.08	1.61	1.45	0.49	-0.67	1.59	0.82
t-value	1.85	2.63	2.27	2.56	1.67	2.35	0.52	-0.66	1.96	0.91
b1(IP-US)	-0.05	-0.20	0.81	1.09	3.11	0.58	0.18	0.58	0.58	0.92
t-value	-0.08	-0.32	0.99	1.26	3.01**	0.88	0.18	0.54	0.67	0.96
b2(MS-JP)	0.12	0.06	-0.17	0.27	0.00	-0.04	0.13	0.04	-0.11	0.19
t-value	1.26	0.53	-1.20	1.82	0.01	-0.37	0.77	0.25	-0.73	1.19
b3(UN-FR)	0.04	0.11	-0.01	-0.21	-0.31	0.08	-0.07	0.14	0.16	0.06
t-value	0.22	0.55	-0.03	-0.77	-0.97	0.41	-0.23	0.41	0.58	0.21
b4(UN-AU)	0.24	0.25	0.17	-0.04	0.15	0.09	0.44	-0.05	-0.09	0.37
t-value	1.52	1.47	0.78	-0.16	0.55	0.48	1.63*	-0.18	-0.36	1.43
b5(EX-SP)	-0.03	-0.02	-0.02	-0.01	-0.15	-0.01	0.01	0.03	-0.03	-0.01
t-value	-0.60	-0.45	-0.28	-0.14	-1.63*	-0.13	0.06	0.39	-0.34	-0.14
R-square	0.09	0.06	0.06	0.09	0.19	0.03	0.06	0.01	0.03	0.08
R-sq(adj)	0.00	0.00	0.00	0.01	0.11	0.00	0.00	0.00	0.00	0.00
F-ratio	1.04	0.70	0.65	1.07	2.52**	0.29	0.73	0.12	0.36	0.92
D. Watson	2.20	2.53	2.09	2.04	1.94	1.97	1.58	1.86	1.84	1.86

P E R I O D E I G H T E E N

a(const.)	1.02	1.56	1.74	2.01	1.55	1.51	-0.02	-0.74	1.43	0.81
t-value	1.86	2.65	2.24	2.46	1.58	2.40	-0.02	-0.72	1.76	0.89
b1(IP-US)	-0.07	-0.34	0.86	1.19	3.15	0.64	0.72	0.74	0.82	0.84
t-value	-0.13	-0.54	1.03	1.34	2.97**	0.94	0.76	0.67	0.94	0.85
b2(MS-JP)	0.13	0.05	-0.16	0.26	-0.01	-0.02	0.05	0.04	-0.13	0.19
t-value	1.29	0.51	-1.17	1.76*	-0.08	-0.18	0.29	0.22	-0.90	1.14
b3(UN-FR)	0.04	0.10	0.00	-0.21	-0.31	0.09	-0.07	0.14	0.16	0.06
t-value	0.22	0.52	-0.02	-0.77	-0.98	0.43	-0.23	0.43	0.61	0.19
b4(UN-AU)	0.24	0.25	0.17	-0.04	0.15	0.09	0.41	-0.05	-0.10	0.37
t-value	1.52	1.48	0.77	-0.18	0.53	0.49	1.61*	-0.20	-0.41	1.43
b5(EX-SP)	-0.03	-0.03	-0.02	-0.01	-0.15	0.00	-0.03	0.03	-0.03	-0.02
t-value	-0.59	-0.47	-0.25	-0.19	-1.69*	0.02	-0.33	0.38	-0.45	-0.18
R-square	0.09	0.06	0.06	0.09	0.19	0.03	0.06	0.01	0.05	0.08
R-sq(adj)	0.01	0.00	0.00	0.01	0.11	0.00	0.00	0.00	0.00	0.00
F-ratio	1.05	0.74	0.63	1.09	2.46**	0.28	0.71	0.16	0.53	0.89
D. Watson	2.22	2.44	2.08	2.06	1.94	2.05	1.96	1.90	1.92	1.84

P E R I O D N I N E T E E N

a(const.)	1.06	1.31	1.80	1.91	1.43	1.45	-0.09	-0.29	1.57	0.74
t-value	1.89	2.25	2.28	2.29	1.42	2.25	-0.10	-0.27	1.90	0.79
b1(IP-US)	-0.17	0.06	0.70	1.37	3.20	0.76	0.89	0.31	0.68	1.00
t-value	-0.28	0.09	0.79	1.47	2.85**	1.06	0.88	0.26	0.74	0.96
b2(MS-JP)	0.13	0.09	-0.17	0.27	0.01	-0.01	0.05	-0.05	-0.16	0.19
t-value	1.27	0.88	-1.20	1.86*	0.08	-0.11	0.33	-0.27	-1.09	1.19
b3(UN-FR)	0.04	0.11	-0.01	-0.20	-0.32	0.09	-0.06	0.14	0.16	0.06
t-value	0.19	0.59	-0.04	-0.75	-0.98	0.45	-0.21	0.42	0.61	0.21
b4(UN-AU)	0.24	0.27	0.17	-0.03	0.16	0.09	0.42	-0.09	-0.11	0.38
t-value	1.51	1.63*	0.75	-0.15	0.56	0.52	1.63*	-0.30	-0.45	1.45
b5(EX-SP)	-0.03	-0.01	-0.02	-0.01	-0.14	0.00	-0.02	0.01	-0.04	-0.01
t-value	-0.62	-0.20	-0.30	-0.11	-1.59	0.08	-0.28	0.07	-0.57	-0.13
R-square	0.09	0.07	0.05	0.10	0.18	0.03	0.07	0.01	0.05	0.08
R-sq(adj)	0.01	0.00	0.00	0.02	0.10	0.00	0.00	0.00	0.00	0.00
F-ratio	1.08	0.85	0.56	1.18	2.34*	0.33	0.75	0.09	0.60	0.92
D. Watson	2.21	2.58	2.10	2.08	1.91	2.05	2.03	1.79	1.88	1.82

	P E R I O D				T W E N T Y					
a(const.)	1.28	1.43	1.56	1.96	1.41	1.62	0.03	-0.02	1.55	0.83
t-value	2.13	2.40	1.87	2.36	1.42	2.41	0.03	-0.02	1.93	0.90
b1(IP-US)	0.26	0.11	0.57	1.26	3.38	0.94	1.07	0.94	1.01	1.32
t-value	0.37	0.17	0.60	1.33	2.97**	1.22	1.03	0.75	1.09	1.25
b2(MS-JP)	0.14	0.09	-0.17	0.27	0.02	0.00	0.06	-0.02	-0.15	0.21
t-value	1.36	0.89	-1.18	1.84*	0.12	-0.03	0.38	-0.12	-1.04	1.27
b3(UN-FR)	-0.05	0.09	0.04	-0.19	-0.34	0.05	-0.10	0.02	0.12	0.01
t-value	-0.25	0.45	0.14	-0.73	-1.05	0.22	-0.34	0.08	0.47	0.03
b4(UN-AU)	0.34	0.25	0.20	-0.09	0.24	0.11	0.45	0.07	0.03	0.48
t-value	1.87*	1.38	0.79	-0.38	0.80	0.53	1.63*	0.21	0.13	1.73*
b5(EX-SP)	-0.04	-0.02	0.00	-0.02	-0.14	0.00	-0.03	0.00	-0.03	-0.01
t-value	-0.69	-0.36	-0.05	-0.21	-1.51	-0.08	-0.34	0.01	-0.43	-0.11
R-square	0.11	0.06	0.05	0.10	0.19	0.03	0.07	0.01	0.06	0.10
R-sq(adj)	0.03	0.00	0.00	0.01	0.11	0.00	0.00	0.00	0.00	0.02
F-ratio	1.38	0.71	0.51	1.13	2.50**	0.36	0.79	0.13	0.63	1.20
D. Watson	2.24	2.41	1.90	2.08	1.95	1.92	2.00	1.78	1.99	1.88
	P E R I O D				T W E N T Y		O N E			
a(const.)	1.45	1.70	1.45	1.92	1.62	1.83	0.38	0.04	2.01	1.04
t-value	2.40	2.81	1.70	2.28	1.61	2.71	0.41	0.04	2.51	1.12
b1(IP-US)	0.05	-0.12	0.63	1.31	3.15	0.69	0.79	0.80	0.57	1.10
t-value	0.07	-0.17	0.63	1.34	2.70**	0.88	0.74	0.62	0.62	1.02
b2(MS-JP)	0.15	0.12	-0.19	0.27	0.03	0.01	0.10	-0.03	-0.10	0.22
t-value	1.47	1.18	-1.32	1.85*	0.20	0.05	0.65	-0.17	-0.74	1.40
b3(UN-FR)	-0.07	0.05	0.05	-0.19	-0.37	0.02	-0.15	0.02	0.06	-0.02
t-value	-0.38	0.25	0.20	-0.70	-1.15	0.08	-0.51	0.06	0.22	-0.07
b4(UN-AU)	0.32	0.23	0.20	-0.09	0.22	0.08	0.42	0.05	-0.01	0.46
t-value	1.77*	1.27	0.79	-0.36	0.72	0.40	1.53	0.16	-0.03	1.66*
b5(EX-SP)	-0.03	0.00	-0.01	-0.02	-0.12	0.01	0.00	0.00	0.00	0.00
t-value	-0.50	-0.03	-0.16	-0.23	-1.36	0.13	-0.05	0.04	-0.01	0.05
R-square	0.11	0.06	0.05	0.10	0.16	0.02	0.06	0.01	0.02	0.09
R-sq(adj)	0.03	0.00	0.00	0.01	0.09	0.00	0.00	0.00	0.00	0.01
F-ratio	1.34	0.73	0.58	1.16	2.11*	0.18	0.70	0.09	0.24	1.12
D. Watson	2.47	2.38	1.92	2.03	1.97	2.08	1.94	1.87	2.08	1.83
	P E R I O D				T W E N T Y		T W O			
a(const.)	1.60	1.62	1.51	2.31	1.97	2.03	0.37	0.12	2.30	1.79
t-value	2.60	2.62	1.73	2.76	1.92	2.97	0.39	0.11	2.87	2.01
b1(IP-US)	-0.09	-0.03	0.65	0.84	2.81	0.48	0.77	0.92	0.22	0.21
t-value	-0.12	-0.04	0.63	0.85	2.32**	0.59	0.69	0.68	0.24	0.20
b2(MS-JP)	0.15	0.12	-0.19	0.26	0.03	0.00	0.10	-0.02	-0.11	0.21
t-value	1.45	1.20	-1.28	1.82*	0.17	0.02	0.63	-0.11	-0.81	1.36
b3(UN-FR)	-0.11	0.07	0.03	-0.26	-0.45	-0.03	-0.14	-0.03	0.00	-0.17
t-value	-0.58	0.35	0.09	-1.01	-1.40	-0.12	-0.48	-0.08	0.01	-0.60
b4(UN-AU)	0.31	0.23	0.18	-0.08	0.21	0.08	0.43	0.01	0.00	0.47
t-value	1.72*	1.28	0.72	-0.34	0.68	0.39	1.56	0.04	-0.01	1.81
b5(EX-SP)	-0.01	-0.01	0.01	0.00	-0.10	0.02	-0.01	0.04	0.01	0.03
t-value	-0.26	-0.14	0.08	-0.06	-1.09	0.34	-0.14	0.43	0.12	0.41
R-square	0.11	0.07	0.05	0.09	0.14	0.01	0.06	0.01	0.02	0.10
R-sq(adj)	0.02	0.00	0.00	0.01	0.06	0.00	0.00	0.00	0.00	0.02
F-ratio	1.28	0.76	0.55	1.07	1.75	0.12	0.71	0.15	0.18	1.20
D. Watson	2.46	2.42	1.95	2.01	1.88	2.11	1.97	1.86	2.02	1.83
	P E R I O D				T W E N T Y		T H R E E			
a(const.)	1.53	1.70	1.53	2.07	1.62	2.19	0.35	0.40	2.10	1.73
t-value	2.41	2.69	1.71	2.43	1.55	3.03	0.36	0.34	2.60	1.91
b1(IP-US)	-0.09	-0.04	0.53	1.02	3.10	0.55	0.97	0.94	0.50	0.35
t-value	-0.12	-0.05	0.50	1.01	2.52**	0.65	0.85	0.66	0.52	0.33
b2(MS-JP)	0.15	0.13	-0.20	0.27	0.05	0.01	0.12	-0.01	-0.09	0.21
t-value	1.42	1.19	-1.34	1.89*	0.27	0.09	0.72	-0.07	-0.68	1.42
b3(UN-FR)	-0.08	0.04	0.03	-0.20	-0.36	-0.09	-0.16	-0.12	0.04	-0.16
t-value	-0.43	0.21	0.12	-0.78	-1.14	-0.39	-0.53	-0.34	0.15	-0.58
b4(UN-AU)	0.31	0.23	0.19	-0.09	0.19	0.07	0.42	0.01	-0.02	0.46

t-value	1.71*	1.27	0.74	-0.37	0.64	0.35	1.51	0.02	-0.07	1.78*
b5(EX-SP)	-0.01	-0.01	0.01	0.01	-0.08	0.01	-0.02	0.02	0.01	0.03
t-value	-0.15	-0.24	0.13	0.10	-0.93	0.09	-0.21	0.22	0.20	0.40
R-square	0.10	0.07	0.05	0.09	0.15	0.01	0.07	0.01	0.02	0.10
R-sq(adj)	0.02	0.00	0.00	0.01	0.07	0.00	0.00	0.00	0.00	0.02
F-ratio	1.22	0.76	0.57	1.08	1.83	0.14	0.77	0.14	0.21	1.22
D. Watson	2.42	2.43	1.99	1.99	1.97	2.02	1.98	1.77	2.06	1.67
		P E R I O D			T W E N T Y			F O U R		
a(const.)	1.74	1.81	1.59	2.04	1.44	2.22	0.57	0.66	2.08	2.21
t-value	2.79	2.77	1.75	2.34	1.37	3.05	0.57	0.55	2.54	2.59
b1(IP-US)	-0.31	0.02	0.43	0.85	3.18	0.50	0.99	0.68	0.49	-0.12
t-value	-0.42	0.03	0.40	0.82	2.54**	0.58	0.83	0.48	0.50	-0.12
b2(MS-JP)	0.15	0.12	-0.20	0.27	0.05	0.01	0.10	-0.02	-0.09	0.20
t-value	1.42	1.09	-1.34	1.92*	0.31	0.09	0.63	-0.10	-0.67	1.45
b3(UN-FR)	-0.12	0.01	0.03	-0.18	-0.33	-0.09	-0.22	-0.16	0.04	-0.24
t-value	-0.63	0.03	0.11	-0.68	-1.02	-0.41	-0.72	-0.46	0.18	-0.94
b4(UN-AU)	0.34	0.20	0.21	-0.04	0.19	0.08	0.38	0.04	-0.01	0.53
t-value	1.95**	1.06	0.82	-0.16	0.65	0.40	1.35	0.14	-0.04	2.2**
b5(EX-SP)	-0.01	-0.01	0.01	0.00	-0.08	0.00	-0.01	0.01	0.01	0.02
t-value	-0.27	-0.18	0.08	0.01	-0.91	0.07	-0.18	0.14	0.19	0.25
R-square	0.12	0.05	0.05	0.08	0.15	0.01	0.06	0.01	0.02	0.14
R-sq(adj)	0.04	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.06
F-ratio	1.53	0.56	0.56	0.99	1.83	0.14	0.69	0.11	0.20	1.71
D. Watson	2.60	2.30	1.99	1.92	1.94	2.09	1.89	1.85	2.01	1.92

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

APPENDIX 5.20

THE RESULTS OF CROSS-SECTIONAL REGRESSION

$$Ri = a + b1B1 + ... + b5B5$$

Where Ri is the mean of six monthly returns of each stock market and B1 to B5 are the estimated betas of US industrial production (IP-US), Japanese money supply (MS-JP),French unemployment (UN-FR),Australian unemployment (UN-AU) and Singaporean export (EX-SP) respectively.

	P1	P2	P3	P4	P5	P6	P7	P8
a(const.)	3.14	2.63	1.61	2.62	1.92	2.95	2.61	2.51
t-value	1.55	1.26	1.16	1.08	0.95	1.89	1.64	1.59
b1B1(IP-US)	-0.04	0.79	1.99	1.44	3.38	1.33	-0.63	0.77
t-value	-0.02	0.31	1.09	0.48	1.25	0.58	-0.27	0.23
b2B2(MS-JP)	-23.29	-19.65	-15.81	-7.23	2.93	-0.95	1.36	6.73
t-value	-1.87	-1.48	-1.97*	-0.60	0.24	-0.12	0.18	0.89
b3B3(UN-FR)	6.30	7.52	11.48	14.34	12.21	6.14	1.66	2.39
t-value	1.26	1.53	3.39**	2.39**	2.45**	1.33	0.39	0.31
b4B4(UN-AU)	13.07	12.98	16.81	13.93	5.26	3.31	3.19	1.07
t-value	2.22*	2.06*	4.93*	2.29*	1.02	0.69	0.69	0.21
b5B5(EX-SP)	34.18	46.28	56.85	39.98	58.98	40.40	10.42	33.92
t-value	0.93	1.05	1.84	0.82	1.37	1.10	0.28	0.73
R-sq(adj)	0.23	0.16	0.76	0.51	0.52	0.00	0.00	0.00
F-ratio	1.52	1.34	6.71**	2.85*	2.93*	0.99	0.29	0.62
D. Watson	1.38	0.99	0.79	0.85	1.52	2.21	2.66	2.08

	P9	P10	P11	P12	P13	P14	P15	P16
a(const.)	2.93	2.09	1.89	1.11	1.06	4.55	3.40	3.43
t-value	1.96	0.88	0.89	1.21	0.75	3.18	1.76	2.22
b1B1(IP-US)	0.55	-0.78	-2.51	1.35	2.72	-1.53	-1.36	-0.65
t-value	0.24	-0.31	-0.97	1.03	1.59	-0.90	-0.59	-0.41
b2B2(MS-JP)	4.12	7.22	-1.24	3.16	1.49	1.88	11.60	9.70
t-value	0.55	0.72	-0.13	0.78	0.31	0.32	1.39	1.60
b3B3(UN-FR)	-1.76	-13.37	-8.38	-1.70	0.49	-0.63	15.28	8.11

t-value	-0.24	-1.48	-1.09	-0.57	0.14	-0.13	1.10	0.96
b4B4(UN-AU)	1.78	-8.55	3.19	0.66	0.39	-1.15	-4.90	-2.11
t-value	0.30	-1.14	0.52	0.27	0.11	-0.24	-0.86	-0.49
b5B5(EX-SP)	22.25	-1.94	-34.19	30.17	62.93	-7.73	-40.13	-17.64
t-value	0.64	-0.06	-0.86	1.39	2.47**	-0.27	-1.00	-0.68
R-sq(adj)	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00
F-ratio	0.32	0.52	0.64	0.89	1.53	0.36	0.90	0.90
D. Watson	2.38	0.39	0.30	0.54	1.01	0.46	1.18	1.48

	P17	P18	P19	P20	P21	P22	P23	P24
a(const.)	2.67	1.57	1.83	1.05	1.81	2.13	-3.21	-3.89
t-value	1.35	0.57	0.70	0.76	1.71	1.24	-1.71	-2.44
b1B1(IP-US)	1.89	2.03	1.28	1.77	1.83	-2.51	-0.11	-0.62
t-value	0.99	0.88	0.49	1.40	1.61	-0.95	-0.03	-0.25
b2B2(MS-JP)	13.94	14.40	10.68	1.84	-3.55	-9.89	-1.39	-3.28
t-value	1.71	1.36	1.04	0.33	-0.69	-0.94	-0.13	-0.38
b3B3(UN-FR)	17.79	21.86	20.50	13.08	4.60	-9.20	2.21	-0.99
t-value	1.69	1.52	1.37	1.44	0.43	-0.60	0.10	-0.07
b4B4(UN-AU)	-4.17	1.54	1.13	5.72	5.34	7.67	5.88	0.43
t-value	-0.76	0.22	0.18	1.70	1.89	1.61	1.22	0.07
b5B5(EX-SP)	7.84	-0.84	-17.95	-8.76	10.72	-47.58	-33.77	-28.75
t-value	0.24	-0.02	-0.40	-0.31	0.36	-1.41	-0.79	-0.52
R-sq(adj)	0.16	0.00	0.00	0.18	0.20	0.24	0.00	0.00
F-ratio	1.35	0.80	0.51	1.40	1.44	1.58	0.88	0.15
D. Watson	1.03	1.32	1.35	1.73	1.13	1.91	1.72	1.74

** & * Significant at the 5 and 10 % level. P1 to P24 = period 1-24

CHAPTER SIX

MAXIMUM LIKELIHOOD PROCEDURE FOR ESTIMATING COINTEGRATION VECTORS: JOHANSEN MODEL

6.0. Introduction

This chapter deals with the Johansen model (1988), an alternative cointegration technique for estimating a long-run relationship of international stock market prices and economic variables. Specifically, the chapter is set out as follows: the first part contains some justifications for the application of this model, the second part explains the model's theoretical background and procedure for applying the model in this study. Finally, the third part reports the empirical results and also draws out the implications of our results.

6.1. Engle-Granger Versus Johansen Procedures

Recently, the concept of cointegration and error correction models (ECM) has attracted the attention of many researchers including Engle and Granger (1987)[14], Stock (1987), Johansen (1988), Nymoen (1989), Hall (1989), Taylor and Tonks (1989), Blangiewicz & Charemza (1990) and Johansen & Juselius (1990). Most of the earlier studies employ the

[14]The Engle-Granger two-step procedure has been explained in Chapter 4. The empirical results of this technique are reported and discussed extensively in Chapter 5.

Engle and Granger two-step procedure under the framework of OLS to test and estimate the cointegrating vectors. One may establish a two-step estimation procedure by first performing a level regression (i.e static model), second putting the residuals obtained from this regression into a dynamic model (or error corrections model). This procedure was followed and described in the previous chapter.

Engle and Granger claim that the two-step procedure would not only facilitate explicit tests of the underlying assumption of cointegration but would also provide estimates of the parameters which were superior to normal OLS and other standard econometric estimates. However, the usefulness of this procedure is questionable, particularly, in the respect of (1) a degree of small sample bias may occur in the estimated coefficients (Banerjee et al. [1986]) (2) there is no provision for the test for more than one cointegrating vector (Hall [1989]).

Following the procedure in Johansen (1988), a maximum likelihood estimation of the cointegration vectors will largely eliminate the above problems. Furthermore, Hall (1989) compares the maximum likelihood estimates of the cointegrating vector with those derived by the Engle and Granger two-step procedure and shows that the maximum likelihood estimator provides estimates of cointegrating vector which conform well with those produced by OLS.

6.2. Johansen Model and Procedure Employed in this Study[15]

Johansen (1988) suggests a maximum likelihood procedure which provides estimates of the cointegrating vectors (r) between a set of variables X and offers test statistics for the

[15]Since this chapter concentrates on Johansen's procedure, we reproduce our explanation on Johansen's theoretical frameworks from Chapter 4 here.

number of cointegrating vectors. The model begins with the lag polynomial distribution of order k as

$$X_t = \pi_1 X_{t-1} + \ldots + \pi_k X_{t-k} + e_t \quad t = 1,\ldots T \qquad (29)$$

where, X is a vector of N related variables; e_t, an N-dimensional vector, which is independently and identically distributed with zero mean and variance matrix Ω; π denotes cointegrating matrix which is defined as $\pi = \alpha\beta'$ (α and β are Nxr matrices) and the rows of β form the **r** distinct cointegrating vectors.

In fact, Johansen's model is based on the following theorem:

"The maximum likelihood estimate of the space spanned by β is the space spanned by the r canonical variates corresponding to the r largest squared canonical correlations between the residuals of X_{t-k} and ΔX_t corrected for the effect of the lagged differences of the X process. The likelihood ratio test statistic for the hypothesis is that there are at most r cointegrating vectors is

$$-2 \ln Q = -T \sum_{i=r+1}^{N} \ln (1 - \lambda_i) \qquad (30)$$

where, λ_{r+1}... ...λ_N are the N-r smallest squared canonical correlations." (pp. 236-237)

In order to employ this model, Hall's regression program REG-X is used. The program begins by reparameterizing (29) into

the following error correction model:

$$\Delta X = \Gamma_1 \Delta X_{t-1} + \ldots \Gamma_{k-1} \Delta X_{t-k-1} + \Gamma_k X_{t-k} + e_t \qquad (31)$$

where, $\Gamma_i = -I + \pi_1 + \ldots + \pi_i$; i= 1... k

Then, the program estimates (a) a set of residuals R_{0t} by regressing ΔX_t on the lagged differences of ΔX_t and X_{t-k} (b) a set of R_k residuals by regressing X_{t-k} on the same set of

lagged first difference. These two sets of residuals are, therefore, used to form the four matrices S_{00}, S_{0k}, S_{kk} and S_{k0} as defined below.

Hall expresses the likelihood function of parameters α, β, Ω denotes as

$$L(\alpha,\beta,\Omega)=|\Omega|^{-T/2}\exp[-1/2\sum_{t=1}^{T}(R_{0t}+\alpha\beta'R_{kt})'\Omega^{-1}(R_{0t}+\alpha\beta'R_{kt})] \quad (32)$$

If β is fixed, it can be maximized over α and Ω by regressing R_{0t} on $-\beta'R_{kt}$, this gives:

$$\alpha(\beta) = - S_{0k}\beta(\beta'S_{kk}\beta)^{-1} \quad (33)$$

and $$\Omega(\beta) = S_{00} - S_{0k}\,\beta(\beta'S_{kk}\beta)^{-1}\beta'S_{k0} \quad (34)$$

where, $$S_{ij} = T^{-1}\sum_{t=1}^{T} R_{it}R_{jt}\ ;\ i,j = 0,k$$

So, maximizing the likelihood function may be reduced to minimizing

$$|S_{00} - S_{0k}\beta(\beta'S_{kk}\beta)^{-1}\beta'S_{k0}| \quad (35)$$

and Hall shares that (35) will be minimized when

$$|\beta'S_{kk}\beta - \beta'S_{k0}S_{00}^{-1}S_{0k}\beta| / |\beta'S_{kk}\beta| \quad (36)$$

attains a minimum with respect to β

Define D as the diagonal matrix of ordered eigenvalues $\lambda_1 ..> .... > \lambda_N$ of $S_{k0}S_{00}^{-1}S_{0k}$ with respect to S_{kk}, that is λ_i satisfies

$$|\lambda S_{kk} - S_{k0}S_{00}^{-1}S_{0k}| = 0 \quad (37)$$

and E as the matrix of the corresponding eigenvectors, then, $S_{kk}ED = S_{k0}S_{00}^{-1}S_{0k}E$, where E is normalised such that $E'S_{kk}E = I$.

To calculate eigenvalues in (37) the Reg-X program decomposes the matrix $S_{kk} = CC'$ using a Cholesky decomposition which gives

$$| \lambda I - C^{-1}S_{k0}S_{00}^{-1}S_{0k}C'^{-1} | = 0 \qquad (38)$$

and if V_1.....V_N denote the normalised eigenvectors such that $V'V = I$, then $E = C'^{-1}V$.

In applying the Johansen model in this study, the following procedures are involved:

(1) The ten related countries in this study are divided into four groups, i.e. the US, the UK, West Germany, France, and Japan (Group 1); Japan, Singapore, Malaysia, Australia and South Africa (Group 2); the UK, West Germany, France and Norway (Group 3) and West Germany, France and Norway (Group 4). Then, the long-run relationship and the stability of stock market prices and economic variables within each group are examined.[16]

(2) The market indices and economic variable (levels) are converted to natural logarithms.

(3) Each data set (market indices and economic variables) is divided into 2 subsets [I_{it}; $t = 1,2,3,.....N_1$] and [I_{it}; $t = N_1+1,.....N$] covering period 1980 - 1983 and 1984 - 1987 respectively. The GNP series are based on quarter end observations.

(4) Hall's Reg-X program is run for each sub-period with a maximum lag of 3, that is the lowest order which is adequate to obtain approximate whiteness of the residuals.

6.3. Empirical Results and Implications

In Table 6.1, the results of likelihood ratio test statistics for stock market prices and economic variables from four country groups in period 1 and 2 are presented together with the 95 percent critical value of Johansen.

[1616]Group 1 comprises well developed countries with developed markets, Group 2 represents countries in Asian-Pacific region (except South Africa), while countries within Europe and continental Europe come under Group 3 and 4 respectively. The similarity of economic characteristics and location are the basis of this grouping.

TABLE 6.1

RESULTS OF LIKELIHOOD RATIO TEST OF MAXIMUM r VECTORS FOR STOCK MARKET PRICES AND ECONOMIC VARIABLES ESTIMATED BY JOHANSEN PROCEDURE CARRIED OUT OVER PERIOD ONE (P1) (JAN 1980-DEC 1983) AND PERIOD TWO (P2) (JAN 1984-DEC 1987)

		G R O U P 1					G R O U P 2				
		r					r				
		0	1	2	3	4	0	1	2	3	4
MP	P1	83.5	38.82	18.67	5.90	0.01	44.97	28.09	12.14	3.97	0.23
	P2	84.2	49.92	28.13	13.70	1.84	80.44	39.38	24.46	13.24	2.95
GNP	P	98.4	51.66	24.46	6.47	0.04	121.10	76.19	35.75	6.07	0.19
IP	P1	99.9	50.10	24.79	2.42	0.07	73.60	40.44	19.72	11.58	4.09
	P2	74.9	36.71	18.02	4.50	0.68	71.06	44.58	23.08	10.40	2.38
CP	P1	103.3	49.98	29.45	14.56	6.72	116.90	76.86	42.22	15.34	2.11
	P2	106.7	55.60	26.46	7.11	0.76	68.04	35.21	15.53	3.32	0.17
MS	P1	62.1	31.83	11.73	1.91	0.03	79.26	46.89	24.25	10.36	3.81
	P2	91.9	44.66	22.09	9.14	3.38	68.24	34.90	14.80	6.28	0.38
TB	P1	92.9	53.10	29.90	8.50	0.10	121.10	76.20	35.80	6.10	0.20
	P2	78.7	51.23	31.75	15.18	5.27	73.60	40.44	19.72	11.58	4.09
UN	P1	166.3	87.39	46.25	13.78	5.52	96.31	56.46	28.18	8.46	1.52
	P2	147.5	64.89	29.42	12.07	1.92	85.43	46.03	25.73	11.57	2.56
IMP	P1	69.5	36.99	15.40	4.96	0.45	77.34	48.84	24.70	8.15	2.39
	P2	57.8	35.64	17.17	5.49	1.61	66.75	40.52	22.35	8.04	0.14
EXP	P1	59.3	29.18	14.39	5.11	0.01	68.67	38.05	19.45	9.28	0.51
	P2	63.3	30.22	14.88	5.62	0.17	77.71	40.89	21.19	8.33	1.02
JS 95 %		57.2	38.60	23.80	12.00	4.20	57.20	38.60	23.80	12.00	4.20

		G R O U P 3				G R O U P 4		
		r				r		
		0	1	2	3	0	1	2
MP	P1	51.9	24.80	6.30	0.06	23.99	6.81	0.02
	P2	54.5	28.78	13.02	3.24	29.16	11.75	3.11
GNP	P	136.8	40.00	8.90	0.00	86.90	24.30	0.30
IP	P1	51.2	27.99	6.99	2.16	22.76	9.09	3.26
	P2	34.0	17.48	6.69	0.26	20.39	5.27	0.33
CP	P1	43.9	23.80	14.38	6.72	22.15	12.56	5.35
	P2	63.2	29.83	13.35	0.04	25.68	8.09	0.02
MS	P1	30.9	14.34	2.65	0.16	17.14	3.07	0.15
	P2	51.5	23.80	9.29	1.67	44.16	16.71	2.44
TB	P1	91.6	41.49	13.07	2.86	63.68	26.33	3.52
	P2	52.4	29.27	13.04	5.08	25.69	7.88	2.24
UN	P1	94.9	43.57	15.14	1.39	49.89	6.78	1.69
	P2	141.1	52.20	18.88	0.06	102.80	26.64	1.31
IMP	P1	39.1	16.34	5.55	0.18	26.04	5.23	1.01
	P2	43.9	21.54	8.77	1.45	25.59	11.47	1.39
EXP	P1	44.6	13.75	4.87	0.04	37.30	4.56	0.29
	P2	38.4	21.99	11.59	3.91	26.91	11.43	4.71
JS 95 %		38.6	23.8	12.0	4.2	23.8	12.0	4.2

Notes: (a) Group 1 = US, UK, West Germany, France and Japan; (b) Group 2 = Japan, Singapore, Malaysia, Australia and South Africa; (c) Group 3 = UK, West Germany, France and Norway and(d) Group 4 = West Germany, France and Norway (e) the data set for GNP cover one period only, from Jan 1980 to Dec 1984 and (f) JS denotes Johansen Statistics - 95 % critical value (Johansen 1988).

By and large the evidence shows that the likelihood ratio test statistics are significant at the 5 percent level for r = 0. This means the null hypothesis that there are at most 0

cointegrating vectors for both stock market prices and economic variables within each country group can be easily rejected. Therefore, it is clear that there is at least one cointegrating vector for both stock market prices and economic variables within countries in Group 1 (US, UK, WG, FR and JP), Group 2 (JP, SP, MY, AU and SA), Group 3 (UK, WG, FR, NW) and Group 4 (WG, FR and NW).

The likelihood ratio tests that there are at most 0, 1, 2 or more cointegrating vectors of stock market returns and economic variables within countries in each group during period 1 and 2 are summarised in Table 6.2. From these results, the following generalisations can be made:

(1) Group 1, consisting of the US, the UK, West Germany, France and Japan, produces a relatively high number of cointegrating vectors of economic variables. There may, for Group 1 countries, be more than 3 cointegrating vectors in the stock prices and 4 in economic variables (CP, TB and UNEMP). It seems that in period one, there are no cointegrating vectors at all within market prices from the Asian-Pacific region (Group 2). Countries in Group 3 and 4 within Europe tend to have fewer cointegrating vectors in the economic variables.

(2) The results also show that the cointegrating vectors of stock markets and economic variables within countries in each group for period one and two are not stable. The number of cointegrating vectors of stock markets returns for all groups tends to increase in period two. There is also an increase in cointegrating factors of some economic variables in period 2, especially TB and MS from Group 1 and 3.

TABLE 6.2

A SUMMARY OF SIGNIFICANT LIKELIHOOD RATIO TEST STATISTICS FOR THE HYPOTHESIS THAT THERE ARE THE MOST r COINTEGRATING VECTORS AT 5 PERCENT SIGNIFICANCE LEVEL

	Group 1		Group 2		Group 3		GROUP 4	
V'ble	P1	P2	P1	P2	P1	P2	P1	P2
MR	1	3	-	3	1	2	0	0
GNP*	2		2		1		1	
IP	2	1	1	2	1	-	-	-
CP	4	2	3	0	1	2	-	0
MS	0	1	2	0	-	1	-	1
TB	2	4	2	1	2	3	1	0
UNEMP	4	3	2	2	2	2	0	1
IMP	0	1	2	1	0	0	0	0
EXP	0	0	0	1	0	0	0	0

Notes (1) * The test for the number of r cointegrating vectors for GNP is based on one period test i.e. 1980 to 1987. (2) The countries in each group are: Group One = US, UK, West Germany, France and Japan; Group Two = Japan, Singapore, Malaysia, Australia and South Africa; Group Three = UK, West Germany, France and Norway and Group Four = West Germany, France and Norway.

The results imply that there is a significant long term relationship between stock market prices in US, UK, West Germany, France and Japan. The stock prices within European countries are also related to each other. However, the relationship between stock markets within Asian-Pacific region only have been cointegrated in the later period. Beside that, the relationship between international stock markets is unstable in the long run.

Interestingly, the results also suggest that the movements of economic variables do not significantly differ from those of stock market prices. For example, the relationship between similar economic variables from the countries within the same group also change over the long period. For some economic variables in European countries, the strength of the relationship tends to increase as time increases.

The relationship of international stock prices and economic variables can be obtained from the estimated eigenvectors, i.e. the coefficients estimates of the cointegrating relation, which are shown in Appendix 6.0. For example the maximum likelihood estimate of the cointegrating vector for stock prices in the US, the UK, WG, FR, JP within Group 1 during the first period would be 1, -0.36, -1.39, 1.03 and 2.05.[17]

In fact, these results are consistent with the earlier findings as documented in Chapter 5[18] i.e. the Box Chi-square, Chow test and the results derived from Engle and Granger procedure using DW statistics. Furthermore, the above results also support the findings in Ripley (1972), Cho, Eun and Senbet (1986) and Taylor and Tonks (1989).

6.4. An Error Correction Model for Stock Prices

According to Engle and Granger (1987) and Hylleberg and Mizon (1989), if a cointegrating vector exists between a set of variable X, then there is an error correction mechanism which links the variables in X_t, such that

$$A(B)(1-B)X_t = \tau z_{t-1} + e_t \qquad (51)$$

---

[17]Note that the eigenvectors of row 1 were normalised, so that the US stock prices take the value of one.

[18]However, we have reported in Chapter 5 that the international stock markets and economic variables are not integrated since the considerable amount of statistical results produced by ADF technique is not supportive to reject the hypothesis of non-cointegration. Here, in contrast, we describe the international stock markets and economic variables are cointegrated. We expect this to occur because the method of applying cointegration technique is not the same. In Engle-Granger two-step estimation procedure, we use univariate cointegration regression i.e. one explanatory variable. Intuitively, the cointegration phenomenon characteristics in univariate case may be inferior as compared to multivariate approach which we adopt in Johansen model.

where, $A(B) = I + A_1B_1 +...+ A_nB_n$, is a NxN matrix of lag polynomial of order n, τ is a Nx1 vector of constants, e_t denotes Nx1 error vector which has stationary white noise elements and $z_t = \alpha X$, (α, the unique cointegrating vector).

Since our results show that there is at least one cointegration vector in international stock prices during these two periods, it is appropriate to identify the error correction representation. Given the dynamic form of error correction mechanism, one should expect that the changes in stock prices of a market will have a significant effect on other markets. For the purpose of interpreting the implication of ECM, we investigate only the joint effects of stock prices from the US, West Germany, France and Japan on the UK market by employing the following autoregression model. This model is based on the concept of error correction equation as stated above.

$$\Delta UK_t = \alpha + \sum_{i=1}^{n} ß_{1i}\Delta UK_{t-i} + \sum_{i=1}^{n} ß_{2i}\Delta US_{t-i} + \sum_{i=1}^{n} ß_{3i}\Delta WG_{t-i} + \sum_{i=1}^{n} ß_{4i}\Delta FR_{t-i} + \sum_{i=1}^{n} ß_{5i}\Delta JP_{t-i} +$$

$$ß_6US_{t-k} + ß_7UK_{t-k} + ß_8WG_{t-k} + ß_9FR_{t-k} + ß_{10}JP_{t-k} + e_t \qquad (52)$$

where, all stock indices (level) are in logarithms covering the whole period (1980-1987). This model involves a regression of the first difference in the UK, ΔUK_t, on all lagged differences of all variables up to third lag (n) and 4 period lagged level (k) of each variable. Our model involves testing for significance of lagged differences and lagged level of the overseas market indices. In the case of a univariate analysis, the above model could reduce to AUVAR (augmented, unrestricted vector autoregression shown in Engle and Granger (1987). The results are given in Table 6.3 below.

TABLE 6.3

THE RESULTS OF ERROR CORRECTION TEST

$$\Delta UK_t = \underset{(1.57)}{0.368} - \underset{(-1.48)}{0.286}(\Delta UK_{t-1}) - \underset{(-0.04)}{0.008}(\Delta UK_{t-2}) - \underset{(-1.51)}{0.301}(\Delta UK_{t-3}) +$$

$$\underset{(0.87)}{0.149}(\Delta US_{t-1}) + \underset{(0.27)}{0.048}(\Delta US_{t-2}) - \underset{(-0.34)}{0.06}(\Delta US_{t-3}) + \underset{(0.43)}{0.058}(\Delta WG_{t-1}) +$$

$$\underset{(2.81)**}{0.365}(\Delta WG_{t-2}) - \underset{(-0.56)}{0.082}(\Delta WG_{t-3}) - \underset{(-0.50)}{0.063}(\Delta FR_{t-1}) - \underset{(-0.73)}{0.084}(\Delta FR_{t-2}) +$$

$$\underset{(0.12)}{0.015}(\Delta FR_{t-3}) + \underset{(2.49)**}{0.461}(\Delta JP_{t-1}) - \underset{(-0.18)}{0.038}(\Delta JP_{t-2}) + \underset{(1.50)}{0.327}(\Delta JP_{t-3}) -$$

$$\underset{(-2.05)**}{0.2220}(US_{t-4}) - \underset{(-0.34)}{0.0340}(UK_{t-4}) + \underset{(1.11)}{0.0779}(WG_{t-4}) + \underset{(0.45)}{0.0301}(FR_{t-4}) +$$

$$\underset{(0.49)}{0.0500}(JP_{t-4})$$

R-sq = 0.29 R-sq(adj) = 0.10 F-ratio = 1.51*

* Significant at the 10 % level.
** Significant at the 5 % level.

The results show that stock markets from West Germany, Japan and the US are significantly related to the UK at the 5 percent level. Therefore, during period 1980 to 1987, there is an error correction representation which links stock markets from the UK, the US, West Germany and Japan. France, however, has no strong evidence of cointegration with the UK. With the exception of France, the results support the findings in Taylor and Tonks (1989) which indicates the presence of Granger-causality running from the UK to West Germany and Japan.

In order to examine whether there is an error correction mechanism in the cointegrating vectors of stock prices from these countries for the period 1980 to 1987, we perform the following analyses: (a) The beta coefficients of 4 period lagged level of each variable, i.e. $ß_1US_{t-k}$, $ß_2UK_{t-k}$, $ß_3WG_{t-k}$, $ß_4FR_{t-k}$, $ß_5JP_{t-k}$ are respectively replaced by the eigenvectors in rows

4 as reported in Appendix 6.1 (i.e. -6.835, -4.191, -5.441, 4.225, 7.710). These eigenvectors are considered because they belong to the highest eigenvalue during the period under study (b) These are, then, subtracted from each observation of ΔUK_t to obtain $\Delta UK_t'$ and finally (c) $\Delta UK_t'$ is regressed on all lagged differences of all variables up to the third lag (n), as[19]

$$\Delta UK_t' = \alpha + \sum_{i=1}^{n} \beta_{1i} \Delta UK_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta US_{t-i} + \sum_{i=1}^{n} \beta_{3i} \Delta WG_{t-i} + \sum_{i=1}^{n} \beta_{4i} \Delta FR_{t-i} + \sum_{i=1}^{n} \beta_{5i} \Delta JP_{t-i} + e_t .. \quad \text{..... (53)}$$

The results of this regression model are reported in the Table 6.4.

Table 6.4

THE RESULTS OF ERROR CORRECTION TEST

(the Constrained Regression Model)

$$\Delta UK_t' = 4.540 - \underset{(-0.83)}{0.145}(\Delta UK_{t-1}) + \underset{(0.60)}{0.109}(\Delta UK_{t-2}) - \underset{(-1.10)}{0.196}(\Delta UK_{t-3}) +$$

$$\underset{(1.23)}{0.210}(\Delta US_{t-1}) + \underset{(0.23)}{0.040}(\Delta US_{t-2}) + \underset{(0.13)}{0.022}(\Delta US_{t-3}) - \underset{(-0.11)}{0.014}(\Delta WG_{t-1}) +$$

$$\underset{(2.33)*}{0.302}(\Delta WG_{t-2}) - \underset{(-1.52)}{0.209}(\Delta WG_{t-3}) - \underset{(-0.65)}{0.073}(\Delta FR_{t-1}) - \underset{(-0.70)}{0.077}(\Delta FR_{t-2}) +$$

$$\underset{(0.11)}{0.012}(\Delta FR_{t-3}) + \underset{(1.99)*}{0.345}(\Delta JP_{t-1}) - \underset{(-1.06)}{0.196}(\Delta JP_{t-2}) + \underset{(0.58)}{0.107}(\Delta JP_{t-3})$$

R-sq = 0.19 R-sq(adj) = 0.03 F-ratio = 1.22

*Statistically significant at the 5 % level

As shown in Table 6.4 above, both West Germany and Japan are significantly related to the UK. This implies that the cointegration vector of stock prices from the UK, West Germany and Japan produces an error correction mechanism. However, comparing the

[19]We calculate $\Delta UK_t'$ based on this equation: $UK_t - UK_{t-1} = \alpha + \beta(UK_t - UK_{t-1})$ and $UK_t = \alpha + UK_{t-1}(1-\beta)$. With the 4 lagged level, β is equivalent to the estimate in (a) above.

coefficients on the lagged differences of the unconstrained regression (52) with those from the constrained regression (53), we find that the coefficients on both regressions are not statistically different (see analysis of variance in Appendix 6.2), thus confirming the error correction model and the long term relationship within this group of countries. One can therefore think of the model as linking the UK market through a long term equilibrium relationship with the other markets. It is even possible that the UK market could be forecast by the model since the representative (Table 6.3) uses past value of the UK and other markets to forecast current values of the UK market.

6.5. Summary and Conclusion

This chapter employs Johansen model to estimate the long-run relationship of the international stock prices and economic variables. The results show that there is at least one cointegrating vector for the international stock prices and economic variables. It seems that the group of developed countries, specifically the US, the UK, the West Germany, France and Japan, tend to have high number of cointegrating vectors of stock prices and economic variables. The results also indicate that the cointegrating vectors of stock prices and economic variables within countries are not stable in the long run. By and large, the number of cointegrating vectors of stock market and economic variables tend to increase in the later period.

Finally, this study suggests that the cointegrating vectors of stock markets within developed countries, namely the UK, West Germany and Japan produce an error correction mechanism, implying that the changes in stock prices of a market within these countries will have significant effects on the other markets.

APPENDIX 6.0

EIGENVALUES AND EIGENVECTORS OF STOCK MARKET RETURNS AND ECONOMIC VARIABLES DERIVED BY JOHANSEN ESTIMATION PROCEDURE CARRIED OUT OVER PERIOD ONE (JAN 1980 TO DEC 1983) & PERIOD TWO (JAN 1984 TO DEC 1987)

MARKET RETURNS

EIGENVALUES	E I G E N V E C T O R S				
	US	UK	WG	FR	JP
	P e r i o d O n e				
0.6295	11.42	4.06	15.85	-11.72	-23.44
0.0024	-8.61	-1.03	2.57	9.44	12.84
0.1227	7.82	-9.61	11.60	-3.78	-8.36
0.2471	12.19	2.83	-20.38	7.67	1.03
0.3609	6.55	-14.65	-1.40	-1.43	21.83
	P e r i o d T w o				
0.0400	3.62	-16.57	7.49	-7.38	13.76
0.5327	-35.69	32.11	3.67	2.73	-4.40
0.2744	11.59	-26.07	3.58	0.70	5.47
0.3838	-33.22	7.63	-2.50	8.44	12.01
0.2316	-3.73	-13.69	6.07	-20.54	27.96

EIGENVALUES	E I G E N V E C T O R S				
	JP	SP	MY	AU	SA
	P e r i o d O n e				
0.0051	20.18	1.36	-6.74	14.46	-9.62
0.2985	11.38	-5.15	11.22	-6.17	-6.14
0.0798	-10.63	-12.28	12.52	-7.11	8.91
0.1660	-19.77	18.57	-9.32	5.92	-4.46
0.3128	-28.06	13.18	-5.67	1.56	12.04
	P e r i o d T w o				
0.0634	2.79	-12.34	10.61	4.09	-0.57
0.2208	8.48	12.21	-6.28	-8.84	-2.05
0.2044	-8.78	-8.16	6.84	-1.28	12.55
0.2821	-10.35	12.12	-11.95	1.83	7.49
0.5985	18.68	-16.54	7.27	-29.11	17.91

EIGENVALUES	E I G E N V E C T O R S			
	UK	WG	FR	NW
	P e r i o d O n e			
0.1295	10.61	-23.60	2.09	7.55
0.0014	-0.69	6.54	7.48	-2.04
0.3370	6.69	5.36	8.57	-12.26
0.4523	2.91	-38.60	5.07	13.56
	P e r i o d T w o			
0.0694	-5.04	3.99	2.59	1.01
0.1954	-17.15	1.37	8.82	1.76
0.4363	0.57	-5.31	7.53	-5.28
0.2955	-27.62	-10.98	15.58	23.63

EIGENVALUES	E I G E N V E C T O R S		
	WG	FR	NW
	P e r i o d O n e		
0.0005	3.11	6.96	-0.12
0.1399	12.08	7.28	-11.82
0.3175	-35.58	2.54	15.09
	P e r i o d T w o		
0.0668	3.46	0.51	-0.43
0.3208	-5.49	7.76	-5.13
0.1747	-7.87	0.89	11.01

G N P

EIGENVALUES	E I G E N V E C T O R S				
	US	UK	WG	FR	JP
0.4621	23.24	36.09	25.01	2.23	-103.10
0.6084	6.97	120.40	56.39	-19.28	-223.50
0.1992	-30.64	-142.00	125.90	7.63	143.80
0.0012	16.70	-124.50	77.88	47.04	9.93
0.8003	-149.90	-120.90	86.59	43.48	254.00

EIGENVALUES	E I G E N V E C T O R S				
	JP	SP	MY	AU	SA
0.0019	-62.55	-11.84	0.14	49.04	-6.41
0.5935	-44.01	31.31	2.03	82.72	-51.15
0.2106	-21.63	5.66	1.95	10.96	-7.37
0.5060	-95.19	-37.63	-2.17	96.58	-22.68
0.81415	-151.10	7.33	-2.18	-22.93	72.83

EIGENVALUES	E I G E N V E C T O R S			
	UK	WG	FR	NW
0.0001	-32.50	143.00	-27.54	-7.45
0.3099	-94.91	104.40	32.18	-7.12
0.7261	-26.63	-32.34	40.34	4.99
0.9823	0.90	0.26	-12.65	10.39

EIGENVALUES	E I G E N V E C T O R S		
	WG	FR	NW
0.6324	-58.48	29.59	6.03
0.0106	-104.80	39.85	4.14
0.9265	-12.96	-2.77	9.97

I P

EIGENVALUES	E I G E N V E C T O R S				
	US	UK	WG	FR	JP
	P e r i o d O n e				
0.3917	15.23	72.67	38.85	-133.30	-61.04
0.0507	3.77	41.57	-43.53	17.42	-38.60
0.4302	-13.02	-5.02	11.88	113.10	-9.99
0.6689	61.71	-6.14	-122.10	176.20	-3.28
0.0017	-31.35	-20.16	53.18	-13.53	82.39
	P e r i o d T w o				
0.0150	-71.70	-16.13	-1.78	48.86	98.88
0.2595	-33.04	85.29	-32.52	-104.90	16.70
0.5722	5.88	-32.72	76.13	-79.27	-30.64
0.3399	-127.30	47.18	-7.13	103.00	8.27
0.0814	-69.01	-13.10	-24.64	17.50	75.23

EIGENVALUES	E I G E N V E C T O R S				
	JP	SP	MY	AU	SA
	P e r i o d O n e				
0.0012	54.09	-1.82	-4.47	21.49	-3.35
0.1558	-4.61	10.70	0.71	17.29	-5.42
0.2662	47.86	13.63	-7.79	52.53	-63.93
0.7034	33.89	-67.60	11.02	-8.47	50.95
0.4479	27.97	-24.57	18.80	-47.84	43.90

P e r i o d T w o

0.4408	97.83	-17.15	-6.25	0.31	40.61
0.5111	-59.50	10.38	7.40	22.90	-46.96
0.1949	1.45	-27.39	23.75	4.69	34.97
0.0623	-83.84	-7.61	-24.72	44.44	-11.67
0.2901	122.10	-5.19	-13.37	13.56	97.56

EIGENVALUES	E I G E N V E C T O R S			
	UK	WG	FR	NW
	P e r i o d O n e			
0.0469	34.08	-12.58	4.08	3.86
0.1018	-6.71	46.36	-51.93	21.18
0.4028	-44.20	-47.39	189.50	19.69
0.3728	-33.68	-25.97	-23.27	27.79
	P e r i o d T w o			
0.0057	11.82	-3.51	50.86	1.07
0.1332	2.46	38.17	-78.36	2.14
0.2131	-77.11	48.64	97.39	-5.10
0.3073	-45.14	9.49	-0.69	21.91

EIGENVALUES	E I G E N V E C T O R S		
	WG	FR	NW
	P e r i o d O n e		
0.0699	35.22	-11.33	20.05
0.2619	-23.65	123.40	-11.28
0.1214	-47.31	70.89	16.68
	P e r i o d T w o		
0.1039	40.02	-67.74	0.13
0.0073	2.16	64.27	1.37
0.2853	-12.90	-53.52	21.42

C P

EIGENVALUES	E I G E N V E C T O R S				
	US	UK	WG	FR	JP
	P e r i o d O n e				
0.1387	25.43	96.64	64.74	-67.89	-156.70
0.6945	-232.40	128.60	55.93	-50.52	241.90
0.3663	-125.60	99.06	74.38	0.55	-126.40
0.2816	-9.47	99.63	-263.30	76.49	-77.82
0.1599	15.59	-111.90	168.60	-17.38	96.83

Period Two

0.4767	28.53	-34.18	184.80	57.22	-171.20
0.0169	-186.40	-52.18	-53.12	208.10	-21.99
0.1315	101.70	-76.07	122.60	-43.14	113.80
0.3495	94.36	-229.20	-182.80	213.50	145.80
0.6784	-63.91	153.10	-103.90	-167.70	302.60

EIGENVALUES	EIGENVECTORS				
	JP	SP	MY	AU	SA
	Period One				
0.2548	-6.92	0.73	94.02	190.30	-156.60
0.0457	-32.32	43.38	36.29	-8.74	-20.29
0.4496	-64.18	-143.00	187.10	-122.80	42.87
0.5895	-233.50	119.00	-29.98	156.00	-64.39
0.5369	-57.76	-63.99	37.90	-212.50	156.30
	Period Two				
0.0674	-43.87	-104.80	57.86	-30.27	13.00
0.0039	-40.38	131.60	-155.10	16.10	10.12
0.5178	5.43	144.00	482.70	-162.00	45.05
0.3543	-297.00	220.90	-441.40	-19.62	46.48
0.2376	29.30	170.80	11.91	-227.90	90.43

EIGENVALUES	EIGENVECTORS			
	UK	WG	FR	NW
	Period One			
0.1565	-34.02	-10.36	-78.72	119.70
0.3605	-106.20	192.00	56.42	-66.26
0.1388	-1.01	-270.20	52.86	69.80
0.1894	-36.39	68.20	-85.00	74.04
	Period Two			
0.3065	-121.90	-158.60	248.90	-28.53
0.0009	16.58	-80.17	83.75	-57.17
0.2561	100.80	-379.40	63.98	-71.54
0.5235	-335.20	185.30	171.70	97.19

EIGENVALUES	EIGENVECTORS		
	WG	FR	NW
	Period One		
0.1481	-15.12	-77.03	95.15
0.1121	-263.30	69.31	52.41
0.1919	-90.37	-92.85	130.70

	P e r i o d T w o		
0.3235	-175.10	160.90	-55.10
0.0005	74.58	-94.32	52.86
0.1641	330.80	-135.50	47.53

M S

EIGENVALUES	E I G E N V E C T O R S				
	US	UK	WG	FR	JP
	P e r i o d O n e				
0.0006	29.03	13.04	17.54	-28.54	7.35
0.3602	5.92	37.58	-12.90	-36.50	19.15
0.1962	-106.50	37.41	35.17	17.35	-5.38
0.0409	-15.35	-7.89	-24.17	24.02	5.07
0.4893	16.73	-31.08	39.20	-12.58	51.06
	P e r i o d T w o				
0.1201	29.19	1.72	-8.89	-14.65	-16.30
0.0723	-68.84	32.44	20.02	9.01	-3.10
0.6500	20.14	-23.96	79.98	-44.33	-16.50
0.2502	1.55	-12.48	11.43	52.51	-30.69
0.3944	-18.06	-41.60	27.97	82.46	42.05

EIGENVALUES	E I G E N V E C T O R S				
	JP	SP	MY	AU	SA
	P e r i o d O n e				
0.0811	-10.29	13.66	19.42	-25.92	-5.12
0.2655	-45.28	2.96	5.83	-9.64	7.54
0.5129	18.93	-59.61	39.26	-33.37	12.49
0.1355	19.41	-13.89	3.00	25.72	-1.19
0.3954	-8.18	49.73	-72.83	1.34	12.10
	P e r i o d T w o				
0.0085	5.46	-10.40	12.87	2.46	7.15
0.1724	5.10	22.93	13.60	-25.52	-1.53
0.5232	-50.53	17.73	-20.18	50.97	-21.42
0.1228	-22.56	9.80	13.19	-11.17	13.46
0.3603	27.33	-41.33	62.31	-28.17	11.76

EIGENVALUES	E I G E N V E C T O R S			
	UK	WG	FR	NW
	P e r i o d O n e			
0.0037	25.31	21.54	-16.16	15.30
0.5374	14.81	37.04	-26.24	0.76
0.3078	-39.73	17.46	37.16	-14.35
0.2287	-36.34	29.49	-21.19	56.38
	P e r i o d T w o			
0.5689	9.87	48.92	-53.93	-1.86
0.3555	-17.50	62.01	-46.54	6.82
0.2065	-48.30	30.13	98.57	1.33
0.0492	-28.11	-1.48	11.28	26.01

EIGENVALUES	E I G E N V E C T O R S		
	WG	FR	NW
	P e r i o d O n e		
0.0034	18.95	-11.25	15.79
0.0627	-43.63	20.95	-7.81
0.2685	8.99	-39.84	50.61
	P e r i o d T w o		
0.5648	55.02	-42.97	1.18
0.3511	-33.18	67.35	-7.93
0.0713	-30.81	-15.05	19.68

T B

EIGENVALUES	E I G E N V E C T O R S				
	US	UK	WG	FR	JP
	P e r i o d O n e				
0.2301	0.92	0.29	1.25	3.64	7.99
0.5871	-9.13	7.99	-0.13	5.43	-2.07
0.3778	-4.75	-8.23	8.66	-2.20	8.33
0.1702	0.63	-0.33	-3.37	10.96	-1.83
0.4033	5.36	-7.73	-9.13	14.80	30.43
	P e r i o d T w o				
0.3513	-1.40	9.65	3.86	7.02	-6.99
0.1105	-9.46	3.74	-6.24	8.31	5.61
0.1977	-4.20	-3.78	10.70	-5.51	0.67
0.4571	-20.27	-9.68	2.18	16.97	2.24
0.3081	0.04	-0.55	-10.71	11.70	4.99

EIGENVALUES	E I G E N V E C T O R S				
	JP	SP	MY	AU	SA
	P e r i o d O n e				
0.0043	3.90	0.21	-3.13	-0.25	7.41
0.4829	-17.82	6.52	-8.18	5.68	-4.02
0.6317	13.43	3.21	2.12	7.42	-1.07
0.5929	-5.08	-1.42	-30.27	8.10	-0.76
0.1224	-5.36	-2.87	-1.78	0.77	1.93
	P e r i o d T w o				
0.0870	-9.90	9.16	2.03	2.33	10.75
0.5214	-7.43	9.89	8.19	-4.69	8.48
0.1654	-13.08	4.55	7.29	0.95	2.84
0.3691	6.73	0.06	-12.13	2.19	-5.49
0.1532	-1.593	2.43	-5.01	1.12	6.03

EIGENVALUES	E I G E N V E C T O R S			
	UK	WG	FR	NW
	P e r i o d O n e			
0.0764	2.86	0.13	5.09	2.83
0.2469	-13.06	0.79	13.87	-20.30
0.5458	0.26	-11.08	21.26	-17.36
0.7516	0.80	3.81	-10.15	30.27
	P e r i o d T w o			
0.4022	10.78	-4.01	6.24	6.18
0.1621	-1.15	3.91	0.17	-4.78
0.1068	2.22	-10.83	11.96	-11.87
0.3029	-6.14	5.46	4.36	43.10

EIGENVALUES	E I G E N V E C T O R S		
	WG	FR	NW
	P e r i o d O n e		
0.0932	0.56	6.99	-4.51
0.4692	-11.27	22.02	-21.41
0.6457	2.21	-4.71	25.30
	P e r i o d T w o		
0.0485	4.36	-2.14	-9.22
0.1179	-8.83	11.11	-9.14
0.3268	3.29	6.61	39.52

UNEMP

EIGENVALUES	E I G E N V E C T O R S				
	US	UK	WG	FR	JP
	P e r i o d O n e				
0.1155	10.91	-11.38	-2.92	10.94	6.68
0.5141	-11.63	-2.02	10.90	12.12	-5.53
0.1676	-12.63	-9.04	10.56	-4.24	6.45
0.8269	6.87	-10.72	-20.97	43.30	18.27
0.5991	4.11	-2.67	-16.62	17.33	35.46
	P e r i o d T w o				
0.5454	14.16	13.18	-4.05	-10.15	-11.98
0.0417	6.93	20.52	-9.53	3.48	12.64
0.8404	6.63	2.14	32.68	6.35	0.97
0.2019	59.94	-68.01	-28.56	58.09	-5.09
0.3198	-6.01	1.66	8.67	-27.21	18.35

EIGENVALUES	E I G E N V E C T O R S				
	JP	SP	MY	AU	SA
	P e r i o d O n e				
0.3549	15.98	-4.97	0.91	-2.84	-0.15
0.0332	-3.61	7.62	-0.94	-0.39	0.19
0.1429	-0.48	-4.97	5.13	-5.57	2.94
0.5875	3.51	-18.67	9.16	7.62	-1.62
0.4666	5.00	-0.53	-0.67	-7.52	7.14
	P e r i o d T w o				
0.2699	18.58	-9.37	-0.08	-2.01	2.45
0.1816	8.29	-13.17	-4.29	-2.90	2.47
0.0552	-0.56	43.60	5.36	-3.24	3.52
0.5833	3.99	4.84	-0.96	12.17	-8.82
0.3631	-3.15	1.06	1.61	-8.04	10.65

EIGENVALUES	E I G E N V E C T O R S			
	UK	WG	FR	NW
	P e r i o d O n e			
0.2633	11.32	-7.40	3.72	1.09
0.6805	1.78	22.60	-37.52	-7.31
0.4684	-11.25	6.46	23.09	-2.15
0.0303	4.14	-12.45	-2.19	9.81

	P e r i o d T w o			
0.0014	28.25	-4.23	1.18	-1.25
0.8613	7.59	31.47	3.13	0.19
0.5231	-21.21	-9.27	31.31	1.00
0.3418	15.69	-21.11	22.48	6.63

EIGENVALUES	E I G E N V E C T O R S		
	WG	FR	NW
	P e r i o d O n e		
0.1068	0.92	3.89	0.44
0.6164	-23.70	38.61	7.67
0.0371	-9.43	0.12	8.81
	P e r i o d T w o		
0.8161	28.60	8.66	-0.34
0.0287	5.83	-3.06	-4.15
0.4304	-21.28	33.92	5.19

I M P

EIGENVALUES	E I G E N V E C T O R S				
	US	UK	WG	FR	JP
	P e r i o d O n e				
0.3811	14.45	2.29	-17.79	3.73	-14.03
0.0098	0.07	4.41	-2.42	4.87	3.66
0.2072	7.38	-10.39	20.62	4.59	0.33
0.0954	-6.65	-6.79	-21.68	12.95	-5.89
0.5144	18.01	-3.11	-35.67	14.63	19.28
	P e r i o d T w o				
0.0352	13.17	-6.48	-6.92	7.37	-0.18
0.0825	-19.57	9.65	4.66	-5.93	-7.44
0.2287	-6.35	17.57	-11.09	6.08	3.61
0.3366	-3.68	-11.81	-28.56	28.11	1.28
0.3889	-3.36	8.02	-29.75	-2.97	8.01

EIGENVALUES	E I G E N V E C T O R S				
	JP	SP	MY	AU	SA
	P e r i o d O n e				
0.0518	2.81	-7.44	-7.05	2.92	6.33
0.3077	-10.65	18.30	-9.12	2.99	0.75
0.1200	14.60	-3.35	3.60	10.23	-5.59
0.4692	-12.16	-36.11	10.25	4.32	8.42
0.4152	10.18	2.06	16.14	-19.46	8.52

Period Two

0.0031	7.79	12.77	-8.91	2.60	8.12
0.4416	-5.47	10.17	4.69	1.17	-11.00
0.2724	-0.71	-12.51	13.80	9.82	-6.82
0.1609	-2.65	4.67	-5.02	4.26	-2.80
0.3323	-3.29	-7.35	11.31	-5.50	7.88

EIGENVALUES	EIGENVECTORS			
	UK	WG	FR	NW
Period One				
0.0040	3.87	1.29	5.29	-2.22
0.2131	-13.16	5.89	16.36	-8.94
0.1125	-1.90	-33.72	8.25	8.19
0.3979	-0.14	22.20	-20.82	23.95
Period Two				
0.0318	2.45	-9.76	2.38	4.28
0.2471	-3.34	3.72	13.27	4.84
0.3916	-14.23	-30.91	30.03	-3.47
0.1499	-14.00	7.94	-8.13	8.97

EIGENVALUES	EIGENVECTORS		
	WG	FR	NW
Period One			
0.0221	8.53	6.98	-4.95
0.0896	-31.93	8.17	7.91
0.3703	23.12	-20.52	23.19
Period Two			
0.0303	10.11	-1.95	-5.04
0.2008	6.48	9.65	4.73
0.2693	26.55	-26.51	8.14

EXP

EIGENVALUES	EIGENVECTORS				
	US	UK	WG	FR	JP
Period One					
0.0002	-1.93	-11.67	17.20	-8.85	-1.83
0.1863	16.40	0.68	-4.49	7.59	2.14
0.1072	-13.14	-20.75	36.56	-6.71	-4.18
0.2800	-17.05	-43.39	7.93	19.63	-1.83
0.4874	-16.10	-27.07	-3.08	3.26	28.69

		Period Two			
0.0038	16.33	5.58	-5.51	-3.43	3.23
0.1141	-13.01	9.91	8.45	-8.64	-11.85
0.1860	5.87	-17.78	2.81	2.96	-3.23
0.5206	-5.31	-10.40	-13.41	42.35	-10.54
0.2889	9.69	-16.21	29.81	-2.35	4.18

EIGENVALUES	EIGENVECTORS				
	JP	SP	MY	AU	SA
		Period One			
0.4936	2.43	12.46	-2.02	13.71	-4.31
0.2023	-21.70	37.74	-8.39	1.67	8.45
0.0113	1.29	-11.60	13.96	0.40	0.67
0.1771	2.07	-16.06	-7.09	12.59	4.10
0.3385	9.64	0.71	-7.25	-4.95	13.76
		Period Two			
0.3546	11.34	-1.50	-3.46	-1.52	3.04
0.0224	4.29	1.02	7.99	5.76	-2.47
0.5587	-5.18	-30.45	26.56	-5.19	3.87
0.1498	2.72	5.87	-7.96	6.47	1.18
0.2486	3.99	11.76	-4.97	-12.80	7.26

EIGENVALUES	EIGENVECTORS			
	UK	WG	FR	NW
		Period One		
0.0008	9.64	-15.53	8.84	0.42
0.1019	-8.13	24.03	-2.22	-2.97
0.1791	-28.37	-0.33	11.31	8.45
0.4969	2.35	10.13	-33.23	27.72
		Period Two		
0.0832	13.77	3.19	-1.86	-7.25
0.2064	-13.32	29.16	-3.59	3.73
0.3062	-2.65	-16.14	36.50	-1.85
0.1569	17.37	-3.22	-19.13	5.98

EIGENVALUES	EIGENVECTORS		
	WG	FR	NW
	Period One		
0.0066	-8.64	8.59	3.54
0.0903	-25.02	7.82	4.85
0.5169	10.66	-30.33	26.12
	Period Two		
0.1389	23.09	-5.35	1.16
0.2910	-19.24	36.72	-4.03
0.0993	-4.16	-3.98	9.06

APPENDIX 6.1

THE EIGENVALUES AND EIGENVECTORS PLUS RESULTS OF LIKELIHOOD RATIO TEST OF MAXIMUM r VECTORS FOR STOCK PRICES FROM US, UK, WEST GERMANY, FRANCE AND JAPAN ESTIMATED BY JOHANSEN PROCEDURE CARRIED OUT OVER THE PERIOD 1980 TO 1987

EIGEN-	E I G E N V E C T O R S				
VALUES	US	UK	WG	FR	JP
0.1062	12.470	-9.796	-0.774	-5.498	6.885
-0.0664	-4.620	11.960	-6.848	0.249	-2.005
-0.0154	-5.629	-1.668	0.597	-0.768	7.502
0.3868	-6.835	-4.191	-5.441	4.225	7.710
0.1412	-6.965	-4.279	6.728	-7.799	9.764

LIKELIHOOD RATIO TEST OF MAX r VECTORS		
r	LR	95% Critical Value (Johansen [1988])
0	77.93	57.2
1	32.44	38.6
2	18.28	23.8
3	7.84	12.0
4	1.45	4.2

APPENDIX 6.2

RESULTS OF ANOVA FOR DETERMINING THE DIFFERENCE BETWEEN COEFFICIENTS IN REGRESSION 1 (R1) AND REGRESSION 2 (R2)

SOURCE	DF	SS	MS	F	p
FACTOR	1	0.623	0.623	1.07	0.309
ERROR	35	20.471	0.585		
TOTAL	36	21.095			

				INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV			
LEVEL	N	MEAN	STDEV	-+---------+---------+---------+-----			
R1	21	0.0367	0.2054	(----------*----------)			
R2	16	0.2986	1.1439	(------------*------------)			
				-+---------+---------+---------+-----			
POOLED STDEV		0.7648		-0.30	-0.00	0.30	0.60

CHAPTER SEVEN

SUMMARY, IMPLICATIONS FOR MARKET EFFICIENCY AND CONCLUSIONS

7.0. Objective, Methodology and Findings

The purpose of this dissertation has been to investigate (1) the structure and stability of international relationship between equity markets and between economic activities (2) consistency in the comovements of inter-country equity markets and economic activities and (3) the influence of economic forces in each country on any observed international equity market relationship. The analysis of this study has mainly focused 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.

In Chapter Two, previous studies on international equity market relationship were reviewed. The results varied from one study to another. Some evidence suggested that international equity markets are not correlated, while others supported the view that there is structure and some stability in international equity market relationships. Furthermore, previous studies agreed that a number of common economic factors contribute significantly to the joint movement of some major world's stock markets but failed to examine extensively the effects of such factors in each country on international stock markets.

Theoretical frameworks, dealing with Mean-Variance Portfolio Theory, CAPM and APT were presented in Chapter Three. The theories, testable implications and assumptions were

discussed. Subsequently, an extension of the theories to the international front were also reviewed. Finally, limitations, alternative approaches, and the current state of capital market theories were explained.

In Chapter Four, the methodology, research design , sources of data, and description of variables to test the six hypotheses were presented. Within the framework of Mean-Variance Portfolio Theory, correlation coefficients and regression parameters were computed to analyse the structure of the international stock markets. The same statistical techniques were repeatedly employed when investigating and discussing the relationship between inter-country identical economic activities. The stability of inter-country stock markets and the similar economic variables relationships were analysed by estimating: (1) the Box chi-square statistics for testing the stability of the covariance matrix (2) cointegrating vectors based on Engle-Granger and Johansen procedures for examining a long run relationship (3) the Chow test for equality between sets of coefficients in two linear regression.

Following that, an analysis of consistency in the comovements of stock markets and similar economic variables were carried out through (1) the procedures of canonical correlation in identifying linear combination of dependent and independent variables (2) factor analysis in finding a common factor of the covariation of a set of variables and (3) a regression analysis in determining the relationship between common factors of both stock markets and economic variables.

Finally, a model which is based on the concept of APT/ Multi-Index Model was developed to find and discuss the effects of similar common underlying factors on the international stock markets. For this model, the beta coefficients from the first-pass time series regression and the mean rate of returns of the ten stock markets were calculated to estimate

the parameters of cross-sectional regressions. The empirical findings were reported in Chapter Five and Six.

There are several interesting features of international equity markets which have been uncovered. The first finding of this study is that most market indices appear to be significantly correlated with each other. The empirical evidence indicates that the US and UK stock exchanges form a core of international markets that are more highly correlated than other markets. These two markets are generally described as relatively well developed and open to international capital flows. They act as central markets into which most other world's major markets are linked. There is a strong tie between continental European markets. Another striking feature is that equity markets from the English-speaking countries, the US, the UK and Australia have some form of relationship with each other. The comovements of stock markets in the Pacific basin, except Singapore-Malaysia pair, tend to move independently. The analysis does not, however, suggest that movements in share prices in one or other of the core markets "drive" movements in other markets. The relationships, at least in the monthly observation sets, are all simultaneous. The issue of Granger-type causality is not therefore relevant at this stage. It is only in Chapter Six, that the concept of causality is covered (see below).

More importantly, this study finds that the correlation coefficients between the UK and continental Europe are higher than those of intra-continental Europe. Previous studies, however, have shown that the correlations between the UK and continental European markets were smaller. The contrast in the results of the present study and previous research might well be associated with the absence of some institutional constraints under EMS in the later period.

Another important development which has taken place during the period of this study is a significant change in the characteristics of correlation coefficients between Japan and other international stock markets. The results of this study revealed that the Japanese market has a fairly significant relationship with other stock markets, especially with the US and the UK. Previous studies found that the Japanese stock market was insignificantly linked with other world markets.

In fact, the changes in characteristics of the correlation as stated above are not surprising because the empirical evidence shows that the relationship between international equity markets are not stable in the long run. In this study the nature of the instability suggests that the relationship between international equity markets is becoming stronger i.e. the correlations between the United States, the United Kingdom, West Germany, Australia and Japan are increasing over time.

This study establishes some empirical evidence of a structural relationship between similar economic activities. Interestingly, this study finds that many structural characteristics of similar economic activities do not differ substantially with those of equity markets. The results show that there is a group of developed countries, namely the US, the UK, West Germany, France and Japan, whose similar economic variables have relatively higher correlation coefficients. Furthermore, there is an identifiable trend which indicates that the correlation between identical economic variables within European countries are generally higher than those in Asian-Pacific countries. In the Asian-Pacific region, the relationship between similar economic variables, except between Singapore and Malaysia, is rather weak, while South Africa appears to be closer to Asian-Pacific countries than European countries and the US.

In the case of the structural stability of inter-country economic activities, this study finds that the correlations between similar economic activities remain stable over the short period. The evidence also suggests that the degree of relationship between similar economic activities, especially within European countries and Singapore-Malaysia pair in Asian-Pacific countries, tend to increase as time increases.

The similarity in the structure of equity markets and economic variables as mentioned above is supported by the subsequent results. This study finds that the joint movement of inter-country equity markets and similar economic activities are consistent. In many cases, the common underlying factors of covariation between equity markets are similar to those of economic variables. Factor analysis shows that the countries whose equity market indices (or similar economic variables) have large weights on the same factors are those whose economic characteristics have most in common. For example, the market (or economic) data from the US, the UK, West Germany, France, Japan and Australia enter strongly and jointly into the same factor of equity market indices (or economic variables). In a regression analysis, factor scores of equity markets and economic variables which highly load on data from similar countries are significantly correlated.

The APT/Multi-Index Model which is designed to examine the effects of economic forces in each country on international equity markets produced interesting results. Factor analysis and regression were used to find specific economic variables which represent international underlying common factors. Five potential common factors, namely US industrial production, French unemployment, Australian unemployment, Singaporean export and Japanese money supply, were identified.

Using the Fama-MacBeth approach, all five economic variables are significant cross-sectionally in explaining variations in returns in the ten stock market prices over the period

tested. This means the factors are systematically priced across the international equity markets. Since the model is one of the techniques to explain the factor-return relationship, so, it implies that there is a positive tradeoff between return and factors on international stock markets.

In fact, the presence of similar common underlying factors on the international stock markets was confirmed further when applying the Johansen model in Chapter Six. This model, as an alternative cointegration technique for estimating a long-run relationship of international stock market prices revealed that there is at least one cointegrating vector for the international stock prices. The findings also suggested that the international stock markets are cointegrated.

The analysis, then, proceeded to find out whether there exists an error correction mechanism linking the stock prices from the UK, the US, West Germany, France and Japan. The results from our autoregression model indicated that the lagged differences of market prices from West Germany and Japan and lagged levels of market prices from the US are significantly related to the first differences of market prices from the UK. This means the stock prices from the UK, West Germany, Japan and the US fit well into the autoregression model. In other words, they (excluding France) have an error correction representation or Granger-causality. Hence, the results of our autoregression model (ECM) confirm the findings in cointegration analysis. This implies that international capital markets are cointegrated but weak and unstable. Furthermore, from the results of ECM or Granger-causality, we also can infer the inefficiency of international equity markets. However, the degree and robustness of the inefficiency are not known because we are unable to carry out appropriate tests because of our data limitations. Therefore, further work using data covering a long period might be useful to reveal the degree of international stock market inefficiency.

7.1. Contributions / Implications of this Study

Despite some limitations, this study has contributed to the understanding of the structure of international stock markets and shed some light on the structure of inter-economic activities and the effects of economic factors in each country on international share prices.

The conclusion of this study suggests that the international stock markets are becoming more integrated. The evidence has shown that the structure of inter-market correlations has tended to increase over times. This phenomenon, in fact, has been confirmed by various statistical results. The trend in structural relationship of inter-country similar economic activities is consistent with those of equity markets and gradually positive over time, implying that the structures of underlying 'world' factors as a portfolio's systematic risks are becoming clearer in the long run.

This is consistent with the evidence from previous research that the correlation between international markets have tended to increase over time. It is also clear that the results of IAPM tests may be sample specific by period. This study suggests that there may well be an international asset pricing mechanism which is evident for fully hedged investors. Since Solnik's model is framed in non-hedged terms, the results of this study may not strictly imply support for Solnik's model. On the other hand, as Kaplanis showed, covariances of international terms tend to reveal characteristics which are similar regardless of whether the returns are calculated on a hedged or unhedged basis. There is not yet a formal model of international asset pricing which is based on the "optimal hedge" advocated by Black (1989). So, this study cannot easily confirm or reject approaches to international pricing based on partial hedging.

Therefore, it should be pointed out that the possibility of reducing risk through international diversification appears to have declined over time. Investors must be careful when deciding what correlation coefficients to use when building portfolios. The use of ex post correlation coefficients as proxies of ex ante measures is only possible if intertemporal correlation coefficients are stationary. Of course, as a general rule, investors should choose the correlation coefficients estimated from a historical time period in which underlying economic factors similar to those they expect over the portfolio's expected holding period.

By the same token, the results of this study also have implications for investment managers and corporate planners. The knowledge of the structure and stability of inter-country stock prices and similar economic activities becomes an important input in formulating an efficient foreign portfolio. However, a final claim about the net benefits from international diversification should depend on several other factors such as market liquidity, currency exchange risk, country credit risk, tax withholding and capital repatriation regulation, which are beyond the scope of this study.

Researchers who are concerned with the issues of international equity market efficiency, integration and segmentation also benefit from this study. The results from Johansen model (cointegration technique) and our autoregression model (ECM) suggested that some major international stock markets have an error correction representation or Granger-causality. The presence of this time lagged market adjustment process implies that one of the stock market index from these countries can be used to help forecast the other. This, in turn, leads to suggest that these markets are not internationally efficient.

But then, if the behaviour of international equity markets is inefficient, two fundamental questions might be raised: First, whether it could be tradable, i.e. whether the efficiency is sufficiently large to allow investors to earn abnormal profits from trading on a basis of the

inefficiency. In fact, because of the short time period from which data was available the question is outside the scope of this research. The second question concerns the robustness of the relationship. The findings of this study have tended to reject the concept that the results are robust because: (1) there appears to be a significant increasing in cointegration of international stock markets (2) the movement of investment funds and other capitals between countries has become less restricted (3) the abolition of some exchange control requirements.

Furthermore, the results of a cross-sectional test of the APT/Multi-Index Model lead to support the hypothesis that the stock markets examined in this study are influenced by similar common underlying factors. The acceptance of this hypothesis implies that the common underlying economic factors are priced systematically across international equity markets. Therefore, this might suggest the argument that international equity markets are becoming more integrated.

If capital markets in different countries are integrated (especially some financial markets within European countries), 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 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, 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 reduce 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 have varied widely. Even in this study the evidence is by no mean unambiguous. Nevertheless the results suggest there are 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.

7.2. Limitations

A number of limitations have been discussed in earlier chapters. First, the special characteristics of this research might limit the inferences drawn from the statistical tests. The relevant characteristics are (a) the choice of broad market portfolio indices used as proxies for share prices (b) adjustments and replacements made to some economic variable data and (c) nonstationary characteristics of the time series data. (This latter point does not apply of course to the results of Chapter Six or to the Engle-Granger results in Chapter Five)

Second, the theoretical and statistical procedures used in this study might cloud the conclusions and implications of the findings. These procedures include (a) the use of ex post beta as a proxy for ex ante beta (b) the validity of the APT/Multi-Index Model at the international level (c) an application of the Fama-MacBeth procedure to a small number of

observations to estimate a cross-sectional systematic risk (d) the use of factor analysis to determine the number of common factors.

Third, there are econometric and statistical problems which might have produced biased results leading to erroneous conclusions. Some of the related problems are (a) measurement error in some variables used in this study (b) spurious correlation and regression (c) multicolinearity and (d) misspecification.

Finally, the major disadvantage is that the results obtained here are sample-specific. This study is limited to the time period of January 1980 to December 1987 and the sample includes only the indices of stock markets and economic variables from 10 countries in the above time period. Thus, extrapolation of the results to other time periods or different populations at a more specific sectors and contexts is not valid and, in fact, potentially dangerous.

7.3. Suggestions for Future Research

Some other interesting contributions could be realised if limitations and constraints involved in this study are avoided. It is, therefore, important to consider the following suggestions for the improvement of future studies:

(1) If more comprehensive market indices (or share prices at corporate level) which reflect various economic sectors are obtained and regressed against the related economic variables, the estimate of ex ante beta can be more meaningful. Accordingly, this will yield a better understanding of the risk-return behaviour in various sectors and of the economic effects on the international stock prices.

(2) With a larger sample over a longer period of time, the structural relationship and stability of international stock prices and economic variables could be tested for long-run behaviour. A comparison of international equity market structures over different economic conditions could also be made. Such tests may be useful to examine whether the stability of the world economy will affect the structure of international equity markets. Furthermore, with a larger sample, spurious correlation and regression is not as likely and the statistical power of empirical test can be enhanced.

(3) Finally, this analysis should be reviewed or replicated in future period (say next 5 years) in order to find out whether or not the assumptions and implications of this study still hold.

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