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STABILITY AND STRUCTURE IN THE CURRENCY AND EQUITY MARKETS OF THE INDUSTRIALIZED WORLD

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I. INTRODUCTION

The inter - temporal stability of international stock market relationships has been studied recently, among others, by Panton, Lessig and Joy [20], Ripley [23], Hilliard [12], and Maldonado and Saunders [18], who have employed varied methodologies, sample countries, and study periods and have reported more or less conflicting results. Fon example, Panton, Lessig, and Joy [20], using cluster analysis, found some degree of stability and structure in international capital markets, while Ripley [23], employing factor analytic methodology, concluded that more than fifty percent of the movement in the indices of industrially developed countries is endogenous. Along similar lines Hilliard [12] utilized spectral analysis to examine the structure of international equity market indices during the OPEC oil crisis, and concluded that whereas most intra - continental prices moved simultaneously, even in the context of hourly fluctuations, most inter-continental prices did not seem to be closely related-thus rendering the question of leads and lags irrelevant.

* The University of Tennessee, The University of Maryland, and The Pensylvania State University, respectively. Earlier versions of this research were presented at the 1982 Meeting of the Academy of International Business, the 1982 Meeting of the Financial Managsment Association, and faculty Seminars at the following Universities : The University of Maryland, The University of Tennessee, L'Université de Nice (IAE) and L'Université de Droit, d' Economie, et des Sciences Appliquée d'Aix - Marseille (CEFTI). A more recent update of this study was presented by the senior author at a special invited Session of the Greek Economic Association held in Athens during June 1983. We wish to thank our colleagues for the opportunity to present the results of our research and for critical and constructive commentary that led to th present and significantly improved version of our study.

in a more recently published research Maldonado and Saunders [18], using Box-Jenkins techniques and non - parametric runs-tests, tested both for sensitivity to sample period and investment horizon and concluded that for periods longer than two quarters «... the intercountry correlations are generally unstable... (and)... it is not possible to reiject the hypothesis that correlations follow a random walk». [18, p. 62]. However in the latest research on this important theme by Philippatos,Christofi, andChristofi [21], the authors were unable to substantiate fully the results in [18] for a larger and more representative cross sectional sample of the fourteen major industrialized countries from the group of nations in the Organization of Economic Cooperation and Development (OECD). Indeed, the authors of this study [21] found that there exists structure and stability in the inter - temporal relationships among the national stock market indices of the industrialized world.

The stability of inter-temporal relationships among various national stock market indices serves as the foundation of the research focused on the benefits of international diversification and/or the comovement of equity prices. Indeed stability along with structure, ($p<1$), constitute the sufficient and necessary conditions for the existence of *ex ante* gains from diversification. Thus, any serious questions raised about the stability of the international correlation martrix deserve a thorough study and prompt response. However, it should be noted at this juncture that serious questions about the stability of inter - temporal relations among national stock market indices must be investigated within a framework that allows for generalization of the results beyond that found in the recent literature on this subject. *First*, as stock market units are defined in terms of the investor's home currency, adjusted for exchange rate movements, the inter-temporal stability of stock market indices is, in turn, affected by the stability of inter-temporal relationships among the exchange rates of the countries involved. Hence, we need to study the stability of both stock market and exchange rate relationships over time.[1] *Second*, as capital and currency market studies during the past few years have been couched in terms of the various versions of asset pricing models, such as the Capital Asset Pricing Model (CAPM), it will be interesting to

1. It should be noted at this juncture that structure and stability in the relations among world currencies constitute the necessary and sufficient conditions for *ex ante* gains from diversification of investment into currencies. In this spirit, several authors have dealt with the aspect of «currency cocktails» as vehicles of diversified international investments. For example, Levy and Sarnat [17] constructed optimal portfolios of noninterest-bearing currencies and of foreign currencies and common stocks. Other authors who have pursued similar research include Johnson, Hultman, and Zuber [14], Johnson and Zuber [13], Aubey and Cramer [1], Blackie [2], and Kouri and Braga de Macedo [15].

go beyond the confines of the full - covariance frameworxfc employed by recent researchers. Thus, we must specify the appropriate version of an international asset pricing model as well as establish sound proxies for the world market indices for equities and currencies. Third, as the exchange rate regime prevalent totay differs drastically from that in the 1960's, we must allow the investors to adjust their expectations accordingly rather than restrict them to the extrapolation of hi storical data drawn from the fixed into the flexible exchange period.[2] Finally, the investment horizons tested must allow for intermediate and long-term holding periods.

In light of the above, we propose to report the results of our research on the inter-temporal stability of relationships among the national stock exchanges and the respective currencies of fourteen (14) industrialized countries for the period of January 1959 to December 1978. Our research employs the market model rather than the standard full - covariance framework utilized in recent studies- although it should be noted that both methodologies properly employed yield comparable results - and reflects the effects of the change in the exchange rate regimes during the sample period. The world index of common stock indices utilized in our analysis is that computed by Capital International S.A. (CIP). This is a capitalization weighted index which incorporates capital changes but excludes cash dividends.[3] In the same vein, the world index of currencies employed here is the International Monetary Fund's (IMF) Special Drawing Right (SDR).[4] The presumed stability of the value of the SDR vis-a-vis individual currencies is contingent upon the stability of the relationships among the component currencies.

The study is carried out by means of (a) principal component analysis ; (b) parametric tests, such as the Chow-test for stability in the parameters of a linear model; (c) a t-test for changes in slope (only) over time ; (d) nonparametric tests, such as a runs-test for randomness ; and (e) the Fisher-Z tranformation test

2. For a detailed discussion on the Bayesian adjustment see Vasicek [27]. See also Philippatos and Christofi [22] for an application of this procedure.

3. For a discussion of the Capital International stock market indices see [26].

4. The SDR was created in 1969 by the IMF in order to augment international liquidity without becoming dependent upon the dollar as a reserve currency. At that time its value was set equal to 888671 grams of fine gold or one U.S. dollar. In 1974, because of instability in the value of the SDR vis-a-vis nondollar currencies, resulting from the introduction of floating exchange rates, a procedure was adopted for basing the value of the SDR on the market value of a basket of 16 currencies. As of January 1, 1981, the basket was further simplified by keeping only the five «major» currencies : namely, the U.S. dollar Deutsche Mark, Yen, French Franc, and Pound Sterling. Coincidentally, this was basket used by the IMF for determining the interest rate on the SDR.

such as a runs-test for randomness ; and (e)the Fisher-Z tranformation test for differences in the correlation coefficients computed from two subperiods. Needless to say, tests for heteroscedasticity were also employed in order to validate a ρ r i o-r i the appropriateness of the above tests. The results of our research indicate that there exist both structure and stability of inter-temporal relationships among the currencies and common stock equities of the fourteen major industrialized countries in the OECD. The study is presented in four sections. Part Π discusses the data and methodology, Part III presents the empirical findings, and Part IV gives a summary of the results.

II. DATA AND METHODOLOGY

The sample studied consists of monthly exchange rates and common stock market averages of the fourteen major industrialized countries within the OECD grouping namely, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Sweeden, Switzerland, the U.K. and the U.S.A. The data period for the common stock indices covers the twenty years from January 1959 to December 1978, which include both the fixed and flexible exchange rate regimes. However, the data for the stability tests on currency returns are confined to the period associated with flexible exchange rates officially - in this case July 1974 to December 1978 - so as to render the search for structure and stability economically as well as institutionally meaningful. Additionally, since the SDR was first indexed to sixteen currencies in July 1974, that date marks the beginning of our investigation. All the data are expressed in terms of U.S. dollars for the purposes of this study. For each of the above countries, we obtained the values of the industrial share price indices and the exchange rates, as they appear in the IMF Tape of International Financial Statistics.

Let us define the exchange rate for country i at time t, $\tilde{X}_{it}$, expressed in units of country i's currency per U.S. dollar. Then the continuously compounded return on currency i at time t, $\tilde{r}_{it}$, is given by expression (1), below :

$$\tilde{r}_{it} = \ell n \ (X_{i\,t-1} / \tilde{X}_{it}), \tag{1}$$

where- denotes random variable.

Similarly, let us define dollar value of one foreign stock market unit at the end of period t, adjusted for exchange rate movements (unhedged) by expression (2),

$$\tilde{VI}_{it} = \tilde{I}_{it} / \tilde{X}_{it}, \tag{2}$$

and the continuously compounded return on stock index i, at time $\tilde{R}_{it}$, y

$$\tilde{R}_{it} = en \ (\tilde{V}I_{it-1}/\tilde{V}I_{it}), \tag{3}$$

where $\tilde{I}_{it}$ denotes the industrial share price index level for country i, at time t.[5]

Assuming that the fluctuations of returns ru and Rit are generated by a «common» factor - astandard premise supported by the empirical literature-than the returns from investing in any country's stock market index or currency may be given as follows :

$$\tilde{r}_{it} = a_i + b_i\tilde{r}_{wt} + \tilde{e}_{it} \tag{4}$$

$$\tilde{R}_{it} = \alpha_i + \beta_i\tilde{R}_{wt} + \tilde{\varepsilon}_{it}, \tag{4'}$$

where Rwt= continuously compounded return on the currency world index (SDR) at time t ;

$r_w t$ — continuously compounded return on the stock world index (CIP) at time t ;

ai, ai, bi, βί= parameters to be estimated ;

eit, εit = the t[th] random-error terms.

Although expressions (4) and (4') do not necessarily require beta-stationarity, forming expectations via this model we need to assume it,[6] i.e.,

$$bt = b, \ \ vt$$

5. As is common with most aggregate indices dividends are not generally included in their computation. This exclusion results in the understatement of rates of return. However the exclusion of transaction costs also overstates the rates of return, thus providing a balancing effect. A further remedy, applicable in the current analysis, is to assume that the average dividend paid in each country is equal to the eaverage world dividend, which will cause no bias in the estimates obtained via the market model. Simply put, its exclusion from both the dependent and the independent variables will not affect the regression coefficients.

6. The topic of beta stationarity has been the subject of many earlier studies dealing with the formation of expectations via the CAPM. The works of Blume [3] [4] Brenner and Smidt [5], and Sharpe and Cooper [25] are considered to be among the pioneering studies in this area. For a detailed review of these researches and an alternative methodology, see Eubank and Zumwalt [7]. More recently, Garbade and Rentzler [9] proposed a test for beta stationarity using a variable parameter regression (VPR), as opposed to the random coefficient mode! (RCM) utilized by Fabozzi and Francis [8].

$$\beta_t = \beta, \quad \forall t$$

It should be noted here that testing the stationarity of beta is equivalent to testing the stability of the correlation matrix, since

$$\beta_i = \rho_{iw} \frac{\sigma_i}{\sigma_w}, \qquad (5)$$

where ρ_{iw} = correlation coefficient between the returns on the i^{th} country index and the returns on the world index ;

σ_i, σ_w = standard deviations of returns on the i^{th} country's index and the world index, respectively.

Now, assuming that the ratio (σ_i/σ_w) is constant, β and ρ can be expressed in the linear form given in expression (5). And, by similar reasoning, we can generalize the proposition to apply to bj.

In testing the stability of β, the assumption of homoscedastic disturbance must be observed. This point can be made more clear by considering an alternative expression of β, given in (6), below

$$\beta_i = \left[1 - \left(\frac{\sigma^2_\varepsilon}{\sigma^2_i} \right)\right]^{\frac{1}{2}} \cdot \left[\frac{\sigma_i}{\sigma_w} \right], \qquad (6)$$

where σ_ε^2 is the variance of the error term. Obviously the assumption of homoscedastic disturbance concerns the correlation coefficient as well-an important condition that was ignored by some previous studies [18]. Although the estimated β will be statistically unbiased - rendering it suitable for analysis and policy-making - it will lack the minimum variance (efficiency) property in the presence of heteroscedastic ε-making it virtually ineffectual for the forecasting function that is the cornerstone of investment decisions. In fact, we cannot calculate easily the variance of β in such a case .[7] Thus, the presence of heteroscedasticity renders the Chow-test inapplicable, as it utilizes the sum of the squared residuals.

7. See [16, pp. 148 - 5] or any other standard textbook for additional elaboration on the consequences of violating the assumption of homoscedasticity.

III. EMPIRICAL RESULTS

In line with the methodology developed above, we applied both parametric and non - parametric tests to the results obtained from the sample of the fourteen industrialized countries.

A. Tests for Heteroscedasticity

As a first step, we investigated the presence of heteroscedasticity in the residuals by employing a parametric test first suggested by Glejser [10] and later applied to financial data by Brenner and Smidt [5]. For each country, the market model, as stated in (4) and (4'), was applied and the residuals were obbtained. Then the absolute values of these residuals were regressed against the world index and time separately. In the case of industrial share prices, this procedure was repeated for three periods - namely the period of the fixed exchange rates, the period of the flexible exchange rates[8], and the entire 240 - month period from January 1959 to December 1978. However, in the case of currencies the procedure was applied only once for the entire period of July 1974 to December 1978. On the basis of results from these tests (not shown here) we accepted the hypothesis of «pure homoscedasticity» ($a = 0$ and $\beta = 0$) for the first model that employs the appropriate world index on the entire period, while for the subperiods and the second model utilizing time as the explanatory variable we found cases of «mixed homoscedasticity» (α 0 and $\beta = 0$). Hence, having concluded that heteroscedasticity is not a serious problem, we proceed with the utilization of the standard statistical tests below that assume that existence of homoscedasticity.

B. Tests for Stability in the Parameters

The second step in the analysis of data from the fourteen industrialized countries involved the application of parametric stability tests to detect possible changes in the maintained hypothesis posited by equations (4) and (4') due to changes in either α or β or both between any two relevant subperiods. For the case of industrial share prices the economically meaningful subperiods are delineated

8. For the functional purpose of this study the period after 1970 was considered as the unofficial but de facto era of flexible exchange rates, since some currencies (Canadian dollar-May 1970 and D-mark-May 1971) began floating before the March 1973 date of the official change.

by the fixed and flexible exchange rate regimes.[9] Additional time subdivisions are provided by the posited four and five year investment horizons[10] and by the natural subdivision of the time series into equal subperiods, as is shown with the currency data base. Formally, the test statistic is given by the ratio :[n]

$$F_{k}n_1+n_2-2K = \frac{S_3/k}{S_2/(n_1+n_2-2K)} \tag{7}$$

where k = number of parameters (in this case, k = 2) ;

$n_{15}n_a$ = number of observations in periods one and two, respectively (not necessarily equal) ;

S_r = Sum of Squared Residuals (SSR) in the pooled regression (over n_1+n_2)

S_2 = SSR in n_1 Plus SSR in n_2 ;

$S_3 = S_1 - S_2$.

The results of some of the parametric stability tests on the currency data are shown on Table 1, while the findings on the industrial share prices are presented on Table 2. With respect to the stability of exchange rate returns over the two equal subperiods itwas found that only two out of thirteen countries (Norway and Sweeden) showed different regression parameters, as confirmed from Table 1. The same two countries appeared as the exceptions also when we employed another test that delineates the effects of the time series only upon the betas.[12] Si-

9. If we detect any change in the functions (4) or (4') between these periods, then a further investigation is needed (via a dummy variable or some other technique) to identify the cause of the change. If no change is detected in the assumed function, we may conclude that neither α nor β have changed. See [16, pp. 164-8].

10. In computing F- ratios according to (7), we assumed investment horizons of four and five years. These horizons were selected on the oasis of the results obtained from the tests for heteroscedasticity and the basic premise that a minimum of 48 observations is required for sound regression results. Empirical support for the selected investment horizons can also be found in [23].

11. The decision rule is, of course : If F > F, reject the hypothesis that the two regressions are the same at the αα level of significance.

12. Due to the usual space limitations the results of many statistical tests discussed here are not shown. Nevertheless, they are available from the authors upon request. It should also be noted here at this juncture that substantive analytical and empirical support for the results on β- stability can be found in Philippatos, Christofi, and Christofi [21].

TABLE 1
RESULTS OF CHOW – TESTS WITH CURRENCIES

PERIOD / COUNTRY	7/74 – 9/76 / 10/76 – 12/78
AUSTRIA	2.67
BELGIUM	0.53
DENMARK	2.33
FRANCE	1.64
GERMANY	1.45
ITALY	0.73
NETHERLANDS	1.27
NORWAY	4.44*
SWEDEN	4.31*
SWITZERLAND	0.30
UK	3.13
CANADA	2.43
JAPAN	1.26

*Significant at the 5 % lev.

milar support for the maintained hypothesis of stability was found for the industrial share prices, as shown on Table 2. The above findings persisted when the data series was segmented into equal subsamples for ditfferent investment horizons.

C. Tests for Stability in the Correlation Martix

In line with the methodologies employed in previous studies that have investigated correlation stability for other economic series, we also computed quarterly, annual, and biennial correlation coefficients for each country' s currency and share price returns with their respective world indices, η the basis of the findings (not shown here) we were unable to identify any discernible patterns. Subsequently, and for the sake of brevity, we applied runs - tests [13] on the annual correlation coefficients of the industrial share price data and on the quarterly exchange rate returns. In the former case the results strongly reject the hypothesis of randomness in the coefficients. In the latter case the decision was split as the hypothesis of randomness was rejected in only seven out of thirteen cases.

13. For a complète description of the runs - test employed in this analysis, see [18, p. 58)].

TABLE 2

RESULTS OF CHOW TESTS FOR 48 – MONTH (PANEL A) AND 60 – MONTH (PANEL B) INVESTMENT HORIZONS WITH INDUSTRIAL SHARE PRICES

	(PANEL A)			(PANEL B)	
PERIOD COUNTRY	1959 – 1962 1963 – 1966	1963 – 1966 1967 – 1970	1971 – 1974 1975 – 1978	1961 – 1965 1966 – 1970	1971 – 1978 1976 – 1978
AUSTRIA	6.94*	3.90*	2.00	1.98	0:29
BELGIUM	1.25	3.37*	0.30	0.19	0.21
DENMARK	1.08	1.66	2.21	1.41	2.36
FRANCE	5.30*	1.46	1.16	2.78	0.45
GERMANY	7.03*	0.78	0.08	6.76*	0.47
ITALY	2.59	0.13	0.43	1.04	0.04
NETHERLANDS	3.39*	3.54*	0.93	3.33	1.54
NORWAY	1.20	1.49	1.22	2.52	0.79
SWEDEN	0.11	0.41	1.19	1.04	0.83
SWITZERLAND	3.69*	5.11*	0.06	3.47*	1.51
UK	0.53	0.98	2.64	0.16	0.62
CANADA	0.36	0.45	0.61	0.87	0.11
JAPAN	0.36	0.37	0.87	1.24	0.17
USA	0.58	1.04	0.25	2.12	0.10

* Significant at the 5 % level. The periods 1967–70 and 1971–74 in Panel A as well as 1966–70 and 1971 – 75 in Panel B are excluded in order to avoid the heteroscedasticity problems associated with comparisons between fixed and flexible exchange rate periods.

D. Principal Components Analysis

As a final test of stability in stockprice and exchange rate relationships, we employed the method of Principal Components Analysis. This method is a special case of Factor Analysis, albeit one that is highly useful when the analysis involves many time series and the purpose of the investigation is to identify patterns of movement common to several series. [u] Clearly, this approach is superior to bivariate statistical techniques, in that it expilores the interrelationships among a set of variables caused by common «factors», mostly economic in natu-

14. For a detailed discussion on the technique of principal component analysis, the interested reader is referred to [6], [11], [16], or any standard textbook on multivariate d4ta analysis. Also, for an application of this method on similar interrelationships among national stock market indices, see [19] and [23]. Please note that as indicated earlier, the data were expressed in logarithmic form so as to remove first - order serial correlation, which might have given rise to spurious inferences aôout the causes of common movement.

re. Each factor (or principal component) is a linear combination uof the original variables. The coefficients of the original variables used to construct a factor (often called loadings or component correlations) indicate the relationship (correlation) between the factor and the variable. The proportion of the variation expla-i ned by each principal component is the eigenvalue, (or latent root, or characteristic root) divided oy the number of variables, provided that the variables have anb teen stardized.

Table 3 shows the results of the principal component analysis on the currency returns utilizing the entire fifty-four monthly observations. As can be readily observed, the first component accounts for more than 70% of the total variation in the 14 variables, and each variable is highly correlated with the first principal component.[15] As a matter of simple interpretation, there appears to be one common factor that influences the movements of the original variables. Interest - rates, money supply,rôand real - income differentials, as suggested by the monetary approach of exchange - rate determination, might result in this clustering. It should also be noted here that, although the contribution of the second factor in explaining the total variation was statistically significant, the component correlations of this factor were mostly insignificant, thus forcing its elimination from further consideration. t[6] Spesifically, the significant second-component correlations were at most three out of fourteen. Interestingily enough, the return relative of the Canadian dollar was consistently excluded from the first factor, common to all other exchange - rate relatives, and naturally it along cora-along comprises a big portion of the second factor.

Table 4 shows the results of the principal component analysis on the industrial share price returns. In this case, the first component explains about 30 percent of total variation in the fourteen indices and more than 50 percent of the variation is explained by the first five components. National stock market indices are highly correlated with the first principal component, and there appears to ôe a common factor that influences the movement of the original variables.

15. In assessing the significance or the component correlation coefficients, we applied the critical values (standard errors) for the Pearson product moment correlation coefficients as explained in [16, pp. 431 - 432]. The critical values for samples of 30 and 60 are 338 and 248 at the 0.05 level and 440 and. 328 at the 0.01 level, respectively. Note that the component correlations are the product of the square root of the eigenvalue and fthe eigenvectors of the respective principal component.

16. Bartlett's X^2, as explained in [6], [11], and [16] was greater than the critical value appearing the X^2 - Table. This suggests the inclusion of additional factors in our analysis.

TABLE 3

PRINCIPAL COMPONENTS ANALYSIS WITH CURRENCIES : (7/1974 to 12/1978)

EIGENVECTORS						Component First	Correlations Second
USA	0.31274	0.02642	−0.13869	0.01250	−0.01095	−.990*	.029
UK	0.21290	−0.32290	0.38526	−0.10452	−0.77813	.674*	−.359*
AUSTRIA	0.30788	0.09176	−0.11876	−0.05005	−0.00879	.975*	.102
BELGIUM	0.30639	0.11411	−0.09577	−0.03339	−0.10149	.970*	.127
DENMARK	0.30175	0.12668	−0.14795	−0.06505	−0.05058	.956*	.141
FRANCE	0.28156	−0.08682	0.09171	0.11726	0.07789	.892*	−.097
GERMANY	0.30600	0.12095	−0.09350	−0.06204	−0.02454	.969*	.135
ITALY	0.18793	−0.44045	0.15196	0.76092	0.22184	.595*	−.490*
NETHERLANDS	0.30500	0.09046	−0.08379	0.00005	−0.11524	.966*	.101
NORWAY	0.29045	0.13487	−0.20473	0.01816	−0.00502	.920*	.150
SWEDEN	0.27244	0.11825	−0.28537	0.00411	0.13240	.863*	.132
SWITZERLAND	0.27143	−0.08000	0.01342	0.05580	0.18205	.860*	−.089
CANADA	0.01188	0.74645	0.57403	0.31353	−0.02122	.038	.831*
JAPAN	0.20854	−0.19350	0.53560	−0.53170	0.51103	.660*	.215
EIGENVECTORS	10.0282	1.2395	.7502	.5930	.4671		
% VARIATION EXPLAINED	71.63	8.85	5.36	4.24	3.34		

*Statistically significant at the 0.05 level or less.

TABLE 4
PRINCIPAL COMPONENT ANALYSIS FOR INDUSTRIAL SHARE PRICES (1/1959–12/1978)

EIGENVECTORS						COMPONENT FIRST	CORRELATIONS SECOND
USA	0.28801	−0.51187	0.03621	0.04896	−0.01897	.667*	−.586*
AUSTRIA	0.23937	0.44322	−0.03961	−0.07844	−0.03364	.554*	.507*
BELGIUM	0.32811	0.02029	−0.22464	−0.25876	−0.02728	.760*	.023*
DENMARK	0.18083	0.36367	0.56704	−0.06260	−0.12383	.419*	.416*
FRANCE	0.21160	0.10345	−0.02371	0.71400	0.16684	.490*	.118*
GERMANY	0.28068	0.21572	−0.18804	0.24893	0.19446	.650*	.247*
ITALY	0.25319	0.19915	−0.30686	−0.21142	0.16472	.586*	.228*
NETHERLANDS	0.34881	0.07574	0.01944	0.02366	−0.05316	.808*	.087*
NORWAY	0.25404	0.03955	−0.22294	−0.34060	−0.41036	.588*	.045
SWEDEN	0.23086	0.03102	0.41055	0.18608	−0.52857	.535*	.036
SWITZERLAND	0.32441	0.00824	−0.23626	00.12424	0.06678	.751*	.009
UK	0.25251	−0.30881	0.16180	−0.21044	0.05665	.585*	.354*
CANADA	0.29390	−0.45629	0.04186	0.12063	−0.01339	.681*	−.522*
JAPAN	0.19198	0.00953	0.43894	−0.28042	0.65665	.445*	.011
EIGENVALUES :	5.3650	1.3106	1.0994	.8895	.8182		
% VARIANCE EXPLAINED	38.32	9.36	7.85	6.35	5.84		

*Significant at the 1 percent level.

A particularly important area to which the results of our research relate is that of gains expected from international portfolio diversification. In orher to address the topic of diversification meaningfully, two conditions must be first satisfied : The first (sufficient) condition pertains to the intertemporal stability of the returns relationships and has been dealt with throughout the study. The second (necessary) condition posits the existence of a less than perfectly positive correlation between the returns under analysis. In order to investigate whether the necessary condition for gains from international portfolio diversification was satisfied, we also computed the corelation coefficient matrix for the returns of all currencies and all industrial share prices. The results (non shown here) indicate that although most correlation coefficients are high, all are less than unity, especially between the share price indices. Hence, we can conclude that both the necessary and the sufficient conditions for meaningful international diversification are satisfied on the basis of our empirical results.

IV. CONCLUSIONS

In perspective, the results of our reasearch suggest that the hypothesis of stability and structure in the inter - temporal relationships among the currencies and the industrial share prices of the industrialized countries cannot be rejected, at least for the intermediate and long term horizons. The inferences derived from our study point to the existence of international economic factors that contribute to the stability of these relationships. Consequently, our results reveal important implications for both the area of portfolio selection and exchange rate determination, which we hope will be of some assistance in the future to researchers and practitioners alike.

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