

Country Risk: The Significance of the Country Factor for Share-Price Movements in the United Kingdom, Germany, and Japan

I. INTRODUCTION

In another place I have shown that share prices in the equity markets of the United States, United Kingdom, Germany, and Japan do behave as if there exists one multinational equity market.¹ Share prices in the non-U.S. countries were shown to be related to, and affected by, the price changes in the U.S. equity market. This, however, does not rule out the possibility that share prices in each national component of the market move together in addition to the market-wide movements. The purpose of this paper is to measure and describe those share-price fluctuations associated uniquely with their country of origin, and then, on the basis of those price changes, to identify and estimate the country factor in share-price movements in the equity markets of the United Kingdom, Germany, and Japan.

In this paper the position is taken that each of the non-U.S. markets has a "character" of its own as a geopolitical entity, but this does not necessarily mean that the world market must therefore be segmented. This argument is similar to the one that the existence of different industries in the United States does not negate the possibility of the functioning of one American equity market.

II. THE RELATIONS AMONG THE NON-U.S. EQUITY-MARKET INDICES

The identification and estimation of the country factors in share-price movements are done in two levels of data. In the first stage indices of share prices are examined, and in the second the country factors are estimated on the basis of a sample of individual shares.²

As share prices in the non-U.S. markets are commonly affected to some extent by the U.S. market, let us start by stripping away this common factor from the equity markets of the United Kingdom, Germany, and Japan.

* Tel-Aviv University. This paper is based, in part, on my dissertation, which was completed in June 1971 at the Graduate School of Business, University of Chicago. I am grateful for the guidance and help provided by Professors M. H. Miller, R. Z. Aliber, E. F. Fama, A. B. Laffer, and N. Gonedes.

1. T. Agmon, "The Relations among Equity Markets: A Study of Share Price Comovements in the United States, United Kingdom, Germany and Japan," *Journal of Finance* (September 1972).

2. For a description of the data, see Appendix A.

One way to estimate the net relationship among any given group of non-U.S. markets is by regressing returns in one market on both the returns in the U.S. market and those in the other non-U.S. equity markets. The relationship among the non-U.S. markets, summarized by the slope coefficients associated with these markets in the multiple regression equations, is measured after accounting for the U.S. market factor. The following equation system was estimated for a 55-month period, from July 1961 to January 1966. A summary of the results is presented below:

$$\begin{aligned} \ln P(\text{U.K.}) = & .5222 + .3019 \ln P(\text{U.S.}) \\ & (4.196) \quad (2.094) \\ & + .1632 \ln P(\text{Ger}) + .0127 \ln P(\text{Jap}) \\ & (1.387) \quad (0.153) \\ r^2 = & .248 \quad \text{D-W} = 2.33 \end{aligned}$$

$$\begin{aligned} \ln P(\text{Ger}) = & .1694 + .6338 \ln P(\text{U.S.}) \\ & (1.014) \quad (4.185) \\ & + .2228 \ln P(\text{U.K.}) - .0395 \ln P(\text{Jap}) \\ & (1.387) \quad (-0.409) \\ r^2 = & .391 \quad \text{D-W} = 1.60 \end{aligned}$$

$$\begin{aligned} \ln P(\text{Jap}) = & .5374 + .5014 \ln P(\text{U.S.}) \\ & (2.315) \quad (2.054) \\ & + .0363 \ln P(\text{U.K.}) - .0827 \ln P(\text{Ger}) \\ & (0.153) \quad (-0.409) \\ r^2 = & .110 \quad \text{D-W} = 1.86. \end{aligned}$$

The *t*-values are in parentheses. The variables are log price relative of the sampled share price indices, respectively.

The above shows that the U.S. market is the connecting link in the four-country equity market.³ This is evident because the only significant regression coefficient in each equation is that one relating the dependent variable to the U.S. market index. The findings suggest a special type of international equity market which consists of one central market, the United States, and three peripheral markets, the United Kingdom, Germany, and Japan. Each of the peripheral markets is related to the central market, in terms of share-price movements, but there is no other significant relationship among the peripheral markets.

3. Another way to demonstrate the same interrelation is by regressing one non-U.S. market index on the U.S. market index, and the residuals obtained by regressing another non-U.S. index on the U.S. market index. The second variable in the multiple regression represents an equity market after the U.S. market factor has been removed. The results of such a multiple regression for the relations between the United Kingdom and Germany are as follows (*t*-values are in parentheses):

$$\begin{aligned} \ln P(\text{U.K.}) = & .5675 + .4365 \ln P(\text{U.S.}) - .0108 \text{ Res (Ger)} \\ & (5.758) \quad (4.452) \quad (-0.718). \end{aligned}$$

III. THE ESTIMATION OF THE "COUNTRY" FACTORS

To obtain an estimate of the country factor—that is, the net explanatory power of the domestic share price index—the domestic indices were first regressed on the U.S. market index. The residuals so obtained from these regressions were used as indicators for the net "country" factor in share-price movements. The degree to which the appropriate domestic indices can explain domestic share-price movements was estimated by the following multiple regression equation:

$$\ln R_{ij} = a + b_1 \ln P(\text{U.S.}) + b_2 C_j,$$

where R_{ij} is the price relative for the i th share in the j th country and C_j is the j th country's residuals. The regression equations were estimated for the 145 shares in the individual share sample. The parameters presented in table 1 are country averages. For example, b_1 was averaged

Table 1

A Summary of the Estimation of the Country
Factor
(Multiple Regression July 1961–January 1966)

	$b_1(\text{U.S.})$	$b_2(\text{Country})$	r^2	No. of Firms
United Kingdom	.3760 (1.380)	.6612 (2.261)	.127	71
Germany	.8181 (4.903)	1.000 (6.170)	.490	31
Japan	.3773 (1.184)	.9494 (3.850)	.218	43

NOTE.—The t -values are in parentheses.

over 71 English shares, 31 German shares, and 43 Japanese shares, all equally weighted.

The results indicate clearly that another systematic factor, associated with the country, does exist. This is apparent from the value and the significant level of the country coefficient, b_2 . The estimation of the country factor does, however, leave two unanswered questions: (a) can this factor be identified uniquely as a country factor, and (b) what do the country factors indicate with respect to international diversification of investment? These two questions are answered in the following sections.

IV. THE IDENTIFICATION OF THE COUNTRY FACTOR

The fact that a systematic common factor, in addition to the U.S. market index, is evident in each of the non-U.S. groups does not necessarily identify this factor as uniquely associated with the country. This additional factor may be related to any other common characteristic of the

shares of any given country. Specifically, this factor could be a function of the systematic risk associated with each of the countries.⁴ All three non-U.S. countries are characterized by a different distribution of systematic risk from the one associated with the U.S. market. The English and Japanese groups are composed, almost exclusively, of shares with very low systematic risk. To find out whether the "country" factors are related to a particular distribution of systematic risk, the shares in the sample were regressed on the U.S. market index and on the three country residuals.⁵ The regression equations were set as follows:

$$\ln R_{ij} = a + b_1 \ln P(\text{U.S.}) + b_2 C_j + b_3 C_k + b_4 C_l,$$

where R_{ij} is the price relative of the i th share in the j th market, C_j is the country residual associated with the country of the regressed share, and C_k and C_l are the country residuals of the other two non-U.S. countries. The reported results are average parameters, averaged over countries (see table 2).

Table 2
A Summary of Multiple Country-Multiple
Regression Results, July 1961-January 1966

	$\hat{\beta}_1(\text{U.S.})$	Country Residual			r^2	No. of Firms
		$\hat{\beta}_2(\text{U.K.})$	$\hat{\beta}_3(\text{Ger})$	$\hat{\beta}_4(\text{Jap})$		
United Kingdom . . .	.3609 (1.134)	.6762 (2.240)	— .0248 (—0.069)	—0.200 (0.146)	.134	71
Germany	.8941 (4.821)	.1140 (0.199)	.9235 (5.820)	— .1076 (—0.036)	.480	31
Japan	.3720 (1.170)	.0710 (0.218)	.0682 (0.155)	.9489 (3.861)	.217	43

NOTE.—The t -values are in parentheses.

The results show that in respect to movements of share prices the primary consideration, other than the U.S. index, is the country of origin of the share.⁶ This is especially telling in the comparison of the Japanese and English groups. The two countries are similar in terms of their average relations to the central market, the U.S. market; the average $\hat{\beta}_1$ is .3609 for the United Kingdom and .3720 for Japan. Yet, no explanation of English share-price movements can be derived from the Japanese country factor. Likewise, the English country factor has no

4. The systematic risk is measured by the coefficient relating the price relative of a particular share to the returns of the market index, in this case the U.S. market. For a discussion of the concept of systematic risk, see E. F. Fama and M. H. Miller, *The Theory of Finance* (New York: Holt, Rinehart & Winston, 1972).

5. For an explanation of how and why country residuals are used, see n. 3.

6. The above statement is also correct when we look at the distribution of the coefficient rather than at the country averages only. For a description of the distribution, see Appendix B.

explanatory power with regard to the movements of Japanese share prices. The evidence presented in table 2 strongly suggests that the country factor is not related to any particular level of systematic risk.

Additional evidence that the country factor cannot be explained by other common characteristics is obtained by simulating the countries within the U.S. market. Each of the non-U.S. countries was matched by a group of U.S. shares with similar coefficients with regard to the U.S. market. The matched U.S. groups were regressed on both the U.S. index and the appropriate country residual.⁷ The results are reported in table 3.

Table 3

Estimation of Country Factor on Similar U.S. Portfolios

(Multiple Regressions, July 1961–January 1966)

U.S. Portfolio Matched with:	$\hat{b}_1(\text{U.S.})$	$\hat{b}_2(\text{Country})$	r^2	No. of Firms
United Kingdom	.3576 (2.400)	.0682 (0.327)	.086	16
Germany	.9033 (5.094)	— .0219 (—0.107)	.310	22
Japan	.3576 (2.400)	.0488 (0.153)	.096	16

NOTE.—The t -values are in parentheses.

These results, like those presented in table 2, show that the second systematic factor found in share-price movements associated with the non-U.S. countries is a unique country factor. The significance of the appropriate country factor in each of the comparable U.S. portfolios is zero.

V. COUNTRY FACTOR AND INTERNATIONAL DIVERSIFICATION

The country factors in the non-U.S. equity markets were estimated and identified in the preceding sections. The different countries appear to have a unique country risk associated with share price movements.

Let us go back to the question raised before: what do the country factors indicate with respect to international diversification of investment? From the point of view of a U.S. investor holding a well-diversified portfolio, the relevant issue is to what extent country risk is diversifiable. In other words, is the country risk systematic or non-systematic?

7. The English and Japanese groups contain some shares with very low-systematic-risk coefficients which cannot be matched with U.S. shares. Thus the United Kingdom and Japan were simulated by a low-systematic-risk U.S. portfolio with a comparable average-systematic-risk coefficient.

The evidence presented below indicates that country risk in the three non-U.S. equity markets is not necessarily systematic and can, to an extent, be diversified away. Some information about the extent to which country risk can be diversified away can be derived from table 4.

Table 4
Correlation Matrix of Country Residuals (*R*),
1955-66

	United Kingdom	Germany
Germany	-0.151	...
Japan	0.040	0.070

The findings show that once the U.S. factor is removed, the non-U.S. country indices are virtually independent of each other. The evidence presented in table 4 is in agreement with the other results reported in this paper. The same inference can be made on the basis of the comparison of the English and Japanese groups reported above, which suggested that the country factors associated with the two markets are independent of each other, although the two countries are similar in terms of their relations with the U.S. market.

VI. CONCLUSIONS

Although movements of share prices in the equity markets of the United Kingdom, Germany, and Japan are related to price changes in the U.S. market index, there is also another residual factor affecting share-price fluctuations in these three markets. The residual factor can be uniquely associated with the country. The existence of some unique country factors, however, does not contradict the possibility of the functioning of one multinational equity market. The country factors are found to be virtually independent of each other, so that the potential gains from international diversification, if any, are small.

APPENDIX A

THE DATA

INDICES OF SHARE PRICES

For each equity market, one index was chosen as the representative index for the purposes of this study. The indices are: United States, Fisher Arithmetic Index;⁸ United Kingdom, *Financial Times* Ordinary Share Index; Germany, *Frankfurter Allgemeine Zeitung* Index; Japan, Tokyo Stock Exchange Price Index.

In addition, time series of other indices were obtained to permit certain additional intracountry, as well as international, comparisons. The list of secondary indices includes the following: United States, Dow Jones In-

8. The Fisher Arithmetic Index was composed by L. Fisher, Graduate School of Business, University of Chicago.

dustrials; United Kingdom, *Economist*/Extel Indicator; Japan, Dow Jones Tokyo.

The series were constructed by recording end-of-month quotations for each of the different indices. All the non-U.S. indices were converted to U.S. dollar terms by multiplying the index number at t by the appropriate spot exchange rate for the same date. The time series were transformed to price relatives where $PR_t = P_t/P_{t-1}$.⁹ All data were recorded for the period January 1955–October 1966 (142 monthly observations).

An independent source for intercountry comparisons was obtained from indices of share prices published by the IMF in *International Financial Statistics*. The indices are as follows: United States, Standard and Poor; United Kingdom, Actuaries' Investment Index; Germany, all shares (Frankfurt exchange); Japan, all shares (Tokyo exchange). All indices in this group, except that of the United Kingdom, are based on monthly averages. The United Kingdom index is based on the price quotations for the last Tuesday of every month. The time series are expressed as price relatives, in domestic currency terms, for the period January 1959–June 1968 (114 monthly observations).

INDIVIDUAL SHARE DATA

The primary source of share-price data in this study is a sample of 145 common stocks listed and traded on the exchanges of London, Frankfurt, and Tokyo. The sample consists of most of the large and internationally oriented firms in the three non-U.S. markets. Only firms which have been listed 10 years or more were included in the sample. The sample firms within a country are distributed among the different industries. Some are internally diversified as well. For each of the firms in the sample, end-of-month price quotations were recorded for the period June 1961–January 1966 (56 monthly observations). Share prices were converted to dollars and adjusted for dividends and capital gains. Log price relatives were calculated so that the effective size of the sample is 55 monthly observations.

The main sources for the data are: United Kingdom, *Economist* and *Financial Times*; Germany, share studies of the Deutsche Bank and publications of the *Frankfurter Allgemeine Zeitung*; Japan, *Japan Stock Journal*.

APPENDIX B

THE RELATIONS BETWEEN THE COUNTRY FACTOR AND SHARE PRICE CHANGES IN THE NON-U.S. MARKETS

Price changes in each of the non-U.S. markets were related to changes in the four country factors. The average coefficients with respect to each of the country factors are reported in table 2. The distribution of these coefficients for each of the equity markets of the United Kingdom, Germany, and Japan is presented in tables B1, B2, and B3.

9. The main series were adjusted for dividend yield and major capital changes.

Table B1
United Kingdom

	$\hat{b}_1(\text{U.S.})$	$\hat{b}_2(\text{U.K.})$	$\hat{b}_3(\text{Germany})$	$\hat{b}_4(\text{Japan})$
Average	0.3609	0.6762	-0.0248	0.0200
Fractiles:				
1	-0.0463	-0.0122	-0.4130	-0.3175
2	0.0986	0.2893	-0.3032	-0.1893
3	0.1677	0.5152	-0.2031	-0.1495
4	0.2931	0.6758	-0.1037	-0.0940
5	0.3443	0.8254	-0.0703	-0.0434
6	0.4455	0.9648	0.0370	0.0065
7	0.5113	1.0657	0.1586	0.1002
8	0.5659	1.1439	0.3064	0.2294
9	0.7172	1.3381	0.4481	0.3996
Average <i>t</i> -value	1.345	2.240	-0.068	-0.146

Table B2
Germany

	$\hat{b}_1(\text{U.S.})$	$\hat{b}_3(\text{Germany})$	$\hat{b}_2(\text{U.K.})$	$\hat{b}_4(\text{Japan})$
Average	0.8940	0.9235	0.1140	-0.1076
Fractiles:				
1	0.5400	0.3784	-0.2742	-0.4111
2	0.6476	0.8322	-0.1710	-0.1663
3	0.7358	0.9415	-0.1201	-0.1089
4	0.7658	0.9806	-0.0414	-0.0893
5	0.8075	1.0743	0.0293	-0.0134
6	0.8820	1.1267	0.1671	0.0194
7	0.9688	1.2169	0.2100	0.0566
8	1.0050	1.2410	0.2601	0.1040
9	1.4700	1.3523	0.9944	0.1533
Average <i>t</i> -value	4.821	5.819	0.199	-0.0367

Table B3
Japan

	$\hat{b}_1(\text{U.S.})$	$\hat{b}_3(\text{Germany})$	$\hat{b}_2(\text{U.K.})$	$\hat{b}_4(\text{Japan})$
Average	0.3720	0.0682	0.0710	0.9489
Fractiles:				
1	-0.0234	-0.3999	-0.4386	0.5222
2	0.1649	-0.2386	-0.2291	0.6374
3	0.2479	-0.1347	-0.0646	0.8033
4	0.3051	-0.0204	0.0877	0.9424
5	0.3733	0.0527	0.1647	0.9707
6	0.4150	0.1817	0.1963	1.0350
7	0.4933	0.2401	0.2288	1.0780
8	0.6012	0.3110	0.4474	1.1522
9	0.7290	0.5599	0.5095	1.4149
Average <i>t</i> -value	1.170	0.156	0.2181	3.861

The regression equation is as follows:

$$\ln R_{ij} = \hat{a} + \hat{b}_1 \ln P(\text{U.S.}) + \hat{b}_2 C_j + \hat{b}_3 C_k + \hat{b}_4 C_l,$$

where R_{ij} is the price relative of the i th share in the j th market, C_j is the country residual factor associated with the country of the regressed share, and C_k and C_l are the country residuals of the other two non-U.S. countries.

The distribution of the coefficients b_1 , b_2 , b_3 , and b_4 for the three non-U.S. countries is described by both the average and the deciles.

Country	Mean	1st Decile	9th Decile
U.S.	0.0000	0.0000	0.0000
Japan	0.0000	0.0000	0.0000
U.K.	0.0000	0.0000	0.0000

Country	Mean	1st Decile	9th Decile
U.S.	0.0000	0.0000	0.0000
Japan	0.0000	0.0000	0.0000
U.K.	0.0000	0.0000	0.0000
France	0.0000	0.0000	0.0000
Germany	0.0000	0.0000	0.0000
Italy	0.0000	0.0000	0.0000
Spain	0.0000	0.0000	0.0000
Sweden	0.0000	0.0000	0.0000
Norway	0.0000	0.0000	0.0000
Denmark	0.0000	0.0000	0.0000
Finland	0.0000	0.0000	0.0000
Ireland	0.0000	0.0000	0.0000
Greece	0.0000	0.0000	0.0000
Portugal	0.0000	0.0000	0.0000
Belgium	0.0000	0.0000	0.0000
Netherlands	0.0000	0.0000	0.0000
Luxembourg	0.0000	0.0000	0.0000
Austria	0.0000	0.0000	0.0000
Switzerland	0.0000	0.0000	0.0000
Poland	0.0000	0.0000	0.0000
Czech Republic	0.0000	0.0000	0.0000
Slovak Republic	0.0000	0.0000	0.0000
Hungary	0.0000	0.0000	0.0000
Slovenia	0.0000	0.0000	0.0000
Croatia	0.0000	0.0000	0.0000
Serbia	0.0000	0.0000	0.0000
Bosnia and Herzegovina	0.0000	0.0000	0.0000
Montenegro	0.0000	0.0000	0.0000
Albania	0.0000	0.0000	0.0000
Moldova	0.0000	0.0000	0.0000
Romania	0.0000	0.0000	0.0000
Bulgaria	0.0000	0.0000	0.0000
Greece	0.0000	0.0000	0.0000
Turkey	0.0000	0.0000	0.0000
Israel	0.0000	0.0000	0.0000
India	0.0000	0.0000	0.0000
China	0.0000	0.0000	0.0000
Japan	0.0000	0.0000	0.0000
U.S.	0.0000	0.0000	0.0000

Country	Mean	1st Decile	9th Decile
U.S.	0.0000	0.0000	0.0000
Japan	0.0000	0.0000	0.0000
U.K.	0.0000	0.0000	0.0000
France	0.0000	0.0000	0.0000
Germany	0.0000	0.0000	0.0000
Italy	0.0000	0.0000	0.0000
Spain	0.0000	0.0000	0.0000
Sweden	0.0000	0.0000	0.0000
Norway	0.0000	0.0000	0.0000
Denmark	0.0000	0.0000	0.0000
Finland	0.0000	0.0000	0.0000
Ireland	0.0000	0.0000	0.0000
Greece	0.0000	0.0000	0.0000
Portugal	0.0000	0.0000	0.0000
Belgium	0.0000	0.0000	0.0000
Netherlands	0.0000	0.0000	0.0000
Luxembourg	0.0000	0.0000	0.0000
Austria	0.0000	0.0000	0.0000
Switzerland	0.0000	0.0000	0.0000
Poland	0.0000	0.0000	0.0000
Czech Republic	0.0000	0.0000	0.0000
Slovak Republic	0.0000	0.0000	0.0000
Hungary	0.0000	0.0000	0.0000
Slovenia	0.0000	0.0000	0.0000
Croatia	0.0000	0.0000	0.0000
Serbia	0.0000	0.0000	0.0000
Bosnia and Herzegovina	0.0000	0.0000	0.0000
Montenegro	0.0000	0.0000	0.0000
Albania	0.0000	0.0000	0.0000
Moldova	0.0000	0.0000	0.0000
Romania	0.0000	0.0000	0.0000
Bulgaria	0.0000	0.0000	0.0000
Greece	0.0000	0.0000	0.0000
Turkey	0.0000	0.0000	0.0000
Israel	0.0000	0.0000	0.0000
India	0.0000	0.0000	0.0000
China	0.0000	0.0000	0.0000
Japan	0.0000	0.0000	0.0000
U.S.	0.0000	0.0000	0.0000

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