by Donald R. Lessard

World, Country, and Industry Relationships in Equity Returns

Implications for Risk Reduction Through International Diversification

The growing awareness that different national equity markets often perform very differently in any given period has led to increased investor interest in international diversification of investment portfolios. It appears that at least for the U.S., however, this interest has not been translated into much actual foreign portfolio investment. One reason for this may be the relative novelty of foreign investment and the special problems it poses.

Equity investing in international markets differs from equity investing in the domestic market in three important respects: (1) The covariances among securities within national markets are much higher than the covariances among securities in different markets. National factors have a strong impact on security returns relative to any common world factor. This contrasts with the more familiar covariance structure of the single market, like that of the U.S., where there is a well defined national market factor and few stable relationships among returns on individual securities beyond this factor. (2) Barriers imposed by taxation, currency controls, or even investor tradition may segment financial national markets sufficiently that securities are priced in a domestic, rather than an international, context. (3) Rates of exchange between different currencies may fluctuate, raising the possibility of exchange risk in international investment.

In this article I present evidence concerning the covariance structure of equity returns in international markets and discuss some of its implications for portfolio selection. The discussions are largely descriptive, but this seems appropriate given the current lack of information about this structure. I consider the following questions: What are the elements in this covariance structure? Do world, country, or industry factors dominate? What does this structure suggest about gains from international diversification, if markets are assumed to be integrated? Segmented?

Two sets of data are used. The first is monthly percentage changes in market-value weighted price indexes for 16 countries and for 30 industries covering the period January 1959 to October 1973.[1] The second is monthly price changes for 205 individual securities from 14 countries and 14 industries for the period January 1969 to October 1973.[2]

The Covariance Structure of Returns

Results obtained by Solnik and others for a large number of countries show that a substantial part of the variance of returns on individual stocks is ex-

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1. Footnotes appear at end of article.

plained by national market indexes.[3] The part of variance they explained represents systematic risk, which cannot be diversified away within the domestic market. However, a number of studies show that the correlations between the national indexes are relatively low and, therefore, that only a fraction of national systematic risk elements is systematic in a world context.[4] Thus diversification across national boundaries should be expected to result in a substantial reduction in portfolio risk.

Tables 1 and 2 illustrate these two points. Table 1 reports the average proportion of variance of individual stocks in each of 16 countries explained by their respective domestic stock market indexes. Table 2 reports the proportions of these stock market indexes explained by two alternative world indexes, a capitalization-weighted index of the various country indexes—the world market index—and an equally weighted index of the various country indexes.

The proportions reported in Table 1 are intuitively plausible in that they show, with few exceptions, the greatest risk reduction through domestic diversification is possible in the U.S. and that other smaller, less diverse economies display greater proportions of national systematic risk in stock returns.

The results in Table 2, which relate to the benefits of international diversification, also are in line with what one would expect. The markets bearing the closest relationships to the market value weighted world index are the U.S. and Canada, reflecting the overwhelming proportion of world stock market capitalization represented by these two—nearly 70 per cent. Those moving most closely with the equally weighted index, on the other hand, are European countries with strong economic ties through trade and capital flows. In either case, the results are striking in terms of the relatively low average proportions of variance explained by world factors. Since each domestic market index represents a diversified portfolio, a useful comparison is the proportion of variance of diversified U.S. portfolios explained by the U.S. market index.[5] Jensen, for example, reported a figure of 60 per cent for 115 U.S. mutual funds for the period 1960 to 1969.[6] On the surface, at least, these results confirm the relative importance of the international dimension in risk reduction.

The existence of common elements in returns

TABLE 1: Average Proportion of Variance of Individual Security Returns Explained by National Market Indexes[a]

Country	Solnik Results 1966-1971[b]	205 Stock Sample 1969-1973[b]
Australia	—	0.34
Austria	—	0.37
Belgium	0.16	0.49
Denmark	—	0.31
France	0.30	0.46
Germany	0.45	0.44
Italy	0.46	0.43
Japan	—	0.27
Netherlands	0.23	0.40
Norway	—	0.46
Spain	—	0.40
Sweden	0.45	0.42
Switzerland	0.35	0.51
U.K.	0.37	0.37
U.S.A.	0.22	—

[a]Proportions reported are for returns translated into U.S. dollar equivalents.

[b]Solnik's data are for two-week periods, the data for the 205 stocks are monthly. Solnik's generally lower correlation figures may reflect a downward bias due to generally stronger non-trading effects over the shorter holding periods.

TABLE 2: Proportion of Variance of National Indexes Explained by Alternative World Indexes
(monthly observations January 1959 to October 1973)[a]

Country	Market Value Weighted Index	Equally Weighted Index
Australia	0.111	0.202
Austria	0.045	0.201
Belgium	0.262	0.501
Canada	0.667	0.382
Denmark	0.008	0.116
France	0.096	0.402
Germany	0.223	0.490
Italy	0.062	0.256
Japan	0.079	0.155
Netherlands	0.454	0.527
Norway	0.020	0.222
Spain	0.004	0.089
Sweden	0.131	0.285
Switzerland	0.295	0.545
U.K.	0.169	0.226
U.S.A.	0.880	0.300
Simple Average	0.219	0.306
Market Value Weighted Average[b]	0.626	0.294

[a]The proportion of variance explained is equal to the R^2 of $R_j = \alpha_j + \beta_j R_w + \epsilon_j$ where R_j is the monthly percentage change in the national market index for country j and R_w is the monthly percentage change in the world market factor.

[b]Using market values as of December 1972.

within each country and of relatively low correlations between these country effects can be described by a multi-index market model of the following form for the return on security i from country j:

$$\tilde{R}_i = \alpha_i + \beta_i \tilde{F}_w + \gamma_i \tilde{F}_j + \epsilon_i \quad (1)$$

where α_i, β_i, and γ_i are stable parameters specific to security i, and $\tilde{F}_w$ and $\tilde{F}_j$ are respectively world and country indexes.[7] However, it is possible that in addition to world and country factors there are other important group elements in the covariance structure. One obvious possibility is a set of industry elements.

Industry Elements in the Covariance Structure

In order to test for industry elements, returns on the 205 individual stocks were regressed against (1) a world index and (2) the residuals of the country or industry indexes obtained by regressing these on the world index. Four alternative relationships were estimated using two different surrogates for the world factor—one a market value weighted average of the country indexes (MWI), the other an equally weighted average of the country indexes (EWI)—and the residual of either the country or the industry index on the world index used. To summarize, I had

$$R_{it} = \alpha_i + \beta_i (MWI)_t + \gamma_i RC_j(MWI)_t + \epsilon_t, \quad i \text{ included in } j,\ j=1,J \quad (2a)$$

$$R_{it} = \alpha_i + \beta_i (MWI)_t + \gamma_i RI_k(MWI)_t + \epsilon_t, \quad i \text{ included in } k,\ k=1,K \quad (2b)$$

$$R_{it} = \alpha_i + \beta_i (EWI)_t + \gamma_i RC_j(EWI)_t + \epsilon_t, \quad i \text{ included in } j,\ j=1,J \quad (2c)$$

$$R_{it} = \alpha_i + \beta_i (EWI)_t + \gamma_i RI_k(EWI)_t + \epsilon_t, \quad i \text{ included in } k,\ k=1,K \quad (2d),$$

where R_i is the return on stock i, member of country j and industry k in period t, MWI is the market value weighted world index, EWI is the equally weighted world index, $RC_j(\ )$ is the residual series remaining after the country j index is regressed on the world index specified in parentheses, and $RI_k(\ )$ is the residual of the industry k index on the particular world index.

The results of these regressions summarized by country in Tables 3 and 4 clearly show that there is a world element in returns. However, they show an even stronger set of country effects together with important, but relatively weaker, industry effects. The dominance of the country effects is especially marked in the regressions involving the equally weighted world index as the proxy for a world factor in stock returns. Industry factors are large relative to country factors for only three countries—Australia, Japan, and the U.K. In the case of the first two this can be explained by noting that certain groups of companies oriented primarily toward international markets represent a dominant proportion of their total industry capitalization (excluding the U.S. and Canada).[8]

Undoubtedly, some of the explanatory power of country and industry elements is redundant, although further tests are required to determine the extent to which this is the case. Clearly, however, country factors are the most important elements in the covariance structure, reinforcing the view that the international dimension is particularly critical in reducing risk through diversification.

Segmentation versus Integration and Gains from International Diversification

The low correlations between the country factors represent the key to gains from international diversification. The magnitude of these gains will depend, however, on whether markets are segmented or integrated internationally. In the former case, assuming the validity of the capital asset pricing model, prices and expected returns are determined by the undiversifiable risk of each security in the context of the appropriate national portfolio. In the latter, prices and expected returns are determined by the undiversifiable risk of each security in the context of the world portfolio.

With fully integrated markets, the advantage to international diversification is a pure diversification effect, a reduction in the non-systematic risk of the portfolio.[9] With fully segmented markets gains might be even greater, since prices would adjust to reflect the fact that some previously undiversifiable risk was becoming diversifiable.[10]

As Adler and Dumas point out, segmentation or integration cannot be determined from the covariance matrix of returns.[11] Strong national elements are consistent with an internationally integrated market, although it is easy to see why national fluctuations might be even more important in the case of segmented capital markets accompanied by restrictions on transfers of other factors of production. Furthermore, a stable world element is consistent with either type of market relationship. Again, it may be the result of *economic* linkages as well as linkages in capital markets.

If markets are integrated, the low correlations between countries may overstate the benefits of international diversification. Because a few large countries represent the bulk of the market value, risk elements unique to these countries will contribute to the risk of the world portfolio.[12] Since asset prices in an integrated world market will adjust to

TABLE 3: World, Country, and Industry Contributions To Variance of Individual Securities

Stocks Grouped by Country	Average Proportion of Variance Explained by: Market Value Weighted World Index (MWI)	Residual of Country Index on MWI[b]	Residual of Industry Index on MWI	Equally Weighted World Index (EWI)	Residual of Country Index on EWI	Residual of Industry Index on EWI
Australia	0.107 (11/15)[a]	0.250 (12/15)	0.193 (11/15)	0.168 (14/15)	0.197 (10/15)	0.148 (1/15)
Austria	0.013 (0/4)	0.097 (4/4)	0.070 (1/4)	0.131 (3/4)	0.264 (4/4)	0.011 (0/4)
Belgium	0.055 (4/11)	0.444 (11/11)	0.105 (9/11)	0.320 (11/11)	0.180 (10/11)	0.015 (6/11)
Denmark	0.051 (1/2)	0.280 (2/2)	0.037 (0/2)	0.148 (2/2)	0.191 (2/2)	0.002 (0/2)
France	0.028 (2/27)	0.437 (27/27)	0.127 (18/27)	0.256 (27/27)	0.211 (27/27)	0.025 (3/27)
Germany	0.086 (17/26)	0.366 (25/26)	0.107 (13/26)	0.275 (25/26)	0.169 (21/26)	0.030 (6/26)
Italy	0.012 (0/18)	0.427 (18/18)	0.076 (10/18)	0.062 (8/18)	0.356 (18/18)	0.035 (4/18)
Japan	0.088 (23/35)	0.190 (33/35)	0.227 (23/35)	0.129 (28/35)	0.156 (30/35)	0.200 (24/35)
Netherlands	0.188 (6/7)	0.221 (6/7)	0.097 (4/7)	0.344 (7/7)	0.079 (3/7)	0.034 (3/7)
Norway	0.008 (0/5)	0.457 (4/5)	0.077 (2/5)	0.188 (4/5)	0.294 (4/5)	0.013 (0/5)
Spain	0.011 (0/7)	0.393 (6/7)	0.046 (1/7)	0.110 (6/7)	0.311 (6/7)	0.012 (1/7)
Sweden	0.069 (5/8)	0.356 (7/8)	0.070 (3/8)	0.165 (6/8)	0.260 (7/8)	0.016 (0/8)
Switzerland	0.161 (9/9)	0.363 (9/9)	0.139 (8/9)	0.387 (9/9)	0.141 (7/9)	0.017 (0/9)
U.K.	0.084 (20/31)	0.297 (31/31)	0.286 (26/31)	0.100 (20/31)	0.287 (30/31)	0.285 (28/31)
Simple Average	0.069	0.327	0.118	0.199	0.221	0.060
Market Value Weighted Average	0.075	0.290	0.192	0.164	0.212	0.154

[a] Numbers in parentheses are the number of correlations significantly different from zero at the five per cent level divided by the total number in each group. (Two-tailed t-test with 58 observations, critical value of r = 0.251, $r^2 = 0.063$.)

[b] That is, the average proportion variance of the stocks in the indicated country explained by the time series of residual returns remaining after the country index is regressed against the Market Value Weighted World Index (MWI).

TABLE 4: World, Country, and Industry Contributions To Variance of Individual Securities

Stocks Grouped by Industry	Average Proportion of Variance Explained by: Market Value Weighted World Index (MWI)	Residual of Country Index on MWI[b]	Residual of Industry Index on MWI	Equally Weighted World Index (EWI)	Residual of Country Index on EWI	Residual of Industry Index on EWI
Chemicals	0.065 (8/19)[a]	0.350 (18/19)	0.095 (9/19)	0.184 (12/19)	0.239 (15/19)	0.040 (4/19)
Steel	0.068 (8/19)	0.381 (19/19)	0.179 (11/19)	0.218 (17/19)	0.228 (18/19)	0.122 (6/19)
Non-Ferrous	0.062 (8/18)	0.430 (18/18)	0.210 (16/18)	0.233 (16/18)	0.267 (16/18)	0.115 (8/18)
Buil. Prod.	0.057 (6/15)	0.390 (14/15)	0.156 (11/15)	0.190 (13/15)	0.257 (14/15)	0.079 (4/15)
Forest Prod.	0.065 (7/16)	0.218 (15/16)	0.136 (8/16)	0.138 (13/16)	0.155 (12/16)	0.123 (6/16)
Electrical	0.110 (12/14)	0.403 (14/14)	0.178 (11/14)	0.234 (14/14)	0.282 (14/14)	0.128 (6/14)
Automobiles	0.064 (7/13)	0.367 (12/13)	0.207 (11/13)	0.248 (12/13)	0.241 (11/13)	0.100 (7/13)
Tires	0.041 (3/8)	0.358 (8/8)	0.223 (7/8)	0.158 (6/8)	0.240 (8/8)	0.106 (5/8)
Food Prod.	0.052 (5/17)	0.280 (16/17)	0.131 (10/17)	0.132 (11/17)	0.200 (15/17)	0.091 (5/17)
Breweries	0.080 (11/19)	0.214 (17/19)	0.112 (10/19)	0.181 (17/19)	0.131 (13/19)	0.107 (6/19)
Textiles & App.	0.073 (8/15)	0.280 (15/15)	0.103 (5/15)	0.165 (10/15)	0.197 (12/15)	0.072 (5/15)
Pharma-ceuticals	0.105 (8/11)	0.349 (11/11)	0.125 (6/11)	0.180 (9/11)	0.272 (11/11)	0.105 (5/11)
Oil	0.073 (5/14)	0.370 (13/14)	0.182 (7/14)	0.218 (13/14)	0.237 (13/14)	0.114 (4/14)
Airlines	0.097 (4/7)	0.271 (6/7)	0.217 (5/7)	0.283 (6/7)	0.129 (5/7)	0.117 (3/7)
Simple Average	0.072	0.333	0.161	0.197	0.220	0.101
Market Value Weighted Average	0.075	0.290	0.192	0.164	0.212	0.154

[a] Numbers in parentheses are the number of correlations significantly different from zero at the five per cent level divided by the total number in each group. (Two-tailed t-test with 58 observations, critical value of r = 0.251, $r^2 = 0.063$.)

[b] That is, the average proportion variance of the stocks in the indicated country explained by the time series of residual returns remaining after the country index is regressed against the Market Value Weighted World Index (MWI).

induce investors to hold the world portfolio, alternative portfolios with more complete diversification of these country elements would be inefficient in terms of the tradeoff between risk and expected return. If markets are segmented, on the other hand, then a more complete diversification of country effects should be beneficial.

The effect of the disproportionate market capitalization of these few countries on the risk of the world portfolio is illustrated by four risk figures based on actual market indexes for 16 countries—an equally weighted average of the standard deviations of the indexes, a market value weighted average of the index standard deviations, the standard deviation of the world portfolio, and that of a portfolio in which each country has equal weights. In Table 5 we see that, although the market value weighted *average* is lower than the unweighted *average*, reflecting the relatively lower risk of the dominant U. S. portfolio, the standard deviation of the (market-value weighted) world *portfolio* is considerably higher than that of the equally weighted *portfolio*.

TABLE 5: Illustration of Impact of International Diversification on Portfolio Risk

	Annual Standard Deviation (%)	Annual Variance (%)
Average for all 16 Indexes	15.0	225.0
Market Value Weighted Average for all 16 Indexes	13.6	185.0
World Market Portfolio	10.6	112.4
Equally Weighted Portfolio of National Indexes	8.3	68.9

Expected Returns, Covariances, and Gains from International Diversification

Given the possibility of segmented markets, no claims can be made about the magnitude of gains from investing internationally based solely on the covariance structure. The analysis also must incorporate estimates of expected returns in various markets. Of course, in an idealized international market with no segmentation, identical expectations, and identical investor preferences, one would expect all investors to hold the world market portfolio. In this kind of equilibrium, expected returns for the respective national portfolios will be those that induce investors to hold the world market portfolio, given the covariance structure of the national portfolios.

However, casual observations of investor holdings suggest that, relative to the proportions in the world market portfolio, investors in each country do indeed tend to concentrate their portfolios in domestic securities. Certainly U.S. investors do not devote 40 per cent of their portfolios to foreign securities, as implied by world portfolio proportions.

The interesting question, then, is whether this investor behavior is rational within the context of efficient, internationally integrated capital markets. Undoubtedly, there are departures from the idealized conditions listed above, and some of them, such as differential transactions costs, taxes or restrictions on foreign exchange transactions, would result in differential returns to resident and nonresident investors, leading investors of different nationalities to hold different portfolios. In general, however, since any departure from the world portfolio will entail taking on some risk that is potentially diversifiable, costs associated with international diversification have to be sufficient to offset the "unnecessary" risk.

To illustrate the importance of the diversification foregone by restricting investment to the domestic portfolio, I consider two cases—one in which one assumes markets are segmented and one in which one assumes they are integrated. In the first case, one estimates the level of returns on foreign market portfolios relative to the domestic level that should induce U.S. investors to incorporate foreign securities in their portfolios. If one assumes segmented markets, the U.S. investor will evaluate the foreign portfolios in the context of the U.S. market. In this case, the return required on the country j portfolio by a U.S. investor will depend on the systematic risk of the foreign portfolio in the context of the U.S. market, $\beta_j^{U.S.}$.[13]

Table 6 presents three sets of risk figures for each country: its total risk measured by standard deviation σ_j; its systematic risk in the context of the U.S. market, $\beta_j^{U.S.}$; and its systematic risk in the context of the world market portfolio β_j^{W}. The $\beta^{U.S.}$ figures suggest that U.S. investors would find most of the foreign countries' portfolios attractive at expected returns below the expected return on the U.S. market. However, since most of these portfolios have higher total risks than the U.S. portfolio, under the segmented markets assumption, their expected returns should be higher. Therefore, barriers in the form of taxes, restrictions, or transactions costs would have to be substantial to justify holding only domestic assets.

The second case assumes that capital markets are integrated internationally and that expected returns on each country's portfolio reflect the con-

TABLE 6: Risk Measures for Country And World Portfolios

Country j	Standard Deviation of Annual Returns σ_j	U.S. Market Risk $\beta_j^{U.S}$	World Market Risk β_j^{W}
Australia	16.1	0.28	0.51
Austria	13.0	0.11	0.26
Belgium	11.4	0.32	0.55
Canada	12.3	0.78	0.95
Denmark	11.5	0.03	0.10
France	17.1	0.24	0.50
Germany	19.4	0.52	0.86
Italy	21.6	0.23	0.50
Japan	18.4	0.25	0.49
Netherlands	14.8	0.69	0.94
Norway	16.0	0.06	0.21
Spain	12.7	0.02	0.08
Sweden	13.6	0.31	0.46
Switzerland	18.6	0.65	0.96
U.K.	15.8	0.34	0.61
U.S.A.	12.5	1.00	1.10
World	10.6	0.75	1.00

tribution of its individual securities to the risk of the world portfolio. One then can determine how much return an investor would give up by holding only his domestic portfolio rather than a globally diversified portfolio with the same total risk. Since this equivalent-risk portfolio is a combination of the world portfolio and risk-free borrowing or lending, its expected return is given by the world capital-market line,

$$E(\tilde{R}_{wj}) = i + \sigma_j \left[\frac{E(\tilde{R}_w) - i}{\sigma_w} \right], \qquad (3)$$

where $E(\tilde{R}_{wj})$ is the expected return on the globally diversified portfolio with the same standard deviation as the domestic portfolio, σ_j, i is the pure rate of interest, and $E(\tilde{R}_w)$ and σ_w are the expected return and standard deviation of the world portfolio. The expected return of the country j portfolio, on the other hand, is given by the domestic capital-market line,

$$E(\tilde{R}_j) = i + \beta_j^w [E(\tilde{R}_w) - i], \qquad (4)$$

where β_j^W is the world market risk of the portfolio.

The two return figures are calculated using the β_j^W's and σ_j's estimated over the entire 1959 to 1973 period and assuming that $E(\tilde{R}_w) = 10$ per cent, i=6 per cent, and that $\sigma_w = 10.6$ per cent, the historical figure. The results reported in Table 7 show that, for all countries except the U.S. and Canada, the domestic investors would suffer a substantial reduction in return if they held only their

TABLE 7: Equilibrium Returns of Domestic and Equivalent-Risk Globally Diversified Portfolios In an Integrated World Market*

Country j	Expected Return of Domestic Portfolio* $E(\tilde{R}_j)$	Expected Return of "Risk Equivalent" World Portfolio* $E(\tilde{R}_{wj})$	Reduction in Return for Equivalent Total Risk $E(\tilde{R}_{wj}) - E(\tilde{R}_j)$
Australia	8.02	12.08	4.06
Austria	7.04	10.92	3.88
Belgium	8.20	10.28	2.08
Canada	9.79	10.64	0.85
Denmark	6.40	10.36	3.96
France	8.01	12.48	4.47
Germany	9.45	13.32	3.87
Italy	8.02	14.16	6.14
Japan	7.95	12.96	5.01
Netherlands	9.77	11.60	1.83
Norway	6.85	12.04	5.19
Spain	6.30	10.80	4.50
Sweden	7.85	11.12	3.27
Switzerland	9.82	13.04	3.22
U.K.	8.46	11.46	3.30
U.S.A.	10.41	10.72	0.31

* Assuming that the risk-free rate is six per cent and the expected return on the world market portfolio is ten per cent.

domestic portfolios. The reason the U.S. investor would suffer only a minor reduction is that the domestic portfolio is very highly correlated with the world portfolio, primarily because it represents such a large proportion of the latter's total value. Note, however, what this implies in terms of expected returns for the various domestic portfolios. The U.S. has the highest expected return, reflecting its extremely high systematic risk.

Compared to the first, this illustration shows the importance of the extent to which domestic markets are linked. With the expected returns generated in perfectly integrated markets, the U.S. investor would lose little by holding only the U.S. portfolio. (Of course, if many U.S. investors favored the domestic portfolio, then it would not provide as high an expected return and there would be greater incentive for international investment.)

Actual return outcomes are more consistent with the assumption of segmented markets than the assumption of integrated markets. Results obtained by Bergstrom for 1959 to 1973 show that almost all national portfolios have provided higher returns than the U.S.[14] On the other hand, since there is international investment, markets cannot be totally segmented. This suggests that the truth lies somewhere between the two sets of assumptions. ■

(Footnotes on following page)

Footnotes

1. The indexes incorporating capital changes but excluding cash dividends are computed by Capital International S.A. and published in their monthly publication, *Perspective*. These indexes, which exclude foreign stocks listed on a particular market, were converted into U.S. dollars at official rates by Capital International through May 1971 and by the author at quoted rates in subsequent periods.
2. The countries are the same as in the first set, excluding the U.S. and Canada. The 205 stocks are the same ones used to compute the respective industry indexes.
3. Bruno H. Solnik, *European Capital Markets* (Lexington Books, 1973).
4. Herbert G. Grubel, "Internationally Diversified Portfolios," *American Economic Review* (December 1968), pp. 1299-1314; Grubel and Kenneth Fadner, "The Interdependence of International Equity Markets," *Journal of Finance* (March 1971), pp. 89-94; Donald Lessard, "World, National, and Industry Factors in Equity Returns," *Journal of Finance* (May 1974), pp. 379-391; Haim Levy and Marshall Sarnat, "International Diversification of Investment Portfolios," *American Economic Review* (September 1970), pp. 668-675; Duncan M. Ripley, "Systematic Elements in the Linkage of National Stock Market Indices," *Review of Economics and Statistics* (September 1973), pp. 356-361; and Solnik.
5. It should be noted, however, that several of the country portfolios include fewer than 20 securities, biasing the comparison to some extent. For further discussion, see Lessard.
6. Michael C. Jensen, "Risk, the Pricing of Capital Assets, and the Evaluation of Investment Portfolios," *Journal of Business* (April 1967), pp. 167-247.
7. For discussions of alternative multi-index models of international returns, see Paul Korsvold, "International Portfolio Diversification," (unpublished working paper, March 1974); and Solnik.
8. Lessard discusses the relative concentration of firms from specific countries, in terms of market value, in the various international industry groups. In the case of non-ferrous metals, 58 per cent of the market value corresponds to Australian firms; in the case of steel, 57 per cent corresponds to Japanese firms.
9. This pure diversification will be substantial given the existence of strong national risk elements which are diversifiable internationally.
10. This discussion of segmentation versus integration follows that of John G. McDonald, "French Mutual Fund Performance: Evaluation of Internationally Diversified Portfolios," *Journal of Finance* (December 1973), pp. 1161-1180. Richard A. Cohn and John J. Pringle, "Imperfections in International Financial Markets: Implications for Risk Premia and the Cost of Capital to Firms," *Journal of Finance* (March 1973), pp. 59-66. The authors analyze the effect on the price of risk and the risk-free rate of integrating hitherto segmented markets.
11. Michael Adler and Bernard Dumas, "Optimal International Acquisitions," *Journal of Finance* (March 1975), pp. 1-19.
12. A further limitation of the correlation figures between national markets is purely statistical. Several of the markets display substantial serial correlation in returns which may be the result of non-trading effects in the data. This serial correlation will result in an understatement of the true correlations between markets.
13. The results will apply strictly only for an infinitesimal investment in the foreign security. Then, too, foreign investment by a domestic investor will of course change the equilibrium in both markets.
14. Gary F. Bergstrom, "A New Route to Higher Returns and Lower Risks," Journal of Portfolio Management (Fall 1975), pp. 30-38.

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