GAINS FROM PORTFOLIO DIVERSIFICATION INTO LESS DEVELOPED COUNTRIES' SECURITIES

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Abstract. The paper substantiates the intuitive argument for international portfolio diversification—diversification that is not limited to the developed markets, but also includes the corporate securities of less developed countries (LDCs). Such diversification, in light of all the available evidence, appears to be desirable from the standpoint of the investor.

Capital flows resulting from international diversification can tremendously improve liquidity position of the developing countries and provide a major development impact by increasing the probability of success of the capital market development programs being pursued by many LDCs; e.g., Brazil, Venezuela, Colombia, Indonesia, Nigeria, and Korea.

INTRODUCTION

■ The pioneering works of Harry Markowitz[1] and James Tobin[2] resulted in the famous Mean-Variance (M-V) model, which demonstrates that the reduction in risk from portfolio diversification depends on correlations among return distributions of individual securities. Even though diversification among risky assets available in a particular country leads to risk reduction, the potential is rather limited due to the generally high correlations within an economy. This suggests the possibility of further risk reduction through international portfolio diversification. Accordingly, gains from such diversification have been suggested by Grubel[3] (study of eleven developed countries for the period 1959-1966), Levy and Sarnat[4] (study of twenty-eight countries for the period 1951-1967), and Grubel and Fadner[5, 6] (diversification into US-UK-West German stock exchanges for the period January 1, 1965, to June 30, 1967).

The above studies suffer from possible bias due to time period selection. Both Grubel and Levy-Sarnat studies lent themselves to the argument of gains from international diversification as a result of the time periods studied. On the other hand, the period selected by Grubel-Fadner was too short to draw meaningful conclusions. The past research also relied heavily on a single source of published stock price indices. The Levy-Sarnat work which included less developed countries (LDCs) ignored cash dividends and reduction in variance resulting from the presence of averaging in the indices. These problems have considerably reduced the impact of their findings.

Hence, the objective of this paper is to study the desirability of portfolio investments into the corporate securities of less developed countries. The problems of past studies are dealt with by the selection of multiple time periods; extensive use of quarterly data in addition to annual indices; multiple sources of data which include recent performance of leading domestic securities in a selected group of countries; collection and inclusion of dividend data in the analysis; and by estimating the bias resulting from use of averaged indices. A discussion of the barriers to such investments will be followed by potential responses including the Brazilian experience.

METHODOLOGY

In order to provide the necessary theoretical underpinnings to the study, a brief description of the model follows.

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The Model　The study utilizes the M-V model for the generation of efficient sets of portfolios. Under this model, a portfolio x is preferred to another portfolio y, if and only if,

$$Ex \geqslant Ey \text{ and } Var(x) \leqslant Var(y)$$

At least one of the strong inequalities must hold. The expected returns, Ex and Ey, indicate profitability of the two portfolios; whereas the variances, Var (x) and Var (y), indicate their risks. Alternatively, the M-V criterion can be defined as,

$$Ex \geqslant Ey \; ; \; Var(x) < Var(y) \text{ and}$$
$$Ex > Ey \; ; \; Var(x) \leqslant Var(y)$$

Thus, $Ex \geqslant Ey$ and $Var(x) \leqslant Var(y)$ each constitute a necessary condition for the portfolio x to dominate portfolio y.

The portfolio expected returns are weighted averages of expected returns for individual securities making up the portfolio. Thus,

$$Ex = \sum_{i=1}^{n} w_i \, \mu_i$$

where w_i and μ_i are, respectively, the proportion of and expected return for security i in the portfolio of n securities.

The portfolio variance is given by,

$$Var(x) = \sum_{i=1}^{n} w_i^2 \, \sigma_i^2 + 2 \sum_{i=1}^{n} \sum_{\substack{j=1 \\ j>i}}^{n} w_i \, w_j \, R_{ij} \, \sigma_i \sigma_j$$

where, σ_i^2 is the variance of return distribution for the security i and R_{ij} denotes the coefficient of correlation between the returns of securities i and j.

Thus, the degree to which diversification reduces the variance of returns depends on the correlation between return distributions of securities in the portfolio. If returns for all securities are perfectly positively correlated with each other ($R_{ij} = +1$ for all i and j), no reduction in portfolio variance will be achieved. On the other hand, if the securities are perfectly negatively correlated ($R_{ij} = -1$ for all i and j), it is possible to reduce portfolio variance to zero. Thus, diversification in general reduces portfolio variance except in the extreme case where the returns are perfectly positively correlated.[7]

The Data　To access the potential gains from international diversification into LDC securities, efficient sets of portfolios were generated using annual and quarterly stock price indices published by the International Monetary Fund (29 countries for the period 1957-1971) and Capital International Perspective (16 countries for the period 1958-1972).

The time periods were selected to avoid sharp discontinuities in the international markets and to include a period of a weakening U.S. dollar. Since the argument for diversification is largely based on correlation coefficients, and since our sample size of twenty-nine countries requires at least twenty-nine observations for an unbiased estimate of the correlation matrix, quarterly rather than annual indexes were used for the major part of the study.

To determine the percentage of optimal portfolios in the LDCs, the countries were divided into sub groups according to their respective stages of development. The following criteria were used:

Less developed countries (LDC):	US$　0 - 1,000 GNP per capita
Semi-developed countries (SDC):	US$1,000 - 2,000 GNP per capita
Developed countries (DC):	US$2,000+　GNP per capita

The 1970 GNP per capita figures were used for this purpose. The exceptions to this rule were: (1) Italy and Japan are in the developed-country group, for obvious reasons; (2) South Africa is in the semi-developed-country group, a classification accepted by development economists. For a discussion of data sources, see Appendix.

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The price indices for various countries were first adjusted to reflect changes in foreign exchange rates during the given period. The exchange rates used were in terms of U.S. dollars.

Since we are interested in developing an efficient mean variance surface, assuming a one-period model, the arithmetic mean of the periodic rates of return gives the best estimate. In a quarterly context, the period is short enough so that the results differ little from an efficient portfolio in logarithmic returns (where geometric replace arithmetic means).

The mean periodic rates of returns $(\bar{r}_i)$, the variances of returns (V_{ii}), and covariances (V_{ij}) were calculated next. After obtaining the mean rates of return and their correlation matrix, the next step was to generate an efficient surface, using the mean variance criteria. The quadratic programming system developed by Boles, Abram, and Borkon was used to calculate the composition of efficient portfolios which minimize the variances at given rates of return.[8]

The various combinations of portfolio expected return and variance were mapped on the return-standard deviation space. This efficient surface included all the attainable risk-return combinations for an investor who has the opportunity to diversify the equity portfolio internationally. The next step is the choice of optimum portfolio from the efficient set. If all the investors can borrow or lend at the given risk-free rate of interest, the optimum equity portfolio will be represented by the point at which the market line (drawn from the riskless interest rate) is tangent to the locus of efficient portfolios. Thus, all investors, regardless of their own preferences, will diversify the equity part of their total holdings in the same proportions across different nations as given by the optimum portfolio. Differences in investor tastes would determine the proportion of total holdings borrowed or loaned at the existing interest rate. The individual preferences enter the analysis only after the optimum portfolio is selected.[9]

Tables 1 and 2 show the average quarterly returns and standard deviations for all countries in the two data bases for the longest sample periods. Also, compositions of the optimal portfolios at selected rates of interest are indicated. All returns are on a quarterly basis unless specified otherwise.

For all the periods considered, optimal portfolios contain substantial investments in Spanish securities—Spain is an SDC by definition. This is because of the relatively higher returns and low (at times, negative) correlations of the Spanish market with the markets of the rest of the countries (see Table 3). The optimal portfolios contain small amounts of U.S. securities.

For the period 1959-72, the U.S. market is dominated by optimal portfolios when the market risk-free rate of interest is below 3%. Above this rate, the optimal portfolios offer

Portfolio		Expected Return%	Standard Deviation%	Dominance With Respect to U.S. Index
U.S. Index		1.69	7.08	
Optimal Portfolio	@ 2 %	2.15	3.57	International Portfolio
	@ 2 ½%	2.94	4.57	International Portfolio
	@ 3 %	3.40	5.90	International Portfolio
	@ 3 ¼%	3.96	8.88	None

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more than double the expected return as compared to the U.S. market at a slightly higher risk as indicated on page 85.

Optimal International Monetary Fund (IMF) Portfolios

The proportion of total investment in LDC and SDC securities is more than 50% for a majority of optimal portfolios. Ireland, Portugal, South Africa, and Venezuela are the major contributors. Except for Ireland—and, to some degree, Portugal—these countries have considerably lower or negative returns. Nevertheless, they are included in portfolios because of their low or negative correlations with returns in the DCs (see table 3). The U.S. is represented in a very minor way in the optimal portfolios. High correlations with other DCs is the primary reason.

Just as in the previous case, the U.S. market is dominated by optimal portfolios up to interest rates of approximately 2%. Thereafter, the internationally diversified portfolios offer much higher returns for some increase in risk.

Portfolio			Expected Return%	Standard Deviation%	Dominance With Respect to U.S. Index
U.S. Index			1.58	5.53	
Optimal Portfolio	@	¼%	1.90	2.90	International Portfolio
	@	½%	2.25	3.40	International Portfolio
	@ 1 ½%		2.50	3.90	International Portfolio
	@ 2	%	2.90	6.00	None
	@ 2 ½%		3.30	8.80	None

Effect of Time Period Selection

Given the dubious nature of the risk-free interest rate in the international context and to explore the possible effects of chosen time periods, efficient surfaces for four different time periods are plotted for both the IMF and CIP data (See Figure 1). Plotted with these eight surfaces are the efficient surface obtained by Grubel and the U.S. portfolios. Their inspection leads to the following major conclusions:

(1) The efficient surface is encouragingly stable. Apparent gains from international portfolio diversification arise in all series and periods considered;

(2) All IMF and CIP efficient frontiers dominate Grubel's results as well as the U.S. portfolios;

(3) IMF annual 1951-1971 frontier dominates CIP annual 1958-1971 frontier. IMF quarterly 1957-second quarter 1964 dominates CIP quarterly 1959-1965. IMF quarterly third quarter 1964-1971 dominates CIP quarterly 1966-1972 up to the annual expected return of about 9 per cent. This is due to (a) the presence of a weak 1964-1966 Japanese market in the IMF data but not in the CIP data, and (b) the absence of a very strong 1972 Japanese market in the IMF data and its presence in the CIP data. IMF quarterly 1957-1971 dominates CIP quarterly 1959-1972 up to the annual expected return of about 10.5 per cent. As in the previous case, the absence of a strong 1972 Japanese market in the IMF data results in CIP dominance of IMF efficient surface at high expected rates of return.

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TABLE 1

SUMMARY OF CAPITAL INTERNATIONAL PERSPECTIVE, QUARTERLY DATA FOR PERIOD 1959–1972

No.	Name	Average Quarterly Return for Period %	Standard Deviation of Return %	Composition of Optimal Portfolios at % Quarterly Risk-Free Interest Rates			
				2	2½	3	3¾
1.	Australia	1.67	11.8	5.2			
2.	Austria	1.96	7.52	20.7	15.9		
3.	Belgium	1.27	5.76				
4.	Canada	1.56	6.83				
5.	Denmark	1.83	7.64	17.5			
6.	France	1.10	8.92				
7.	Germany	2.42	11.4				
8.	Italy	.97	10.8	2.8	25.7	41.0	80.6
9.	Japan	4.18	10.5				
10.	Netherlands	1.46	7.57				
11.	Norway	1.83	6.91	12.4	.9		
12.	Spain	2.74	6.75	22.2	36.7	36.1	
13.	Sweden	2.03	6.95	5.3	0.0		
14.	Switzerland	3.05	9.67				
15.	U.K.	2.21	8.0	7.5	8.3	22.9	19.4
16.	U.S.	1.69	7.08	6.4	12.5		
Average quarterly portfolio return (%)				2.15	2.94	3.4	3.96
Standard deviation of portfolio return (%)				3.57	4.57	5.9	8.88

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TABLE 2

SUMMARY OF INTERNATIONAL MONETARY FUND, QUARTERLY DATA FOR PERIOD 1957-1971

Country of Investment		Average Quarterly Return for Period %	Standard Deviation of Return %	Composition of Optimal Portfolios at % Quarterly Risk-Free Interest Rates				
No.	Name			$\frac{1}{4}$	$\frac{1}{2}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$
1.	Australia	0.52	8.18					
2.	Austria	1.53	7.01	6.9	3.0			
3.	Belgium	0.25	4.73					
4.	Canada	1.23	5.98					
5.	Ceylon	-1.82	5.76					
6.	Chile	-0.05	15.4					
7.	Denmark	0.54	6.67					
8.	Finland	0.56	8.13					
9.	France	0.29	7.79					
10.	Germany	3.36	9.76	5.5	8.7	16.5	46.4	85.4
11.	India	-0.13	5.75					
12.	Ireland	2.47	5.4	23.1	29.2	37.1	35.4	
13.	Israel	1.21	10.3					
14.	Italy	0.82	7.93					
15.	Japan	2.64	7.43	12.2	14.9	17.7	18.2	13.6
16.	Mexico	-0.6	3.58					
17.	Netherlands	1.54	7.1					
18.	New Zealand	0.59	8.97					
19.	Norway	0.22	5.28					
20.	Peru	-1.54	6.01					
21.	Philippines	-1.25	11.0					
22.	Portugal	1.94	6.24	25.4	30.2	28.7		
23.	So. Africa	1.0	10.4	4.1	1.7			
24.	Spain	0.08	7.57					
25.	Sweden	1.75	6.01					
26.	Switzerland	1.31	7.83					
27.	U.K.	2.06	7.13					
28.	U.S.	1.58	5.53	13.2	12.4			
29.	Venezuela	-0.19	5.3	9.6				
Average quarterly portfolio return (%)				1.9	2.25	2.5	2.9	3.3
Standard deviation of portfolio return (%)				2.9	3.4	3.9	6.0	8.8
% Investment in LDCs and SDCs				62.2	61.1	65.8	35.4	0.0

Note: For country classifications, see Appendix.

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TABLE 3

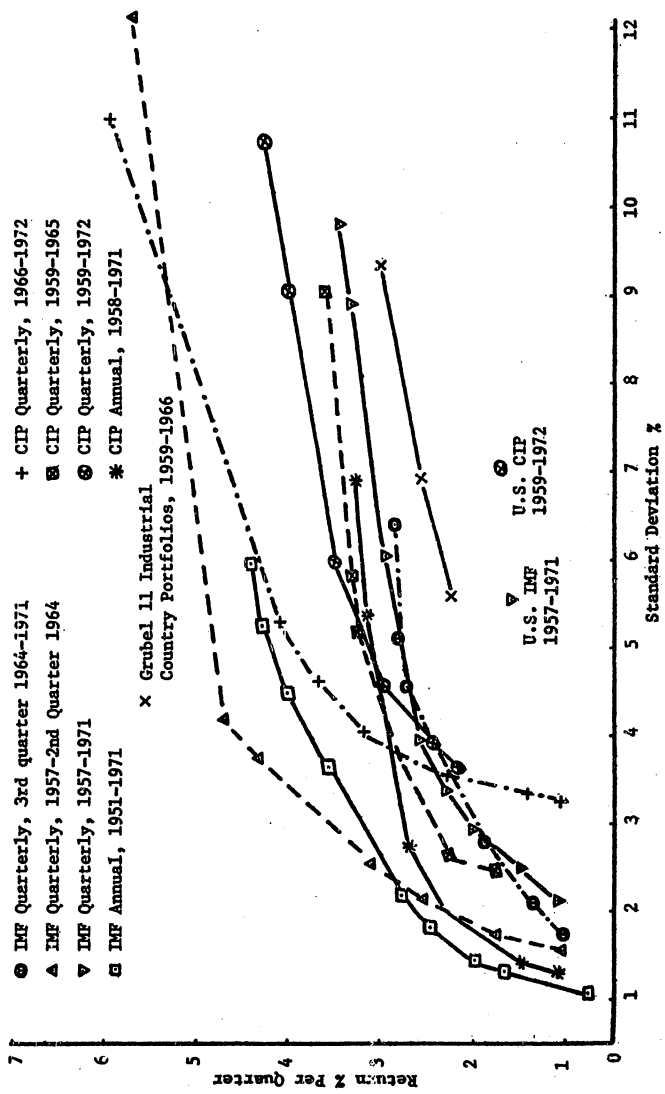CORRELATION COEFFICIENTS FOR COUNTRIES FORMING EFFICIENT PORTFOLIOS

(A) IMF Quarterly, 1957-1971

	Austria	Germany	Ireland	Japan	Portugal	So. Africa	U.S.	Venezuela
Austria	1.0							
Germany	0.399	1.0						
Ireland	0.177	0.238	1.0					
Japan	0.028	0.308	0.339	1.0				
Portugal	-0.066	-0.018	-0.032	-0.132	1.0			
So. Africa	-0.283	-0.025	0.310	-0.033	-0.074	1.0		
U.S.	0.203	0.299	0.263	0.220	-0.126	0.038	1.0	
Venezuela	-0.149	-0.177	-0.229	-0.128	0.183	-0.129	-0.079	1.0

(B) CIP Quarterly, 1959-1972

	Austria	Belgium	Denmark	Italy	Japan	Norway	Spain	Switzerland	U.S.
Austria	1.0								
Belgium	0.247	1.0							
Denmark	-0.134	0.140	1.0						
Italy	0.284	0.258	0.183	1.0					
Japan	0.020	0.143	0.358	0.142	1.0				
Norway	0.330	0.262	0.008	0.121	0.065	1.0			
Spain	-0.100	0.326	0.169	0.145	0.116	0.160	1.0		
Switzerland	0.514	0.641	-0.016	0.477	0.093	0.185	0.095	1.0	
U.S.	0.150	0.569	0.085	0.127	0.090	0.142	0.181	0.460	1.0

FIGURE 1

COMPARISON OF EFFICIENT FRONTIERS—ALL CASES

- ◉ IMF Quarterly, 3rd quarter 1964–1971
- ▲ IMF Quarterly, 1957–2nd Quarter 1964
- ▽ IMF Quarterly, 1957–1971
- ⊡ IMF Annual, 1951–1971

- + CIP Quarterly, 1966–1972
- ⊠ CIP Quarterly, 1959–1965
- ⊗ CIP Quarterly, 1959–1972
- * CIP Annual, 1958–1971

× Grubel 11 Industrial
Country Portfolios, 1959–1966

▽ U.S. IMF
1957–1971

⊗ U.S. CIP
1959–1972

Standard Deviation %

Return % Per Quarter

The consistent IMF dominance can be attributed to the presence of averaging in the IMF indices. Any averaging measure subtly transforms the stochastic character of the underlying price process and reduces the variance of returns in the case of all countries.[10] As a result, the entire efficient surface shifts upward, because variance is understated.

We checked on reduction of variance due to possible averaging by calculating ratios of semiannual to quarterly variances (V_s and V_q respectively) for all twenty-nine countries for the period 1957-1971. On the basis of the results, we can conclude that the averaging may have resulted in an expected reduction by a factor of 0.61 in the variance of reported quarterly returns relative to true variance, if the twenty-nine-country average is indicative.[11]

TABLE 4

AVERAGE ANNUAL DIVIDEND YIELDS FROM INVESTMENT IN DOMESTIC
SECURITIES OF A FEW SELECTED DEVELOPED AND
DEVELOPING COUNTRIES, 1968-1972

Country	Year					Average
	1968	1969	1970	1971	1972	
U.S.	4.4	3.9	4.7	4.2	4.1	4.3
U.K.	4.7	3.3	4.6	5.3	3.7	4.3
Japan	5.7	6.1	5.9	5.7	4.1	5.5
Germany	3.7	4.3	3.7	3.1	2.8	3.5
Colombia	12.9	15.0	11.1	10.1	14.1	12.6
Venezuela	8.4	7.8	10.5	9.4	8.8	9.0
India	--	8.5	7.2	6.9	8.6	7.8

Source: For U.S.: "ISL Daily Stock Price Index," by Standard and Poor, various issues; for U.K. and Germany: "Capital International Perspective," by Capital International, Inc., various issues; for Japan: "Analysts Guide," by Daiwa Securities Co., Ltd., 1972; for India: "Bombay Stock Exchange Guide," Vols. 1-19, latest issues; for Colombia: "Revista del Banco de la Republica," by the Colombian government, various issues; and for Venezuela: "Balsa de Comercio de Caracas," by Venezuelan authorities, various issues.

Note: Figures are for companies in six industries (banking, oil, tobacco, building materials, beverages, and iron-steel). Companies selected are the largest in the private sector in each industry.

Effect of Divi-
dend Exclusion The unavailability of reliable aggregate dividend data for a large majority of the coun-
tries in our study has forced us to demonstrate only the directional impact that such
information would have on our conclusions. To this end, Table 4 shows computation of
the average annual dividend yields for the period 1968-1972 for a group of seven
selected countries. The figures in this table show the average dividend yields in the
LDCs to be almost double those in the DCs. Hence, if good reliable dividend data were
available and were included in our analysis, the case for international diversification into
LDC securities would be strengthened.

Performance
Comparison Be-
tween Leading
LDC and DC Se-
curities Since the argument for gains from international diversification presented so far relies
heavily on the use of indices and averages, we now present market performance over a
five-year period (1968-1972) for a group of leading securities for six major industries of
selected developed and developing countries (see table 5).

The unprecedented upswing in the Japanese market for the years 1971 and 1972,
together with the strong upward revaluation of the yen during this period, resulted in the
dominance of that market in every industry except in the case of beverages. We do not
expect this pattern to repeat itself. Hence, if we examine the second and third best
alternatives available to the U.S. and German investors, it is quite evident that they
would have been well advised to diversify their portfolios to include the securities of the
major LDC corporations.

ACCOUNTING
FOR THE DIS-
PARITY BE-
TWEEN
THEORETICAL-
LY OPTIMAL DI-
VERSIFICATION
AND ACTUAL
EXPERIENCE Despite the potential gains from diversification into LDC securities as suggested by
present and past research, international mutual funds or individual investors have
limited their portfolios almost exclusively to the securities of the developed world. One
could explain this investor behavior in two ways: first, the methodological limitations of
present and similar past studies; and second, the barriers to investments in LDC
securities.

Methodological
Limitations Risk has generally been defined as the variance of the *ex post* rates of return—after
adjustment for exchange rate fluctuations. This definition does not take into account the
risks associated with operating in alien markets, the political risks of expropriation, war,
or confiscation. In addition, use of past exchange rate fluctuations to predict the
exchange rate gain (loss) in the following period to estimate the exchange risk may be
misleading. Thus, the problems associated with the use of *ex post* data as an estimate
of *ex ante* expectations assume added significance in an international context. Howev-
er, for extensive time series data, the *ex post* results, including exchange rate changes,
approach *ex ante* expectations and truly represent the total risk facing a foreign
investor provided the return distribution remains stable over the period.

Although realized sample means, variances, and covariances are unbiased estimates
of the underlying parameters of return, an optimization method applied to these esti-
mates to select an efficient frontier will choose those countries that appear best and,
hence, will tend to select those with favorable errors. Therefore, the efficient frontier will,
in all cases, be biased upward, and the degree of bias will increase with the number of
countries but decrease with the number of observed periods.

TABLE 5

SOME AVERAGE ANNUAL RATES OF RETURN FOR THE PERIOD 1968-1972

(A) From Investment in Domestic Securities of Developed and Developing Countries

| | Country of Investment | | | | | | | | | | | | |
| | Investments in US$ | | | | | | Investments in DM | | | | | | |
Industry	U.S.	U.K.	Japan	Colombia	Venezuela	India[a]	Germany	U.S.	U.K.	Japan	Colombia	Venezuela	India[a]
Commercial banking	20.0	26.6	66.0	6.8[b]	14.1	N[c]	12.7	15.5	20.4	58.0	2.5[b]	9.2	N[c]
Oil	12.1	27.7	48.7	23.1	15.8[b]	29.6	1.4	7.8	23.2	42.3	17.8	10.7[b]	21.3
Tobacco	11.7	12.6	GM[d]	11.2[b]	11.4[b]	12.7	—	7.6	7.9	GM[d]	6.6[b]	6.8[b]	7.5
Building materials	4.5	16.4	65.5	28.5	15.4	14.2	14.6	0.6	10.3	59.2	22.5	10.2	6.6
Beverages	25.0	18.0	30.8	9.7	33.2	28.5	16.4	19.5	12.6	24.9	6.0	27.5	21.0
Iron-steel	1.2	GO[e]	56.8	40.2	15.7[f]	8.7	-0.4	-2.9	GO[e]	50.8	34.2	8.3[f]	1.9

(B) From Equity Investments in Development Banking Institutions

| Country | Name of Corporation | Annual Rate of Return 1968-1972 | |
		U.S. Investor (in US$)	German Investor (in DM)
Korea	Korea Development Finance Corporation (KDFC)	52.0	25.0
Iran	Industrial and Mining Development Bank of Iran (IMDBI)	41.0	18.0

Sources: (A) See Table 4; (B) *Investment Committee Review Reports on KDFC* (Washington, D.C.: International Finance Corp., various issues).

[a] Indian data are for period 1969-1971   [b] Stock dividend data not available.   [c] Nationalized.
[d] Government monopoly.   [e] Government operation.   [f] Dividend data not available.

Note: The companies selected are the largest ones in the private sector. Rates of return include capital gains, cash and stock dividends, and rights issues, as well as foreign exchange gain (loss); they are on a pre-tax basis.

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This bias is of a complex nature, and it is not easy to assess its magnitude without simulation, which is clearly outside the scope of this work. However, a plausible assumption is that the probability of appearance of each country in the efficient set is equally affected by chance variations in the estimated moments of return. As far as our results are concerned, the fact that the percentage of total number of LDCs and SDCs appearing in the efficient set is about the same or higher than that for DCs is very encouraging. This is because it suggests that if the moments of return were exactly known, these percentages of appearance would recur.

A potential alternative to the use of the M-V model would be to estimate national and international market factors using the capital asset pricing model (CAPM). Of late, some research has been reported in this area, notably that of Lessard,[12] Agmon,[13] and Solnik.[14] These works are, however, limited to the developed country markets. Hence, the obvious next step would be to apply CAPM to LDCs. However, at present, it is doubtful whether substantial insight could be gained from application of CAPM to the developing markets. This is because many of the LDC markets in this study are not very active and available LDC stock market indices are of doubtful quality, consistency, or reliability. Also, the CAPM assumptions—e.g., homogeneous expectations and risk-free interest rates—may not hold in an international context. Hence, the M-V model, which relies primarily on mean and variance of the probability distribution of single period portfolio returns, is preferred.

Barriers to Investment in LDC Securities[16] The main obstacles to foreign indirect investment in LDC securities are the less developed character of local capital markets, lack of understanding and unavailability of relevant information, and the differences in accounting practices and capital controls.

Less Developed Character of LDC Capital Markets: A set of unique conditions (country environment, government policies, institutions) that characterize a developing economy has contributed to the existing state of capital markets in LDCs. As a group these conditions constitute the concept of "Portfolio Suppression". Briefly, it includes religious and social practices that contribute negatively to the formation of financial intermediaries, political and economic instability, taxation policies that discriminate against income from financial assets, monetary and fiscal policies that have resulted in high and unstable rates of inflation, interest ceilings on savings and loan rates, preferential treatment accorded to government issues on securities markets, lack of capital market institutions such as underwriters and the resulting high costs of flotation and transactions.

The repressionary environment within which the LDC markets have evolved and operate today has resulted in,

—Lack of supply and demand for new stock issues on primary markets;

—Inefficient markets in the sense that security prices do not reflect all the available informaion. Size, breadth, and depth—i.e., liquidity—is generally lacking except for the largest corporations;

—Inadequate market regulation, security registration, and disclosure practices.

Some of the LDCs have embarked on specific programs to develop their capital markets in order to remove this most important barrier to foreign portfolio investments. This will be discussed briefly under programs to develop LDC markets.

Information: There are many problems associated with obtaining the company, industry, market, and country data deemed necessary for sound investment decision making. First, potential investors are not knowledgeable about the sources of such data. Second, it would be very expensive and, therefore, profitable only for the largest institutions. Third, interpretation of the data would require special knowledge. Finally, some of the information may not be available in published form.

Accounting Practices: Investors have to rely on financial information generated by local accounting firms. Differences in tax laws, consolidation practices, inflation adjustments, and the treatment of foreign exchange losses give rise to distortions and noncomparability of financial statements across countries.

Capital Controls: Capital inflow-outflow restrictions exist in both DCs and LDCs, ranging from none at all to complete prohibition. A detailed study conducted by the author revealed that countries with expectations of reasonable foreign exchange reserves positions were more willing to allow foreign portfolio investments. The countries of Latin America as a group were found to be more permissive than those of Asia.

Foreign Listing: An indirect mechanism for diversifying into LDC securities would be to list them on DC markets. Of course, it would mean that such securities would have to meet the requirements of the developed markets, which in turn would remove the major problems related to international diversification into LDC securities. A study indicated that the listing requirements were much more stringent for developed markets.

Role of Multinational Corporation (MNC): It has been argued that given the barriers to international portfolio investments, the transfer of risk capital to LDCs would be accomplished through the intermediation of MNCs. The risk reduction from international diversification of operations results in lower required rates of return and provides MNCs with a competitive advantage over local firms. Agmon and Lessard found that the benefits of international diversification are recognized by shareholders of U.S.-based MNCs.[16] On the other hand, Kohers concluded that the cost of equity capital of U.S.-based MNCs is not significantly different from that of domestic corporations.[17] Also, Falk and Errunza found that, in general, the risk position of a corporation is not affected by the geographic diversification of activities.[18] Hence, further research is necessary on the role of the MNC as an investment intermediary.

Programs to Develop LDC Capital Markets:[19] Today, a surprisingly large number of LDCs are implementing programs aimed at developing their capital markets. The main motivations are:

—The strong link between capital market development and economic development through the increased participation of foreign and domestic investors in the local securities. This would increase external resources, augment domestic savings, and improve savings allocation.

—The need to develop new sources of development finance to eventually replace traditional sources such as foreign assistance and direct investments. Inadequate assistance levels and conflict between the nation state and the MNC has intensified the desire of LDCs to reduce dependence on these sources.

—To provide the local investor with increased opportunity for domestic diversification.
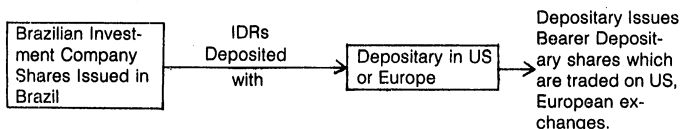
Among the LDCs committed to capital markets reform, Brazil is unique because of the many innovations in the financial sector. The Brazilian effort goes as far back as the early 1960s which resulted in the Brazilian Capital Markets Law of July 1965. The main thrust since then has been on institution building (e.g., investment banks, fundo de Desenvolvimento do Mercado de Capitais, brokerage firms), tightening of market rules and disclosure practices, improvement in market return (through tax incentives, new foreign exchange policy of mini-devaluations, monetary correction on fixed income securities), provision of incentives for companies to go public, and increasing activity in the market through investment by 157 funds and the social integration fund. The results were remarkable. The transaction volume, prices, public offerings, and mutual fund assets rose sharply until the early 1970s.[20]

The confidence crisis that resulted from excessive speculation in the Brazilian stock markets during the early 70s led to more innovations such as the formation of fiscal

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funds, insider trading laws, institution of strict auditing requirements, protection of minority interest, and the development of an enforcement agency like the SEC. However, the most crucial step has been the legalization of foreign portfolio investments in Brazilian securities.

The Decree-Law 1401 and the accompanying resolution, No. 323, issued by the Central Bank of Brazil in May 1975, legalizes and provides incentives for foreign portfolio investments. It provides for the formation of investment companies whose capital is held in whole or in part by individuals or legal entities whether resident or domiciled abroad. At least 50% of the portfolio is invested in shares or convertible debentures of open capital companies. Investment company shares can be transferred by means of simple cession without affecting the registration date of incoming foreign funds or the computation of the period of residence. They may be traded abroad on the securities exchanges, on the over-the-counter market, or privately. Liquidation of the investment is permitted after three years using a procedure similar to mutual fund shares redemption. It is to be effected in tranches limited to 20% of the initial investment every six months. The value of an investment company's share is calculated in the same way as a mutal fund share.[21]

The most controversial aspect of the law concerns illiquidity of foreign funds resulting from the required three years of minimum investment period. Tax incentives and disincentives are also related to the investment period and amounts repatriated. These requirements, together with the minimum amount restriction of US$10,000, effectively rule out the small investors in the absence of special instruments such as Bearer Depositary Receipts (BDR) discussed below.

Brazilian Investment Company Shares Issued in Brazil	IDRs Deposited with	→	Depositary in US or Europe	→	Depositary Issues Bearer Depositary shares which are traded on US, European exchanges.

The BDRs will be issued in whatever denominations deemed necessary. The IDRs (Investment Depositary Receipts) on the other hand will be issued in denominations of as many BDRs as needed to make up the U.S.$10,000 parcel required under the law. Thus, each IDR will be for a net amount of U.S.$10,000 and will be registered separately at the Central Bank of Brazil. IDRs will have dividend coupons attached and would be transferable by delivery.[22]

Of course, it is too early to speculate on the extent of success of the reform. That, only time will tell.

CONCLUSION The *ex post* analysis based on results of the past two decades substantiates the intuitive argument for international portfolio diversification—diversification that is not limited to the developed markets, but also includes the corporate securities of the LDCs. The specific industry and corporate examples strongly support the above argument. Returns available in LDC securities compare favorably with those in sophisticated markets, even after adequate discounting for the problems and additional costs involved in such investments. Thus, diversification, in light of all the available evidence, appears to be desirable.

Capital flows resulting from such diversification can tremendously improve the international liquidity position of the developing countries and provide a major development impact.

Developing countries desirous of attracting indirect investments into their corporate securities would therefore be well advised to relax capital controls, provide accurate and timely information, and embark on a long-term effort toward developing their securities markets to facilitate such flows.

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For any large sample of countries, there are only two coherent sources of indices: International Financial Statistics, an IMF publication for twenty-nine countries in various starting dates beginning with 1944, and the CIP Indices published by the Capital Group, Inc. for sixteen countries from 1959 to the present. Neither source allows for reinvestment of dividends nor gives information on average dividend yield.

IMF publishes monthly, quarterly, and annual average stock price indices for twenty-nine countries. These are generally obtained from the central banks of the individual countries. Except in the case of a few developed countries (DCs) the author's discussions with IMF officials failed to reveal the computational details of the reported indices. Thus, we do not know how the indices are calculated or what percentage of market capitalization they represent.

The CIP indices are based on the share prices of some 750 companies listed on the stock exchanges of sixteen countries. The combined market capitalization of these companies represents approximately 60 per cent of the aggregate market capitalization of the sixteen exchanges. The indices are fully comparable with one another, because they are constructed on the basis of the same design principles and are adjusted by the same formulas. Monthly, quarterly, and annual indices based on end-of-period prices are available.

The formula used for adjustment of price indices to reflect changes in foreign exchange rates is as follows:

$$I_{i,t} = I^*_{i,t} \frac{E_i, \text{ base year}}{E_{i,t}} \ ,$$

where:

$I_{i,t}$ = industrial share price index adjusted for exchange rate changes for country i at the end of period t.

$I^*_{i,t}$ = unadjusted industrial share price index for country i at the end of period t.

E_i, base year = exchange rate at the end of base period for country i, in currency units per U.S. dollar

$E_{i,t}$ = exchange rate at end of period t for country i, in currency units per U.S. dollar.

The next step was to calculate the periodic rates of return for each country from investment in their corresponding stock market. Thus:

$$r_{i,t} = \frac{I_{i,t} - I_{i,t-1}}{I_{i,t-1}} \ ,$$

where $r_{i,t}$ represents the rate of return for the country i in period t from investment in common stocks.

The mean periodic rate of return for country i from investing in common stocks is given by:

$$\bar{r}_i = \frac{1}{T} \sum_{t=1}^{T} r_{i,t}$$

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From the above mean rates of return, a correlation matrix of the twenty-nine countries was calculated.

The variance for the ith country is given by:

$$V_{ii} = \frac{1}{T-1} \sum_{t=1}^{T} (r_{i,t} - \overline{r_i})^2.$$

The covariance of the ith country with j^{th} country is defined as:

$$V_{ij} \equiv COV(r_i, r_j) = \frac{1}{T-1} \sum_{t=1}^{T} (r_{i,t} - \overline{r_i})(r_{j,t} - \overline{r_j}).$$

The quadratic program was then used to solve the following problem:

Minimize Portfolio Variance $= V = \sum_{i=1}^{N} X_i^2 V_{ii} + 2 \sum_{i=1}^{N} \sum_{\substack{j=1 \\ j>i}}^{N} X_i X_j V_{ij},$

subject to: $X_i, X_j \geq 0$

$$E = \sum_{i=1}^{N} X_i \overline{r_i}.$$

and $\sum_{i=1}^{N} X_i = 100$

where: X_i, X_j are investment proportions in market portfolios of countries i and j
V is the portfolio variance
E is the portfolio expected return

$\overline{r_i}, V_{ii}, V_{ij}$ are as previously defined.

Throughout this work, short sales as an investment opportunity were not permitted.

Country Groups DCs: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, U.K., U.S.

LDCs: Ceylon, Chile, India, Mexico, Peru, Philippines, Portugal, Venezuela.

SDCs: Ireland, Israel, South Africa, Spain.

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22. For further information on BDRs and IDRs, refer to the prospectus for "Brazilian Investments, S.A." BRA-N 10 which can be obtained from Banco Bozano, Simonsen de Investimento, S.A. of Rio de Janeiro.