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5 The Effect of Barriers to Equity Investment in Developing Countries

Stijn Claessens and Moon-Whoan Rhee

5.1 Introduction

Equity portfolio flows to developing countries have increased sharply in magnitude in recent years, especially to the so-called emerging countries. Total equity flows to developing countries are estimated to have been $13.2 billion in 1993, quadruple that of three years earlier (table 5.1). Equity flows are quite concentrated among a small group of emerging countries (e.g., Latin America received about 60 percent of all equity flows to developing countries in 1993). Though relatively still small for developing countries on aggregate (about 7 percent of the aggregate net financing they received in 1993), these flows are an important source of finance for some developing countries.

Equity flows have taken place in a number of forms: direct equity purchases by investors in the host stock markets, investments through country funds, issue of rights on equities held by depository institutions (American and global depository receipts [ADRs and GDRs]),[1] and direct foreign equity offerings. In the last three years equity flows have taken place largely through depository receipts. The volume of ADRs/GDRs issued for equity claims of developing countries is estimated to have been about $18.2 billion over 1989–93.[2] Until

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1. ADRs and GDRs are receipts issued by financial intermediaries in industrial countries against shares held in custody by these intermediaries in the developing countries.

2. This includes direct offerings on foreign capital markets by corporations in developing countries outside the ADR/GDR structure (under Rule 144A in the United States). These have been minimal, however.

Table 5.1 **Equity Flows to Developing Countries (millions of dollars, estimates)**

Type of Flow	1989	1990	1991	1992	1993[a]	Total 1989–93[a]
Country funds	$2.2	$2.9	$1.2	$1.3	$2.7	$10.3
ADRs/GDRs	—	$0.1	$4.9	$5.9	$7.3	$18.2
Direct equity	$1.3	$0.8	$1.5	$5.8	$3.2	$12.6
Total	$3.5	$3.8	$7.6	$13.0	$13.2	$41.1

Source: World Debt Tables (1993).
[a]estimated for 1993.

recently, next in importance were (closed-end) country funds: during 1989–93, new country funds were created for developing countries with an aggregated size of $10.3 billion. The sharpest relative increase in the last few years has been direct purchases of equities: these were about $5.8 billion in 1992, up from $0.8 billion in 1990, and were second in importance from 1989 through 1993.

The increased importance of direct equity purchases by foreigners on emerging stock markets may be attributed in part to the progressive removal of barriers by developing countries on foreign participation in their stock markets. Many developing countries have removed restrictions on foreign ownership, liberalized capital account transactions, improved their accounting and information standards, and in general have made it easier for foreigners to gain access to their markets (see, further, for example, Mathieson and Rojas-Suárez 1993 and Reisen and Fischer 1993). Particularly in Europe and Latin America, many countries now have very few or no restrictions on access by foreigners to their markets and treat foreign investors in most ways identical to domestic investors.

At the same time, returns on stock markets in emerging countries have been high; for example, the International Finance Corporation (IFC) composite index for Latin America was up 294.2 percent over 1988–92, compared to 108.4 percent for the Standard and Poor's 500 (S&P 500). This also may have been a factor motivating the larger inflows of foreign equity. At the same time, however, the volatility of rates of return has been high, reaching, for example, more than 100 percent for Argentina.

The increase of these equity flows to a number of developing countries and the opening up of their stock markets raise a number of issues. An important one is the effect of the removal of barriers on the risk-return trade-off in these markets, that is, how much has the risk-return trade-off changed? The purpose of this paper is to investigate this question and to quantify the effects of barriers to access by foreign investors on stock prices and rates of return.

To answer this question, we use the newly created indexes by the IFC Emerging Markets Data Base (EMDB) on the degree of foreign access or "in-

vestability." The IFC investability indexes capture for each stock the barriers to free access by foreigners (general inflow or outflow restrictions, general or sector-specific ownership restrictions, remittance restrictions, other exchange restrictions, restrictions on capital structure, etc.). These indexes should thus be a good indicator of the relative importance of barriers across securities at a given point in time in one market or across a number of markets, or of changes in barriers over time.

Summarizing our results, we find a positive relationship between price-earnings (P/E) ratios and the degree of access for almost all the countries. For four out of the seven markets we study in detail, this result is robust to the inclusion of the world beta and the degree of international spanning of the domestic market. Only for Jordan and Mexico, however, is this result robust to the inclusion of the additional factor of the supply of stocks. For the relationship between rates of return and the investability index, we find evidence of a negative sign for Jordan only, which is also less robust. For other countries, we do not find that abnormal stock returns are related in a systematic fashion to a stock's investability index.

The outline of this paper is as follows. Section 5.2 presents an overview of possible analytical frameworks. Section 5.3 describes the data we use and provides some statistics on the rates of return. We then perform the Stehle (1977) test for market segmentation or integration for each market to investigate whether these markets indeed show signs of being segmented. Section 5.4 provides the empirical results of these tests of market integration and market segmentation. We then describe in section 5.5 the concept of the investability index as developed by the IFC and provide some statistics on the investability indexes. In section 5.6 we perform the tests on the (cross-sectional and time-series) relationship between the P/E ratio and the rate of return on an individual stock on the one hand and the level of its investability index on the other hand, and we perform some robustness tests. Section 5.7 concludes.

5.2 Overview of Possible Analytical Models

Tests assuming no barriers. Without barriers, international integration tests can be performed using the various international asset pricing models that have been developed. Past empirical tests along these lines specifically concerned with developing countries—and which assume no barriers—are, for example, Lessard (1973, 1974); Divecha, Drach, and Stefek (1992); Bekaert (1993); Buckberg (1993); Diwan, Errunza, and Senbet (1993b); de Santis (1993); Harvey (1993); and Tesar and Werner (1993). All the papers find that there are significant diversification benefits available from investing in developing countries. Most of these tests, however, use a specific asset pricing model which assumes full integration. As a result, one doesn't know whether these diversification benefits can be achieved.

Tests assuming barriers. Without explicitly incorporating the type and severity of barriers in an asset pricing model, several papers have investigated market integration (or segmentation) using the test developed by Stehle (1977). The advantage of the Stehle methodology is that it allows for tests of both full integration and full segmentation. Jorion and Schwartz (1986), focusing on interlisted stocks, reject full market integration between Canada and the United States using this test, something which they attribute to legal barriers. Mittoo (1992) investigates the same issue and finds segmentation pre-1981, but integration afterward, especially for interlisted stocks.

With barriers, assets in different markets may have different expected rates of return even when their risk characteristics are the same. One way of testing integration in the presence of barriers is to model the barriers explicitly, derive the resulting theoretical equilibrium asset prices, and verify the model using actual asset prices. Following Jorion and Schwartz (1986), barriers can be classified into indirect barriers, arising from differences in available information, transaction costs, accounting standards, etc.; and legal barriers, arising from the different judicial status of foreign and domestic investors—for example, ownership restrictions and taxes. Typically only legal barriers are incorporated in asset pricing models, as these can easily be modeled explicitly.[3]

Theoretical models here are Black (1974, 1978); Stulz (1981); and Errunza and Losq (1985, 1989). For imperfectly accessible stocks (i.e., foreigners can own stocks up to a fraction δ less than 1), Eun and Janakiramanan (1986) and Stulz and Wasserfallen (1992) develop models. These papers find theoretical "mispricing" resulting from the barriers given the specific asset pricing model used. As expected, the analytical predictions on asset pricing with barriers crucially depend on the type of market segmentation.

There are some empirical investigations building on these models for industrial countries. Hietala (1989) investigates the pricing of individual Finnish stocks which can be owned by foreign as well as domestic investors (unrestricted) versus stocks which can be owned only by domestic investors (restricted). Other papers have applied these tests to developing countries. Errunza and Losq (1985) find tentative empirical support for a hypothesis of mild[4] market segmentation. Errunza, Losq, and Padmanabhan (1992) find that many emerging markets are neither completely integrated with nor completely segmented from industrial countries.

For imperfectly accessible stocks, Stulz and Wasserfallen (1992) test their model for Swiss stocks and find that a relaxation of investment barriers substantially lowers the value of the shares available to foreigners relative only to the value of the shares available to all investors. Bailey and Jagtiani (1992) use

3. For these reasons, Bekaert (1993) employs a nonparametric approach for testing the relationships between barriers and measures of market integration.

4. Defined as a situation where the industrial countries' security markets are well integrated, and developing-country investors can invest in all these (foreign) security markets, but foreign investors cannot vice versa invest in developing countries.

this model to investigate differential pricing of restricted and unrestricted stocks for Thailand. They find that cross-sectional difference in the severity of foreign ownership explains some of the variation in the premiums of unrestricted shares over restricted shares, leading to a mildly segmented capital market.

5.3 The Rate of Return Data

The raw data we have cover twenty emerging markets. The price and rate of return data are generally available from 1975 on. Tables 5.2 and 5.3 provide some basic statistics for the rates of return on the IFC indexes and other market data in these emerging markets over the period 1989–92. Appendix A describes the criteria used for creating the indexes.

As can be observed from table 5.2, the IFC indexes have in general increased, for some countries by multiple factors (e.g., Argentina). There is also a great variation in the market capitalization across countries.[5] The rates of return in emerging markets in general are high, but so are the standard deviations (table 5.3). The highest rate of return is for Argentina, more than 100 percent on an annual basis. However, Argentina also has the highest standard deviation, almost 130 percent, and the highest range. In general, the rates of return and standard deviations for the emerging markets are much higher than those for the industrial countries. Table 5.3 also provides the skewness and kurtosis measures, which indicate that the rates of return are not likely drawn from normal distributions. Jarque-Bera tests for normality bear this out: for most markets it rejects normality (see, further, Claessens, Dasgupta, and Glen 1993).

Table 5.4 provides some cross-sectional information on the monthly rates of return of the individual stocks for each market (the methodology used for creating the individual stocks' rates of return is described in Claessens, Dasgupta, and Glen 1993). There is a great cross-sectional variation in the monthly rates of return behavior. Autocorrelation coefficients likewise vary over a wide range.

5.4 Test of Market Segmentation

We first use the model of Stehle (1977), as also applied by Jorion and Schwartz (1986); Errunza, Losq, and Padmanabhan (1992); and Mittoo (1992), to separately investigate the hypothesis of market integration or segmentation for each emerging market. The Stehle model assumes that the capital asset pricing model (CAPM) holds and that exchange risk is not priced. The test

5. It is important to note that the IFC indexes cover only a subset of all stocks listed on the various exchanges, varying between 39 percent (Turkey) and 90 percent (Colombia) in terms of market capitalization. Typically, because of its selection criteria, the IFC index will be weighted toward the larger market capitalization and more liquidly traded stocks.

Table 5.2 **International Finance Corporation (IFC) Indexes and Other Data for Each Market: January 1989 and December 1992 (millions of U.S. dollars, unless otherwise noted)**

Country	IFC Stocks		IFC Index		IFC Price/Earnings Ratio		IFC Price/Book Value Ratio		IFC Market Capitalization		IFC Value Traded		Total Market Capitalization		Exchange Rate	
India	...	63	...	59.03	...	12.19	...	1.60	...	8661.31	...	259.65	...	12037.54	...	2063.50
Indonesia	60	62	233.25	415.96	18.18	33.74	2.6	14.74	11624.16	25365.18	1068.88	...	2518.98	65118.90	15.16	28.68
Korea	61	91	730.26	518.61	38.46	21.43	2.75	1.06	54828.72	66461.02	5556.64	6006.51	94233.33	107447.97	680.00	788.40
Malaysia	62	62	134.12	226.89	36.52	21.84	2.30	2.53	20176.60	47940.53	188.03	773.27	25175.59	94003.82	2.73	2.62
Pakistan	50	58	176.52	455.14	7.32	21.86	1.21	2.55	825.72	3773.68	6.33	32.74	2427.11	8028.36	18.95	25.50
Philippines	18	30	1526.25	2056.78	12.34	14.13	2.81	2.45	2590.98	8167.09	65.20	83.70	4123.46	13794.50	20.61	25.60
Taiwan	62	70	866.08	503.74	42.60	16.57	8.35	2.15	90820.99	60454.10	15156.36	3171.63	139174.36	101124.43	27.65	25.17
Thailand	29	51	376.89	900.42	12.83	13.93	2.15	2.52	6476.44	28368.39	321.99	1876.84	9875.27	58258.87	25.39	25.49
Greece	26	32	226.14	537.42	10.12	6.89	1.63	1.67	2289.03	5376.53	8.22	112.20	3922.75	9488.60	155.00	215.30
Jordan	25	27	132.93	181.79	15.78	14.49	1.48	1.61	1697.46	1987.65	41.29	70.16	2320.86	3365.03	0.48	0.67
Portugal	23	30	637.84	503.06	15.05	9.05	2.77	1.02	4117.01	4867.61	14.57	52.25	6626.11	9213.36	152.47	146.92
Turkey	18	25	134.41	227.01	2.26	6.95	1.48	1.29	718.91	3872.42	2.32	158.33	1115.90	9930.80	1855.00	8540.00
Argentina	24	29	188.10	1253.14	0.55	37.99	0.08	1.20	1243.96	14292.60	16.23	1111.52	1876.49	18632.57	0.00	1.00
Brazil	56	69	95.00	158.92	4.57	−24.43	0.46	0.37	10516.38	23199.80	388.06	803.25	24280.00	45261.38	0.99	12243.00
Chile	26	35	754.93	3315.58	4.10	12.99	0.78	1.71	4923.25	21932.54	22.14	96.08	7601.91	29643.89	245.00	382.33
Colombia	21	20	359.32	2171.64	5.39	27.95	0.97	1.73	1036.14	5107.24	3.43	23.40	1144.98	5681.19	343.00	811.77
Mexico	52	62	462.19	2608.21	3.47	12.28	0.58	1.99	8828.23	66108.21	145.06	1806.25	13655.43	139060.77	2.30	3.12
Venezuela	13	17	147.85	523.61	8.80	15.63	1.89	1.61	1279.38	4997.28	12.26	95.73	1878.43	7599.70	38.30	78.16
Nigeria	15	24	33.82	64.43	5.61	8.98	1.16	1.74	397.69	796.97	0.10	0.72	752.72	1220.73	6.90	21.50
Zimbabwe	...	17	...	384.76	...	2.03	...	0.31	...	267.97	...	0.44	...	627.63	...	5.48

Source: EMDB.

Note: The first column under each heading refers to January 1989 and the second to December 1992. The (double) columns are: number of stocks, level of the IFC index (1984 = 100), IFC P/E ratio, IFC P/BV ratio, IFC market capitalization, IFC value traded, total market capitalization, and exchange rate (LC/$). The P/E ratios can be misleading in high inflation countries (such as Argentina and Brazil in the late 1980s, as the earnings are measured as the average flow over the past twelve months, and prices are taken at the end of the periods). Similarly, P/BV ratios can be misleading in a highly inflationary environment.

Table 5.3 **Statistic on the Index Rates of Return (1989–1992), by Country (annual percentage changes)**

Country	*N*	Meanchg	Stdchg	Minchg	Maxchg	Skewchg	Kurtchg	Autocorr
India	35	−16.6	32.1	−250.6	224.9	0.18	0.12	0.25
Indonesia	48	22.2	39.6	−292.6	423.2	0.60	0.92	0.17
Korea	48	−4.4	31.3	−230.9	319.0	0.94	1.23	−0.18
Malaysia	48	17.6	21.7	−186.8	155.9	−0.56	0.36	−0.10
Pakistan	48	28.7	31.0	−189.9	423.2	1.64	5.19	0.28
Philippines	48	14.2	34.7	−351.6	325.0	−0.17	1.59	0.34
Taiwan	48	3.7	49.2	−409.6	359.5	0.14	0.18	0.18
Thailand	48	29.1	29.6	−270.0	201.7	−0.59	0.28	0.25
Greece	48	31.4	53.4	−206.8	702.9	1.83	4.01	0.13
Jordan	48	11.8	20.2	−154.1	193.9	−0.18	0.93	−0.16
Portugal	48	−2.4	25.4	−170.1	348.3	1.34	4.31	0.06
Turkey	48	33.6	70.5	−377.4	829.5	1.12	1.46	0.22
Argentina	48	109.0	129.5	−779.4	2137.3	2.34	8.98	−0.12
Brazil	48	41.8	83.4	−682.7	573.8	0.06	−0.14	−0.09
Chile	48	43.5	26.0	−109.7	255.4	0.24	−0.68	0.41
Colombia	48	53.4	39.6	−209.5	448.1	1.61	2.83	0.52
Mexico	48	47.5	27.0	−170.1	235.9	−0.02	−0.37	0.16
Venezuela	48	48.1	54.1	−313.8	582.6	0.62	1.15	0.33
Nigeria	48	16.1	30.2	−507.1	226.0	−2.98	13.54	0.15
Zimbabwe	35	−29.0	31.4	−276.6	180.4	−0.34	−0.42	0.29

Note: The monthly rates are multiplied by 12 to obtain the yearly rates. The standard deviation is obtained by multiplying the monthly standard deviation with the square root of 12. *N* is the number of months, Meanchg refers to the mean change in the rate of return, Stdchg to the standard deviation of the rate of return, Minchg and Maxchg to the minimum and maximum change in the rate of return, Skewchg to the skewness coefficient, Kurtchg to the kurtosis coefficient, and Autocorr to the first order autocorrelation. First observation for Indonesia and Zimbabwe is January 1990.

requires running the following regressions. First, we project the rate of return of the domestic IFC market indexes, $j, = 1, \ldots, K$, on the rate of return on a world portfolio index, here approximated by the Morgan Stanley Capital International (MSCI) world index (the net dividends reinvested series), to get the orthogonal component in the domestic index (note that all time subscripts are omitted):

$$R_j = \alpha_{0,j} + \alpha_{1,j} R_w + V_{j-w}, \tag{1}$$

where R_j is the rate of return on the index in market j, R_w is the rate of return of the world index, and V_{j-w} is the component orthogonal to the projection of R_j on R_w.

We then regress the world rate of return on the various IFC indexes' rates of return to get the orthogonal components here:

$$R_w = \delta_{0,j} + \delta_{1,j} R_j + V_{w-j}, \tag{2}$$

where V_{w-j} is the component orthogonal to the projection of R_w on R_j.

Table 5.4 **Minimum and Maximum Values of Cross-Sectional Values of Monthly Time Series of Rates of Return for All Stocks**

Country	Years	Avail	Lmean–Hmean		Lstd–Hstd		Lmin–Hmin		Lmax–Hmax		Lautolag–Hautolag	
India	90–92	90	−0.085	0.388	0.013	2.182	−0.776	−0.010	0.007	12.484	−0.838	0.569
Indonesia	76–92	69	−0.005	0.078	0.074	0.386	−0.565	−0.131	0.265	2.910	−0.304	0.248
Korea	76–92	105	−0.027	0.057	0.054	0.223	−0.648	−0.071	0.084	1.342	−0.696	0.244
Malaysia	86–92	75	−0.028	0.072	0.045	0.332	−0.499	−0.069	0.109	2.037	−0.538	0.463
Pakistan	85–92	77	−0.046	0.096	0.040	0.263	−0.443	−0.062	0.069	1.093	−0.418	0.340
Philippines	85–92	34	−0.092	0.079	0.037	0.352	−0.593	−0.085	0.000	2.848	−0.350	0.478
Taiwan	85–92	77	−0.036	0.055	0.108	0.305	−0.725	−0.172	0.205	1.685	−0.260	0.271
Thailand	76–92	58	−0.030	0.104	0.063	0.389	−0.517	−0.137	0.138	1.774	−0.448	0.366
Greece	76–92	34	−0.054	0.043	0.050	0.235	−0.497	−0.049	0.042	1.408	−0.310	0.416
Jordan	78–92	30	−0.023	0.106	0.057	0.170	−0.468	−0.110	0.139	0.753	−0.374	0.250
Portugal	86–92	30	−0.051	0.066	0.074	0.324	−0.758	−0.124	0.118	1.885	−0.423	0.275
Turkey	87–92	25	−0.084	0.094	0.140	0.389	−0.466	−0.251	0.241	2.274	−0.228	0.415
Brazil	76–87	80	−0.091	0.208	0.117	0.753	−4.538	−0.180	0.000	3.628	−0.411	0.646
Chile	76–92	44	−0.017	0.075	0.097	0.348	−0.798	−0.109	0.213	3.011	−0.254	0.387
Colombia	85–92	22	−0.050	0.057	0.082	0.367	−0.475	−0.103	0.000	3.209	−0.220	0.402
Mexico	76–92	83	−0.046	0.099	0.019	0.501	−1.000	−0.012	0.064	3.695	−0.333	0.449
Venezuela	85–92	17	−0.016	0.075	0.144	0.316	−0.572	−0.301	0.273	1.955	−0.361	0.236
Nigeria	85–92	25	−0.051	0.057	0.093	0.174	−0.621	−0.392	0.145	0.784	−0.077	0.327
Zimbabwe	76–92	21	−0.097	0.048	0.107	0.250	−0.643	−0.040	0.130	1.239	−0.408	0.267

Note: Avail is the number of stocks for which data are available during the period. Lmean is the lowest mean rate of return for any stock in a market, and Hmean the highest rate of return. Lstd is the lowest standard deviation of the rates of return across all stocks in a given market, Hstd the highest. Lmin is the lowest minimum rate of return across all stocks in a given market; Hmin is the highest minimum rate of return in a given market. Similarly for Lmax and Hmax, the highest. Autolag is the first autocorrelation, with Lautolag the lowest and Hautolag the highest in a given market. No data on individual stock rate of return were available for Argentina.

The Stehle test then involves two cross-section tests, using the orthogonal components of the regressions (1) and (2). Under full integration, the parameter on the slope coefficients (denoted here by $\beta_{i,j-w}$) of the individual stocks' rates of return on the orthogonal component of the regression of the local index on the world portfolio should not be significantly different from zero. Under complete segmentation, the parameter on the slope coefficients (denoted here by $\beta_{i,w-j}$) of the individual stocks' rates of return on the orthogonal component of the regression of the world portfolio on the local index should be not be significantly different from zero. In other words, assuming complete integration or complete segmentation, equation (3) or (4) should hold for the rate of return on stock i in market j:

$$E(R_{i,j}) = \gamma_{0,j} + \gamma_{1,j}\beta_{i,j,w} + \gamma_{2,j}\beta_{i,j-w} \tag{3}$$

$$E(R_{i,j}) = \eta_{0,j} + \eta_{1,j}\beta_{i,j} + \eta_{2,j}\beta_{i,w-j}, \tag{4}$$

where $R_{i,j}$ is the return on stock i in market $j, i = 1,..N_j$, where N_j is the number of stocks in market j. Under complete integration, $\gamma_2 = 0$ and $\eta_2 \neq 0$, and under complete segmentation $\eta_2 = 0$ and $\gamma_2 \neq 0$.

Since we have actual rates of return, we need to decompose the rates of return in an expected component and an unexpected component. Under complete integration

$$R_{i,j} = E(R_{i,j}) + \beta_{i,j,w}[R_w - E(R_w)] + \beta_{i,j-w} V_{j-w} + \varepsilon_{i,j}. \tag{5}$$

Under complete segmentation

$$R_{i,j} = E(R_{i,j}) + \beta_{i,j}[R_j - E(R_j)] + \beta_{i,w-j} V_{w-j} + \theta_{i,j}. \tag{6}$$

Substituting equation (3) into (5) and (4) into (6) we get two equations which give us the empirical model under market integration (7) and under segmentation (8), respectively:

$$R_{i,j} = \gamma_{0,j}(1 - \beta_{i,j,w}) + \gamma_{2,j}\beta_{i,j-w} + \beta_{i,j,w}R_w + \beta_{i,j-w}V_{j-w} + \varepsilon_{i,j} \tag{7}$$

$$R_{i,j} = \eta_{0,j}(1 - \beta_{i,j}) + \eta_{2,j}\beta_{i,w-j} + \beta_{i,j}R_j + \beta_{i,w-j}V_{w-j} + \theta_{i,j}. \tag{8}$$

Estimating these equations using the two-pass approach often used in empirical studies of traditional asset pricing models (see Fama 1991) is not straightforward here since the βs are measured with error—there is thus an errors-in-the-variables problem—and the cross-section equations (7) and (8) are biased. To overcome this problem, cross-section tests traditionally have been done using portfolios of stocks, in the expectation that the formation of portfolios will reduce the measurement error (the Fama-Macbeth [1973] method). Because of the limited data we have here, this is difficult (there are few stocks for each country with complete data on rates of return, on average less than twenty). We therefore use the rates of return on the individual stocks directly.

We use the nonlinear, seemingly unrelated regression (SUR) technique, which is asymptotically efficient and equivalent to the maximum likelihood

estimation (MLE) method (see, further, Gibbons 1980 and 1982).[6] This method is consistent, but may not have good small sample properties. We therefore use all securities which are consistently available in a given market over the 1989–92 period. We estimate for each market N equations (N being the number of securities in the market) as a system of equations with cross-equation restrictions on the γ and η coefficients in each market and no restrictions on the βs (except that they are constant over time). The estimation technique allows for correction of heteroscedasticity across the stocks and exploits the contemporaneously correlated errors. The parameter estimates and other statistics are in table 5.5.

The R^2s for the segmentation and integration tests (last column) vary between 0.18 (Jordan) and 0.74 (Nigeria) and are of similar magnitude (by country) for the two tests (reflecting the fact that the two systems are basically run with the same set of fundamental variables). The integration hypothesis is rejected at the 5 percent level for ten out of the sixteen countries for which we have consistent data.[7] The segmentation hypothesis is not rejected at the 5 percent level for all countries and at the 10 percent level for only three countries (India, Korea, and the Philippines). For two countries, the segmentation test did not converge (Colombia and Malaysia). Combining the two tests, market integration can and market segmentation cannot be rejected (at the 5 percent level) for eight countries (Brazil, Greece, Korea, Mexico, Pakistan, the Philippines, Taiwan, and Thailand). For six countries neither market segmentation nor market integration can be rejected (Chile, India, Jordan, Nigeria, Venezuela, and Zimbabwe), possibly indicating a low power of our test.

The results of these estimation techniques can be compared with the results for Canada–United States: Jorion and Schwartz (1986) find strong evidence of market segmentation, and Mittoo (1992) finds evidence of market segmentation for the pre-1981 period, but integration for the post-1981 period. For developing countries, Errunza, Losq, and Padmanabhan (1992), using IFC EMDB data over the 1976–87 period, reject complete market integration for all eight developing countries they study and reject complete market segmentation of five of these eight countries (Brazil, Chile, Greece, Korea, and Mexico). They conclude that "mild" segmentation best describes the market structure for these five countries. Compared to their results, we find that relatively fewer countries are not integrated (ten out of sixteen compared to eight out of eight), but more are segmented (fourteen out of the fourteen markets which converged compared to their five out of eight).

6. We use the SAS routine SYSNLIN (version 5.0) for the nonlinear seemingly unrelated regression (NLSUR). Other approaches are the MLE method of Litzenberger and Ramaswamy (1979), the procedure outlined in Gibbons (1980), and the odd/even instrumental variable approach of Mankiw and Shapiro (1986). We did use the odd/even method but this method had a lower power as it could reject neither market segmentation nor integration for any of the countries.

7. Data for individual stock rates of return are missing for Argentina for all years; for Turkey and Indonesia, data were only available since 1987 and 1990, respectively; for Portugal no stock has data available consistently for the 1989–92 period.

Table 5.5 **Slope Coefficients for the Integration and Segmentation Tests**

		Integration				Segmentation			
	N	$\gamma_{0,j}$	$\gamma_{2,j}$	R^2	I	$\eta_{0,j}$	$\eta_{2,j}$	R^2	S
Indonesia	18	0.0333	−0.0265	0.46	not reject	0.0121	−0.1956	0.46	not reject
		(0.002)	(0.067)			(0.786)	(0.076)		
Korea	22	−0.0106	0.0279	0.40	reject	0.1841	0.2604	0.40	not reject
		(0.144)	(0.0001)			(0.163)	(0.053)		
Malaysia	29	0.0089	0.0154	0.37	reject	NC			
		(0.221)	(0.0001)						
Pakistan	31	0.0132	0.0108	0.29	reject	−2.623	5.954	0.28	not reject
		(0.012)	(0.042)			(0.896)	(0.895)		
Philippines	16	−0.0243	0.0478	0.30	reject	0.0523	0.194	0.29	not reject
		(0.015)	(0.0001)			(0.335)	(0.079)		
Taiwan	20	−0.0148	0.045	0.68	reject	−0.0674	0.490	0.68	not reject
		(0.107)	(0.0001)			(0.079)	(0.389)		
Thailand	9	0.0560	0.0215	0.46	reject	0.211	0.546	0.47	not reject
		(0.036)	(0.003)			(0.525)	(0.301)		
Greece	8	−0.035	0.0545	0.55	reject	−0.152	0.522	0.56	not reject
		(0.067)	(0.0001)			(0.605)	(0.418)		
Jordan	9	−0.0056	0.0092	0.18	not reject	0.059	−0.362	0.19	not reject
		(0.460)	(0.203)			(0.586)	(0.575)		

(*continued*)

Table 5.5 (continued)

		Integration				Segmentation			
	N	$\gamma_{0,j}$	$\gamma_{2,j}$	R^2	I	$\eta_{0,j}$	$\eta_{2,j}$	R^2	S
Brazil	18	−0.002	0.0375	0.45	reject	−12.54	−8.798	0.45	not reject
		(0.799)	(0.0001)			(0.977)	(0.977)		
Chile	22	0.0627	−.0024	0.37	not reject	0.188	−2.020	0.40	not reject
		(0.005)	(0.877)			(0.744)	(0.489)		
Colombia	20	0.0077	0.0435	0.33	reject	NC			
		(0.234)	(0.0001)						
Mexico	21	0.0227	0.0466	0.32	reject	0.158	−6.748	0.32	not reject
		(0.042)	(0.0001)			(0.941)	(0.927)		
Venezuela	12	0.0100	0.0199	0.36	not reject	0.0073	0.940	0.36	not reject
		(0.479)	(0.390)			(0.941)	(0.199)		
Nigeria	14	1.196	−0.914	0.74	not reject	6.622	−5.914	0.74	not reject
		(0.808)	(0.807)			(0.962)	(0.961)		
Zimbabwe	10	0.0006	0.0059	0.22	not reject	0.006	−0.030	0.22	not reject
		(0.969)	(0.805)			(0.673)	(0.176)		

Note: Approximate p-values (for the t-statistics) are in parentheses. In spite of using many different starting values for the parameters, and even after the maximum iterations were increased up to 2000 and the convergence criteria were raised to 0.0001, no convergence (NC) was obtained for Colombia and Malaysia for the segmentation test. R^2s are obtained as one minus the ratio of sum of squared residual (totaled for all equations) over sum of squared totals (totaled for all equations).

It is worth noting that the overall fit of both cross-section equation (5) as well as (6) improves over time.[8] The fact that both the complete segmentation model as well as the complete integration model describe the cross-sectional behavior of returns better as time progresses is somewhat puzzling. A priori, we expected that the integration model would have performed better over time—as countries opened up—and the segmentation model worse. One explanation is that both equations essentially use the same set of explanatory variables, world and local rates of return, and consequently that the behavior over time of the overall fit has to be similar.

5.5 Barriers and the Investability Indexes

This section provides some statistics on the investability indexes. Barriers to access by foreigners are more severe for developing countries than for industrial countries. While many developing countries have liberalized in recent years, in the past many had—and some still have—capital controls affecting the general ability to invest in and repatriate capital out of the host country, restrictions on foreign investment (e.g., restrictions on the general permissible share of foreign ownership), and other sector or company-specific ownership restrictions.

In addition to these legal barriers, other barriers likely limit foreigners' access to these markets.[9] The IFC investability indexes are, however, only concerned with legal barriers. In particular, the investability indexes are compiled on the basis of information on type (and/or changes) of identifiable barriers (in or out, ownership restrictions, remittance restrictions, other foreign exchange restrictions, restrictions on capital structure, etc.). Typically, however, the index reflects the share of stocks which can be held by foreigners, that is, the δ-constraint. Indirect barriers are not incorporated in the index (even though the IFC categorizes the severity of these indirect barriers by market; see the IFC *Emerging Markets Factbook,* 1993). Appendix B describes the method used for creating the investability indexes and the restrictions in place as of the end of 1992 for some selected emerging markets.

8. We estimate the cross-section equations (5) and (6) for every month during the period December 1988–December 1992, where we use estimates of the various betas obtained from using the previous three years of data (instead of running it as systems with constant betas). We then measure the degree of improvement over time in overall fit for each country through the correlations of the R^2s of the cross-section equations with an index which runs from one (first cross-section equation) to forty-nine (last cross-section equation). For both equations (5) and (6), fourteen out of the sixteen correlations are positive (six of which are significantly so at the 5 percent level).

9. For example, there can be restrictions imposed on investors by the home country (e.g., restrictions on the share of foreign assets held by pension funds) and other regulatory and accounting standards in the home country. Also, indirect barriers may exist, such as the efficiency of the domestic stock (and other financial) markets; the regulatory, accounting, enforcement, etc., standards in the host country; the different forms of sovereign (or transfer) risk; and taxes (see Demirguc-Kunt and Huizinga 1992) and other transaction costs. We do not analyze these restrictions.

The investability indexes are available from December 1989, initially for ten of the twenty markets in the EMDB and later for eighteen. The investability indexes take on values between 0.0 (complete lack of access by foreigners) and 1.0 (complete access). Table 5.6 provides information (the number of stocks, the mean level, the standard deviation, the range, and the skewness of the indexes) on the cross-sectional distributions of the investability index within a given country, at different points in time. Figure 5.1 provides the time-series plots for the mean and cross-sectional standard deviation for the seven countries which have consistent data for the investability index and the stock rates of return since 1989 (Chile had missing data for 1991 and thus could not be plotted). As can be observed from the figure and also by comparing the three panels of table 5.6, there are sharp movements over time in the degree to which foreigners can access these markets. For Mexico, for example, the index goes up from an average of 0.10 in January 1989 to 0.61 at the end of 1992 and further to 0.80 in March 1993. Similarly, the average for Brazil goes up from 0.18 to 0.53. Except for Malaysia, the cross-sectional mean is lower in Asia, an indication that few markets in this region have opened up.

The cross-sectional standard deviation of the index at the end of 1992 varies greatly, from 0.00 for Taiwan to 0.51 for Colombia, Greece, and Venezuela. In general, the cross-sectional standard deviation is lower in Asia (even though less so for Pakistan, the Philippines, and Malaysia), an indication that these countries have mostly marketwide, not sector- or stock-specific restrictions.

The time-series plots of the cross-section variation and table 5.7 show that European and Latin American countries have seen the greatest variation over time in the mean index (the standard deviation of the mean index [Stdmn] in table 5.7 is higher for European countries, except Jordan, and Latin American countries, except Venezuela). Asian countries have the least variation over time. Also taking into account the low cross-sectional variation in Asian countries, this reflects that those Asian countries which opened up during this period did so in a marketwide fashion. Altogether there are four markets which have little time-series variation in access (i.e., for which in table 5.7 the Stdmn ≤ 0.04), but a reasonable cross-sectional variation (i.e., for which, according to table 5.6, the Std ≥ 0.16 at any point in time and for which we have complete data on rates of return and investability indexes): Jordan, Malaysia, the Philippines, and Thailand. Of these four, Jordan has the lowest mean index, 0.09 at the end of 1992.

5.6 Tests of the Relationship between the Investability Indexes, P/E Ratios, and Rates of Return

So far, we have found evidence of market segmentation for about ten markets. We now proceed to more formally incorporate barriers in our empirical tests, using the models of Eun and Janakiramanan (1986) and Stulz and Wasserfallen (1992), and the application of these models by Bailey and Jagtiani

Table 5.6 **Cross-Sectional Analysis of the Investability Index for Each Country in January 1989, June 1990, and December 1992**

Country	Date	Number of Stocks	Mean Level	Standard Deviation	Range (= maximum)	Skewness
Malaysia	8901	62	0.84	0.34	1.00	−1.74136
Philippines	8901	18	0.28	0.46	1.00	1.08486
Thailand	8901	29	0.30	0.20	1.00	1.14879
Greece	8901	26	0.31	0.47	1.00	0.88525
Jordan	8901	25	0.10	0.20	0.49	1.59749
Portugal	8901	23	0.74	0.45	1.00	−1.16667
Argentina	8901	24	0.58	0.50	1.00	−0.36103
Brazil	8901	56	0.18	0.19	0.56	0.31331
Chile	8901	26	0.09	0.12	0.25	0.68705
Mexico	8901	52	0.10	0.30	1.00	2.82184
Malaysia	9006	62	0.86	0.32	1.00	−2.03384
Philippines	9006	29	0.22	0.41	1.00	1.43347
Thailand	9006	34	0.29	0.21	1.00	0.91982
Greece	9006	26	0.77	0.43	1.00	−1.35763
Jordan	9006	25	0.10	0.20	0.49	1.59749
Portugal	9006	27	0.67	0.48	1.00	−0.75423
Turkey	9006	18	0.89	0.32	1.00	−2.70579
Argentina	9006	24	0.42	0.50	1.00	0.36103
Brazil	9006	56	0.10	0.17	0.50	1.22881
Chile	9006	28	0.08	0.12	0.25	0.80870
Mexico	9006	54	0.56	0.50	1.00	−0.23005
Venezuela	9006	13	0.38	0.51	1.00	0.53859
India	9212	63	0.26	0.25	0.49	−0.09769
Indonesia	9212	62	0.15	0.12	0.24	−0.62193
Korea	9212	91	0.10	0.02	0.24	0.25280
Malaysia	9212	62	0.85	0.33	1.00	−1.87221
Pakistan	9212	58	0.09	0.28	1.00	3.02748
Philippines	9212	30	0.25	0.43	1.00	1.24847
Taiwan	9212	70	0.03	0.00	0.05	−5.67578
Thailand	9212	51	0.27	0.16	0.50	−0.31587
Greece	9212	32	0.47	0.51	1.00	0.13149
Jordan	9212	27	0.09	0.19	0.49	1.71783
Portugal	9212	30	0.38	0.48	1.00	0.56336
Turkey	9212	25	0.80	0.41	1.00	−1.59749
Argentina	9212	29	0.79	0.41	1.00	−1.52730
Brazil	9212	69	0.53	0.47	1.00	−0.12553
Chile	9212	35	0.14	0.13	0.25	−0.17986
Colombia	9212	20	0.50	0.51	1.00	0.00000
Mexico	9212	66	0.61	0.49	1.00	−0.44428
Venezuela	9212	17	0.41	0.51	1.00	0.39424

Note: Statistics provide the cross-sectional distribution of the investability index at a given point in time. The cross-sectional minimum is 0.0 in all markets. No data were available for Nigeria and Zimbabwe.

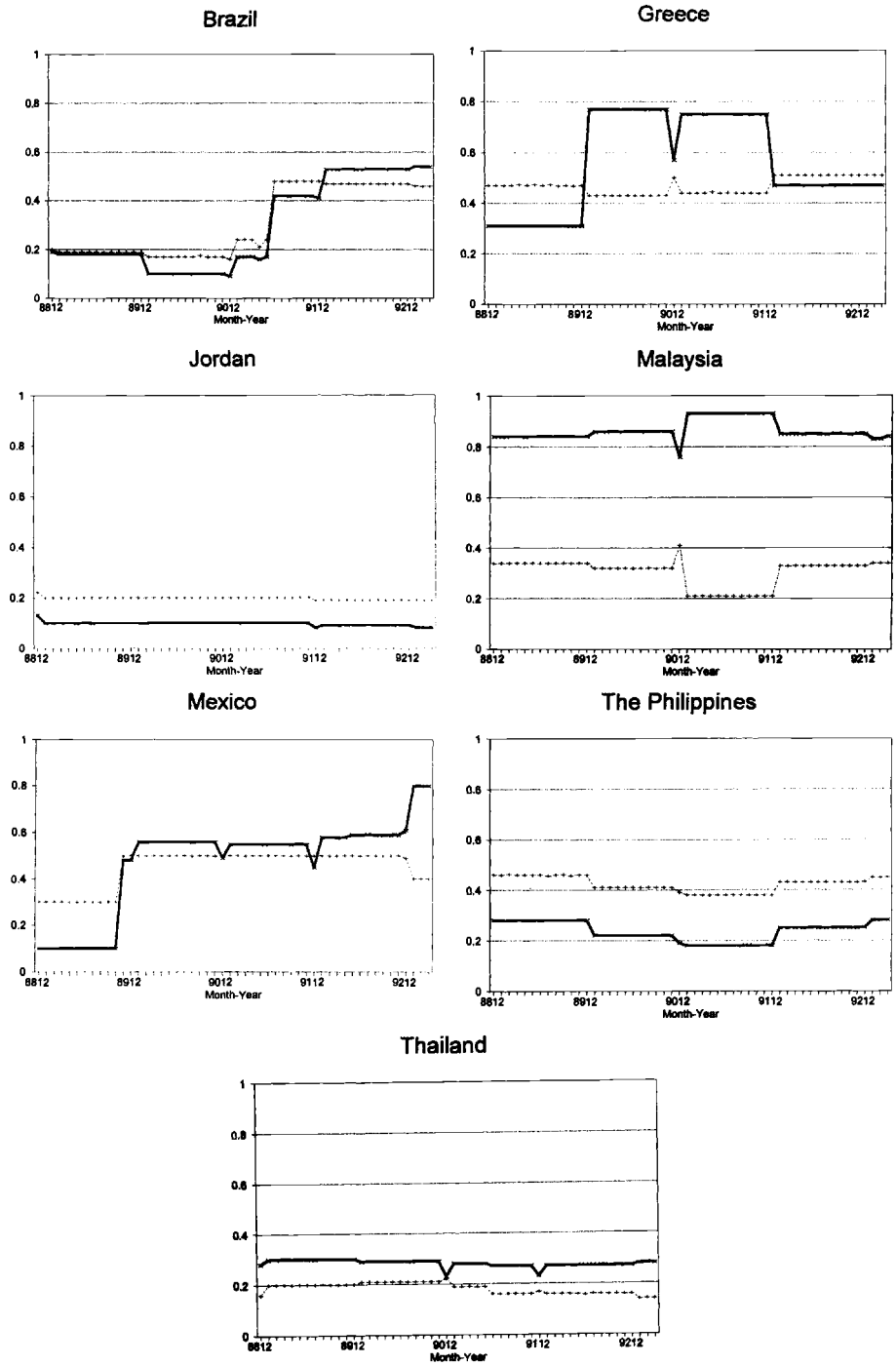

Fig. 5.1 Mean and standard deviation of the investability indexes (by country)
Note: ++ = mean; ——— = standard deviation.

Table 5.7 **Time-Series Analysis of the Cross-Sectional Mean of the Investability Indexes**

Country	*N*	Mean	Stdmn	Minmn	Maxmn
India	31	0.20	0.07	0.10	0.37
Indonesia	5	0.14	0.01	0.14	0.15
Korea	15	0.10	0.00	0.09	0.10
Malaysia	52	0.87	0.04	0.76	0.93
Pakistan	25	0.09	0.01	0.09	0.13
Philippines	52	0.23	0.04	0.18	0.28
Taiwan	27	0.03	0.00	0.03	0.03
Thailand	52	0.28	0.02	0.23	0.30
Greece	52	0.56	0.19	0.31	0.77
Jordan	52	0.10	0.01	0.08	0.13
Portugal	52	0.57	0.14	0.38	0.83
Turkey	44	0.79	0.10	0.56	0.89
Argentina	52	0.61	0.15	0.33	0.79
Brazil	52	0.30	0.18	0.09	0.54
Chile	40	0.10	0.03	0.06	0.14
Colombia	26	0.38	0.12	0.25	0.50
Mexico	52	0.47	0.21	0.10	0.80
Venezuela	39	0.41	0.03	0.31	0.44

Note: The statistics apply to the time series of the mean value of the investability index for a given market. Chile has missing data for 1991. Stdmn refers to the standard deviation of the mean index, Minmn to the minimum of the mean index, and Maxmn to the maximum of the mean index.

(1992). We start with the assumption that the world and the emerging country have the same numeraire (dollars) so that exchange risk is not priced. Consequently, we focus on the dollar rates of return. We further assume that the residents of the emerging countries have full access to foreign financial markets and foreign stocks. The high levels of flight capital observed for many developing countries indicate that this is a reasonable assumption. Foreigners are, however, restricted from full access to the emerging markets and can invest only up to a fraction δ measured by the investability index.

When the δ-constraint is binding, two prices for the same security will occur: a "domestic" price for that share of the stock which can only be held by domestic residents, and a "foreign" price for the share of the stock which can be held by both foreigners and domestic residents. Compared to a situation with no restrictions, a discount can arise for the domestic price and a premium for the foreign price. The ratio of foreign to domestic prices will, among others, depend on the supply of both classes of shares, relative to domestic and foreign investors' wealth.

Apart from the fact whether the constraint on ownership is binding on the foreigners—which we assume it is—the degree to which the domestic market offers unique risk-return characteristics from a world capital market point of view plays an important role in determining the existence and size of the dis-

count and premium. If the domestic market can be mimicked perfectly using world assets, then foreigners will not be willing to pay a premium for emerging markets' stocks. And if domestic residents can lay off the risk of their emerging market stocks through positions in stocks available in the world capital markets, then they do not require a discount on emerging market stocks, even if they are forced to hold them because of the δ-constraint.[10]

We test these relationships using individual stocks' P/E ratios and rates of return for the seven countries for which we have consistent data on returns and investability indexes.[11] Since we are not studying unrestricted and restricted shares of the same firm, but rather shares of individual firms which vary in their degree of restrictiveness, we cannot calculate the ratio of foreign to domestic prices here.[12] However, we can study the price-earning ratio of a stock. Similarly, we can use domestic rates of return (instead of the difference between the returns to foreign and domestic shareholders).

We estimate mimicking portfolios on the basis of the IFC index for the emerging market and the MSCI indexes for thirteen industrial countries. Specifically, the mimicking portfolios are created through ordinary least squares (OLS) regressions of (the rates of return on) the indexes on (the rates of return on) the thirteen MSCI indexes. We then use the predicted values from this regression as the rates of return on the mimicking portfolio.[13] As in Stulz and Wasserfallen (1992) and Bailey and Jagtiani (1992), we also include in the estimations a size (or supply) variable, here taken as the log of the market capitalization of each stock, $MV_{i,t}$. Finally, we use actual instead of expected P/E ratios or returns.

We thus model the P/E ratio, or alternatively, the (excess) rate of return of domestic stock i in market j, as

$$(9) \qquad (P/E)_{i,t} = \alpha_{0,t} + \alpha_{1,t}\delta_{i,t} + \alpha_{2,t}\beta_{i,w,t} + \alpha_{3,t}[\beta_{i,j,t} - \beta_{i,a,t}] + \alpha_{4,t}MV_{i,t} + \varepsilon_{i,t},$$

where $\delta_{i,t}$ indicates the share foreigners can buy of a particular stock i at time t (the investability index), $\beta_{i,w}$ is the slope coefficient of stock i on the world

10. Notice that this approach resembles segmentation/integration tests where the residual of a projection of the local return on the world return (and vice versa) was used. Here the local index is mimicked more generally using (in principle) all worldwide traded assets. Since barriers and associated "mispricing" of individual securities can affect the overall domestic stock market, (announcements of) barriers on individual securities can lead to a marketwide effect through "spillover" effects (see, further, Eun, Claessens, and Jun 1993). We do not attempt to control for these effects.

11. The results for seven other countries are available upon request.

12. Even though we have some stocks of the same firm (e.g., Telmex shares A, B, C, and L) which differ in degree of investability, the sample of such stocks is small. Other foreign prices are available in the form of country-fund and ADR prices. For an analysis of country-fund prices, see Hardouvelis, La Porta, and Wizman (chap. 8 in this volume) and Diwan, Errunza, and Senbet (1993a, 1993b).

13. The mimicking is, as expected, generally poor as these markets have a low correlation with markets of industrial countries. The residual domestic risks are consequently quite large.

portfolio (here the MSCI world index), $\beta_{i,a}$ is the slope coefficient of stock i on the mimicking portfolio A, $\beta_{i,j}$ is the slope coefficient of stock i on the local market index j (note that the αs are not stock specific), and where the subscript t for the β-coefficients indicates that these are estimates updated every month using the previous three years of data. The difference between $\beta_{i,j}$ and $\beta_{i,a}$ represents the domestic risk that cannot be hedged through positions in foreign assets. When there is no residual risk to bear, $\beta_{i,j} - \beta_{i,a} = 0$ and the world CAPM prevails. To estimate the betas, we regress the rates of return during the three-year period preceding the date on the respective indexes.

The coefficients $\alpha_{1,t}$ depend on the relative risk aversion, the wealth of both foreign and domestic investors, and the total supply of restricted and unrestricted shares. The prior is, when the access constraint is binding, that the coefficients $\alpha_{1,t}$ are positive (an increase in δ relaxes the foreign constraint, decreases the required rate of return, and increases the P/E ratio). The coefficients $\alpha_{2,t}$ represent the world market price of risk and are expected to be negative. The coefficients $\alpha_{3,t}$ are expected to be negative as a decrease in the ability to mimic local risk increases the required rate of return and lowers the P/E ratio. Finally, $\alpha_{4,t}$ are expected to be positive as an increase in the supply of assets, keeping liquidity constant, raises the required rate of return and lowers the P/E ratio. When using the rate of return as the dependent variable, the signs of the α-coefficients are expected to take the opposite value.

We do not impose time-series restrictions on the coefficients $\alpha_{0,t}-\alpha_{4,t}$ for each market, that is, we do not use the SUR technique we used for the integration/segmentation tests. Rather we employ the Fama-MacBeth (1973) methodology where we estimate a separate cross-section equation for each month in the 1989–92 period for each market and then calculate averages, standard deviation, etc., of the time series of the slope coefficients.[14]

The results for the P/E ratio alone are in the first panel of table 5.8, which reports the means of the slope coefficients, the t-value for the time-series means, and the means of the individual t-values. The other panels cover the results when we include different combinations of the other right-hand-side variables. The results for the rates of return are in table 5.9.

The results for regressions of the P/E ratios on the index alone confirm the notion that the P/E ratio is positively related to the degree of access by foreigners, suggesting that barriers to access have a negative impact on prices. As measured by the t-value for the mean slope coefficient, for all seven countries, the mean slope is significantly positive (with Brazil marginally). When including other explanatory variables, we find that the positive sign for δ is robust to the inclusion of the world beta and the degree of international spanning of the

14. The main reason we use the Fama-MacBeth methodology is that equation (9) is not formally derived from any rate of return generating process. As a result, the restrictions which would need to be imposed on the coefficients in an SUR are unclear and the more traditional Fama-Macbeth method is preferred.

Table 5.8 **Time-Series Summary of Cross-Sectional Regressions of Price/Earnings Ratio (P/E) against Investability Index (1989–1992)**

	MN δ	T δ	MN T δ	β_w	T β_w	MN T β_w	MN $\beta_j-\beta_a$	T $\beta_j-\beta_a$	MN T $\beta_j-\beta_a$	MN MV	T MV	MN T MV
Malaysia	40.45	2.65	−0.04									
Philippines	57.62	3.45	1.08									
Thailand	5.1	3.83	0.64									
Greece	28.31	3.06	1									
Jordan	125.87	3.26	0.23									
Brazil	9.18	1.94	0.12									
Mexico	6.19	4.13	0.98									
Malaysia	53.17	1.71	−0.06	37.44	0.78	0.23						
Philippines	−52.22	−3.18	−0.28	54.88	2.87	−0.23						
Thailand	−25.73	−8.52	−1.01	10.99	9.02	1.44						
Greece	140.18	1.85	0.76	−109.3	−1.63	−0.71						
Jordan	4.2	1.02	−0.01	11.74	3.41	0.21						
Brazil	7.33	2.17	0.3	−0.33	−0.48	−0.39						
Mexico	11.69	3.6	0.38	−1.95	−0.76	0						
Malaysia	71.11	1.62	−0.1				−17.9	−0.3	0.37			
Philippines	10.66	1.89	−0.24				−82.77	−3.05	−1.39			
Thailand	−9.53	−5.89	−0.31				11.9	7.71	1.94			
Greece	288.19	1.64	0.21				236.21	1.56	−1.02			
Jordan	26.31	2.24	−0.08				3.28	0.4	−0.45			
Brazil	10.58	2.33	0.55				−3.25	−4.92	−1.02			
Mexico	9.75	4.77	0.48				−5.49	−2.08	−0.25			

Malaysia	−2.3	−0.15	−0.17							−16.31	−2.73	0.31
Philippines	−38.41	−2.4	0.04							0.77	0.31	−0.77
Thailand	−13.47	−7.35	−0.47							1.29	4.6	0.55
Greece	−65.12	−1.55	0.28							60.61	1.81	0.17
Jordan	43.6	4.53	0.45							−6.58	−5.34	−0.51
Brazil	−13.99	−2.27	−0.93							3.15	4.37	1.81
Mexico	10.46	2.67	0							0.07	0.05	0.69
Malaysia	66.62	1.52	−0.08	16.33	0.34	0.37	−10.28	−0.16	0.51			
Philippines	4.2	1.13	0.04	13.16	2.1	−0.75	−77.76	−3.04	−1.22			
Thailand	−18.4	−6.17	−0.58	4.51	4.36	0.41	9.38	6.2	1.11			
Greece	370	1.71	0.35	−108.1	−1.68	−1.21	240.34	1.6	−1.06			
Jordan	16.97	1.82	−0.02	31.29	3.03	0.21	14.94	1.29	−0.25			
Brazil	10.43	2.22	0.67	−2.18	−3.36	−0.79	−3.92	−6.26	−1.39			
Mexico	12.31	4.06	0.57	−4.34	−1.07	−0.11	−5.56	−1.7	−0.45			
Malaysia	22.94	0.97	−0.13	35.19	0.75	0.18				−7.15	−1.38	0.4
Philippines	17.06	2.33	0.28	85.15	2.97	0.07				−25.4	−3.32	−0.87
Thailand	−27.16	−8.59	−1.17	11.95	10.11	1.61				1.68	7.89	0.96
Greece	−35.86	−0.6	0.35	−32.24	−0.78	−0.45				51.08	1.71	0.16
Jordan	51.39	4.54	0.54	20.06	4.63	0.34				−9.28	−5.09	−0.57
Brazil	−0.23	−0.07	−0.64	−0.01	−0.01	−0.29				2.29	7.1	2.01
Mexico	11.6	2.67	0.07	−1.96	−0.8	−0.18				0.14	0.11	0.64

(*continued*)

Table 5.8 (continued)

	MN δ	T δ	MN T δ	β_w	T β_w	MN T β_w	MN $\beta_j-\beta_a$	T $\beta_j-\beta_a$	MN T $\beta_j-\beta_a$	MN MV	T MV	MN T MV
Malaysia	25.87	0.71	−0.19				−19.77	−0.33	0.34	−16.92	−2.69	0.28
Philippines	21.82	3.12	0.32				−83.72	−3.08	−1.54	−4.14	−3.04	−0.95
Thailand	−10.64	−5.92	−0.4				11.85	7.19	1.58	−0.13	−0.72	0.06
Greece	174.61	1.59	0.02				218.29	1.57	−0.86	47.36	1.79	−0.08
Jordan	32.21	4.07	0.49				3.94	0.47	−0.53	−1.55	−0.98	−0.55
Brazil	5.47	0.84	−0.34				−2.9	−3.09	−0.61	1.5	3.36	1.68
Mexico	10.57	2.91	0.09				−5.46	−1.91	−0.44	−0.62	−0.39	0.65
Malaysia	35.48	0.97	−0.16	14.46	0.31	0.34	−10.87	−0.16	0.51	−7.93	−1.45	0.34
Philippines	39	3.06	0.47	32.96	2.62	−0.41	−74.07	−2.99	−1.22	−14.25	−3.19	−0.8
Thailand	−21.33	−6.18	−0.71	6.46	4.37	0.57	8.23	4.56	0.57	0.5	1.99	0.34
Greece	235.3	1.68	0.06	−53.95	−1.24	−0.75	227.95	1.63	−0.84	35.29	1.71	0.11
Jordan	32.15	3.51	0.53	37.82	3.68	0.34	16.36	1.43	−0.35	−3.63	−1.89	−0.55
Brazil	5.88	0.91	−0.19	−1.37	−2.13	−0.7	−3.02	−3.12	−0.89	1.51	3.29	1.45
Mexico	12.47	2.93	0.23	−4.31	−1.13	−0.22	−5.73	−1.68	−0.62	−0.17	−0.11	0.67

Note: MN stands for the time-series mean of the cross-sectional regression coefficients. Std represents the standard deviation of the cross-sectional regression coefficients. T stands for the *t*-value of the mean of the time-series of coefficients, i.e., mean*sqrt(n)/std. MN T stands for the mean of the *t*-values of the individual cross-sectional regressions. We use stocks with complete observations from 1/86 through 12/92. δ stands for the investability index. β_w are world betas. β_j are the betas against the local index and β_a are the betas from the mimicking portfolios. MV are one-month lagged log market values. For the number of stocks, see table 5.6 on the investability index. Results are similar when using local betas and betas from mimicking portfolios separately rather than taking the difference between them.

Table 5.9 **Time-Series Summary of Cross-Sectional Regressions of Rates of Return against Investability Index (1989–1992)**

	MN δ	T δ	MN T δ	β_w	T β_w	MN T β_w	MN $\beta_j-\beta_a$	T $\beta_j-\beta_a$	MN T $\beta_j-\beta_a$	MN MV	T MV	MN T MV
Malaysia	0.02	1.77	0.13									
Philippines	0.02	1.7	0.35									
Thailand	0.13	4.28	0.48									
Greece	0.03	2.3	0.55									
Jordan	−0.03	−2.05	−0.2									
Brazil	0.02	0.68	0.14									
Mexico	0.01	1.08	0.1									
Malaysia	0.02	1.48	0.09	−0.01	−0.7	−0.16						
Philippines	0.02	1.94	0.42	0	−0.1	−0.08						
Thailand	0.1	2.82	0.44	−0.02	−0.69	−0.12						
Greece	0.03	2.2	0.59	0	0.35	0.18						
Jordan	−0.04	−1.98	−0.22	0.03	1.86	0.25						
Brazil	0	−0.08	−0.01	−0.03	−2.08	−0.28						
Mexico	0.01	0.91	0.06	0.01	1.01	0.27						
Malaysia	0.02	1.65	0.12				0.01	0.91	0.02			
Philippines	0.02	2	0.41				−0.01	−0.98	−0.34			
Thailand	0.12	3.19	0.44				0	−0.14	0			
Greece	0.02	1.82	0.6				−0.01	−0.86	−0.11			
Jordan	−0.02	−1.09	−0.16				0.03	1.56	0.02			
Brazil	0.04	0.89	0.08				−0.01	−0.6	−0.05			
Mexico	0.02	1.41	0.16				−0.01	−1.65	−0.3			

(*continued*)

Table 5.9 (continued)

	MN δ	T δ	MN T δ	β_w	T β_w	MN T β_w	MN $\beta_j-\beta_a$	T $\beta_j-\beta_a$	MN T $\beta_j-\beta_a$	MN MV	T MV	MN T MV
Malaysia	0.01	1.49	0.12							0	−1	0.11
Philippines	0.03	2.69	0.29							0	−0.71	−0.01
Thailand	0.13	3.83	0.46							0	0.69	0.18
Greece	0.03	2.02	0.43							0	−0.54	−0.14
Jordan	0	0.06	0.01							−0.01	−0.93	−0.09
Brazil	0.02	0.57	0.06							0	0.12	0.1
Mexico	0	−0.36	−0.11							0.01	2.04	0.47
Malaysia	0.02	1.46	0.09	0	−0.11	−0.08	0.01	0.69	−0.02			
Philippines	0.03	2.32	0.47	−0.01	−0.69	−0.15	0	−0.15	−0.21			
Thailand	0.1	2.28	0.32	−0.03	−0.95	−0.08	0.01	0.32	−0.08			
Greece	0.03	1.75	0.55	0	−0.2	0.15	−0.01	−0.58	−0.01			
Jordan	−0.02	−1.38	−0.13	0.05	3.25	0.29	0.05	2.61	0.2			
Brazil	0.02	0.45	0	−0.03	−2.26	−0.18	−0.02	−1.51	−0.2			
Mexico	0.01	0.96	0.15	0.02	1.26	0.34	−0.01	−1.42	−0.38			
Malaysia	0.01	1.27	0.1	0	−0.01	−0.05				0	−1.07	0.09
Philippines	0.04	2.97	0.39	0.01	0.67	0				−0.01	−1.15	−0.05
Thailand	0.09	2.22	0.46	−0.01	−0.33	−0.13				0	0.67	0.05
Greece	0.05	2.74	0.59	0.02	1.14	0.33				−0.01	−1.75	−0.31

Jordan	0.02	0.67	0.09	0.04	2.05	0.34				−0.01	−1.59	−0.19
Brazil	−0.01	−0.23	−0.06	−0.03	−1.97	−0.28				0	0.27	0.07
Mexico	−0.01	−0.55	−0.15	0.02	1.08	0.31				0.01	2.22	0.49
Malaysia	0.01	1.34	0.12				0.02	1.14	0.05	0	−1.01	0.11
Philippines	0.03	3.03	0.37				−0.01	−1.11	−0.35	0	−0.76	−0.05
Thailand	0.11	2.79	0.4				−0.01	−0.26	−0.13	0	−0.07	0.03
Greece	0.03	2.02	0.64				−0.02	−1.15	−0.32	−0.01	−1.01	−0.33
Jordan	−0.01	−0.19	0.06				0.02	1.09	−0.06	0	−0.21	−0.11
Brazil	−0.03	−0.77	−0.07				0	0.36	0.05	0.01	0.48	0.08
Mexico	0	−0.14	−0.06				−0.02	−2.47	−0.39	0.01	2.39	0.52
Malaysia	0.01	1.24	0.1	0	0.37	0.01	0.01	0.87	0.02	0	−1.11	0.09
Philippines	0.04	3.36	0.45	0	0.14	−0.06	0	−0.11	−0.18	−0.01	−1.14	−0.05
Thailand	0.04	0.72	0.2	0.01	0.31	0	−0.01	−0.2	−0.3	0	0.46	0.04
Greece	0.04	2.35	0.67	0.01	0.35	0.19	−0.02	−0.72	−0.15	−0.01	−1.91	−0.46
Jordan	0.01	0.4	0.15	0.06	3.17	0.37	0.05	2.35	0.14	−0.01	−1.01	−0.21
Brazil	−0.01	−0.36	−0.06	−0.02	−1.85	−0.12	−0.01	−0.69	−0.09	0	0.08	0
Mexico	−0.01	−0.49	−0.11	0.02	1.31	0.39	−0.02	−1.88	−0.43	0.01	2.44	0.54

Note: MN stands for the time-series mean of the cross-sectional regression coefficients. Std represents the standard deviation of the cross-sectional regression coefficients. T stands for the *t*-value of the mean of the times-series of coefficients, i.e., mean*sqrt(n)/std. MN T stands for the mean of the *t*-values of the individual cross-sectional regressions. We use stocks with complete observations from 1/86 through 12/92. δ stands for the investability index. β_w are world betas. β_l are the betas against the local index and β_s are the betas from the mimicking portfolios. MV are one-month lagged log market values. For the number of stocks, see table 5.6 on the investability index. Results are similar when using local betas and betas from mimicking portfolios separately rather than taking the difference between them.

domestic market for four markets. Only for Jordan and Mexico is the positive sign for δ maintained across all regression specifications. For the other countries the sign for δ at times turns negative, for example, when including the lagged (log) market value, the third panel. For Jordan, the signs for the other explanatory variables are not always as expected, for example, several of the βs have positive signs. In the case of Mexico, the signs for the βs are, as hypothesized, all negative (e.g., see the very last line of table 5.8).

The *t*-values for the time-series means show that there are quite a number of significant coefficients. For example, for the regression which includes all explanatory variables (the last panel of table 5.8), fourteen out of twenty-eight coefficients are significant on the basis of the *t*-values for the mean (the mean of the individual *t*-values shows, however, that many of the individual regression coefficients were insignificant). But the signs are often not as expected.

For the rates of return, Jordan is the only country which has the expected negative sign for δ (first panel, table 5.9). This negative sign is robust, but loses significance, when including β_w and $\beta_j - \beta_a$, which themselves also have the expected positive and often significant signs. The negative sign for δ disappears when the lagged (log) market value is included. For none of the other markets do we find that returns are negatively related to the investability indexes in a consistent fashion.

The degree to which the model explains the cross-section variation in the P/E-ratios and rates of return varies greatly across equations and countries. While in general we have low explanatory power, with the time-series mean of the adjusted R^2s mostly reaching less than 10 percent, at times the mean adjusted R^2 reaches 70 to 80 percent (figures are not reported).

Our findings may be better understood by referring back to figure 5.1. This figure showed that there is much erratic behavior in the investability indexes, with large swings from month to month for some countries; for example, for Greece in late 1990 the mean index falls in one month from 0.77 to 0.57 and then goes back up to 0.75, casting some doubt on the manner in which these data were constructed. More important, as was noted before, only for Jordan is the mean index stable and low, while at the same displaying a relatively large cross-sectional variation.

The behavior of the indexes may explain why we only find consistent results for both P/E ratios and rates of return for Jordan. For three of the four countries where the investability index was stable while still displaying relatively large cross-sectional variation, the access constraint likely did not bind (Malaysia, the Philippines, and Thailand). This implies one would not expect a cross-sectional relationship between returns and the indexes. For the other countries, the investability indexes were not stable (the mean increased for Brazil and Mexico and behaved erraticly for Greece). This could imply that time-series effects (of opening up or closing of the markets, or of data problems) confounded the cross-sectional relationship between returns and the investability indexes. Put differently, the ex post rates of return are likely a poor proxy of

the ex ante rates of return. A positive relationship between the P/E ratio and the investability indexes could still be maintained if countries opened up (e.g., Brazil and Mexico), however, since then both the cross-sectional and time-series effects would go the same way.

To control for the time-series effects of marketwide opening up, we standardize the P/E ratio of each stock in a given market by dividing it by the market-average P/E ratio. In this way, we control for changes in the P/E ratio of each stock for marketwide developments which may be related to the opening up of the market. Admittedly, this is a crude way of proxying for events which affect a particular stock's P/E ratio over time, but it should provide some indication of how robust our results are to the time-series behavior of the P/E ratios.

The results are reported in table 5.10. Comparing the coefficients in table 5.10 with those of table 5.8, we find that the cross-sectional relationship between a stock's P/E ratio and its δ is robust to this standardization. While, as expected, the slope coefficients drop significantly, the t-values are not affected. If anything, the cross-sectional effect of δ on the P/E ratio is significant at higher levels than in table 5.8. By multiplying the slope coefficients with the mean level of δ (from table 5.7), the relative sensitivity of a stock's P/E ratio with respect to δ can be compared across countries. Excluding Thailand (which has a very low slope coefficient), the mean sensitivity is 0.91, with a standard deviation of only 0.44, indicating some evidence of a common pattern.

We also perform a second robustness test. This involves controlling for the stocks' industry (sector).[15] Our previous results may be capturing differences in P/E ratios by industry to the extent that foreign ownership restrictions differ systematically by industry. Since we often have a limited number of stocks for each country, we cannot control for each industry without running out a degrees of freedom. We therefore classify stocks in two groups: nonbank and bank. Ownership restrictions appear to differ most systematically between these two groups. We perform this second robustness test for two countries, Malaysia and Brazil. Malaysia has twenty-three stocks in nonbank and six in bank. The nonbank group has a much higher δ (100 percent) than the bank group (30 percent): the P/E ratio for nonbank is on average about twice as high as the P/E ratio of the bank stocks. Average rates of return do not differ between the two groups. Brazil has fifteen stocks in nonbank and only three in bank. The P/E ratio for nonbank is on average slightly higher than that of bank, but average rates of return do not differ between the two groups.

The results of similar regressions as in tables 5.8–5.10 but now with a dummy added for sector (nonbank = 0, bank = 1) are reported in table 5.11. As can be observed, for both countries and for the P/E ratio as well as for the rate of return equations, the sector dummies have the right (negative) sign, indicating that the industry classification affects a stock's P/E ratio. For Malay-

15. We are grateful to Donald Lessard for suggesting this extension.

Table 5.10 **Time-Series Summary of Cross-Sectional Regressions of Standardized Price/Earnings Ratio (P/E) against Investability Index (1989–1992)**

	MN δ	T δ	MN T δ	MN β_w	T β_w	MN T β_w	MN $\beta_j-\beta_a$	T $\beta_j-\beta_a$	MN T $\beta_j-\beta_a$	MN MV	T MV	MN T MV
Malaysia	1.95	2.94	−0.04									
Philippines	3.92	3.5	1.08									
Thailand	0.35	3.2	0.64									
Greece	1.89	3.7	1									
Jordan	10.13	3.38	0.23									
Brazil	1.72	3.03	0.21									
Mexico	0.63	4.31	0.98									
Malaysia	2.48	1.8	−0.06	2.68	1.37	0.23						
Philippines	−3.54	−3.23	−0.28	3.64	2.85	−0.23						
Thailand	−1.94	−8.34	−1.01	0.81	9.76	1.44						
Greece	8.17	1.95	0.76	−6.43	−1.68	−0.71						
Jordan	0.39	1.07	−0.01	1.16	3.61	0.21						
Brazil	0.58	2.07	0.34	0.01	0.25	−0.24						
Mexico	1.2	2.93	0.38	−0.36	−1.24	0						
Malaysia	3.18	1.59	−0.1				−0.86	−0.32	0.37			
Philippines	0.67	1.74	−0.24				−5.62	−3.07	−1.39			
Thailand	−0.7	−6.04	−0.31				0.86	8.43	1.94			
Greece	15.95	1.71	0.21				13	1.61	−1.02			
Jordan	2.54	2.37	−0.08				0.55	0.75	−0.45			
Brazil	1.03	2.69	0.59				−0.3	−5.6	−1.02			
Mexico	0.87	3.65	0.48				−0.29	−1.14	−0.25			

Malaysia	−0.04	−0.05	−0.17							−0.7	−2.79	0.31
Philippines	−2.59	−2.38	0.04							0.03	0.15	−0.77
Thailand	−0.99	−7.69	−0.47							0.09	4.79	0.55
Greece	−3.36	−1.47	0.28							3.36	1.82	0.17
Jordan	3.69	3.89	0.45							−0.53	−4.6	−0.51
Brazil	−2.49	−2.38	−0.68							0.4	3.33	1.36
Mexico	1.07	2.25	0							−0.02	−0.15	0.69
Malaysia	3.05	1.54	−0.08	1.66	0.83	0.37	−0.65	−0.22	0.51			
Philippines	0.28	1.11	0.04	0.81	1.92	−0.75	−5.29	−3.06	−1.22			
Thailand	−1.41	−5.93	−0.58	0.34	4.28	0.41	0.67	6.63	1.11			
Greece	20.83	1.78	0.35	−6.32	−1.67	−1.21	13.39	1.67	−1.06			
Jordan	1.61	1.91	−0.02	3.12	3.07	0.21	1.69	1.56	−0.25			
Brazil	1.04	2.61	0.71	−0.2	−3.5	−0.69	−0.4	−7.26	−1.34			
Mexico	1.22	3.16	0.57	−0.74	−1.54	−0.11	−0.22	−0.67	−0.45			
Malaysia	1.17	1.12	−0.13	2.61	1.35	0.18				−0.32	−1.43	0.4
Philippines	1.13	2.34	0.28	5.67	2.97	0.07				−1.72	−3.4	−0.87
Thailand	−2.05	−8.44	−1.17	0.9	10.34	1.61				0.13	8.45	0.96
Greece	−1.41	−0.45	0.35	−2.16	−0.9	−0.45				2.81	1.76	0.16
Jordan	4.41	3.94	0.54	1.84	4.31	0.34				−0.79	−4.44	−0.57
Brazil	−0.28	−0.99	−0.39	0.06	1.19	−0.12				0.24	8.24	1.67
Mexico	1.23	2.31	0.07	−0.36	−1.37	−0.18				0	0.02	0.64
Malaysia	1.22	0.74	−0.19				−0.95	−0.35	0.34	−0.74	−2.78	0.28
Philippines	1.5	3.16	0.32				−5.69	−3.11	−1.54	−0.31	−3.44	−0.95
Thailand	−0.78	−6.11	−0.4				0.84	7.94	1.58	−0.01	−0.49	0.06
Greece	9.69	1.68	0.02				11.98	1.61	−0.86	2.64	1.79	−0.08
Jordan	2.57	3.43	0.49				0.66	0.88	−0.53	−0.04	−0.29	−0.55

(*continued*)

Table 5.10 (continued)

	MN δ	T δ	MN T δ	MN β_w	T β_w	MN T β_w	MN $\beta_j-\beta_a$	T $\beta_j-\beta_a$	MN T $\beta_j-\beta_a$	MN MV	T MV	MN T MV
Brazil	0.26	0.47	−0.12				−0.22	−2.99	−0.65	0.19	5.51	1.38
Mexico	1.04	2.39	0.09				−0.28	−1	−0.44	−0.12	−0.64	0.65
Malaysia	1.7	1.04	−0.16	1.59	0.82	0.34	−0.69	−0.23	0.51	−0.35	−1.49	0.34
Philippines	2.66	3.09	0.47	2.16	2.56	−0.41	−5.05	−3.01	−1.22	−0.98	−3.31	−0.8
Thailand	−1.66	−5.86	−0.71	0.52	4.29	0.57	0.57	4.7	0.57	0.05	2.48	0.34
Greece	13.53	1.76	0.06	−3.37	−1.25	−0.75	12.7	1.69	−0.84	1.93	1.77	0.11
Jordan	2.59	2.92	0.53	3.59	3.48	0.34	1.8	1.67	−0.35	−0.25	−1.46	−0.55
Brazil	0.44	0.79	0.07	−0.07	−1.37	−0.51	−0.29	−3.9	−0.96	0.16	4.4	1.1
Mexico	1.29	2.47	0.23	−0.73	−1.63	−0.22	−0.23	−0.68	−0.62	−0.05	−0.29	0.67

Note: MN stands for the time-series mean of the cross-sectional regression coefficients. T stands for the *t*-value of the mean of the times-series of coefficients, i.e., mean*sqrt(n)/std. MN T stands for the mean of the *t*-values of the individual cross-sectional regressions. We use stocks with complete observations from 1/86 through 12/92. δ stands for the investability index. β_w are world betas. β_j are the betas against the local index and β_a are the betas from the mimicking portfolios. MV are one-month lagged log market values. For the number of stocks, see table 5.6 on the investability index.

Table 5.11 **Time-Series Summary of Cross-Sectional Regressions of Price/Earnings Ratio (P/E) and Rates of Return against Investability Index and Sector Dummy (1989–1992)**

A. P/E Ratio

	MN δ	T δ	MN β_w	T β_w	MN $\beta_j-\beta_a$	T $\beta_j-\beta_a$	MN MV	T MV	MN SEC	T SEC
Malaysia	11.40	1.21							−19.39	−0.94
Brazil	2.14	0.59							−2.2	−1.53
Malaysia	27.12	1.01	23.03	0.46					−12.43	−0.53
Brazil	10.54	2.34	−1.6	−1.83					−7.58	−2.98
Malaysia	35.20	1.17			−2.22	−0.04			−21.19	−0.89
Brazil	10.69	2.32			−4.25	−8.5			3.01	1.13
Malaysia	−53.37	−2.66					−19.43	−2.77	−31.08	−1.33
Brazil	−11.68	−1.78					3.19	4.2	−2.98	−1.71
Malaysia	33.16	0.93	1.52	0.03	2.27	0.04			−15.5	−0.55
Brazil	10.62	2.25	−3.45	−2.87	−5.10	−8.84			−1.47	−0.42
Malaysia	−17.74	−0.65	19.03	0.39			−9.17	−1.49	−19.5	−0.77
Brazil	2.86	0.60	−1.22	−1.33			2.24	7.05	−9.74	−2.45
Malaysia	−34.04	−1.13			−2.56	−0.04	−20.54	−2.74	−33.94	−1.26
Brazil	6.62	0.96			−3.19	−2.71	1.49	2.93	−3.86	−0.73
Malaysia	−14.42	−0.41	−1.47	−0.03	3.02	0.04	−10.45	−1.55	−23.48	−0.76
Brazil	6.92	1.02	−2.87	−2.39	−3.74	−3.04	−1.59	3.06	−14.2	−2.24

B. Rates of Return

	MN δ	T δ	MN β_w	T β_w	MN $\beta_j-\beta_a$	T $\beta_j-\beta_a$	MN MV	T MV	MN SEC	T SEC
Malaysia	0.03	1.27							0.01	0.47
Brazil	0.02	0.69							−0.00	−0.12
Malaysia	0.03	1.04	0.00	−0.30					0.00	0.46
Brazil	0.02	0.37	−0.03	−1.29					−0.03	−0.58
Malaysia	0.02	1.17			0.00	0.44			0.00	0.38
Brazil	0.05	1.16			−0.03	−1.62			0.05	0.68
Malaysia	0.02	1.01					0.00	−0.81	0.00	0.25
Brazil	0.00	0.04					0.00	0.30	0.01	0.24
Malaysia	0.03	1.04	0.00	0.02	0.00	0.25			0.01	0.41
Brazil	0.04	0.81	−0.03	−1.39	−0.04	−1.73			0.04	0.55
Malaysia	0.02	0.81	0.00	0.23			0.00	0.96	0.00	0.22
Brazil	−0.01	−0.31	−0.02	−0.94			0.00	0.44	−0.03	−0.49
Malaysia	0.02	0.78	0.01	0.40	0.01	0.49	0.00	−0.99	0.00	0.12
Brazil	−0.02	−0.54			0.01	0.41	0.01	0.61	−0.03	−0.43
Malaysia	0.02	0.78	0.01	0.40	0.01	0.49	−0.00	−0.99	0.00	0.12
Brazil	−0.00	−0.10	−0.02	−1.22	−0.01	−0.38	0.00	0.00	−0.05	−0.56

Note: MN stands for the time-series mean of the cross-sectional regression coefficients. T stands for the *t*-value of the mean of the times-series of coefficients, i.e., mean*sqrt(n)/std. We use stocks with complete observations from 1/86 through 12/92. δ stands for the investability index. β_w are world betas. β_j are the betas against the local index and β_a are the betas from the mimicking portfolios. MV are one-month lagged log market values. SEC stands for the sectoral dummy. For the number of stocks, see table 5.6 on the investability index. Results are similar when using local betas and betas from mimicking portfolios separately rather than taking the difference between them.

sia, however, the dummies are never significant, while for Brazil only three out of eight are significant in the case of the P/E regressions and none for the rates of return regressions. (Note, however, that there are only three stocks in the Brazil bank group.) Introducing the sector dummy does affect the other slope coefficients, however. In particular, for Malaysia the t-statistics for δ become insignificant for almost all specifications. For Brazil, on the other hand, t-statistics often improve. For Malaysia, this raises the possibility that the regressions on the P/E ratio on δ without sector dummy are misspecified because of multicollinearity between δ and sector (i.e., sector-specific factors other than δ determine a stock's P/E ratio in such a way that high δ sectors end up with high P/E ratios and vice versa). As we use no factors other than δ and sector dummy to control for a stock's P/E ratio, we cannot determine conclusively either way whether it is the sector or the level of δ which is driving the relationship between δ and the P/E ratio. In the case of Brazil, there is no evidence of a coincidence between the industry sector of a stock and its δ.

The negative results for the rates of return are consistent with Bekaert (1993). He finds that there is not a significant relationship between ownership restrictions and the integration of an emerging market with world markets. He conjectures that ownership restrictions are not binding or are being circumvented.

5.7 Conclusions

Tests of market integration using the Stehle (1977) model, employing nonlinear, seemingly unrelated regressions (equivalent to the MLE), reject the market integration hypothesis for most and fail to reject segmentation for all. In particular, we find that over this period Brazil, Greece, Korea, Mexico, Pakistan, the Philippines, Taiwan, and Thailand are segmented from international markets.

We have evidence that the degree of investability affects P/E ratios for seven countries in the expected way. When including other explanatory variables, we find this result to be robust for four markets to the inclusion of the two additional explanatory variables, and for two, Jordan and Mexico, when including three additional variables. It is also robust to the standardization of the P/E ratios. When using rates of return, we only find the expected results for Jordan.

Our weak results for the rates of return are likely because we cover time-series as well as cross-section effects. Without any change in access, that is, on a cross-sectional basis, one would expect stocks which are more accessible to have lower return. However, many markets have opened up and as a result stock prices have increased, implying that ex post returns have been high (even though expected returns may have declined). This implies that on a cross-sectional basis one may not find a negative relationship between a stock's return and its investability index. The other possibility, of course, is that the CAPM is not the right model to use.

Our results indicate two possible avenues for improvements: one, we should attempt to keep the degree of access over time constant; and two, to expand the model to test for the importance of the investability indexes in explaining rate of return behavior. This is left for future research.

Appendix A
General Criteria for Inclusion in the IFC Indexes[16]

The IFC selects stocks for inclusion in the indexes on the basis of three criteria: size, liquidity, and industry. The indexes include the largest and most actively traded stocks in each market, with a target index total representing the top 60 percent of total market capitalization at the end of each year and, as a second step, the top 60 percent of total trading value during each year. Size is measured by market capitalization; liquidity is the total value of shares traded during the year.

Only stocks that are listed on one of the major exchanges in the emerging markets are included in the index. The index will not include stocks whose issuing company is headquartered in an emerging market but listed only on foreign markets.

If several stocks meet the liquidity and size criteria, but only one or two are needed, the IFC selects the stocks that represent industries that are not yet well represented in the IFC index.

In a few instances, particularly where multiple classes of stocks are common (e.g., Brazil and Mexico), the IFC may include in the IFC index more than one class of stock for the same company even though they are not necessarily actively traded. The purpose is to give a balanced view of the capitalization of companies that have other classes of stock that are actively traded.

Stock market "float" (i.e., the amount of issued stock held by the general public and generally assumed to be available for trading) is not a consideration in weighing the indexes, due to the difficulty of obtaining accurate information in a timely manner.

16. Appendix A and appendix B are copied from the IFC methodology notes.

Appendix B
Criteria Used by the IFC for the Investable Indexes and Restrictions on Foreign Investors in Selected Countries

Criteria Used by the IFC for the Investable Indexes

As a first screen, stocks are included in the investable indexes if they are in the global index and are available for purchase by nonresident investment institutions to some degree; the degree is determined by national laws and by company statutes. Governments and companies impose a variety of restrictions on foreign ownership, which may also differ by sector. In addition, individual firms may restrict foreign ownership of (certain classes of) shares. Several examples are shown here; appendix B summarizes the restrictions in effect at the end of 1992 for some selected markets.

General national limits, such as "foreigners as a group may not own more than 10 percent of any company";

Special class of shares, such as A and B class shares in the Philippines. The two are equivalent except that foreigners may not own A class shares:

Sector restrictions, most commonly used to limit foreign ownership of financial institutions, energy producers, utilities, and the media;

Single foreign holder limitations on general classes of shares, such as Brazil's "no more than 5 percent of the voting classes, nor more than 20 percent of aggregate capital" or Colombia's 10 percent limit per investor. The IFC rule in this regard is to use the aggregate that foreign investors as a whole may acquire;

Example: In Colombia, foreigners may own 100 percent of most companies, although no single foreigner may own more than 10 percent. The investable market capitalization would be considered as 100 percent;

"Foreign board" adjuncts to the main stock exchange, where foreign investors may trade listed stocks among themselves, assuring that trades conducted there will not cause the foreign ownership content to exceed maximum permitted level;

Prohibitions on individual foreign investors while permitting multiple foreign mutual funds, if they meet certain criteria, such as minimum fund size and experience. The IFC rule in this regard is to consider the market as open as it is to authorized investors, using the "aggregate investor" rule noted above for individual stock investability factors;

Company statutes that impose limits that differ from national law in some markets. In those case, the IFC uses the most restrictive limit;

Example: The national limit is 49 percent, but a company's articles of incorporation set a limit of 25 percent. The IFC would use a weight of 25 percent;

National limits on the aggregate permitted foreign investment. For example, Taiwan set a ceiling of US$2.5 billion on foreign inflows when it opened its stock market in January 1991. At the end of 1992, this represented about 2.5 percent of total Taiwan Stock Exchange (TSE) capitalization. In this case, the IFC would apply the relative shares of the available stocks within the market against the aggregate limit.

Example: The national limit in a market is $1 billion, and the investable index in the market consists of two stocks, XYZ Inc. and ABC Corp., which have available market capitalizations of $2 billion and $500 million, respectively. In the absence of the aggregate limit, the investable index would use $2 billion and $500 million as the available market capitalization.

However, these amounts would exceed the limit, and the IFC would apply the relative share approach: two stocks represent 80 percent and 20 percent of the available market capitalization, so the investable index would use $800 million and $200 million as the two stocks' "available" market capitalization.

For the calculation of the various IFC price and rate of return indexes, the investable market capitalization of each stock is used for its weight in the index instead of the stock's total market capitalization.

Example: XYZ, Ltd. has a total market capitalization of $100 million but national law prohibits foreign ownership of more than 49 percent of a company. The IFC global index would use the full $100 million as the stock's market capitalization while the investable index would use only $49 million.

To take concerns regrading illiquidity or relatively small market capitalizations into account, the IFC excludes stocks from the investable index if

1. trading value for the year totals less than $10 million, using total trading value unweighted for foreign access.

2. the investable market capitalization is less than $25 million. An exception occurs when the investable capitalization is small but the trading is large. The IFC will not exclude a stock if the value traded exceeds $100 million for the year, regardless of the stock's investable capitalization.

Example: A stock in Korea has a total capitalization of $240 million and trading totaling $1,300 million for the year. With the 10 percent limit currently in effect in Korea, the investable capitalization is only $24 million. It is clearly an accessible, large, and liquid stock, and foreigners are unlikely to have difficulty in trading it.

In rare cases, the selection screens could produce fewer than five stocks in an investable market, which is insufficient for an index. If that happens, the IFC will select as many stocks as needed to reach the minimum of five stocks, using investable capitalization ranked in decreasing order by size.

Restrictions on Foreign Investors at the End of 1992 in Selected Countries

Argentina	The market is considered generally 100 percent investable; some corporate statute limitations apply.
Brazil	The market is considered generally investable; since May 1991 foreign institutions may own up to 49 percent of voting common stock and 100 percent of nonvoting participating preferred stock. Some corporate statute limitations (e.g., Petrobras common are off-limits) apply.
Chile	Foreign portfolio investment is considered to enter Chile through the 1987 Law of 18657 regarding foreign capital investment funds, which limits aggregate foreign ownership to 25 percent of a listed company's shares.
Colombia	The market is considered 100 percent investable from February 1, 1991.
Greece	The market is generally 100 percent investable.
India	A press note issued by the Ministry of Finance of the government of India on September 14, 1992, announced that foreign institutional investors (FIIs) could henceforth invest in all listed securities in both primary and secondary markets. FIIs are required to register with the Securities and Exchange Board of India before making any investment. The market is effectively considered open from November 1, 1992. Investments are subject to a ceiling of 24 percent of issued share capital for the total holdings of all registered FIIs and 5 percent for the holding of a single FII in any one company. The ceiling includes the conversion of fully and partly convertible debentures issued by the company.
Indonesia	Until December 1987, the market was closed to foreign investment. In December 1987, the government introduced deregulation measures that allowed foreigners to purchase shares in eight nonjoint venture companies. On September 16, 1989, the minister of finance of the Republic of Indonesia issued Decree Number 1055/KMK.013/1989, which allowed foreigners to purchase up to 49 percent of all compa-

nies' listed shares, including foreign joint ventures but excluding banks. The Bank Act, 1992, enacted on October 30, 1992, allowed foreigners to invest in up to 49 percent of the listed shares in three categories of banks—private national, state, and joint foreign. Currently only private national banks are listed.

In a few markets, such as Indonesia, companies do not list all the shares outstanding. For its indexes, the IFC counts only the shares listed at the stock exchange.

Jordan — The market is considered generally 49 percent investable.

Korea — Since January 1, 1992, authorized foreign investors have been allowed to acquire up to 10 percent of the capital of listed companies; some corporate statute limitations apply (e.g., POSCO & KEPCO, 8 percent, and some are permitted up to 25 percent). The 10 percent limit applies separately to common and preferred stock. Under the revised regulations of June 22, 1992, effective in July 1992, companies whose foreign holdings already exceeded 10 percent could apply to Korea's securities and exchange commission to increase their limit to 25 percent. As of March 1993, four companies had received permission: Korea Electronic Parts, Korea Long-Term Credit Bank, Trigem Computer, and Young Chang Akki. The ceiling automatically declines when foreign-held shares are sold to domestic investors.

Malaysia — The limit on foreign ownership of Malaysian stocks is subject to some debate. Bank Negara, the central bank, restricts the ownership of banks and financial institutions by foreigners to 30 percent. However, these limits do not appear to be strictly enforced. Under the 1989 Banking and Financial Institutions Act, the approval of the minister of finance is required before foreign investors can buy or sell shares of a licensed bank or finance company amounting to 5 percent or more. Certain nonbank stocks have different foreign share holding limits for tax and other reasons. These are MISC, Proton, Telekom, Tenaga Nasional, Tai Wah Garments, and Yantzekiang. All other stocks are open to foreign portfolio investment without any limits. However, the approval of the Foreign Investment Committee is required for acquiring 15 percent or more of the voting power of a company by any one foreign interest and for acquiring the assets or interests of a company when they exceed M$5 million, whether by Malaysian or foreign interests. Except for a few specific

	cases, the IFC uses 100 percent for most stocks and 30 percent for banks and financial institutions.
Mexico	Foreign portfolio investment is permitted in designated classes of shares, and since May 1989 in most other shares through the use of the Nafinsa Trust arrangement. It is now considered generally 100 percent investable, except for banks, where foreign ownership is restricted to 30 percent.
Nigeria	Closed to foreign investment.
Pakistan	The market is considered 100 percent investable from February 22, 1991.
Philippines	National law requires that a minimum of 60 percent of the issued shares of domestic corporations should be owned by Philippine nationals. To ensure compliance, Philippine companies typically issue two classes of stock: A shares, which may be traded only among Philippine nationals, and B shares, which may be traded to either Philippine nationals or foreign investors and which usually amount to 40 percent of the total. Mass media, retail trade, and rural banking companies are closed to foreign investors.
Portugal	The market is considered generally 100 percent investable; some corporate statute limitations apply, particularly regarding shares issued in privatizations.
Taiwan	The market was opened to foreigners on January 1, 1991, though foreign investors must meet high registration requirements and total cash inflows from abroad cannot currently exceed an official ceiling of $2.5 billion. There is a 10 percent limit on aggregate foreign ownership of issued capital. The domestic transportation industry is closed to foreign investors.
Thailand	Various Thai laws restrict foreign share holdings in Thai companies engaged in certain areas of business. The Banking Law restricts foreign ownership in banks to 49 percent. The Alien Business Law, administered by the Ministry of Commerce, restricts foreign ownership of stocks in specified sectors to 49 percent. In addition, other laws provide similar restrictions on foreign ownership. Restrictions are also faced by foreign investors through limits imposed by company bylaws, which range from 15 percent to 65 percent. The Foreign Board was established in 1988 to facilitate trading in shares registered in foreign names.
Turkey	The market is considered 100 percent investable from August 1989.

Venezuela	Nonfinancial stocks are considered generally 100 percent investable from January 1, 1990, but some restricted classes do exist. Bank stocks are currently not available.
Zimbabwe	Effectively closed to foreign investment by virtue of severe exchange controls.

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Comment

Michael Dooley

This paper attempts to utilize the predictions of a capital asset pricing model to draw inferences about the extent of integration of emerging stock markets with equity markets in industrial countries. The basic idea is straightforward and appealing. If the markets are well integrated, excess returns of individual stocks in the emerging markets should be related to their covariance with the industrial country market portfolio. If the emerging markets are not integrated, excess returns should be related to their covariance with the domestic market portfolio.

One reason to be concerned about the extent of integration is that it might help explain historically large inflows to emerging stock markets since 1989 and the spectacular increases in the market value of these equities. An interesting conjecture is that foreign investors have "finally" recognized that such equities are part of an efficient portfolio. If this is the driving force, we can understand the large inflows in part as a response of international investors to opportunities to improve their risk-return trade-off. Such inflows would be expected even if the expected rate of return in emerging markets were the same as in the world portfolio.

Another possibility is that emerging markets become more attractive for a given level of integration because expected average returns have improved. Such an improvement might be unrelated to diversification but instead be a result of changes in economic policies or the economic environment. In this case the equilibrium excess return on any individual stock would be related to its covariance with the domestic portfolio. In fact, a reasonable interpretation is that recent capital inflows are returns of flight capital. In this case the emerging markets have not become more integrated since residents of the developing countries have always had access to both domestic and international equity

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markets. The evidence from excess rates of return reported here are consistent with this hypothesis.

The first result reported is that excess returns are better predicted by a model that assumes segmentation of markets. One reason this might be the case is that legal restrictions continue to limit nonresidents' holdings of individual stocks in many emerging markets. In these circumstances it would not be surprising were excess returns to reflect the different legal and effective "access" of nonresidents to individual stocks. To control for this possibility the authors use an "investability index" published by the International Finance Corporation (IFC) that measures the intensity of legal restrictions on emerging market stocks. As the authors point out, this proxy is imperfect and it is available for only a few years. But it seems clear that any test of integration of these markets should attempt to control for legal restrictions on nonresident holdings.

Controlling for access, the authors again test the segmentation hypothesis using the covariance of excess rates of return as the measure of integration. The results are that neither access nor covariance with the world portfolio seems to predict excess returns. In contrast, access does seem to explain ex post price earnings ratios.

This result suggests a fundamental difficulty in testing the capital asset pricing model in these markets. As the authors point out, legal restrictions were liberalized rapidly in many of these markets over the short time period for which measures of access are available. If these liberalizations were unanticipated, which seems quite likely for individual stocks, ex post excess returns are very poor predictors of expected returns. While realizations might be unbiased estimates of expected values, the noise might make it difficult to find the systematic pattern suggested by the capital asset pricing model.

The point is probably more general than the authors suggest. It seems quite implausible that the kinds of movements in stock prices observed in recent years in emerging markets could have been expected. Ex post rates of return on the dollar-denominated Brady bonds issued by governments of these countries have also been very high and in this case there clearly was no change in the access of nonresidents to these securities or the integration of world bond markets. Finally, privatization and other policy changes have generated large and probably unexpected changes in the market valuation of firms in emerging markets. In the context of first-order changes in first moments for returns on all investments in emerging markets, it is not surprising that the relatively subtle implications of a capital asset pricing model for first and second moments are difficult to capture.

Comment Don Lessard

Claessens and Rhee examine the impact of the opening of emerging markets to inward foreign investment on the pricing of emerging market assets from two perspectives: whether the risk-return relationship for these assets is consistent with some form of a worldwide capital asset pricing model (CAPM), and whether within country, cross-sectional differences in asset prices correspond to differences in measurable barriers to inward investment.

The answer to the first question—whether the ex ante risk return relationship for emerging market equities is consistent with a worldwide CAPM—is definitely not or probably not. For ten of the sixteen markets examined, integration is rejected, and segmentation is not rejected for any of them.

These results are disappointing, but not surprising. The tests employed require long data series from relatively stable risk and pricing structures, and yield mixed results even for major world markets that have been open to foreign investment for some time and whose institutional structures have been relatively stable. Given that most of the countries in Claessens and Rhee's sample significantly altered the rules for inward investment within the sample period, often in conjunction with other policy and institutional changes such as drastic deficit reduction, monetary reform, privatization of major state enterprises, the establishment of vehicles for contractual savings, and the restructuring of external obligations, it would have been a surprise if strong results had been obtained.

Even the finding that segmentation cannot be rejected for any of the markets may reveal little about the relationship between ex ante returns and risk. It could also reflect the fact that returns in these countries have experienced large country-specific and countrywide "surprises" due to changes in objective local prospects, in local perceptions of those prospects, or in world investor perceptions of those prospects or access to those markets. However, since the tests are well specified and conducted with great care, the results demonstrate the limits of this class of tests that rely on return data alone, rather than any shortcoming in their application by Claessens and Rhee.

The second approach, although less technically sophisticated, offers much more promise. It does not rely on returns data alone, but seeks to explain differences in market valuations of specific stocks, and by inference the discount rates imbedded in them, by measurable differences in barriers to inward foreign investment. Price-to-earnings (P/E) ratios, their dependent variable, are not a very good basis for comparison for two reasons. Earnings are not measured uniformly across countries because of differences in accounting practices and rates of inflation. Second, even within countries, firms differ in their

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mix of assets in place, which give rise to current earnings, and growth opportunities, which give rise to future earnings.

Claessens and Rhee are careful, though, and make these comparisons only within countries, mitigating the inflation and accounting issues. Most of the within-country variation in investability, as determined by the International Finance Corporation (IFC), is the result of differences in (*a*) the sector represented by the stock, given that many countries are more restrictive with respect to foreign ownership in banking, for example, than in industry at large; or (*b*) the stock's market capitalization, since small cap stocks are deemed to be less investable, presumably because of the fixed cost involved in following a particular company. Claessens and Rhee control for the bank versus industry distinction, and the result that P/E is a positive function of investability appears to hold. Given the size factor, though, the results must be viewed with caution. P/E itself may be correlated with a stock's market capitalization. Perhaps some other control for size that is not correlated with earnings, such as sales, could be employed.

The larger question with respect to emerging markets, which both sets of tests address only obliquely, is the extent to which the boom that many of these markets have experienced in recent years is the result of changes in the prospects of those countries, or the recognition of these prospects or access to these markets by outside investors. While disentangling the two sets of factors would be very difficult, there is promise. The relationship between P/E ratios and sovereign debt prices/yields, for example, would largely separate country prospects from foreign investor awareness or access, since the sovereign debt has always been held primarily by foreign banks, and typically in large enough concentrations so that the fixed costs of following a country cannot have been a major consideration. Awareness might be proxied by the marketing of a major stock issue on world markets, such as the Telmex flotation. Further, the diffusion of these effects across different assets from one country as well as across countries could provide important insights regarding causality.

Both sets of tests, and much of the recent literature on emerging markets, assume on the basis of the magnitude of capital flight from these countries that the binding barriers are on inward rather than outward investment. This assumption seems correct on its face, and I have used it many times, but upon reflection it may be invalid. Clearly, wealthy individual investors from less-developed countries have been able to diversify abroad, but less wealthy individuals who cannot effectively overcome the fixed costs of investing overseas and regulated investors such as pension funds or insurance companies are effectively restricted. For a country such as Chile, where pension funds in aggregate are very large relative to the value of local stocks and bonds, outward restrictions may be binding. Of course, inward or outward restrictions have a similar effect in that they cause local dimensions of risk to be priced, but the specification of the spanning portfolios would differ. While this appears to be primarily a technical matter, it may also reflect a policy bias—that the problem

of emerging countries is that they are not sufficiently open to inward foreign investment. The bigger issue in terms of world welfare is the opportunity cost imposed on local savers by restrictions that limit them to home assets that are highly risky on their own, but only weakly correlated with asset returns in the rest of the world. This was the point of my early work on international portfolio diversification for developing countries (Lessard 1973). Merton (1990) has proposed that rate of return swaps on broad market indexes be used to facilitate market integration. This recommendation is especially relevant for emerging markets where concerns over corporate governance and capital flight are paramount.

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