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The Cross-Section of Volatility and Autocorrelation in Emerging Markets

1. Introduction

There is considerable interest in the emerging stock markets. The attraction mainly is based on the high average returns performance. Indeed, the 1993 return of the market capitalization weighted emerging market portfolio published by the International Finance Corporation (IFC) was close to 100%. Investors are also attracted to the low correlations with developed market returns and the high degree of predictability in the returns documented in Harvey (1993, 1994, 1995).

However, the emerging market returns are remarkably volatile. While the level of volatility has been

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subject to study, I focus on the cross-sectional patterns in volatility. High volatility in the asset returns can be caused by (a) lack of diversification in the country index, (b) high risk exposures to volatile economic factors, (c) time-variation in the risk exposures, and/or incomplete integration into world capital markets. Given the difficulty in defining an asset pricing framework which adequately characterizes the expected returns in these emerging markets, my focus will be on the diversification and integration issues.

Another feature of the emerging market returns is their persistence. The serial correlation found in these returns is much higher than observed in developed markets. Another goal of the paper is to analyze why the serial correlation differs across countries. One explanation is that lack of diversification and trading depth induce spurious serial correlation. I find that, while this explantion has some merit in many countries, it is an incomplete explanation of the serial correlation patterns.

The paper is organized as follows. The second section provides a description of the data and some summary statistics on the equity returns of 20 emerging equity index returns. The third section explores explanations for the cross-sectional variation in both volatility and serial correlation are explored. Some concluding remarks are offered in the final section.

2. The emergence of new equity markets

2.1 Data

The Emerging Market Data Base (EMDB) of the International Finance Corporation (part of the World Bank) contains data on more than 800 equities in six Latin American markets (Argentina, Brazil, Chile, Colombia, Mexico, Venezuela), eight Asian markets (India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Taiwan, Thailand), three European markets (Greece, Portugal, Turkey), one Mideast market (Jordan) and two African markets (Nigeria, Zimbabwe). Monthly value-weighted index returns are calculated, with dividend reinvestment, for these 20 countries.

At the end of 1992, the market capitalization of the emerging markets represent 7% of the world equity market capitalization. Given the large returns realized in 1993, this proportion is now at 10%. Interestingly, the emerging markets' share of world GDP is much greater, 19%. This suggests that the emerging equity markets have the potential for additional growth.

Table 1 provides some basic statistics regarding the composition of the indices. For each market in June 1992, the market capitalization in U.S. dollars is provided.[1] First, the emerging markets are small relative to the U.S., Japan and U.K. equity markets. However, some emerging markets are larger than one might think. For example, capitalizations of Mexico and Taiwan are similar to those of the markets in Italy and the Netherlands. There are nine emerging markets that are larger than the smallest MSCI European market (Norway). The total capitalization of the emerging markets is U.S. $747.1. This represents 8% of the MSCI world capitalization.

Table 1 also provides information on average dividend yields, price to earnings ratios and price to book value ratios. In the MSCI countries, dividend yields range from 1.1% for Japan to 5.6% in New Zealand. The overall average dividend yield is 3%. There is much greater variability in the emerging market sample. The dividend yield ranges from 0.0% in Thailand to 11.1% in Jordan. In the largest markets of Mexico and Taiwan, the dividend yield is 1.2%. Some of the largest dividend yields are found in the smallest capitalization countries. For example, in the Europe/Mideast/Africa sample, the average yield is 5.4% whereas the capitalization is less than one fifth of the average.

Both price-earnings and price-book ratios are also presented in table 1. The price earnings ratios are difficult to interpret because of low (and sometimes negative) country earnings resulting from the world recession in 1992. Fama and French (1992), in a sample U.S. firms, notice a U-shaped relation between average returns and P/E ratios. They also find a monotonic negative relation between price to book value and average returns. They argue that these measures potentially explain the cross-sectional variation in expected returns and may be superior to asset risk. The emerging markets allow for reexamination of these findings with a new data set. The variation in the fundamenal ratios in table 1 suggest that stock selection models cannot treat, for example, price to book value, as meaning the same thing in different countries. That is, the methodology studied in FAMA and FRENCH (1992) strategies will be problematic if implemented on a global basis. Indeed, most bottom-up quantitative selection strategies are run country by country (or have dummy variables which allow for fixed effects in different countries) rather than addressing the compatability question directly. FERSON and HARVEY (1994a, b) propose a solution to this problem. They outline a way to filter the attributes, in a way consistent with asset pricing theory, so that stocks can be selected from a pool of many countries.

In the final column of Table 1, country credit ratings are reported. The source of these data is Institutional Investor's semi-annual survey of bankers. Institutional Investor has published this survey in its March and September issues every year since 1979. The survey represents the responses of 75-100 bankers. Respondents rate each country on a scale of 0 to 100, with 100 representing the smallest risk of default. Institutional Investor weights these responses by its perception of each bank's level of

global prominence and credit analysis sophistication. ERB, HARVEY and VISKANTA (1994, 1995) investigate the relation between credit rating, expected returns and volatility.

The credit ratings in the developed markets range between 62.6 (New Zealand) to 91.8 (Switzerland). There is much greater variation in the emerging markets. Nigeria has the lowest rating (19.6) and Taiwan the highest rating (77.5). Indeed, Taiwan is the only emerging market with a credit rating higher than the lowest rating for a developed market.

Table 2 presents measures of concentration and activity in the emerging markets. The first set of measures (number of stocks in IFC index, share of total market value, number of shares traded, value of transactions and turnover ratio) provides information on the depth of these capital markets. Autocorrelation in returns may be related to the frequency and intensity of trading. Volatility of the country index should be linked to the degree of diversification in the index. The number of stocks included in the index is one proxy for the degree of diversification.

The issue of diversification is explored with some alternative measures. Table 2 presents the capitalization of the top 10 firms in each index. For a point of reference, the same measure is presented for Japan, the U.K. and the U.S. Notice that the capitalization of the top 10 companies represents about 12% of the U.S. market. A much different picture is presented in the emerging markets. The percentage capitalization ranges from 24% in Pakistan to 75% in Colombia.

The percentage capitalization of the top 10 firms is an incomplete measure of diversification for two reasons: it does not yield information about the sectoral diversification of the top 10 firms and it tells us nothing about the other firms.

Table 2 presents two concentration measures: asset and sector concentration ratios. The asset concentration ratio yields similar information to the percentage of capitalization of the top 10 firms, however, all firms are included in the concentration measure. The concentration factor (CF) is defined as

$$CF_i = \sqrt{\frac{N}{N-1} \sum_{i=1}^{N} (w_i - 1/N)^2}$$

where N is the number of firms and w_i is the weight of asset i in the total market capitalization. It is obvious that if each firm had equal weights (1/N) then the concentration factor would equal zero. So a larger concentration factor means more inequality across firm size.

The asset concentration factor for the U.S. is 0.08. However, the concentration factor in developing markets is often above 0.20. Notice that some of the larger emerging markets have the lowest asset CFs (Taiwan, Malaysia, Thailand). The highest factor is found for Jordan.

Both the asset concentration factor and percentage capitalization of the top 10 firms does not tell us about the sectoral dispersion of the firms. For example, there may be two countries with the same market capitalization ratio of the top 10 firms. However, there could be a vast difference in the degree of diversification if, in one country, all the firms are in one industry and, in the other country, the firms are well spread out across industry groups. The industry concentration factor is derived from the same formula in (1). However, w_i is now the weight of industry i in the total market capitalization. In developed countries, the industry CF averages about 30%. The results in table 2 show that the CFs for emerging markets range from 28% (Malaysia) to 66% (Nigeria).

The final measure of diversification presented in table 2 is the average cross-correlation of the stocks that compose the index. Obviously, if all the stocks are highly correlated, then it is difficult to argue that the country portfolio is diversified. The average correlation for the developed country returns is 50%. In the emerging markets, the correlation is generally higher reaching 92% for Argentina. However, there are a number of countries with low average correlations (Colombia 34%, Pakistan 17%, Jordan 21%, Nigeria 23% and Zimbabwe 25%). Of course, these correlations could be biased because of infrequent trading in the markets. The use of

monthly data helps to reduce the severity of this problem.[2]

The means, standard deviations and autocorrelations of the 20 emerging markets are presented in Table 3. In the first set of panels, all returns are calculated in U.S. dollar terms (translated using the effective rate on the last trading day of the month). Annualized arithmetic mean returns range from 72.8% for Argentina to -11.4% for Indonesia (whose sample only begins in February 1990). High average returns are often associated with high volatility. For example, both Argentina and Turkey have standard deviations over 75%. Taiwan, whose average return is 40.9%, has an average standard deviation of 54.3%.

Given the high volatility, it is important to report both geometric as well as arithmetic average returns. The geometric mean return for the Latin American Index is 27.6% compared to the arithmetic mean of 35.7%. A less dramatic difference is found for the Asia index, 19.3% arithmetic and 15.7% geometric.

In the overall sample, the arithmetic average return on the emerging markets composite index is 20.4% with a standard deviation of 24.9%. The geometric average is 17.1%. The average returns are roughly 50% higher than the MSCI world composite index (14.9% arithmetic, same sample) and the standard deviation is about 80% higher than the MSCI world index (14.4%).

Table 1: Market capitalization and summary measures of developed and emerging markets in June 1992

Country	Market capitalization* (billions US$)	Weight in MSCI world index (5)	Dividend yield	D/P relative to world[b]	Price/ earnings ratio	P/E relative to world	Price/book ratio	P/B relative to world	Country credit rating
Europe									
Austria	26.7	0.3	1.8	0.60	24.8	1.14	1.6	0.90	84.3
Belgium	73.3	0.7	5.2	1.73	13.6	0.63	1.4	0.74	79.7
Denmark	41.1	0.5	1.8	0.60	108.9	5.02	1.6	0.89	73.4
Finland	13.6	0.2	2.1	0.70	loss	loss	0.6	0.31	70.1
France	377.2	4.0	3.4	1.13	14.9	0.69	1.5	0.84	85.7
Germany	392.0	4.5	3.5	1.17	16.3	0.75	1.9	1.03	89.8
Italy	144.5	1.3	3.3	1.10	21.6	1.00	1.0	0.54	76.1
Netherlands	139.8	2.0	4.3	1.43	13.3	0.61	1.4	0.79	88.1
Norway	21.6	0.3	1.9	0.63	loss	loss	1.9	1.02	76.0
Spain	121.7	1.4	5.1	1.70	9.3	0.43	1.1	0.62	75.8
Sweden	106.8	1.0	3.2	1.07	21.5	0.99	1.5	0.81	75.8
Switzerland	216.5	2.3	2.2	0.73	15.1	0.70	1.5	0.84	91.8
United Kingdom	1,030.1	12.2	5.1	1.70	16.2	0.75	1.9	1.03	84.6
Total Europe	2,704.9	30.7	4.1	1.37	16.2	0.75	1.6	0.88	-
Far East									
Australia	144.0	1.7	3.7	1.23	23.4	1.08	1.5	0.81	66.9
Hong Kong	180.0	1.8	3.4	1.13	15.7	0.72	1.9	1.05	64.6
Japan	2,119.7	22.0	1.1	0.37	30.2	1.39	1.7	0.93	90.8
New Zealand	15.6	0.2	5.6	1.87	13.5	0.62	1.2	0.65	62.6
Singapore/Malaysia	82.7	0.8	1.8	0.60	17.9	0.82	1.6	0.90	78.2
EAFA	5,246.9	26.5	2.9	0.97	20.0	0.92	1.8	1.00	-
North America									
Canada	230.6	2.7	3.2	1.07	62.5	2.88	1.4	0.78	81.6
United States	3,707.3	40.0	3.1	1.03	23.6	1.09	2.2	1.22	87.1
MSCI world	9,198.1	100.0[c]	3.0	1.00	21.7	1.00	1.8	1.00	-
Latin America									
Argentina	25.5	-	0.5	0.18	50.6	2.33	2.6	1.42	26.2
Brazil	50.7	-	1.1	0.37	6.2	0.29	0.7	0.40	27.1
Chile	37.0	-	3.4	1.13	16.2	0.75	2.7	1.50	45.9
Colombia	5.1	-	1.8	0.60	34.6	1.59	3.0	1.65	37.2
Mexico	128.9	-	1.2	0.38	12.7	0.59	2.5	1.40	42.6
Venezuela	9.0	-	1.0	0.32	27.1	1.25	4.6	2.53	39.0

East Asia									
Korea	85.9	-	2.3	0.78	17.0	0.78	0.9	0.49	67.6
Philippines	15.8	-	0.8	0.26	21.7	1.00	4.1	2.26	25.2
Taiwan	135.9	-	1.2	0.40	20.9	0.96	4.0	2.19	77.5
South Asia									
India	69.9	-	0.8	0.26	39.8	1.83	5.8	3.2	37.5
Indonesia	11.7	-	1.3	0.42	17.6	0.80	2.6	1.43	50.5
Malaysia	78.3	-	2.5	0.84	21.6	0.99	3.5	1.93	62.9
Pakistan	8.3	-	2.2	0.72	25.7	1.18	4.5	2.45	27.7
Thailand	43.8	-	0.0	0.00	16.0	0.74	3.1	1.73	61.3
Europe/Mideast/ Africa									
Greece	13.3	-	8.4	2.80	10.7	0.49	2.9	1.59	46.7
Jordan	2.8	-	11.1	3.68	14.3	0.66	1.7	0.92	20.7
Nigeria	1.1	-	6.5	2.17	9.0	0.41	2.2	1.20	19.6
Portugal	11.6	-	4.3	1.44	9.4	0.43	1.6	0.87	65.0
Turkey	11.6	-	5.37	1.79	13.9	0.64	4.2	2.30	43.9
Zimbabwe	0.9	-	6.3	2.11	5.1	0.24	0.7	0.38	26.1

Data from International Finance Corporation (IFC), Fact Book and Morgan Stanley Capital International (MSCI) Perspectives. The country credit ratings are from the March 1992 Institutional Investor semi-annual survey. [a]Capitalization is the June 1992 share price multiplied by the number of outstanding shares for all equities within the country index followed by either MSCI or IFC. [b]The world dividend yield, price to book, price to earnings ratios are based on value-weighted averages of the individual countries in the MSCI universe. [c]May not sum to 100% because of rounding.

Table 2: Activity and concentration measures for the emerging markets

Country	Number of stocks in IFC index[a]	Share of market value (5)[a]	US$ value of transactions (billions)[a]	Turnover ration[a,b]	% cap. of top 10 firms in index[c]	% trading top 10 firms in index[c]	Asset concentration factor[d]	Sector concentration factor[d]	Average correlation of stocks[d]
Latin America									
Argentina	27	85.9	4.824	45.3	64.0	56.5	0.26	0.43	0.92
Brazil	67	47.6	13.373	22.0	25.4	50.9	0.17	0.38	0.70
Chile	35	68.2	1.900	8.0	68.2	65.5	0.18	0.26	0.59
Colombia	20	91.8	0.203	7.1	82.5	57.6	0.18	0.39	0.34
Mexico	56	51.6	31.723	47.9	29.6	32.6	0.21	0.42	0.70
Venezuela	16	77.1	3.240	33.1	68.1	90.9	0.26	0.49	0.60
East Asia									
Korea	77	62.9	85.464	82.3	26.6	9.8	0.16	0.28	0.56
Philippines	30	68.1	1.506	18.8	58.6	48.2	0.33	0.57	0.70
Taiwan	70	66.5	365.232	330.1	29.4	13.4	0.13	0.37	0.77
South Asia									
India	60	36.2	24.295	56.8	22.7	34.2	0.13	0.48	0.55
Indonesia	66	77.5	2.981	40.1	48.4	40.2	0.17	0.44	0.69
Malaysia	62	63.8	10.657	20.2	34.3	21.6	0.12	0.28	0.57
Pakistan	54	53.6	0.645	12.6	31.0	30.3	0.14	0.33	0.17
Thailand	43	50.0	30.089	102.2	29.7	29.1	0.11	0.42	0.47
Europe/Mideast Africa									
Greece	32	60.7	2.443	18.8	45.3	52.1	0.18	0.44	0.72
Jordan	25	62.7	0.432	19.7	51.8	43.3	0.55	0.62	0.21
Nigeria	24	69.0	0.009	0.6	52.9	61.5	0.17	0.66	0.23
Portugal	30	61.3	2.818	32.0	40.6	42.1	0.17	0.40	0.80
Turkey	25	52.7	8.571	52.9	37.9	15.2	0.23	0.36	0.81
Zimbabwe	17	50.9	0.077	4.2	40.0	28.8	0.25	0.43	0.25
Developed markets[e]									
Japan	266	57.0	-	54.0	16.7	-	0.09	0.29	0.46
United Kingdom	145	64.7	-	32.0	25.5	-	0.11	0.30	0.56
United States	332	59.1	-	58.0	11.9	-	0.08	0.32	0.49

Table 3: Means, standard deviations and autocorrelations of 20 emerging markets' returns through June 1992

Country	Sample	Annualized mean arithmetic %	geometric %	Annualized std. dev. %	Autocorrelation ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
Latin America - U.S. $ returns										
Argentina	1976.02	71.79	26.93	105.32	0.05	0.06	0.12	-0.05	-0.10	-0.02
Brazil	1976.02	21.71	3.73	60.85	0.03	-0.03	-0.03	-0.08	0.03	0.01
Chile	1976.02	39.64	31.91	39.74	0.18	0.26	-0.00	-0.04	0.09	0.06
Colombia	1985.02	46.09	40.69	32.73	0.49	0.15	-0.02	-0.13	0.04	-0.10
Mexico	1976.02	30.52	19.04	45.11	0.25	-0.08	-0.04	0.04	-0.01	0.01
Venezuela	1985.02	38.08	26.26	47.79	0.27	0.18	0.08	0.02	-0.07	-0.21
Latin America	1985.02	35.67	27.59	39.62	0.25	-0.04	-0.25	-0.15	-0.10	0.03
East Asia - U.S. $ returns										
Korea	1976.02	18.52	13.80	31.46	0.01	0.07	0.03	-0.01	0.11	0.02
Philippines	1985.02	49.90	42.00	38.86	0.34	0.02	0.07	0.13	0.06	-0.07
Taiwan	1985.02	40.93	26.23	54.29	0.06	0.04	-0.06	0.05	0.13	-0.11
South Asia - U.S. $ returns										
India	1976.02	20.45	16.94	26.63	0.09	-0.10	-0.03	-0.05	-0.09	-0.04
Indonesia	1990.02	-11.40	-17.40	34.61	0.25	0.16	-0.11	-0.12	0.26	-0.72
Malaysia	1985.02	13.24	9.45	27.04	0.05	0.07	-0.06	-0.02	-0.10	0.11
Pakistan	1985.02	25.86	23.40	22.49	0.27	-0.24	-0.18	0.19	0.13	-0.09
Thailand	1976.02	21.75	18.29	25.74	0.12	0.16	-0.00	-0.12	0.06	-0.04
Asia	1985.02	19.31	15.65	26.42	0.01	0.18	-0.06	0.13	0.13	-0.03
Europe/Mideast/ Africa - U.S. $ returns										
Greece	1976.02	9.43	3.49	36.34	0.12	0.18	0.04	-0.05	-0.05	0.04
Jordan	1979.02	10.29	8.66	18.09	0.00	0.03	0.18	0.01	-0.01	-0.01
Nigeria	1985.02	2.44	-6.19	37.40	0.09	-0.13	-0.22	0.03	-0.08	-0.01
Portugal	1986.03	40.71	28.72	51.77	0.28	0.03	-0.02	0.27	0.03	0.44
Turkey	1987.02	44.32	18.50	76.85	0.24	0.10	0.19	0.24	-0.18	-0.08
Zimbabwe	1976.02	9.74	3.90	34.34	0.13	0.15	0.24	0.17	-0.04	-0.03
Composite	1985.02	20.36	17.11	24.84	0.15	0.07	-0.16	-0.02	0.08	0.07
Developed - U.S. $ returns$										
United Kingdom	1976.02	18.69	16.00	22.86	-0.00	-0.08	-0.08	0.01	-0.15	0.04
Japan	1976.02	17.69	14.91	23.41	0.01	-0.03	0.05	0.08	0.12	0.07
United States	1976.02	13.63	12.39	15.28	-0.00	-0.07	-0.07	-0.04	-0.00	0.08
MSCI World	1976.02	13.91	12.81	14.40	0.03	-0.07	-0.03	-0.03	0.02	0.13
Latin America - Local currency returns										
Argentina	1976.02	228.80	155.22	148.31	0.18	0.20	0.12	-0.01	-0.02	-0.11
Brazil	1976.02	155.52	123.82	79.73	0.16	0.23	0.15	0.17	0.20	0.11
Chile	1976.02	61.61	53.48	39.16	0.17	0.29	0.01	-0.00	0.15	0.06
Colombia	1985.02	72.38	65.94	32.68	0.48	0.14	-0.04	-0.16	0.05	-0.15
Mexico	1976.02	62.60	52.65	42.44	0.34	0.00	0.03	0.12	0.06	0.07
Venezuela	1985.02	64.23	55.43	40.47	0.37	0.20	0.19	0.20	-0.03	-0.27

| Country | Sample | Annualized mean | | Annualized std. dev. % | Autocorrelation | | | | | |
		arithmetic %	geometric %		ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
East Asia - Local currency returns										
Korea	1976.02	21.41	16.79	31.06	-0.05	0.06	0.02	-0.04	0.12	0.03
Philippines	1985.02	54.44	46.02	40.63	0.28	-0.03	0.03	0.15	0.04	-0.09
Taiwan	1985.02	33.88	19.86	53.02	0.05	0.03	-0.09	0.02	0.13	-0.12
South Asia - Local currency returns										
India	1976.02	27.91	24.02	28.01	0.11	-0.09	-0.06	-0.07	-0.01	-0.05
Indonesia	1990.02	-6.22	-12.25	34.90	0.25	0.16	-0.12	-0.12	0.27	-0.71
Malaysia	1985.02	13.19	9.51	26.61	0.06	0.07	-0.09	-0.03	-0.06	0.11
Pakistan	1985.02	32.47	29.84	22.61	0.27	-0.25	-0.15	0.21	0.13	-0.08
Thailand	1976.02	23.00	19.61	25.42	0.12	0.16	-0.01	-0.12	0.05	-0.06
Europe/Mideast/Africa - Local currency returns										
Greece	1976.02	19.03	13.59	34.83	0.11	0.15	0.01	-0.10	-0.06	0.02
Jordan	1979.02	16.12	14.59	17.41	0.08	0.05	0.14	-0.03	-0.01	0.00
Nigeria	1985.02	36.20	35.02	12.07	0.12	-0.05	-0.01	0.10	0.11	-0.14
Portugal	1986.03	38.38	26.45	51.63	0.29	0.03	-0.07	0.31	0.08	0.53
Turkey	1987.02	85.65	59.07	77.19	0.18	0.08	0.12	0.21	-0.18	-0.06
Zimbabwe	1976.02	21.79	16.33	33.09	0.10	0.14	0.26	0.21	-0.05	-0.02

The data are from the International Finance Corporation.

2.2 Survivorship bias in the emerging markets sample

There are two potential sources of survivorship bias in the sample of emerging markets. The first concerns the general composition of the countries in the sample. The second source has to do with the way the indices are constructed.

In general, there are many possible countries that might have been included in the sample. Indeed, the World Bank considers any stock market in a developing country as an "emerging market". The classification "developing" is solely determined by the GNP per capita.[3] However, the small number of countries that are included the sample are the winners. While the survivorship problem has been extensively studied in biometrics [see, for example, MILLER (1976)], the work in finance on this difficult problem is very recent. For example, BROWN, GOETZMANN, IBBOTSON and ROSS (1992) study the impact of survivorship on mutual fund performance.

The second source of bias has to do with the way the country indices are constructed. The Emerging Market Data Base of the International Finance Corporation was established in 1981. The IFC now chooses stocks for inclusion in the indices on the basis of three criteria: Size, liquidity and industry. Each country portfolio includes the largest and most actively traded stocks in the market. The IFC target is to hit at least 60% of total market capitalization and 60% of trading volume. Only stocks that are traded on the major market(s) of the emerging country are included.[4] If there are several stocks that meet the size and liquidity criteria, the IFC ``selects the stocks that represent industries that are not well represented in the index'' [see IFC (1993)]. The IFC does not select stocks on the basis of historical financial performance or expected future performance. However, the size and liquidity criteria implicitly reveal information about the past history of the company. Nevertheless, this type of survivorship bias in the index stocks, will also hold for more conventional indices, such as the MSCI or FT-Actuaries.

A more blatant problem is the backtracking of some of the indices. The EMDB was established in early 1981 and the initial indices were based on stocks

selected in 1981. For a number of countries, these indices were backtracked to December 1975. The first sixty months of data are potentially plagued with a lookback bias. That is, to be selected in 1981, the companies had to be successful (or at least solvent). As a result, one might expect the first five years of data to reveal high average returns. Indeed, some firms that may have existed in December 1975 and that dropped out of the market by January 1981, are not included in the IFC index.

The backtracking problem is isolated to the pre-1981 data. In addition, it is not obvious that the problem is that severe. I compared the average returns for 1976-1980 to the average returns over 1981-1992. For the eight largest markets that have data back to December 1975, five have mean returns in the first period that are greater than the second period (when measured in U.S. dollars). This is consistent with survivorship bias. However, if the average returns are computed in local currency terms, only two countries have mean returns in the first period that are greater than the second period. While the importance of survivorship bias is not clear, careful attention is paid later in the paper to separately analyzing the full sample (1976-1992) and the `no backtracking' sample (1981-1992).

3. Cross-sectional patterns in volatility and auto-correlation

3.1 Explaining volatility across emerging markets

In contrast to developed countries' markets, there is a much larger dispersion of expected returns and standard deviation. For example, for the U.S. market portfolio HARVEY (1991) reports an annual standard deviation of 16.3%. The same measure for the Morgan Stanley Capital International world market portfolio is 14.5%. However, in the emerging markets, the standard deviations range from 18.9% (Jordan) to 105.3% (Argentina).

The causes of the cross-sectional dispersion in volatility are explored in table 4. One obvious

explanation, which is pursued in HARVEY (1991) and ROLL (1992), is the lack of diversification within the country index. Regressions try to explain the cross-sectional of volatility measured over the full sample (panels A-C) and the 1986:02-1992:06 subperiod (panels D-E) with three types of measures: size, trading activity and concentration. The analysis is conducted with 19 emerging markets as well as the emerging markets combined with three additional countries: Japan, the United Kingdom and the United States.

The regressions in panels A and D examine the role of size. There is generally a negative relation between the size measures and standard deviation of returns. However, it is difficult to detect a significant relation among the emerging countries. The addition of the three developed countries significantly affects the explanatory power. For example, a regression of standard deviation on the log of the number of firms in the index explains 10.7% of the variation in the 22 country sample. Given the small number of observations, it is important to visualize the data. Figure 1 presents a scatter plot of the standard deviation and the log of the number of firms.

Panels B and E study the relation between volatility and volume of trading. A number of recent studies document significant relations between volume and volatility. My regressions examine both U.S. dollar trading volume and turnover ratios. There is some weak evidence to support the positive relation. In panel E, the coefficient on the log of dollar volume is more than two standard errors from zero. However, in all the regressions no more than 2.9% of the cross-sectional variation in the volatility could be explained.

The final set of regressions examines the role of different measures of concentration in explaining volatility. One would expect that if the index is dominated by a few stocks, returns to that index would be poorly diversified and have higher volatility. However, the percentage share of market capitalization and market trading volume accounted for by the top 10 firms in the index has little ability to explain volatility. Although the sign is positive as

expected, none of the regressions are significant. The second measure is the asset-concentration factor. If all stocks have the same capitalization, then the factor will be zero. So the higher the asset concentration factor, the more likely that the index portfolio is not well diversified. Regression are run with and without Jordan whose asset concentration factor is double that of the next closest country. The results indicate that this variable is able to account for over 20% of the cross-section variation in volatility. Figure 2 shows the relation between this factor and the cross-section of volatility.

There may be situations were the asset concentration factor is low — but there are many stocks in the same industry. The sector concentration factor gives a measure of the dispersion of the index stocks across the industrial sectors. A high sector concentration factor implies that many of the stocks in the index are specialized in one industry grouping. The regression results, however, suggest that there is no relation between sector concentration and volatility.[5]

The final measure of concentration is the average cross-correlation of the stocks within the country index. This variable has an impressive ability to detect cross-sectional difference in volatility. This is not totally unexpected given that the portfolio variance is a function of the correlation of the stocks in the portfolio. However, it is possible to have highly correlated stocks concentrated in a low volatility industry. The correlation measure enters the regression with a positive sign and is up to four standard errors from zero. The average cross-correlation explains up to 50% of the differences in volatility across countries. Indeed, Figure 3 suggests that the relation may be nonlinear.

Table 4: Explaining differences in volatility across different markets

Countries	Explanatory variable	intercept	slope	$\bar{R}^2$
Annualized standard deviation over full sample: Size				
19 Emerging	Log $ capitalization	36.261 [6.897]	2.744 [1.334]	-0.020
19 Emerging plus Japan, U.K. & U.S.	Log $ capitalization	45.371 [7.083]	-1.821 [-1.399]	-0.008
19 Emerging	Log number of companies in index	64.905 [2.201]	-6.170 [-0.807]	-0.036
19 Emerging plus Japan, U.K. & U.S.	Log number of companies in index	77.832 [4.610]	-9.917 [-2.749]	0.107
Annualized standard deviation over full sample: Trading activity				
19 Emerging	Log $ volume	40.720 [8.649]	1.695 [1.728]	-0.014
19 Emerging	Log turnover ratio	31.067 [5.847]	3.713 [1.699]	0.002
19 Emerging plus Japan, U.K. & U.S.	Log turnover ratio	32.074 [6.675]	2.362 [1.168]	-0.028
Annualized standard deviation over full sample: Concentration				
19 Emerging	% capitalization of top 10 firms	34.195 [3.001]	0.194 [0.690]	-0.031
19 Emerging plus Japan, U.K. & U.S.	% capitalization top 10 firms	25.264 [2.796]	0.357 [1.430]	0.057
19 Emerging	% $ volume of top 10 firms	37.500 [4.064]	0.128 [0.638]	-0.042
19 Emerging	Asset concentration[b]	42.703 [4.172]	0.365 [0.007]	-0.059

Countries	Explanatory variable	intercept	slope	$\bar{R}^2$
18 Emerging[a]	Asset concentration[b]	15.148 [0.934]	154.447 [1.553]	0.142
19 Emerging plus Japan, U.K. & U.S.	Asset concentration[b]	33.815 [3.257]	30.993 [0.511]	-0.026
18 Emerging[a] plus Japan, U.K. & U.S.	Asset concentration[b]	8.122 [0.748]	181.622 [2.171]	0.274
19 Emerging	Sector concentration[b]	51.043 [3.648]	-19.603 [-0.660]	-0.048
19 Emerging plus Japan, U.K. & U.S.	Sector concentration[b]	35.581 [2.922]	10.271 [0.360]	-0.047
19 Emerging of stocks in index	Mean cross-correlation	5.015 [0.559]	67.310 [3.696]	0.500
19 Emerging plus Japan, U.K. & U.S.	Mean cross-correlation of stocks in index	1.043 [0.103]	69.964 [3.543]	0.471
Annualized standard deviation over 1986.02—1992.06: Size				
19 Emerging	Log $ capitalization	35.704 [6.360]	3.969 [1.685]	0.011
19 Emerging plus Japan, U.K. \& U.S.	Log $ capitalization	46.182 [6.516]	-1.289 [-0.846]	-0.032
19 Emerging companies in index	Log number of	47.653 [1.409]	-0.703 [-0.077]	-0.059
19 Emerging plus Japan, U.K. & U.S.	Log number of companies in index	72.112 [3.873]	-7.788 [-1.874]	0.035
Annualized standard deviation over 1986.02—1992.06: Trading activity				
19 Emerging	Log $ volume	42.119 [8.195]	2.479 [2.073]	0.023
19 Emerging	Log turnover ratio	29.892 [4.011]	4.831 [1.951]	0.029
19 Emerging plus Japan, U.K. & U.S.	Log turnover ratio	30.804 [4.542]	3.509 [1.556]	-0.008
Annualized standard deviation over 1986.02—1992.06: Concentration				
19 Emerging of top 10 firms	% capitalization	43.570 [3.378]	0.035 [0.117]	-0.058
19 Emerging plus Japan, U.K. & U.S.	% capitalization top 10 firms	32.917 [3.207]	0.229 [0.859]	-0.012
19 Emerging top 10 firms	% $ volume of	40.055 [4.255]	0.123 [0.574]	-0.046
19 Emerging	Asset concentration[b]	48.120 [4.705]	-14.447 [-0.286]	-0.054
18 Emerging[a]	Asset concentration[b]	22.709 [1.398]	127.645 [1.301]	0.058
19 Emerging plus Japan, U.K. & U.S.	Asset concentration[b]	38.893 [3.768]	17.283 [0.295]	-0.044
18 Emerging[a] plus Japan, U.K. & U.S.	Asset concentration[b]	15.453 [1.258]	160.269 [1.920]	0.172
19 Emerging	Sector concentration[b]	48.953 [2.881]	-9.064 [-0.249]	-0.057
19 Emerging plus Japan, U.K. & U.S.	Sector concentration[b]	34.845 [2.536]	18.140 [0.557]	-0.042
19 Emerging of stocks in index	Mean cross-correlation	2.774 [0.320]	75.496 [4.349]	0.542
19 Emerging plus Japan, U.K. & U.S.	Mean cross-correlation of stocks in index	-0.736 [-0.076]	77.617 [4.128]	0.512

[a] Excludes Jordan. All regressions exclude Indonesia whose returns are only available from February 1990.
[b] Source: DIVECHA, DRACH and STEFEK (1992).

3.2 Explaining serial correlation in emerging markets

The first-order autocorrelation coefficients for emerging markets reported in table 3 are much higher than the coefficients for developed markets. For example, the Latin American index has a serial correlation coefficient of 25% and Colombia has a coefficient of 49%. Although these returns are measured monthly and are derived from smaller portfolios of stocks (as opposed to the complete number of listings on the exchange), some of the autocorrelation could be due to infrequent trading of the index stocks.[6]

The regression analysis in table 5 attempts to explain the cross-sectional variation in autocorrelation. As a market becomes large and active, the possibility of infrequently traded stocks diminishes. Panels A, B, D, E show that there is a negative relation between size and trading activity and the autocorrelation coefficients. The log of the number of companies in the index can explain about 20% of the cross-sectional variation in autocorrelation. This relation is presented in Figure 4. While the relation between the volume measures and autocorrelation is not significant at conventional levels, the coefficients are all negative.

The role of concentration in explaining serial correlation is investigated next. Panels C and E show that there is a significant positive relation between the volatility and the percentage capitalization of the top 10 firms. A higher proportion (higher concentration) is associated with higher autocorrelation. This measure is able to explain up to 32% of the cross-sectional variation in autocorrelation and is presented in Figure 5.

Other concentration measures provide a consistent, though less significant, message. The percentage volume of the top 10 firms enters the regression with a positive coefficient that is about two standard errors from zero. Increased asset and sector concentration is also associated with increased autocorrelation. The asset concentration measure and the autocorrelations are detailed in Figure 6.

The final regressions look at the role of the average cross-correlation coefficient. In contrast to the results in explaining volatility, the mean cross-correlation coefficient does not have any ability to explain the cross-sectional variability in the serial correlation coefficients.

The results in table 5 indicate that autocorrelation is negatively associated with market size. With the exception of Mexico, the largest emerging markets have the smallest serial correlation. Autocorrelation is positively related to concentration. If the index is dominated by a few stocks or specialized in a certain sector, this will, in general, lead to higher serial correlation in the returns.

Table 5: Explaining differences in autocorrelation across different markets

Countries	Explanatory variable	intercept	slope	$\bar{R}^2$
First-order autocorrelation over full sample: Size				
19 Emerging	Log $ capitalization	20.157 [3.339]	-1.684 [-0.906]	-0.021
19 Emerging plus Japan, U.K. & U.S.	Log $ capitalization	21.827 [4.448]	-2.534 [-2.754]	0.149
19 Emerging companies in index	Log number of	56.010 [2.778]	-11.114 [-2.130]	0.133
19 Emerging plus Japan, U.K. & U.S.	Log number of	48.915 [4.459]	-9.091 [-3.763]	0.274
First-order autocorrelation over full sample: Trading activity				
19 Emerging	Log $ volume	17.912 [4.685]	-1.443 [-1.156]	0.024

Countries	Explanatory variable	intercept	slope	$\bar{R}^2$
19 Emerging	Log turnover ratio	21.876 [2.672]	-1.813 [-0.864]	-0.022
19 Emerging plus Japan, U.K. & U.S.	Log turnover ratio	22.285 [2.646]	-2.551 [-1.189]	0.013
First-order autocorrelation over full sample: Concentration				
19 Emerging	% capitialization of top 10 firms	-0.383 [-0.055]	0.375 [2.192]	0.205
19 Emerging plus Japan, U.K. & U.S.	% capitalization of top 10 firms	-3.267 [-0.671]	0.426 [3.162]	0.323
19 Emerging	% $ volume of top 10 firms	8.275 [1.902]	0.191 [1.809]	0.037
19 Emerging	Asset concentration[b]	17.416 [2.527]	-6.081 [-0.191]	-0.057
18 Emerging[a]	Asset concentration[b]	1.784 [0.259]	81.326 [2.417]	0.084
19 Emerging plus Japan, U.K. & U.S.	Asset concentration[b]	10.870 [1.571]	16.354 [0.443]	-0.034
18 Emerging[a] plus Japan, U.K. & U.S.	Asset concentration[b]	-4.103 [-0.885]	107.692 [4.104]	0.231
19 Emerging	Sector concentration[b]	16.986 [1.490]	-1.965 [-0.075]	-0.059
19 Emerging plus Japan, U.K. & U.S.	Sector concentration[b]	6.766 [0.655]	17.841 [0.705]	-0.028
19 Emerging	Mean cross-correlation of stocks in index	17.231 [1.945]	-1.912 [-0.142]	-0.058
19 Emerging plus Japan, U.K. & U.S.	Mean cross-correlation of stocks in index	13.661 [1.589]	0.612 [0.046]	-0.050
First-order autocorrelation over 1986.2—1992.06: Size				
19 Emerging	Log $ capitalization	20.568 [2.599]	-2.034 [-0.759]	-0.030
19 Emerging plus Japan, U.K. & U.S.	Log $ capitalization	21.808 [3.545]	-2.690 [-2.279]	0.076
19 Emerging	Log number of companies in index	63.140 [2.536]	-13.220 [-2.015]	0.083
19 Emerging plus Japan, U.K. & U.S.	Log number of	50.910 [3.557]	-9.740 [-3.032]	0.160
First-order autocorrelation over 1986.2—1992.06: Trading activity				
19 Emerging	Log $ volume	17.942 [3.781]	-1.815 [-1.230]	0.010
19 Emerging	Log turnover ratio	25.959 [2.732]	-3.240 [-1.278]	0.003
19 Emerging plus Japan, U.K. & U.S.	Log turnover ratio	26.072 [2.676]	-3.871 [-1.520]	0.031
First-order autocorrelation over 1986.2—1992.06: Concentration				
19 Emerging	% capitialization of top 10 firms	-0.935 [-0.101]	0.378 [1.744]	0.082
19 Emerging plus Japan, U.K. & U.S.	% capitalization of top 10 firms	-3.804 [-0.592]	0.426 [2.465]	0.161
19 Emerging	% $ volume of top 10 firms	6.035 [0.939]	0.235 [1.635]	0.017
19 Emerging	Asset concentration[b]	23.344 [2.465]	-36.777 [-0.796]	-0.014

Countries	Explanatory variable	intercept	slope	$\bar{R}^2$
18 Emerging[a]	Asset concentration[b]	-0.115 [-0.012]	94.398 [1.875]	0.056
19 Emerging plus Japan, U.K. & U.S.	Asset concentration[b]	15.273 [1.633]	-9.263 [-0.179]	-0.047
18 Emerging[a] plus Japan, U.K. & U.S.	Asset concentration[b]	-5.966 [-0.906]	120.297 [2.899]	0.170
19 Emerging	Sector concentration[b]	22.553 [1.285]	-16.167 [-0.392]	-0.049
19 Emerging plus Japan, U.K. & U.S.	Sector concentration[b]	10.914 [0.708]	6.378 [0.166]	-0.048
19 Emerging	Mean cross-correlation of stocks in index	18.163 [1.433]	-4.324 [-0.214]	-0.056
19 Emerging plus Japan, U.K. & U.S.	Mean cross-correlation of stocks in index	14.703 [1.229]	-2.175 [-0.111]	-0.049

[a] Excludes Jordan. All regressions exclude Indonesia whose return is only available from February 1990.
[b] Source: DIVECHA, DRACH and STEFEK (1992).

3.3 Market integration, volatility and serial correlation

There are reasons to doubt that some of the emerging markets are fully integrated into world capital markets. Complete integration means that two assets with the same risk in different markets have the same expected returns. Factors that contribute to market integration are free access by foreigners to domestic capital markets and free access by domestic investors to foreign capital markets. Potential barriers to integration come in the form of: access, taxes and information.

The appendix provides a country-by-country examination of the restrictions that foreign investors face as of the Spring of 1993. The degrees of restrictions vary from completely closed to foreign investors (Nigeria) to 100% investible (nine countries). The appendix also provides some details on a new set of indices developed by the IFC called "investable" indices. While only a short history exists (since 1988), these new indices explicitly account for access restrictions on foreign participation.

There are other restrictions to investment in the form of differential tax rates. Appendix table A1 details the withholding tax for U.S. based institutional investors in effect as of December 1991. Taxes on dividends range from 35% in Chile to zero in Mexico, Malaysia, Jordan and Turkey. The withholding tax for long-term capital gains ranges from 35% in Chile to zero in 10 other countries.[7]

Restrictions on the flow of information are an important barrier to entry. The availability of two general categories of information are detailed in appendix table A2: trading and accounting. Each of the 20 emerging markets has at least one share price index and daily exchange publication. Zimbabwe is the only country that does not have international electronic data coverage of trading. Market commentaries and brokerage reports are published in english in all but two countries: Chile and Venezuela.

All exchanges require consolidated annual reports of the firms that are traded. In 10 countries, quarterly interim reports are published and in 8 countries the reports are made on a semiannual basis. However, accounting standards are considered 'good' in only eight countries: Brazil, Chile, Colombia, Mexico, Korea, Philippines, India and Malaysia. Eight other countries have 'adequate' standards while the standards in Taiwan, Indonesia, Greece and Jordan are considered 'poor'.

Investor protection varies across the different markets. All but two countries (Malaysia and Greece) have functioning securities commissions or a simi-

lar government agency concentrating on the regulation of market activity. However, the degree of investor protection is only considered good in six countries: Brazil, Chile, Mexico, Korea, India and Pakistan. Eleven countries have 'adequate' protection. Three countries, Taiwan, Greece and Turkey, are rated as poor.

The degree of integration varies across different countries. Given these barriers to trade it is unlikely that any asset pricing that assumes complete integration of capital markets will be able to fully account for the behavior of security prices in these different markets. BEKAERT and HARVEY (1994a) propose an asset pricing framework which allows for the degree of market integration to change through time.

Integration impacts on the analysis of volatility and serial correlation. BEKAERT and HARVEY (1994b) argue that developing countries' economic sectors are likely to be concentrated in relatively few industries. As a result, there is high cross-sectional correlation of individual stock returns. This high cross-correlation increases the index volatility. As markets become more developed and integrated into world capital markets, the industrial sector becomes more diversified. In other words, the large cross-sectional dispersion in volatility in emerging markets is a function of the differing degrees of economic development and world integration.

3.4 Implications for portfolio managers

This research has a number of distinct implications for portfolio managers. First, HARVEY (1993, 1994, 1995) demonstrates that emerging market returns are more predictable than developed market returns. As a result, active managers must use the predictability in their asset allocation programs to fully realize the potential of emerging equity market investment. Part of this predictability is driven by serial correlation in these markets. This research explores the reasons why serial correlation differs across the various emerging markets. We offer

strong evidence that serial correlation is determined by the asset concentration of the IFC index. For example, Colombia, which has the highest autocorrelation also has the highest percent capitalization of the top 10 firms in the IFC index for Colombia.

In active management, mean-reversion of equity returns (measured by the autocorrelation) is a valuable investment indicator. My analysis helps explain the patterns in mean-reversion in different countries. While I focus on 20 countries, my analysis is potentially useful in predicting the degree of mean-reversion in new emerging markets (ones not currently tracked by the IFC).

The second implication for portfolio managers concerns the volatility of emerging market returns. Many global managers have avoided emerging markets because of the perceived large volatility exposure associated with each individual market. HARVEY (1995) proves that the global manager can reduce overall portfolio volatility by adding a group of emerging markets to an already diversified global portfolio. This lesson aside, an important question is how to add these emerging markets to portfolios.

In dynamic asset management, a country's expected returns are traded off against its risks. This risk is determined by the interplay of the emerging market return with other market returns as well as the volatility of the emerging market return. My research helps explain why volatility is different across different countries. Sharp evidence is presented that the country index returns volatility is a function of the concentration of stocks within the index. This information about volatility is useful for active management. As with the autocorrelation results, these results are also useful in predicting the volatility of new emerging markets.

4. Conclusions

The large differences in volatility across the 20 countries is analyzed. In my study of 17 mainly developed countries [HARVEY (1991)], volatility ranged from 16% to 41% per annum. In the emer-

ging markets, volatility varies from 19% to 105%. Consistent with the results of ROLL (1992), I show that much of the variation in volatility across emerging markets can be explained by measures of asset and sector concentration. Finally, the persistence of the emerging market returns is investigated. The serial correlation found in these markets is on average much higher than the level found in developed markets. Explanations focus on the degree of diversification in the index portfolios and the amount of trading. However, these explanations yield only a partial explanation of the cross-sectional patterns in serial correlation. The evidence suggests that some of the serial correlation is genuine rather than an artifact of infrequent trading.

The predictability of emerging market returns based on past returns is consistent with the work of HARVEY (1994, 1995) who argues that, in segmented capital markets, predictability is more likely induced by local information rather than world information. The evidence in BEKAERT and HARVEY (1994a,b) suggests that many of these markets are, indeed, segmented from world capital markets.

Appendix: IFC Indices and Restrictions on Foreign Investors

The International Finance Corporation (IFC) began calculating market indices in 1981. The indices, known as the IFC Global (IFCG) Indices, do not take into consideration restrictions on foreign ownership. While there is a trend towards reducing the barriers to foreign ownership, these constraints are binding in a number of countries.

Recently, the IFC has introduced a second set of indices, the IFC Investable (IFCI) Indices. The IFCI indices reflect restrictions on ownership limits. For example, if a firm had a market capitalization of US $300 million and the national law restricts foreign ownership to 50% of any company, the IFC Global index uses the full $300 million as the market capitalization while the IFC Investable index uses $150 million.

Since my paper studies the integration of the emerging markets into world capital markets, I have chosen to use the IFC Global indices. An additional reason for using the Global indices is the limited availability of the Investable indices (data begins in 1988). However, it is important to understand the degree of restrictions in each market. The following is drawn from the International Finance Corporation (1993a).[8]

Argentina. The market is considered generally 100% investable; some corporate statue limitations apply.

Brazil. The market is considered generally investable. Since May 1991 foreign institutions may own up to 49% of voting common stock and 100% of non-voting participating preferred stock. Some corporate statue limitations (e.g., Petrobras common are off-limits) apply.

Chile. Foreign portfolio investment is considered to enter Chile through Law 18657 of 1987 regarding Foreign Capital Investment Funds, which limits aggregate foreign ownership to 25% of a listed company's shares.

Colombia. The market is considered 100% investable from February 1, 1991.

Greece. The market is generally 100% investable.

India. A press release 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 considered effectively open from November 1, 1992. Investments are subject to a ceiling of 24% of issued share capital for the total holdings of all registered FIIs and 5% 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 non-joint 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% of all companies' 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% 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, IFC counts only the shares listed %at the stock exchange.

Jordan. The market is considered generally 49% investable. Korea. Since January 1, 1992, authorized foreign investors have been allowed to acquire up to 10% of the capital of listed companies; some corporate statue limitations apply (e.g. POSCO and KEPCO 8%, and some are permitted up to 25%). The 10% 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 exceed 10% could apply to Korea's Securities and Exchange Commission to increase their limit to 25%. 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%. However, these limits do not appear to be strictly enforced. Under the Bankings and Financial Institutions Act, 1989, the approval of the Minister of Finance is required before foreign investors can buy or sell shares of a licensed bank of finance company amounting to 5% or more. Certain non-bank stocks have different foreign share holdings 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% or more of the voting power of a company by any one foreign interest and for acquiring the assets of interests of a company when they exceed M$5 million, whether by Malaysian or foreign interests. Except for a few specific cases, IFC uses 100% for most stocks and 30% 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% investable, except for banks, where foreign ownership is restricted to 30%.

Nigeria. Closed to foreign investment.

Pakistan. The market is considered 100% investable from February 22, 1991.

Philippines. National law requires that a minimum of 60% of the issued shares of domestic corporations should be owned by Philippine nationals. To ensure compliance, Philippine companies typically issued 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% of the total. Mass media, retail trade and rural banking companies are closed to foreign investors.

Portugal. The market is considered generally 100% investable; some corporate statue limitations apply, particularly regarding shares issued in privatization.

Taiwan. The market was opened to foreigners on January 1, 1991, though foreign investors must meet high registration requirements and total cash inflows much meet high registration requirements and total cash inflows from abroad cannot currently exceed an official ceiling of $2.5 billion. There is a 10% limit on aggregate foreign ownership of issued capital. The domestic transportation industry is closed to foreign investors.

Thailand. Various Thai law restrict foreign shareholdings in Thai companies engaged in certain areas of business. The Banking Law restricts foreign ownership in banks to 49%. The Alien Business Law, administered by the Ministry of Commerce, restricts foreign ownership of stocks in specified sectors to 49%. In addition, other laws provide similar restrictions on foreign ownership. Restrictions are also faced by foreign investors through limits imposed by company by-laws which range from 15% to 65%. The Foreign Board was established in 1988 to facilitate trading in shares registered in foreign names.

Turkey. The market is considered 100% investable from August 1989.

Venezuela. Non-financial stocks are considered generally 100% 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.

table A1: Withholding tax for U.S.-based institutional investors in effect at the end of 1991

Country	Interest	Dividends	Long-term capital gains on listed shares	Country	Interest	Dividends	Long-term capital gains on listed shares
Latin America				*Europe, Mideast and Africa*			
Argentina	20.0	20.0	0.0	Greece[c]	10.0	42/45	0.0
Brazil	15.0	15.0	15.0	Jordan	0.0	0.0	0.0
Chile	35.0	35.0	35.0	Nigeria	15.0	15.0	20.0
Colombia	7.0	20.0	0.0	Portugal	20.0	20.0	0.0
Mexico	0.0	0.0	0.0	Turkey	0.0	0.0	0.0
Venezuela[a]	20.0	20.0	20.0	Zimbabwe	10.0	20.0	30.0
Asia							
India	10.0	10.0	10.0				
Indonesia	20.0	20.0	20.0				
Korea	25.0	25.0	25.0				
Malaysia	20.0	0.0	0.0				
Pakistan	10.0	10.0	0.0				
Philippines[b]	15.0	15.0	0.25				
Taiwan	20.0	20.0	0.0				
Thailand	15.0	10.0	0.0				

[a] No withholding taxes apply to shares of publicly contraolled companies (SAICA).
[b] Transaction tax on gross transaction value, in lieu of capital gains tax.
[c] Unlike other countries, Greece has no corporate profit tax on distributed earnings. Registered shares' rate is 42%, bearer shares' rate is 45%, after exemptions.

Source: World Bank, Emerging Markets Factbook, 1992

table A2: Market information and investor protection in emerging markets

Country	(1) Share price index	(2) Securities exchange publications	(3) international electronic coverage	(4) Regular publication of P/E yield	(5) Market commentaries in English	(6) Company brokerage reports	(7) Consolid. annual audited	(8) Interim statements	(9) Accounting stanards	(10) Investor protection
Latin America										
Argentina	X	AQMWD	X	P	LR	LR	X	Q	A	AS
Brazil	X	AMWD	X	C	LR,IR	LR,IR	X	Q	G	GS
Chile	X	AMWD	X	C	LR	LR,IR	X	Q	G	GS
Colombia	X	AMWD	X	P	-	LR,IR	X	Q	G	AS
Mexico	X	AMWD	X	C	LR,IR	LR,IR	X	Q	G	GS
Venezuela	X	AMWD	X	P	-	LR,IR	X	S (banks only)	A	AS
East Asia										
Korea	X	AMWD	X	C	LR,IR	LR,IR	X	S	G	GS
Philippines	X	AMWD	X	C	LR,IR	LR,IR	X	S	G	AS
Taiwan	X	AMWD	X	C	LR,IR	IR	X	Q	P	PS
South Asia										
India	X	AMWD	X	C	LR	LR	X	S	G	GS
Indonesia	X	AMD	X	C	LR,IR	LR,IR	X	S	P	AS
Malaysia	X	A(M/2)WD	X	C	LR,IR	LR,IR	X	S	G	G-
Pakistan	X	AD	X	P	LR,IR	-	X	S	A	AS
Thailand	X	AQMWD	X	C	LR,IR	LR,IR	X	Q	A	AS
Europe/Mideast/Africa										
Greece	X	AMWD	X	C	LR,IR	LR,IR	X	S	P	P-
Jordan	X	AMWD	X	P	LR,IR	LR	X	-	P	AS
Nigeria	X	AMD	X	P	LR,IR	LR	X	Q	A	AS
Portugal	X	AMWD	X	C	LR,IR	LR,IR	X	S	A	AS
Turkey	X	AMWD	X	C	LR,IR	LR,IR	X	Q	A	PS
Zimbabwe	X	AWD	-	P	LR	LR	X	S	A	AS

ColumnSymbols
(1)   X=at least one share price index is calculated; most have several, and many have sectoral indexes as well.
(2)   A=annual, Q=quarterly, M=monthly, (M/2)=bi-monthly, W=weekly, D=daily.
(3)   X=daily coverage of stock market on an international wire service; - =not available.
(4)   P=published; C=comprehensive and published internationally.
(5),(6) LR=prepared by local brokers or analysts; IR=prepared by international brokers or analysts; - =not available.
(7)   X=consolidated auditted annual accounts required.
(8)   Q=quarterly results must be published; S=semiannual results must be published; - =not required.
(9),(10) G=good, of internationally acceptable quality; A=adequate; P=poor, requires reform; S=functioning securities commission or similar government
        agency concentrating on regulating market activity; - =no regulatory agency.

Source: International Finance Corporation, Emerging Market Factbook 1992, pp.116-155. Data for 1991.

Footnotes

[1]   For most markets, the exchange conversion is based on a rate quoted on the last day of the month in the Wall Street Journal or the Financial Times. When a number of exchange rates exist, the IFC uses the nearest equivalent "free market" rate or a rate that would apply to the repatriation of capital or income. In some cases, even the newspaper rates are not used and the IFC relies on their correspondents in the particular market. See IFC (1993).

[2]   MULLIN (1993) argues that quarterly or annual intervals should be used. He finds that correlations are numerically higher using longer horizon returns. However, it is not clear that the correlations are significantly higher.

[3]   The World Bank uses the following categories: low income are those countries with less than U.S. $635 GNP per capita and middle-income are those countries with U.S. $636-$7,910 GNP per capita in 1991. All markets in low and middle-income countries are considered emerging.

[4]   This excludes companies that are headquartered in the emerging markets but listed only on foreign markets.

[5]   The results of a multiple regression of standard deviation on asset concentration and sector concentration are consistent with the bivariate regressions.

[6]   In addition, the standard deviations reported in table 3 were calculated under the null hypothesis of no serial correlation.

[7]   See DEMIRGUC-KUNT and HUIZINGA (1992) for an analysis of role of differential taxation.

[8]   Also see CASTELIN and STONE (1990). GOOPTU (1993) provides a comprehensive analysis of portfolio investment flows to emerging markets.

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