The Cost of Equity in Emerging Markets: A Downside Risk Approach (II)

JAVIER ESTRADA

JAVIER ESTRADA is an associate professor in the Department of Finance at the IESE business school in Barcelona, Spain.

There has been recent interest in trying to identify the factors that determine the cross-section of stock returns in emerging markets. Defining risk in general, and the factors that affect required stock returns in particular, is difficult in developed markets, let alone in emerging markets, but the issue is critical for both companies and investors, particularly in the light of the increased popularity of investing in emerging markets.

In Estrada [2000] I suggested that measures of downside risk should be correlated with stock returns in emerging markets and found that data at the country level strongly supported this hypothesis. In this article, I test the robustness of that approach by focusing on the relationship between downside risk and stock returns on a cross-section of *industries* in emerging markets. The results below strengthen the case for the semideviation as an appropriate measure of risk in emerging markets.

THE ISSUE AT STAKE

The importance of an appropriate identification of the factors that determine the cross-section of stock returns in emerging markets (in fact, in any market) can hardly be overstated. Companies evaluating projects in emerging markets, and investors evaluating companies in these markets, need to discount expected cash flows at a risk-adjusted rate. Hence, they need to identify the variables that determine such discount rates.

Previous Research

An overview of the literature, including some of the approaches recently proposed for the computation of required returns in emerging markets, appears in Estrada [2000] and is not repeated here. Essential readings on the topic, however, include Claessens, Dasgupta, and Glen [1998]; Diamonte, Liew, and Stevens [1996]; Erb, Harvey, and Viskanta [1995, 1996a, 1996b]; Godfrey and Espinosa [1996]; Harvey [1995]; Lessard [1996]; Patel [1998]; and Rouwenhorst [1999].

The main results reported in Estrada [2000] can be summarized as follows. In emerging markets: 1) stock returns are uncorrelated with systematic risk measured by beta; 2) stock returns are correlated with total risk measured by the standard deviation; 3) stock returns are correlated with downside risk measured by the semideviation with respect to the mean, by the downside beta, and by VaR; 4) costs of equity based on the semideviation seem to be "more plausible" than those based on systematic risk or total risk.

The plausibility of the semideviation as an appropriate measure of risk has been strengthened by recent evidence reported in Harvey [2000], who does not necessarily focus on downside risk. Still, he reports that the semideviation with respect to the mean has a strong correlation with mean returns (0.62) in a joint sample of developed and emerging markets, second in strength only to the cor-

relation between the standard deviation and mean returns (0.64) among the 18 measures of risk he considers.[1]

The Model

The framework in this article is the same as that proposed in Estrada [2000] and, as argued there, it is as simple as the CAPM. Furthermore, it is grounded in modern portfolio theory; it can be applied both at the market level and at the company level; it is not based on subjective measures of risk; it can be fine-tuned to any desired benchmark return; and it captures the downside risk that investors want to avoid (as opposed to the upside potential to which investors want to be exposed).

Consider a required rate of return with two components, a risk-free rate and a risk premium. The former is a compensation for the expected loss of purchasing power, and the latter is an extra compensation for bearing risk. Assume also a U.S.-based, internationally diversified investor; the risk-free rate should compensate this investor for the dollar's expected loss of purchasing power, and the risk premium should compensate him for the risk of investing in the world market portfolio.

In symbols:

$$RR_i = R_f + (RP_W)(RM_i) \quad (1)$$

where RR_i is the required return, R_f is the (U.S.) risk-free rate, RP_W is the world market risk premium, RM_i is a risk measure, and i is a cross-sectional index.

The model proposed focuses on risk measures based on downside risk and, in particular, based on the semideviation of returns with respect to the mean. The downside standard deviation, or semideviation for short, with respect to any benchmark return B (Σ_B) is defined as

$$\Sigma_B = \sqrt{(1/T)\sum_{t=1}^{T}(R_t - B)^2} \text{ for all } R_t < B \quad (2)$$

where R denotes returns, t indexes time, and T is the number of observations in the sample.

The semideviation as a plausible measure of risk goes back at least as far as Markowitz [1959], who argued that this variable generates efficient portfolios somewhat preferable to those based on the standard deviation as a measure of risk. More recently, this measure has been strongly supported by Clash [1999], Sortino and van der Meer [1991], and Sortino, van der Meer, and Plantinga [1999]. For a review of downside risk measures, see Nawrocki [1999].

DATA AND RESULTS

The data used in this article consist of the entire Morgan Stanley Capital International (MSCI) database of 37 industries from companies in emerging markets over the period December 1994 (as far back as these indexes go for emerging markets) through December 1999. These indexes are computed from the MSCI universe of companies, which are grouped into 38 industry groups according to a company's main economic activity (as determined by a breakdown in earnings) and 8 economic sectors.[2]

The industries in the sample, with summary statistics for the monthly returns of these industries over the whole sample period are reported in Exhibit A-1 in the appendix. Exhibit A-1 also reports summary statistics for the Emerging Markets Free index and for the world index with respect to which betas and correlations are estimated. Returns used throughout the article are monthly returns, measured in dollars, and accounting for capital gains.

Cross-Sectional Analysis

The first step of the analysis consists of computing, over the whole sample period available for each industry, one statistic that summarizes the average (return) performance of each industry, and another statistic that summarizes its risk under each of the definitions considered. Average returns for each industry over the whole sample period are summarized by mean monthly arithmetic returns.

Six risk variables are considered in the analysis: The first is *systematic* risk (SR) measured by beta; the second is *total* risk (TR) measured by the standard deviation of returns; and the remaining four are measures of downside risk.

Three measures of downside risk are based on the semideviation of returns with respect to three different benchmarks: the arithmetic mean of each distribution of returns (μ); the risk-free rate (R_f); and 0; which generate the semideviation with respect to the mean (Σ_μ), the semideviation with respect to the risk-free rate (Σ_f), and the semideviation with respect to 0 (Σ_0), respectively. The final measure of risk considered is the downside beta (β^D), defined as the sensitivity of each industry's returns with respect to the world market returns when both (the industry and the world market) go down simultaneously.

All the risk variables for all industries are reported in Exhibit A-2 in the appendix.

A cross-sectional correlation matrix of mean returns and the six risk variables under consideration is reported

EXHIBIT 1
Cross-Sectional Analysis—Correlation Matrix

	MR	SR	TR	Σ_μ	Σ_f	Σ_0	β^D
MR	1.00						
SR	0.44	1.00					
TR	0.32	0.49	1.00				
Σ_μ	0.37	0.59	0.96	1.00			
Σ_f	0.03	0.47	0.91	0.94	1.00		
Σ_0	0.04	0.48	0.91	0.94	0.99	1.00	
β^D	0.08	0.42	-0.14	0.04	0.01	0.02	1.00

MR: Mean return; SR: Systematic risk (beta); TR: Total risk (standard deviation); Σ_μ: Semideviation with respect to μ; Σ_f: Semideviation with respect to R_f; Σ_0: Semideviation with respect to 0; β^D: Downside beta.

EXHIBIT 2
Cross-Sectional Analysis—Simple Regressions

$$MR_i = \gamma_0 + \gamma_1 RV_i + u_i$$

RV	γ_0	p-value	γ_1	p-value	R^2	Adj R^2
Panel A: OLS Estimation						
SR	-1.88	0.01	1.38	0.01	0.19	0.17
TR	-1.01	0.11	0.12	0.06	0.10	0.08
Σ_μ	-1.45	0.05	0.23	0.03	0.14	0.11
Σ_f	0.00	1.00	0.02	0.85	0.00	-0.03
Σ_0	-0.05	0.95	0.03	0.80	0.00	-0.03
β^D	-0.10	0.86	0.18	0.62	0.01	-0.02
Panel B: Heteroscedasticity-Consistent Estimation						
SR	-1.88	0.00	1.38	0.01	0.19	0.17
TR	-1.01	0.10	0.12	0.10	0.10	0.08
Σ_μ	-1.45	0.03	0.23	0.03	0.14	0.11
Σ_f	0.00	1.00	0.02	0.86	0.00	-0.03
Σ_0	-0.05	0.95	0.03	0.81	0.00	-0.03
β^D	-0.10	0.88	0.18	0.66	0.01	-0.02

MR: Mean return; RV: Risk variable; SR: Systematic risk (beta); TR: Total risk (standard deviation); Σ_μ: Semideviation with respect to μ; Σ_f: Semideviation with respect to R_f; Σ_0: Semideviation with respect to 0; β^D: Downside beta. Significance in Panel B based on White's heteroscedasticity-consistent covariance matrix.

in Exhibit 1. The first column of this matrix provides a preview of the results to be analyzed in more detail below.

Exhibit 1 reports two interesting findings that contrast with the results reported in Estrada [2000]. First, systematic risk is the variable most highly correlated with mean returns. Second, total risk is not very highly correlated with mean returns.[3]

More detailed results about the relationship between risk and return across industries can be obtained from regression analysis. I start by running a cross-sectional simple linear regression model relating mean returns to each of the six risk variables considered. More precisely:

$$MR_i = \gamma_0 + \gamma_1 RV_i + u_i \quad (3)$$

where MR_i and RV_i stand for mean return and risk variable, respectively; γ_0 and γ_1 are coefficients to be estimated; u_i is an error term; and i indexes industries.

The results of the six regression models (one for each of the six risk variables considered) are reported in Exhibit 2.

All but one of the results of OLS regression in Panel A display the presence of heteroscedasticity. The results in Panel B based on White's heteroscedasticity-consistent covariance matrix are similar, and the qualitative conclusions are the same: Beta and downside risk as measured by the semideviation with respect to the mean are significantly correlated with stock returns; the rest of the risk variables are not.[4]

Exhibit 2 confirms two interesting results hinted at in Exhibit 1, both in contrast with the results reported in Estrada [2000]. First, systematic risk is significantly correlated with mean returns; hence, unlike country betas, industry betas do explain the cross-section of stock returns. Second, total risk is not significantly correlated with mean returns; hence, although idiosyncratic risk is priced at the country level, it is not priced at the industry level.[5]

This last result is not entirely unexpected. In emerging markets, a good part of the risk is of local nature; hence, the idiosyncratic risk of each market is priced into the returns of each market. Industry indexes, however, are computed by combining companies from *different* countries, so local risk tends to get diversified away.

Exhibit 2 also shows a significant relationship between the semideviation with respect to the mean and mean returns, which confirms the plausibility of this variable as a measure of risk. The semideviations with respect to the risk-free rate and with respect to 0, however, do not explain the cross-section of stock returns. These three results for industries are consistent with those reported in Estrada [2000] for markets.

Exhibit A-3 in the appendix reports the results of multiple regressions in which systematic risk is jointly considered with each one of the other five risk variables under consideration. Due to the presence of heteroscedasticity in all the OLS regressions, only results estimated using White's heteroscedasticity-consistent covariance matrix are reported.

The exhibit shows that, in all but one case, systematic risk is significantly related to mean returns, and the other risk variable is not. The exception is when both beta and the semideviation with respect to the mean are jointly considered, in which case neither comes out significant. This result is likely to be due to multicollinearity because, as Exhibit 1 shows, the correlation between these two explanatory variables is a high 0.59.

Alternative Risk Measures and Costs of Equity

We have so far established that, *unlike the case* across emerging markets, across industries in emerging markets: 1) systematic risk measured by beta does explain the cross-section of stock returns; 2) total risk measured by the standard deviation does not explain the cross-section of stock returns; and 3) downside risk measured by downside beta does not explain the cross-section of stock returns.

We have also established that, *as is the case* across emerging markets, across industries in emerging markets: 1) downside risk measured by the semideviation with respect to the mean does explain the cross-section of stock returns; and 2) downside risk measured by the semideviation with respect to the risk-free rate and with respect to 0 does not explain the cross-section of stock returns.

As I do in Estrada [2000], I now compare the costs of equity based on three alternative risk variables, the two that the analysis has shown to be significantly related to mean returns (beta and the semideviation with respect to the mean) and one additional variable for the sake of completeness (the standard deviation).

I thus consider three risk measures, one based on systematic risk (RM_{SR}) measured by beta, another based on total risk (RM_{TR}) measured by the standard deviation, and another based on downside risk (RM_{DR}) measured by the semideviation with respect to the mean. In all three cases, risk measures are based on the ratio between each risk variable for a given industry and the same variable for the world market. Therefore:

$$RM_{SR} = \beta_i/\beta_w = \beta_i \Rightarrow$$
$$CE_{SR,i} = RR_{SR,i} = R_f + (RP_W)\beta_i \quad (4)$$

$$RM_{TR} = \sigma_i/\sigma_W \Rightarrow$$
$$CE_{TR,i} = RR_{TR,i} = R_f + (RP_W)(\sigma_i/\sigma_W) \quad (5)$$

$$RM_{DR} = \Sigma_{\mu,i}/\Sigma_{\mu,W} \Rightarrow$$
$$CE_{DR,i} = RR_{DR,i} = R_f + (RP_W)(\Sigma_{\mu,i}/\Sigma_{\mu,W}) \quad (6)$$

where CE denotes the cost of equity; β, σ, and Σ_μ denote beta, the standard deviation of returns, and the semideviation of returns with respect to the mean, respectively; and the subscripts i and W denote the i-th industry and the world market, respectively.[6]

EXHIBIT 3
Risk Measures and Costs of Equity

Industry	RM_{SR}	RM_{TR}	RM_{DR}	CE_{SR}	CE_{TR}	CE_{DR}
Appliances and Household Durables	1.92	4.54	3.51	16.98	31.41	25.76
Automobiles	1.14	2.13	2.03	12.72	18.13	17.61
Banking	1.48	1.97	1.94	14.60	17.29	17.13
Beverages and Tobacco	1.18	1.55	1.62	12.91	14.97	15.35
Broadcasting and Publishing	2.11	3.34	3.05	18.04	24.78	23.24
Building Material and Components	1.32	1.87	1.79	13.69	16.71	16.31
Business and Public Services	1.34	2.55	2.29	13.83	20.46	19.03
Chemicals	1.21	1.85	1.70	13.09	16.64	15.81
Construction and Housing	1.60	2.73	2.44	15.26	21.47	19.84
Data Processing and Reproduction	2.04	4.02	3.20	17.67	28.58	24.02
Electrical and Electronics	1.59	2.70	2.31	15.16	21.30	19.15
Electronic Components and Instruments	2.03	3.77	3.23	17.61	27.17	24.19
Energy Equipment and Services	1.61	3.79	3.66	15.31	27.30	26.57
Energy Sources	1.84	2.57	2.41	16.57	20.57	19.68
Financial Services	1.84	2.56	2.25	16.58	20.53	18.83
Food and Household Products	0.93	1.36	1.29	11.57	13.91	13.55
Forest Products and Paper	1.46	2.44	2.02	14.49	19.87	17.55
Gold Mines	0.79	3.77	2.84	10.76	27.18	22.06
Health and Personal Care	1.26	1.90	1.83	13.35	16.90	16.49
Industrial Components	1.17	1.85	1.68	12.90	16.63	15.69
Insurance	1.13	1.96	1.62	12.63	17.22	15.37
Leisure and Tourism	1.47	2.71	2.39	14.53	21.35	19.57
Machinery and Engineering	1.56	2.26	2.09	15.01	18.89	17.95
Merchandising	1.63	2.45	2.39	15.42	19.93	19.58
Metals—Non-Ferrous	1.02	1.94	1.78	12.08	17.13	16.21
Metals—Steel	1.43	2.23	1.93	14.30	18.69	17.06
Miscellaneous Materials and Commodities	1.39	2.19	2.15	14.07	18.47	18.26
Multi-Industry	1.64	2.22	2.18	15.49	18.67	18.41
Real Estate	1.84	2.77	2.37	16.54	21.70	19.46
Recreation and Other Consumer Goods	1.23	3.18	2.41	13.22	23.91	19.69
Telecommunications	1.87	2.29	2.28	16.71	19.04	18.99
Textiles and Apparel	1.27	2.35	2.06	13.41	19.39	17.79
Transportation—Airlines	1.52	3.67	3.14	14.78	26.65	23.71
Transportation—Road and Rail	1.17	3.42	2.91	12.85	25.27	22.47
Transportation—Shipping	0.85	1.78	1.55	11.12	16.22	14.99
Utilities—Electrical and Gas	1.76	2.42	2.44	16.14	19.75	19.87
Wholesale and International Trade	1.70	2.70	2.21	15.76	21.27	18.58
Averages	1.47	2.59	2.30	14.52	20.68	19.08

RM: Risk measure; CE: Cost of equity. SR, TR, and DR indicate systematic risk, total risk, and downside risk, respectively. RMs and CEs follow from Equations (4)-(6). Costs of equity are based on a risk-free rate of 6.44% and a world market risk premium of 5.5%. All costs of equity expressed in %.

These risk measures, as well as their implied costs of equity are reported for all industries in Exhibit 3. The last three columns show the annual costs of equity (or required returns) based on each of the three risk measures considered (shown in the first three columns), on a risk-free rate of 6.44%, and on a world market risk premium of 5.5%.[7]

Not surprisingly, given the results for markets reported in Estrada [2000], the costs of equity based on systematic risk are "rather low," at an average of under 15%. The costs of equity based on total risk, on the other hand, are higher than those based on systematic risk in every industry, and about 6 percentage points higher on average.

The costs of equity based on downside risk are higher than those based on systematic risk in every industry, and lower than those based on total risk in all but two industries. On average, costs of equity based on downside risk are roughly 4.5 percentage points higher than those based on systematic risk, and 1.5 percentage points lower than those based on total risk.

Finally, there are two further interesting points to note from Exhibit 3. First, note that the cost of equity based on downside risk is higher than that based on total risk in only two cases, the Beverages and Tobacco industry and the Utilities (Electrical and Gas) industry. Not surprisingly, Exhibit A-1 shows that these are the two industries with the highest negative (and significant) skewness.

Second, note that the cost of equity based on downside risk is substantially lower (over 5 percentage points) than that based on total risk in two cases, the Appliances and Household Durables industry and the Gold Mines industry. Not surprisingly again, Exhibit A-1 shows that both industries present a high and significant degree of *positive* skewness.

CONCLUDING REMARKS

A widely accepted definition of risk, critical for the purposes of project evaluation and company valuation, has eluded academics and practitioners for decades. In emerging markets, in particular, an appropriate definition is in its early stages, and although several measures of risk have been proposed, none of them has gained wide acceptance so far.

In Estrada [2000], I reported evidence showing that the semideviation with respect to the mean, a well-known measure of downside risk, does explain the cross-section of stock returns in emerging markets. I also argued that the semideviation is grounded in modern portfolio theory, that it can be applied both at the market level and at the company level, that it can be fine-tuned to any desired benchmark return, and that it captures the downside risk that investors want to avoid. Recent evidence by Harvey [2000] further supports the semideviation as an appropriate measure of risk.

The evidence in this article strengthens the semideviation as a plausible measure of risk in emerging markets. It is correlated with mean returns across industries in emerging markets, and it generates costs of equity that seem "more plausible" than the "rather low" figures based on beta.

Unlike the case across emerging markets, across industries in emerging markets systematic risk does explain the cross-section of stock returns, and total risk does not. This is likely because as indexes are computed from companies in different countries, local risk (which is important at the market level) gets diversified away at the industry level.

Risk is difficult to define in general and particularly so in emerging markets. Practitioners puzzled by a wealth of evidence on the poor explanatory power of systematic risk started to look for alternatives to the CAPM long ago. As this and my previous article show, a CAPM-type model that uses the semideviation as a measure of risk is an equally simple alternative that has several advantages over the standard CAPM.

APPENDIX
Background Information

EXHIBIT A-1
Summary Statistics (monthly dollar returns)

Industry	μ_A	μ_G	σ	ρ	β	SSkw	SKrt
Appliances and Household Durables	2.56	1.21	17.36	0.42	1.92	3.84	5.91
Automobiles	-0.33	-0.67	8.13	0.54	1.14	-1.24	0.20
Banking	0.33	0.03	7.54	0.75	1.48	-3.33	4.78
Beverages and Tobacco	0.63	0.45	5.93	0.76	1.18	-5.37	7.41
Broadcasting and Publishing	1.64	0.80	12.75	0.63	2.11	-1.08	3.93
Building Material and Components	-0.35	-0.61	7.14	0.71	1.32	-2.01	2.59
Business and Public Services	1.78	1.31	9.75	0.53	1.34	-0.58	3.81
Chemicals	-0.32	-0.58	7.09	0.65	1.21	-0.82	2.43
Construction and Housing	-1.19	-1.74	10.44	0.59	1.60	0.48	2.62
Data Processing and Reproduction	1.42	0.34	15.39	0.51	2.04	3.35	4.94
Electrical and Electronics	1.87	1.36	10.33	0.59	1.59	1.54	5.52
Electronic Components and Instruments	2.82	1.83	14.41	0.54	2.03	1.18	1.91
Energy Equipment and Services	1.18	0.01	14.50	0.42	1.61	-2.38	5.35
Energy Sources	0.73	0.23	9.82	0.72	1.84	-1.49	4.83
Financial Services	-0.91	-1.38	9.80	0.72	1.84	0.65	2.01
Food and Household Products	0.09	-0.05	5.20	0.69	0.93	-1.58	2.72
Forest Products and Paper	-0.57	-0.99	9.33	0.60	1.46	1.92	2.24
Gold Mines	-1.04	-1.97	14.42	0.21	0.79	4.99	8.37
Health and Personal Care	0.75	0.48	7.27	0.66	1.26	-1.91	2.28
Industrial Components	-0.83	-1.08	7.08	0.63	1.17	-0.33	0.65
Insurance	-0.07	-0.34	7.49	0.57	1.13	1.93	1.82
Leisure and Tourism	-1.06	-1.60	10.36	0.54	1.47	0.17	0.83
Machinery and Engineering	-1.19	-1.57	8.66	0.69	1.56	-0.57	0.38
Merchandising	0.27	-0.20	9.38	0.67	1.63	-3.26	4.60
Metals—Non-Ferrous	0.18	-0.09	7.43	0.53	1.02	-0.28	1.42
Metals—Steel	-0.05	-0.41	8.51	0.64	1.43	0.76	4.47
Miscellaneous Materials and Commodities	-0.06	-0.42	8.36	0.63	1.39	-2.62	3.53
Multi-Industry	0.14	-0.23	8.50	0.74	1.64	-2.11	5.25
Real Estate	-1.32	-1.88	10.61	0.66	1.84	1.13	2.17
Recreation and Other Consumer Goods	-0.26	-0.93	12.14	0.39	1.23	5.50	13.27
Telecommunications	1.19	0.79	8.76	0.82	1.87	-3.22	5.03
Textiles and Apparel	0.31	-0.10	9.00	0.54	1.27	0.19	1.19
Transportation—Airlines	-0.82	-1.80	14.05	0.41	1.52	1.66	4.31
Transportation—Road and Rail	-1.32	-2.16	13.09	0.34	1.17	1.33	0.72
Transportation—Shipping	-0.32	-0.55	6.80	0.48	0.85	-0.21	0.08
Utilities—Electrical and Gas	-0.16	-0.63	9.25	0.73	1.76	-4.44	7.06
Wholesale and International Trade	0.02	-0.49	10.30	0.63	1.70	2.28	4.95
Averages	0.16	-0.37	9.90	0.59	1.47	-0.16	3.66
Emerging Markets Free Index	0.45	0.17	7.35	0.80	1.54	-3.98	5.91
World Index	1.53	1.45	3.82	1.00	1.00	-3.96	6.13

μ_A: Arithmetic mean (%); μ_G: Geometric mean (%); σ: Standard deviation (%); ρ: Correlation coefficient with respect to the world market; β: Beta with respect to the world market; SSkw: Coefficient of standardized skewness; SKrt: Coefficient of standardized kurtosis. Sample period: January 1995-December 1999.

EXHIBIT A-2

Risk Variables (monthly dollar returns)

Industry	SR	TR	Σ_μ	Σ_f	Σ_0	β^D
Appliances and Household Durables	1.92	17.36	10.52	9.38	9.12	0.40
Automobiles	1.14	8.13	6.08	6.52	6.25	0.84
Banking	1.48	7.54	5.83	5.90	5.68	1.87
Beverages and Tobacco	1.18	5.93	4.85	4.80	4.59	1.48
Broadcasting and Publishing	2.11	12.75	9.15	8.58	8.35	1.95
Building Material and Components	1.32	7.14	5.38	5.80	5.55	1.45
Business and Public Services	1.34	9.75	6.86	6.22	5.99	1.97
Chemicals	1.21	7.09	5.10	5.53	5.27	1.23
Construction and Housing	1.60	10.44	7.30	8.19	7.92	1.91
Data Processing and Reproduction	2.04	15.39	9.58	9.05	8.77	1.02
Electrical and Electronics	1.59	10.33	6.92	6.26	6.04	1.33
Electronic Components and Instruments	2.03	14.41	9.67	8.49	8.24	1.15
Energy Equipment and Services	1.61	14.50	10.96	10.67	10.46	2.22
Energy Sources	1.84	9.82	7.21	7.11	6.88	2.11
Financial Services	1.84	9.80	6.75	7.55	7.26	1.64
Food and Household Products	0.93	5.20	3.87	4.08	3.83	1.04
Forest Products and Paper	1.46	9.33	6.05	6.66	6.37	1.39
Gold Mines	0.79	14.42	8.51	9.43	9.12	1.00
Health and Personal Care	1.26	7.27	5.47	5.35	5.11	1.27
Industrial Components	1.17	7.08	5.04	5.78	5.49	1.09
Insurance	1.13	7.49	4.86	5.20	4.91	0.75
Leisure and Tourism	1.47	10.36	7.15	8.03	7.74	1.67
Machinery and Engineering	1.56	8.66	6.27	7.20	6.91	1.13
Merchandising	1.63	9.38	7.16	7.27	7.04	1.66
Metals—Non-Ferrous	1.02	7.43	5.32	5.50	5.23	0.95
Metals—Steel	1.43	8.51	5.79	6.08	5.81	1.66
Miscellaneous Materials and Commodities	1.39	8.36	6.44	6.71	6.47	1.86
Multi-Industry	1.64	8.50	6.52	6.69	6.46	2.07
Real Estate	1.84	10.61	7.09	8.15	7.85	1.69
Recreation and Other Consumer Goods	1.23	12.14	7.22	7.65	7.36	1.64
Telecommunications	1.87	8.76	6.83	6.52	6.31	1.99
Textiles and Apparel	1.27	9.00	6.18	6.29	6.01	1.00
Transportation—Airlines	1.52	14.05	9.41	10.11	9.84	0.89
Transportation—Road and Rail	1.17	13.09	8.73	9.78	9.48	0.33
Transportation—Shipping	0.85	6.80	4.65	5.14	4.84	0.90
Utilities—Electrical and Gas	1.76	9.25	7.32	7.61	7.38	2.39
Wholesale and International Trade	1.70	10.30	6.61	6.88	6.60	1.38
Averages	1.47	9.90	6.88	7.09	6.82	1.41
Emerging Markets Free Index	1.54	7.35	5.78	5.80	5.59	1.93
World Index	1.00	3.82	3.00	2.56	2.38	1.00

SR: Systematic risk (beta); TR: Total risk (standard deviation); Σ_μ: Semideviation with respect to μ; Σ_f: Semideviation with respect to R_f; Σ_0: Semideviation with respect to 0; β^D: Downside beta. All numbers but betas in %.

EXHIBIT A-3

Cross-Sectional Analysis—Multiple Regressions

$MR_i = \gamma_0 + \gamma_1 RV_{1i} + \gamma_2 RV_{2i} + v_i$

RV_1/RV_2	γ_0	p-value	γ_1	p-value	γ_2	p-value	R^2
SR/R	-2.06	0.01	1.18	0.02	0.05	0.44	0.21
SR/Σ_μ	-2.15	0.00	1.07	0.06	0.11	0.37	0.21
SR/Σ_f	-1.29	0.11	1.72	0.00	-0.15	0.11	0.23
SR/Σ_0	-1.36	0.08	1.71	0.00	-0.15	0.13	0.23
SR/β^D	-1.75	0.00	1.54	0.01	-0.26	0.54	0.21

MR: Mean return; RV: Risk variable; SR: Systematic risk (beta); TR: Total risk (standard deviation); Σ_μ: Semideviation with respect to μ; Σ_f: Semideviation with respect to R_f; Σ_0: Semideviation with respect to 0; β^D: Downside beta. Significance based on White's heteroscedasticity-consistent covariance matrix.

ENDNOTES

The author thanks Inés Bardají for valuable research assistance.

[1]The correlation between the semideviation with respect to the mean and mean returns (0.68) is third in strength, among all the 18 risk measures considered, for the subsample of emerging markets.

[2]The aerospace and military technology industry is dropped from the sample due to lack of data.

[3]A third interesting result that contrasts with those reported in Estrada [2000] is that downside betas exhibit a very low correlation with mean returns.

[4]Throughout the article, all hypothesis are tested at the 5% significance level.

[5]A third interesting result that contrasts with those reported in Estrada [2000] is that, unlike country downside betas, industry downside betas are not significantly correlated with mean returns.

[6]Note from Equation (4) that $\beta_i/\beta_w = \beta_i$ because, by definition, the beta of the world market is equal to 1.0.

[7]The 6.44% risk-free rate is based on the yield of ten-year U.S. Treasury notes at the end of 1999. The 5.5% world market risk premium is similar to that used by Stulz [1995].

REFERENCES

Claessens, Stijn, Susmita Dasgupta, and Jack Glen. "The Cross-Section of Stock Returns: Evidence from the Emerging Markets." *Emerging Markets Quarterly*, Winter 1998, pp. 4-13.

Clash, James. "Focus on the Downside." *Forbes*, February 12, 1999, pp. 162-163.

Diamonte, Robin, John Liew, and Ross Stevens. "Political Risk in Emerging and Developed Markets." *Financial Analysts Journal*, May-June 1996, pp. 71-76.

Erb, Claude, Campbell Harvey, and Tadas Viskanta. "Country Risk and Global Equity Selection." *The Journal of Portfolio Management*, Winter 1995, pp. 74-83.

——. "Expected Returns and Volatility in 135 Countries." *The Journal of Portfolio Management*, Spring 1996a, pp. 46-58.

——. "Political Risk, Economic Risk, and Financial Risk." *Financial Analysts Journal*, November-December 1996b, pp. 29-46.

Estrada, Javier. "The Cost of Equity in Emerging Markets: A Downside Risk Approach." *Emerging Markets Quarterly*, Fall 2000, pp. 19-30.

Godfrey, Stephen, and Ramon Espinosa. "A Practical Approach to Calculating Costs of Equity for Investment in Emerging Markets." *Journal of Applied Corporate Finance*, Fall 1996, pp. 80-89.

Harvey, Campbell. "Drivers of Expected Returns in International Markets." *Emerging Markets Quarterly*, Fall 2000, pp. 32-48.

——. "Predictable Risk and Returns in Emerging Markets." *Review of Financial Studies*, Fall 1995, pp. 773-816.

Lessard, Donald. "Incorporating Country Risk in the Valuation of Offshore Projects." *Journal of Applied Corporate Finance*, Fall 1996, pp. 52-63.

Markowitz, Harry. *Portfolio Selection*. New Haven and London: Yale University Press, 1959.

Nawrocki, David. "A Brief History of Downside Risk Measures." *Journal of Investing*, Fall 1999, pp. 9-25.

Patel, Sandeep. "Cross-Sectional Variation in Emerging Markets Equity Returns—January 1988-March 1997." *Emerging Markets Quarterly*, Spring 1998, pp. 57-70.

Rouwenhorst, Geer. "Local Return Factors and Turnover in Emerging Stock Markets." *Journal of Finance*, 54 (1999), pp. 1439-1464.

Sortino, Frank, and Robert van der Meer. "Downside Risk." *The Journal of Portfolio Management*, Summer 1991, pp. 27-31.

Sortino, Frank, Robert van der Meer, and Auke Plantinga. "The Dutch Triangle." *The Journal of Portfolio Management*, Fall 1999, pp. 50-58.

Stulz, Rene. "Globalization of Capital Markets and the Cost of Capital: The Case of Nestle." *Journal of Applied Corporate Finance*, Fall 1995, pp. 30-38.