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The International Cost of Capital — The Empirical Evidence

- In this report, we present evidence that U.S. dollar returns on emerging market equities primarily are a function of returns on the broad U.S. equity market (e.g., the S&P 500) and on the corresponding emerging country's U.S. dollar-denominated bonds (e.g., Bradys or Yankees).
- We also review our methodology for estimating the cost of capital in emerging economies, which we have developed and refined since the late 1980s. We specifically demonstrate how the statistical evidence can be used to estimate the cost of equity for an emerging market company or project.
- This empirical evidence supports our long-standing hypothesis that the cost of capital for an investment in an emerging economy is a combination of the cost of capital of a similar U.S.-based investment and the specified emerging country's international borrowing cost.
- Further analysis suggests that returns on emerging country stocks which are widely followed in the U.S. market (e.g., Teléfonos de México, Telefónica de Argentina and YPF) are statistically dependent on returns in the broad U.S. market. Conversely, returns on emerging country stocks which may be less followed, or traded, in the U.S. market (e.g., Corimon and Banco Ganadero) are not statistically dependent on returns in the broad U.S. market.
- Moreover, as macroeconomic conditions in an emerging economy become more volatile, U.S. dollar returns on a specified foreign equity start becoming more statistically dependent on the specified country's bond returns. Conversely, returns on equities of relatively stable countries (e.g., Chile) are not statistically dependent on returns of the country's corresponding U.S. dollar-denominated bonds.

INTRODUCTION

When the worldwide privatization boom began in the late 1980s, sellers, buyers and financial intermediaries realized that they needed a framework within which to price assets in disparate regions of the world. Unfortunately, standard international corporate finance theory could offer little assistance, primarily because it argued that when valuing, for example, telephone assets in Mexico, one should account for Mexican risk by adjusting the expected cash flows and then discounting these cash flows by applying a weighted-average cost of capital, a method which would apply to similar telephone assets residing in the United States. This approach was not applicable primarily because analysts had no rational way of adjusting cash flows to reflect country risk, such as Mexico's.

As an alternative method, Salomon Brothers recommended a strategy of adjusting the weighted-average cost of capital. Intuitively, we argued, in a virtually integrated global capital market, the risk associated with the Mexican telephone asset example consists of two building blocks: (1) a U.S. telephone asset risk, and (2) the risk associated with an investment in Mexico. We further argued that a U.S. telephone asset risk would be estimated by analyzing returns on U.S. telecommunications companies, while the risk of an investment in Mexico would be estimated by analyzing returns on Mexican Bradys or Yankees.¹

In this report, we empirically test the hypothesis that we proposed in 1991 and reiterated in 1994, based on available data. We conclude that our empirical results justify our methodology. Moreover, we present a few examples where we apply the statistical evidence to estimate the cost of equity for three Latin American companies.

¹ For a detailed description of our methodology, see *The Executive's Guide to International Capital Budgeting: 1994 Update*, Niso Abuaf et al., Salomon Brothers Inc, August 1994.

WEIGHTED-AVERAGE COST OF CAPITAL

Salomon Brothers's Approach to Discount Rates

The discount rate or hurdle rate that correctly accounts for **business** and **financial** risks is the investment's after-tax **weighted-average cost of capital (WACC)**.

Salomon Brothers employs a building-block approach to determine the discount rate for each of the major business segments of an investment opportunity.

Our approach integrates elements of a U.S. dollar-based capital asset pricing model (CAPM) approach with data indicative of the risks inherent in an investment in a given industry and in a given country.

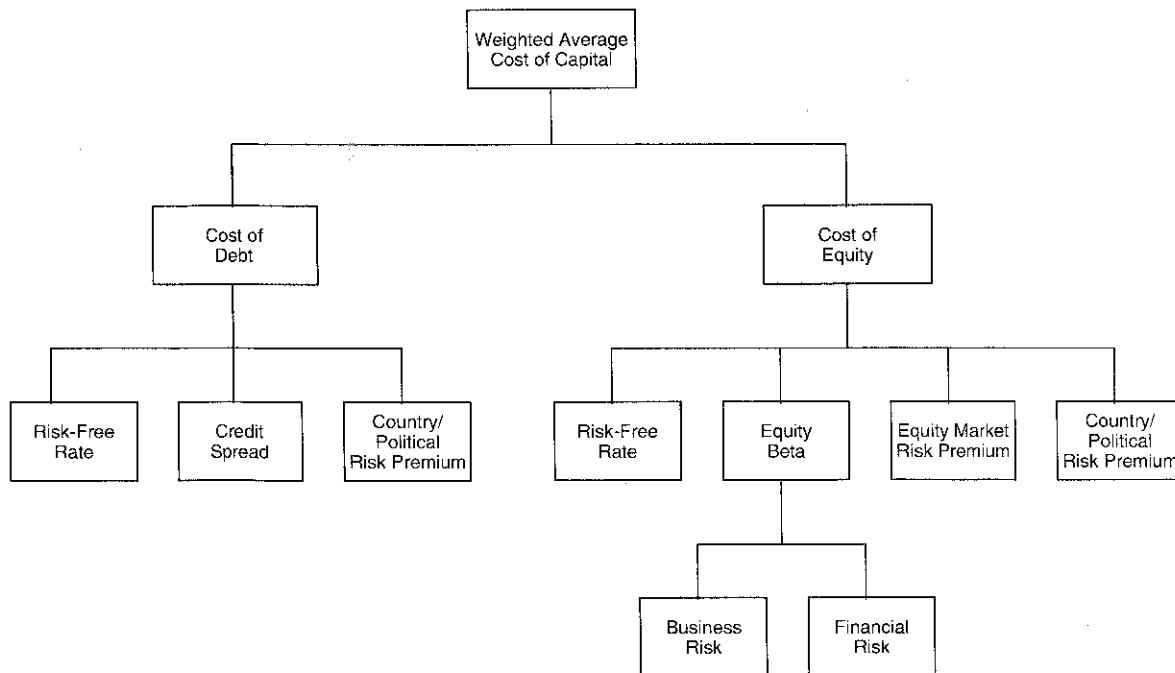
Although discounted cash flow analysis (DCF) enables the investor to consider both transaction and country-specific factors, it requires a specifically tailored approach to give effect to relevant country or political risks, local economic and market conditions and outlook, and exchange rate issues specific to local markets.

Discount Rate = WACC for a Particular Investment

Finance theory holds that the proper discount rate for any investment undertaken by a firm is the cost of capital associated with that particular investment. Discount rates for the firm as a whole or for other types of investments within the firm are not appropriate.

The cost of capital is the return expected by investors as compensation for bearing risk. As such, the cost of capital for a particular investment should reflect **only** the risk of that investment.

Figure 1. Components of the Cost of Capital



Political Risk Premium: Concept

The political risk premium represents the incremental return investors require for use of their funds in international investments and represents **non-systematic** risks, such as expropriation, currency blockage, and other political acts that would reduce the present value of an investment.

Political Risk Premium: Practice

When the fixed-income markets are well developed for a specific country, we examine the spreads between dollar-denominated Yankee, Euro, and Brady bonds and U.S. Treasuries, which are representative of the incremental return required by investors for lending to an international entity. Such estimates capture the market's view of an appropriate political risk premium. In cases where there are no liquid dollar-denominated securities traded, we rely on a proprietary political risk premium model, as well as qualitative factors.

Yankee and Euro Bonds

Yankee and Euro bonds are typically short-duration, dollar-denominated securities issued by sovereigns or high-quality corporations in the international capital markets. Their yields and spreads to comparable maturity U.S. Treasuries are easily observable in the market. Examining a cross section of these bonds usually provides sufficient data to estimate the long-term political risk premium in a particular country.

Brady Bonds

Brady bonds are restructured loans of governments that, in general, have their next two coupon payments and principal guaranteed by high-quality (AA or better) corporate bonds, and U.S. Treasuries, respectively. The remaining payments represent pure sovereign risk and comprise the "stripped yield" of the security. The combined cash flows represent the "cash flow yield." The stripped spreads to U.S. Treasuries for Brady Bonds are usually higher than spreads on Yankee and Euro Bonds. However, when utilizing Brady bonds, the stripped spread may overstate the true political risk premium because the risk of expropriation is usually less than the default risk of sovereign entities.

A prudent combination of the Yankee and Euro bond spreads and Brady Bond stripped spreads comprise the lower and upper bound of our political risk premium estimate.

Proprietary Political Risk Premium Model

In cases where there are no liquid dollar-denominated securities traded, we rely on a proprietary political risk premium model and on judgmental factors.

THE EMPIRICAL EVIDENCE

More than half of a decade after our proposed solution, we now have enough data to test our hypothesis that the cost of capital — or equity — of a project in an emerging economy is a function of the project-specific cost of capital worldwide and the specified emerging economy's global borrowing cost.

Figure 2 presents the regression results of returns on emerging market American Depository Receipts (ADRs) as a function of returns on the S&P 500 and returns on various Latin American Brady or Yankee bonds.

The overwhelming conclusion arising from Figure 2 is that returns on the emerging country bonds significantly affect returns on various Latin equities.

Figure 2. Sensitivities (Betas) of Emerging Market ADRs to the S&P 500 and Corresponding Bonds

	S&P 500 Coefficient (T-statistic)	Bond Coefficient (T-statistic)	Adjusted R ²	YTD Average Trading Volume (shares)	Time Period	Country
Telmex	0.813 (9.289)	0.750 (16.816)	27.5%	3,024,181	5/17/91-9/06/96	Mexico
Tribasa	0.799 (3.392)	1.180 (12.210)	22.4%	657,160	9/24/93-9/06/96	Mexico
ICA	0.680 (4.446)	1.039 (14.531)	21.9%	410,055	6/19/92-9/06/96	Mexico
Dina	0.502 (2.046)	1.199 (11.295)	16.0%	145,428	3/31/93-9/06/96	Mexico
Bufete	0.408 (1.789)	0.804 (8.638)	12.2%	50,956	11/5/93-9/06/96	Mexico
TAR	0.882 (7.462)	0.812 (23.638)	54.4%	709,440	3/11/94-9/06/96	Argentina
TEO	0.751 (5.035)	0.763 (20.207)	53.3%	159,167	12/9/94-9/06/96	Argentina
Galicia	0.561 (3.811)	0.870 (19.325)	36.2%	261,659	7/2/93-9/06/96	Argentina
Banco Frances	0.883 (5.203)	0.759 (15.041)	30.8%	151,412	11/24/93-9/06/96	Argentina
YPF	0.682 (7.024)	0.437 (14.714)	29.8%	1,146,169	7/2/93-9/06/96	Argentina
TGS	0.606 (3.649)	0.504 (11.738)	27.9%	77,272	11/18/94-9/06/96	Argentina
Baesa	0.385 (2.213)	0.488 (9.004)	10.7%	108,375	5/6/93-9/06/96	Argentina
Aracruz	0.364 (2.783)	0.680 (8.297)	7.4%	158,111	5/29/92-9/06/96	Brazil
Cemig	0.108 (0.507)	0.940 (3.347)	3.6%	NA	3/28/95-9/06/96	Brazil
CTC	0.499 (8.218)	0.004 (0.034)	4.2%	124,979	7/20/90-9/06/96	Chile
Enersis	0.696 (5.260)	0.183 (0.871)	3.9%	145,956	10/20/93-9/06/96	Chile
Cerveceria Unidas	0.648 (5.640)	0.422 (2.100)	3.6%	63,600	9/24/92-9/06/96	Chile
Química Y Minera	0.467 (4.291)	0.015 (0.085)	2.4%	46,147	9/21/93-9/06/96	Chile
Madeco	0.524 (3.945)	0.284 (1.324)	2.2%	60,314	5/28/93-9/06/96	Chile
Laboratorio Chile	0.324 (1.726)	0.815 (2.294)	1.5%	22,965	6/29/94-9/06/96	Chile
Chilgener	0.302 (2.183)	0.299 (1.148)	1.1%	117,009	7/19/94-9/06/96	Chile
Corimon	0.302 (1.000)	0.277 (2.596)	1.1%	30,956	3/23/93-2/13/96	Venezuela
Ganadero	0.085 (0.494)	0.124 (0.629)	0.0%	10,121	11/15/94-9/06/96	Colombia

Notes: Data are daily. The following are the names of the companies abbreviated above: ICA (Empresas ICA S.A.); Tribasa (Grupo Tribasa S.A. de C.V.); Telmex (Teléfonos de México); Dina (Consorcio G Grupo Dina S.V. de C.V.); Bufete (Bufete Industrial S.A.); TEO (Telecom Argentina S.A.); TAR (Telefónica de Argentina S.A.); Banco Francés (Banco Francés del Río de la Plata S.A.); Galicia (Banco de Galicia y Buenos Aires); YPF (YPF S.A.); TGS (Transportadora de Gas del Sur S.A.); Baesa (Buenos Aires Embotelladora S.A.); CTC (Compañía de Teléfonos de Chile S.A.); Enersis (Enersis S.A.); Cervecerías Unidas (Compañía Cervecerías Unidas S.A.); Química Y Minera (Química Minera Chile S.A.); Madeco (Madeco S.A.); Laboratorio Chile (Laboratorio Chile); Chilgener (Chilgener S.A.); Aracruz (Aracruz Celulose S.A.); Cemig (Cemig S.A.); Corimon (Corimon S.C.A.); Ganadero (Banco Ganadero S.A.). The following representative bonds were used for each country: Mexico Par Bonds (6.25% of 12/31/2019); Argentina FRBs (6.625% of 3/31/2005); Chile RST CB (4.375% of 12/01/2005); Brazil IDU (6.6875% of 1/1/2001); Republic of Colombia (7.25% of 2/23/2004); and Venezuela Par Bonds Series A (6.75% of 3/31/2020). In each figure, regression results are ordered in descending R².

Source: Salomon Brothers Inc.

With seven exceptions (TAR, TEO, TGS, Cemig, Laboratorio Chile, Chilgener, and Ganadero), the regressions in Figure 2 span the pre-1994 (Tequila effect) and the post-1994 Latin American markets. Some of the broad facts which emerge from Figure 2 are described below.

Mexico. With the exception of Bufete — which has a low trading volume — all Mexican company returns statistically depend on the S&P 500. In addition, all of the Mexican returns are statistically and strongly dependent on Mexican Brady Bond returns.

Argentina. Typically, companies better known by U.S. and international investors (as reflected in their high trading volumes) tend to have stronger correlations with the S&P 500, as reflected by larger T statistics. All of the Argentine equity returns are statistically and strongly dependent on Argentine Brady Bond returns.

Brazil. Returns on the Brazilian paper company — Aracruz — are borderline dependent on the S&P 500 and strongly dependent on Brazilian Brady Bonds. A more extreme example is Cemig, which is even more dependent on the Brady Bonds and less so on the S&P 500.

Chile. Returns on somewhat deeply traded Chilean companies such as CTC and Enersis — similar to returns also on the deeply traded Telmex, TAR and YPF — are strongly dependent on the S&P 500. Chilean ADR returns are independent of Chilean bonds.

Venezuela. Returns on Corimon are not dependent on the S&P 500 and are only marginally dependent on Venezuelan Brady Bonds. However, regressions run on weekly data — which are not included in this report — indicate a stronger dependence on Venezuelan Brady bonds.

Colombia. Returns on Ganadero are not statistically dependent on the S&P 500 or on Colombian bond returns.

Conclusion. Returns on internationally well-known ADRs, as reflected by high trading volumes or widely followed industries, such as telecommunications, are statistically dependent on the S&P 500. With few exceptions, all ADR returns are statistically dependent on the corresponding Brady, Yankee or otherwise U.S. dollar-denominated bonds. The exceptions are Chilean and Colombian ADRs issued by countries which are investment-grade rated by at least one credit-rating agency. This evidence supports our hypothesis that if a country is macroeconomically stable, its ADRs would not be affected by returns on its bonds. Analogously, if a country is macroeconomically unstable, its ADRs would be affected by returns on its bonds.

Figure 3 repeats the same process as Figure 2, but covering only the time period beginning in 1994 and including the 1994 and 1995 Latin American bear equity and bond markets.

Figure 3 leads us to similar conclusions as Figure 2. Internationally better-known companies tend to have equity returns that are statistically dependent on the S&P 500. Countries which have exhibited significant macroeconomic instability beginning in 1994 — such as Mexico, Argentina, and Brazil — have companies with returns that are statistically dependent on Brady Bond returns. This was evident in the Latin American bear market of 1994 and 1995, where Mexican, Argentine and Brazilian equities moved in tandem with their respective Brady bonds.

Figure 3. Sensitivities of Emerging Market ADRs to the S&P 500 and Corresponding Bonds, Jan 94-Sep 96

	S&P500 Coefficient (T-statistic)	Bond Coefficient (T-statistic)	Adjusted R ²	Comments	Country
Telmex	0.670 (5.140)	0.824 (15.370)	34.6%		Mexico
ICA	0.701 (3.286)	1.117 (12.736)	25.2%		Mexico
Tribasa	0.822 (3.376)	1.175 (11.734)	22.7%		Mexico
Dina	0.536 (1.842)	1.212 (10.118)	16.4%		Mexico
Bufete	0.395 (1.701)	0.798 (8.352)	11.9%		Mexico
TAR	0.882 (7.462)	0.812 (23.638)	54.4%	3/11/94-9/06/96	Argentina
TEO	0.751 (5.035)	0.763 (20.207)	53.3%	12/9/94-9/06/96	Argentina
Galicia	0.634 (3.938)	0.867 (18.206)	37.7%		Argentina
YPF	0.703 (7.062)	0.436 (14.797)	33.7%		Argentina
Banco Frances	0.886 (5.161)	0.759 (14.933)	31.3%		Argentina
TGS	0.606 (3.649)	0.504 (11.738)	27.9%	11/18/94-9/06/96	Argentina
Baesa	0.485 (2.476)	0.496 (8.550)	12.3%		Argentina
Aracruz	0.298 (1.797)	0.984 (9.665)	14.1%		Brazil
Cemig	0.108 (0.507)	0.940 (3.347)	3.6%	3/28/95-9/06/96	Brazil
CTC	0.810 (6.795)	0.079 (0.423)	6.2%		Chile
Cerveceria Unidas	0.801 (5.505)	0.433 (1.891)	5.0%		Chile
Enersis	0.665 (4.893)	0.170 (0.797)	3.6%		Chile
Madeco	0.542 (3.738)	0.253 (1.108)	2.3%		Chile
Quimica Y Minera	0.441 (3.973)	0.001 (0.004)	2.3%		Chile
Laboratorio Chile	0.324 (1.726)	0.815 (2.294)	1.5%	6/29/94-9/06/96	Chile
Chilgener	0.302 (2.183)	0.299 (1.148)	1.1%	7/19/94-9/06/96	Chile
Corimon	0.724 (1.953)	0.189 (1.543)	1.3%		Venezuela
Ganadero	0.085 (0.494)	0.124 (0.629)	0.0%	11/15/94-9/06/96	Colombia

Notes: Data are daily. In each figure, regression results are ordered in descending R².
Source: Salomon Brothers Inc.

To establish a benchmark for our analysis, we report regression results of returns on several well-known U.S. companies in Figure 4. The results strongly indicate that U.S. equity returns are statistically dependent on S&P 500 returns, but are independent of U.S. Treasury Bond returns. Therefore, this benchmark study underscores the importance of emerging market bond returns in determining emerging market equity returns.

Figure 4. Sensitivity of Well-Known American Stocks to the S&P 500 and U.S. Treasury Bond, 1 Jan 93-9 Sep 96^a

	S&P 500 Coefficient (T-statistic)	Bond Coefficient (T-statistic)	Adjusted R ²	YTD Average Trading Volume (shares)
General Electric	1.343 (10.540)	-0.049 (-0.421)	42.8%	2,155,595
AT&T	1.069 (6.768)	0.124 (0.852)	26.5%	2,423,093
Exxon	0.641 (5.164)	0.034 (0.299)	16.0%	1,264,373
Microsoft	1.319 (5.511)	-0.504 (-2.290)	13.4%	4,376,937
General Motors	0.926 (3.931)	0.023 (0.106)	9.3%	2,400,444

^a The 8.75% of 8/15/2020.

Note: Data are weekly. In each figure, regression results are ordered in descending R².

Source: Salomon Brothers Inc.

The results reported in this presentation can be used as confirmation that our methodology for determining an international cost of equity is valid. As previously stated, the estimation process relies on the following building blocks, which represent the modified capital asset pricing model:

- Risk-free rate;
- The expected excess return on the S&P 500 (equity market risk premium);
- The estimated S&P beta (S&P's regression coefficient) for the given company; and
- The expected political risk premium derived from observing the fixed-income markets.

Figure 5. Estimating the Cost of Equity for Selected Companies

Company	Risk Free Rate	Equity Market Risk Premium (%)	S&P Beta	Political Risk Premium	Cost of Equity
Telmex	6.5%	7.4%(a)	0.81	2.0%	14.5%
				4.0%	16.5%
TAR	6.5%	7.4%(a)	0.88	3.0%	16.0%
				5.0%	18.0%
YPF	6.5%	7.4%(a)	0.68	3.0%	14.5%
				5.0%	16.5%

^a A range of 5.0% - 7.5% is generally accepted by practitioners as a reasonable range for the EMRP. At Salomon Brothers, as a first step our recommendation is 7.4%.
Source: Salomon Brothers Inc.

In addition, the regression results reported in Figures 2 and 3 may be used to estimate the expected cost of equity for the selected companies. The estimation process relies on the following building blocks:

- The expected return on the S&P 500;
- The estimated S&P beta (S&P's regression coefficient) for the given company;
- The expected yield on the corresponding Brady or Yankee bond;
- The estimated Brady beta (the Brady bond's regression coefficient); and
- A standard deviation associated with the Brady beta (in practice, two times the standard deviation).

Figure 6. Estimating the Cost of Equity for Selected Companies

	Expected S&P 500 Return	S&P Beta	Brady Beta	Expected Brady Yield	Cost of Equity	
Telmex	12%	0.81	0.75 (0.04) ^a	9.94%	17.21%	± 0.89%
	13				18.02	± 0.89
	14				18.84	± 0.89
TAR	12	0.88	0.81 (0.03)	13.17	21.28	± 0.91
	13				22.16	± 0.91
	14				23.04	± 0.91
YPF	12	0.68	0.44 (0.03)	13.17	13.94	± 0.78
	13				14.62	± 0.78
	14				15.30	± 0.78

^a Standard deviation of Brady beta equals the regression coefficient divided by the t - statistic of estimate, as reported in Figure 1. This estimate, however, has to be adjusted for yield volatility.
Note: A purist would also apply a standard deviation to the S&P 500 beta. We do not follow that method for the sake of simplicity.
Source: Salomon Brothers Inc.

CONCLUSIONS

We find statistical evidence that well-traded Latin American ADR returns statistically depend on the S&P 500. In addition, returns on ADRs issued by Latin American countries with significant levels of macroeconomic and political instability (such as Mexico, Argentina and Brazil) statistically depend on corresponding Brady bond returns. Based on these statistical findings, we conclude that Latin American ADR returns are a function of the S&P 500 and Brady bond returns.

We believe that this conclusion supports our previous recommendations that the cost of capital for a project in an emerging economy is a function of the global cost of capital for that project and of the specific country's borrowing cost. Consequently, we reiterate some of our previous recommendations:

- In estimating an international cost of capital, additional adjustments have to be made for political risk, particularly when analyzing projects in emerging countries. Such risk includes currency inconvertibility, expropriation, civil unrest and institutional instability.
- When estimating political risk, an analyst should rely on fixed-income risk premiums on a given country's convertible currency (for example, the U.S. dollar, Deutschemark or Japanese yen), public debt (Brady or Yankee bonds) or bank loans. As an example, in Figure 6, we demonstrate that the cost of equity for YPF ranges from 13.84%-15.40% (assuming a 13% expected S&P 500 return).

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