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A Practical Approach to Calculating Emerging Market Costs of Equity

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Agenda

- Why firms might need international cost of capital estimates.
- A framework to generate benchmark, cost of equity estimates.

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Why International Costs of Capital?

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International Activities

- Cross-border investments face a host of unique risks, including
  - tax, regulatory, and legal uncertainties,
  - currency regime uncertainties, and
  - macroeconomic, political, and business uncertainties.
- To allocate resources effectively, it is critical to *understand*, *measure*, and *value* these risks.

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Investment/Performance Analysis

$$Valuation = \underbrace{-\$70m}_{\substack{Capital\ /\\ Investment}} + \underbrace{\frac{\$25m}{(1+r_{Mexico})^{1}}}_{year\ 1} + \underbrace{\frac{\$25m}{(1+r_{Mexico})^{2}}}_{year\ 2} + \ldots$$

- Issues:
  - Cash flows … how good are our estimates?
  - The discount rate … what is r_{Mexico} ?
  - The big question … what are the relevant risks?

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Cash Flows

- Scenario analysis can be useful in assessing risks.
  - Insights into consequences of specific “events”
    - financial crises
    - currency devaluation
    - bouts of hyperinflation, etc
  - Insights into break-even levels, critical thresh-holds ultimate viability of activity.
- However, even with scenario analysis, need appropriate, *risk-adjusted discount rates*.

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Risk-Adjusted Discount Rates

- Risk-adjusted discount rates used for a variety of purposes, such as:
  - Discounting expected/possible cash flows (NPV analysis);
  - Acting as benchmarks/hurdle rates for investments in specific countries/sectors;
  - Assessing the relative values of investments, or the relative performance of business units, across countries.
- These risk-adjusted discount rates the focus of the remainder of this session.

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A Framework to Generate Cost of Capital Estimates

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Goals

- A useful framework should:
  - generate *benchmark* cost of equity estimates.
    - capture the relevant risks of cross-border investments.
  - prove systematic and applicable to a large number of countries;
  - be easy to understand.

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Issues ~ What Currency Perspective?

- Foreign currency:
  - Evaluate flows denominated in foreign currency.
  - No *explicit* consideration of currency trajectory.
- Base currency (e.g., USD):
  - Translate flows into USD, then evaluate.
  - Explicit consideration of currency effects.
    - Permits consideration of alternative scenarios.
  - Greater availability of relevant data?
  - Permits comparison to domestic cost of capital.
- If analysis performed correctly, currency perspective should not matter.
- As “reasonableness check,” perform analysis both ways.

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Issues ~ What Framework?

- As a starting point, we might begin with the Capital Asset Pricing Model (CAPM).
  - Under CAPM, expected return is equal to (1) a risk-free rate, plus (2) an equity premium, defined as the asset's beta times the market risk-premium.

$$E(R_i) = \underbrace{R_f}_{\substack{risk\\ free\\ rate}} + \beta_i \quad * \quad \underbrace{(R_m - R_f)}_{\substack{risk\\ premium =\\ expected\ market\\ return\ less\\ risk\ free\ rate}}$$

    - The market risk-premium is the amount by which the market is expected to outperform the risk-free rate.

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What Framework?

- Query ~ Is it appropriate to use standard CAPM to determine country-specific discount rates?
  - Theoretical concern … Does the framework capture the risks of potential "regime" changes and transfer risks?
  - Practical considerations … do the results yielded by simple CAPM seem appropriate?
- On both grounds, we suggest modifications to a standard CAPM.

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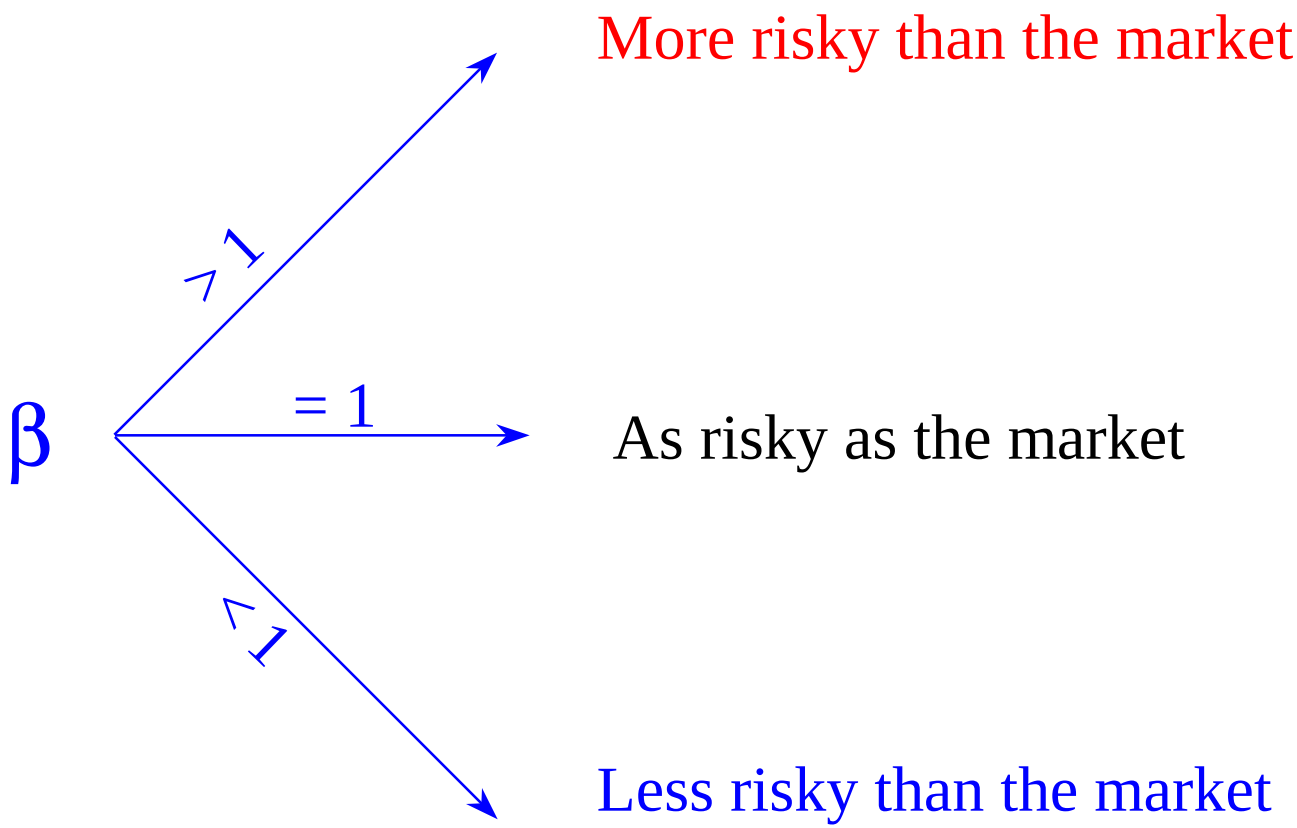
What Framework?

- Interpretation of Beta:



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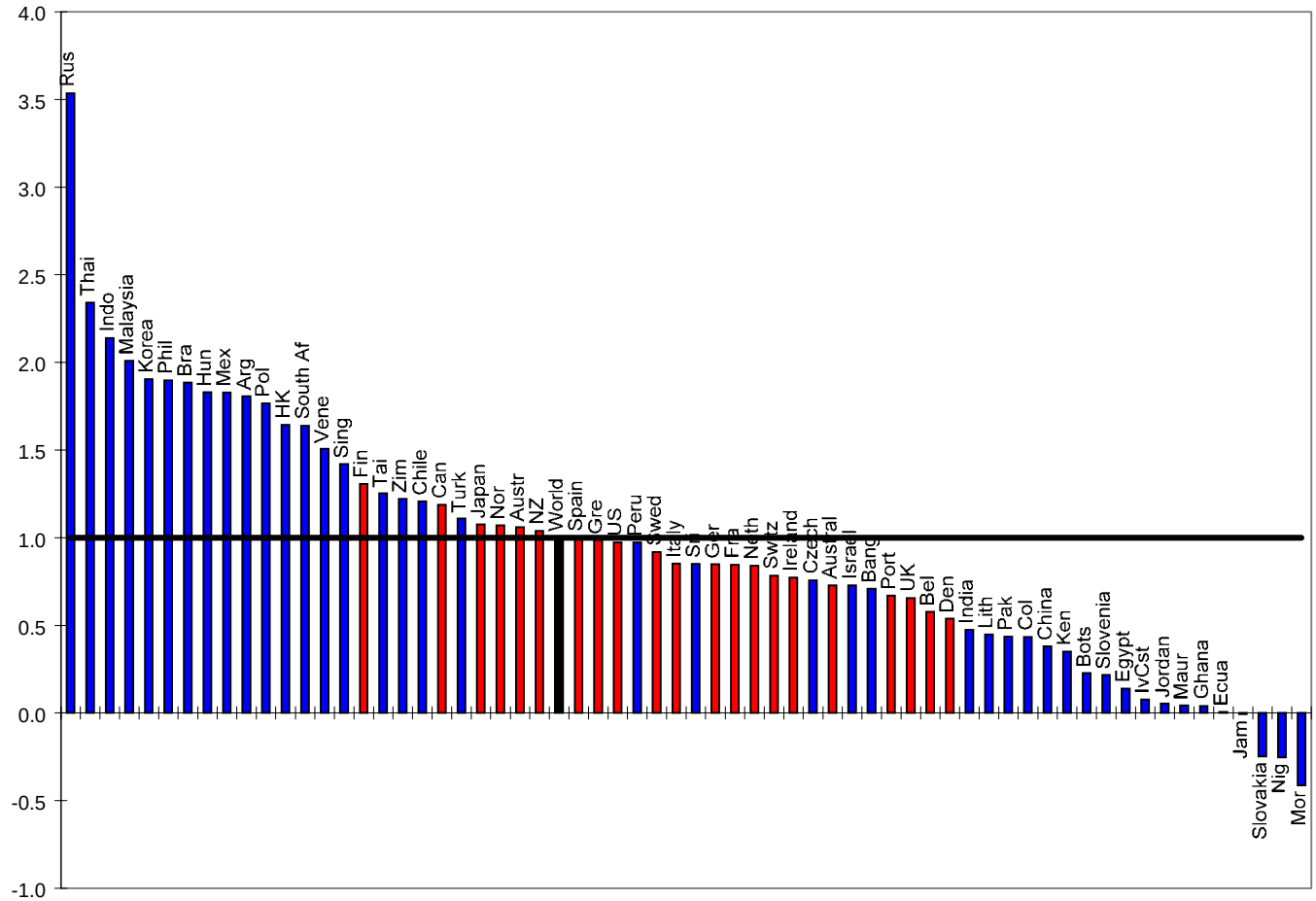
What Framework?

- Estimated country/equity betas yield surprising results:
  - many (especially emerging market) betas less than 1
    - "risk" of foreign investments/activities (even emerging markets) relatively easily diversifiable?
  - many emerging market betas lower than those for developed countries
    - relatively less non-diversifiable risk?

What Framework?

Estimated Country Betas (CAPM)



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What Framework?

- Beta in CAPM:

$$\beta = \text{correlation}\,(r_i, r_m) \times \sigma_i/\sigma_m$$

The correlation between the returns to the asset/project and the market

The ratio of the volatility of the asset/project to the volatility of the market.

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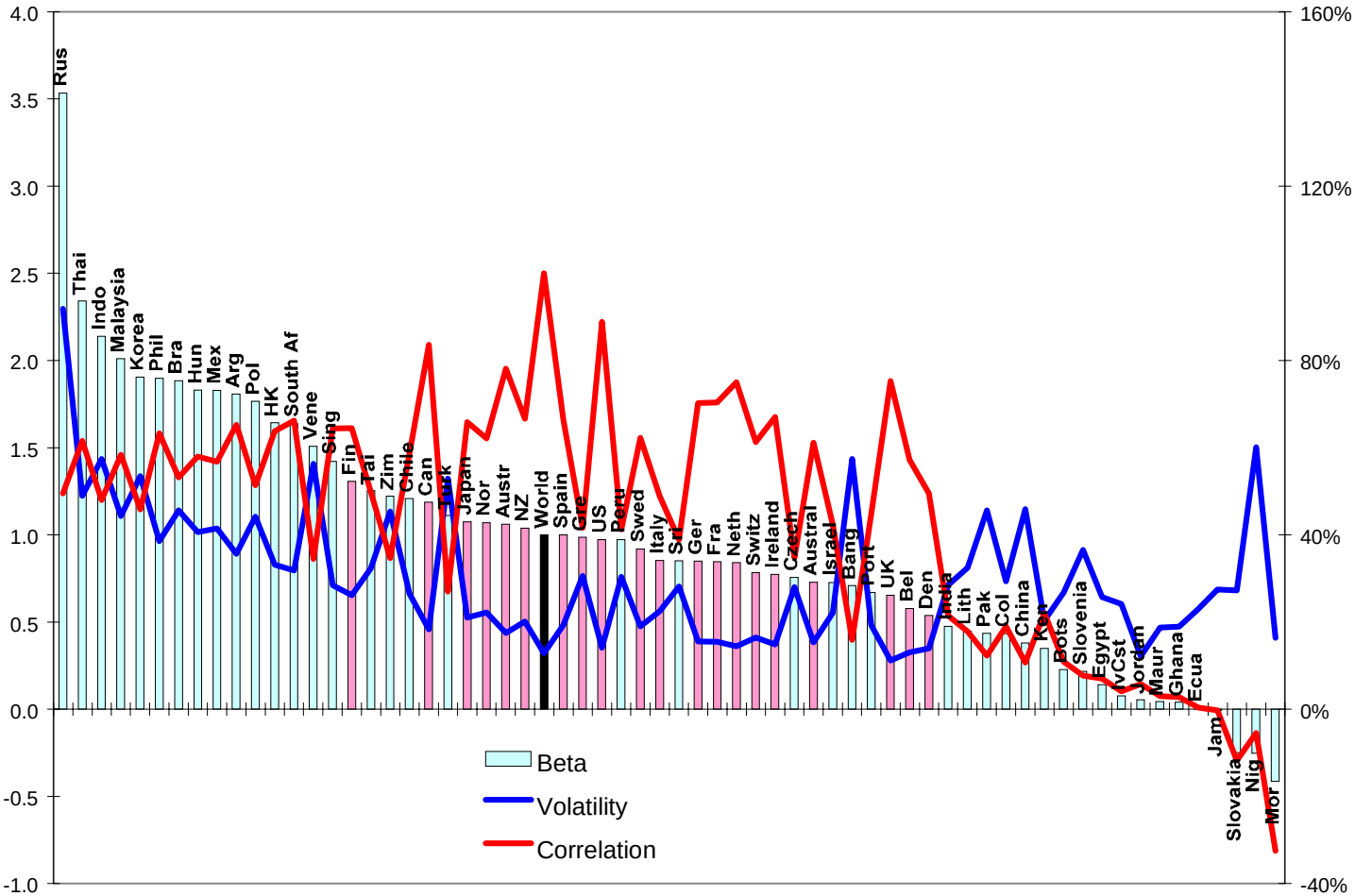
What Framework?

Volatility and Correlation



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What Framework?

- The “low” betas for many foreign countries reflect a combination of:
  - comparable or even high equity market volatility (especially in some emerging markets), and
  - *low correlation* (especially for some emerging markets) with the global market.
- In general, low estimated betas tend reflect low measured correlation.

What Framework?

- Query ~
  - Does low correlation represent potential to diversify away risks?
  - Or, does it suggest market segmentation, a potential risk?
- To the extent that low correlation reflects market segmentation, then
  - standard beta provides biased (low) estimate of the risk associated with foreign market,
  - risk premium calculated using standard beta will be too low.
- But, what alternative?

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Proposed Framework

- Incorporate several adjustments to standard CAPM:

$$R_i = R_{f,US} + \text{Credit Spread}_i + \beta_{a\,i} \times \text{Risk Premium}_m$$

USD risk-free interest rate

Spread to reflect the credit quality of country i

Adjusted beta for country i

Market risk premium

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Implementing the Framework

- Credit Spreads:
  - Spreads on sovereign debt *denominated in hard/reserve currencies* can provide insight into the appropriate credit spread
  - Sources of credit spread information
    - Global, Euro, Dragon bonds
    - Yankee issues
    - Brady bonds

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Implementing the Framework

- Assessment of relevant credit spread requires some judgment because
  - Across countries, actual issues differ in tenor, duration, liquidity, and other terms and characteristics.
  - Yields, and therefore yield spreads, change over time.
  - Many countries have not issued traded, “hard” currency (i.e., USD) denominated debt.

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Implementing the Framework

- Adjusted beta:
  - Step 1: Modify traditional beta to deal with low correlations of markets across countries.

    To that end, define a variable *v* as:

    v_i = vol of foreign market$_i$ ÷ vol of US market

    $= \sigma_i/\sigma_m$

  - Motivation:
    - Consider the foreign market as a leveraged version of the market portfolio
      - Leverage scales up the "risk" of the market portfolio.
      - What effect on expected return?

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Implementing the Framework

- The effect of leverage:

	Volatility	Expected return
$1 invested in the market:	σ_m	r_m
$1+δ invested in market:	$(1+\delta)\,\sigma_m$	$r_m + \delta(r_m - r_{f,USD})$
(δ borrowed)		$r_{f,USD} + (1+\delta)(r_m - r_{f,USD})$

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Implementing the Framework

- Leverage continued:
  - If we choose δ so that:

vol of leveraged market portfolio = vol of foreign market,

or, $$(1+\delta)\,\sigma_m = \sigma_i$$

so, $$(1+\delta) = \sigma_i / \sigma_m = \nu_i$$

then, the expected return to the portfolio is:

or, $$r_p = r_{f,US} + (1+\delta)(r_m - r_{f,US})$$

or, $$r_p = r_{f,US} + (\sigma_i / \sigma_m)(r_m - r_{f,US})$$

or, $$r_p = r_{f,US} + \nu_i (r_m - r_{f,US})$$

- So, with leverage as a proxy for foreign risk, we might use ν_i as an adjusted beta.

Implementing the Framework

- Adjusted beta
  - Step 2: Even using v_i, is there a risk of double counting, in the sense that economic and political developments may affect a country's credit spread *and* the volatility of its equity market?
  - To deal with potential "double counting," we propose an additional adjustment to v_i:

$$\beta_{a,i} = 0.6\, v_i$$
$$= 0.6\, \sigma_i / \sigma_m$$

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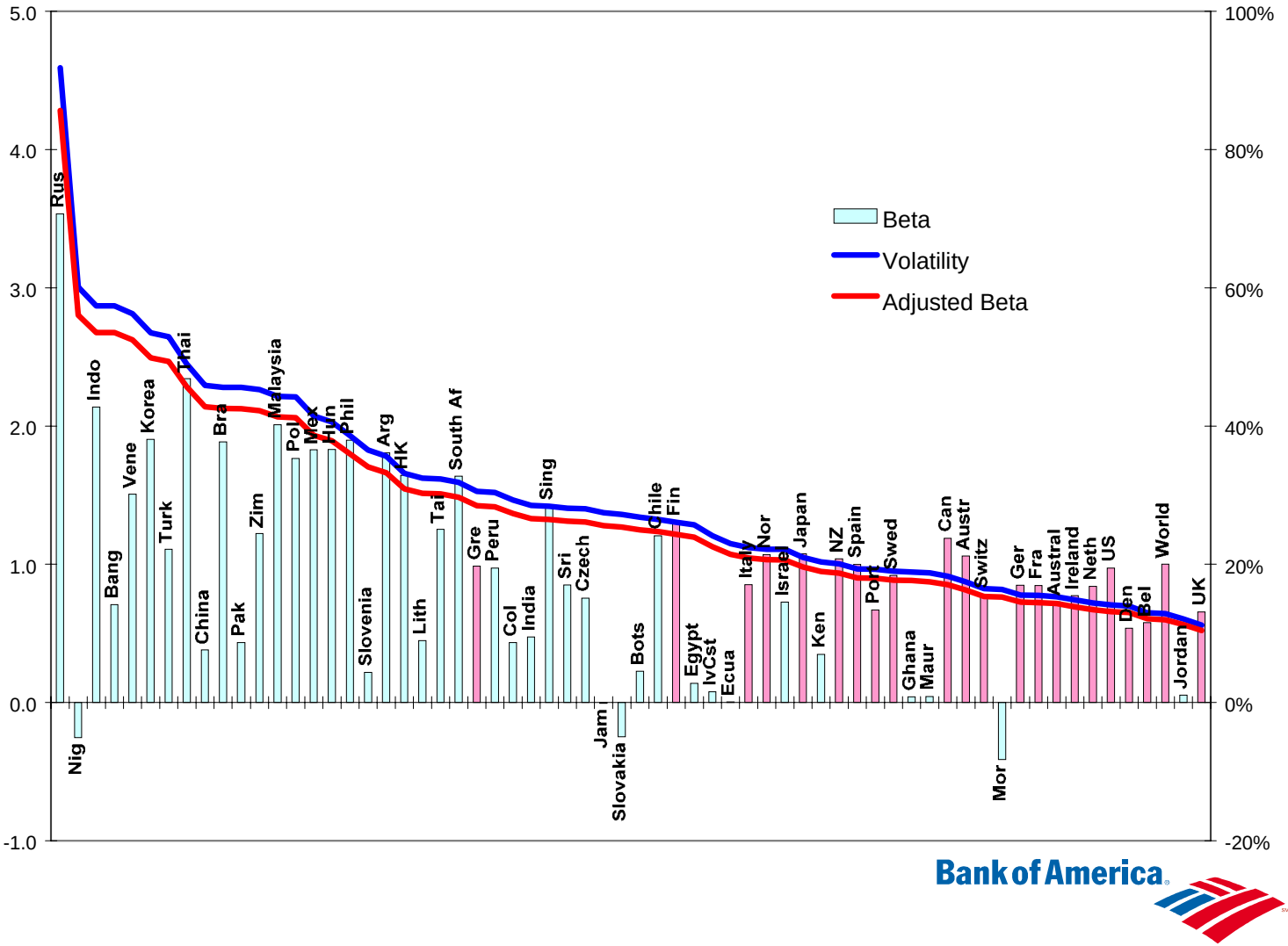
Implementing the Framework

- Adjusted betas:



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Implementing the Framework

- Adjusted betas:
  - Greater than 1.
  - Values for emerging markets tend to exceed those for more developed markets.

Implementing the Framework

- Data limitations:
  - Some countries do not have traded, hard currency denominated debt.
  - Some countries may not have equity markets (or deep, liquid) markets.

Implementing the Framework

- Data limitations:
  - To overcome the absence of data, use a *yardstick* for country risk
    - Country ratings.
    - Surveys of Country Risk--Institutional Investor, Euromoney, etc.
  - Using the yardstick, assign countries to tiers
    - In each tier, some countries will have hard-currency debt and equity markets.
    - Determine an average credit spread and an average adjusted beta for each tier.
    - Assign specific spread and adjusted beta to each country, based upon where the country falls in its tier.

Proposed Framework

- Incorporate several adjustments to standard CAPM:

$$R_i = R_{f,US} + \text{Credit Spread}_i + \beta_{a\,i} \times \text{Risk Premium}_m$$

US risk-free interest rate

Spread to reflect the credit quality of country i

Adjusted beta for country i

US market risk premium

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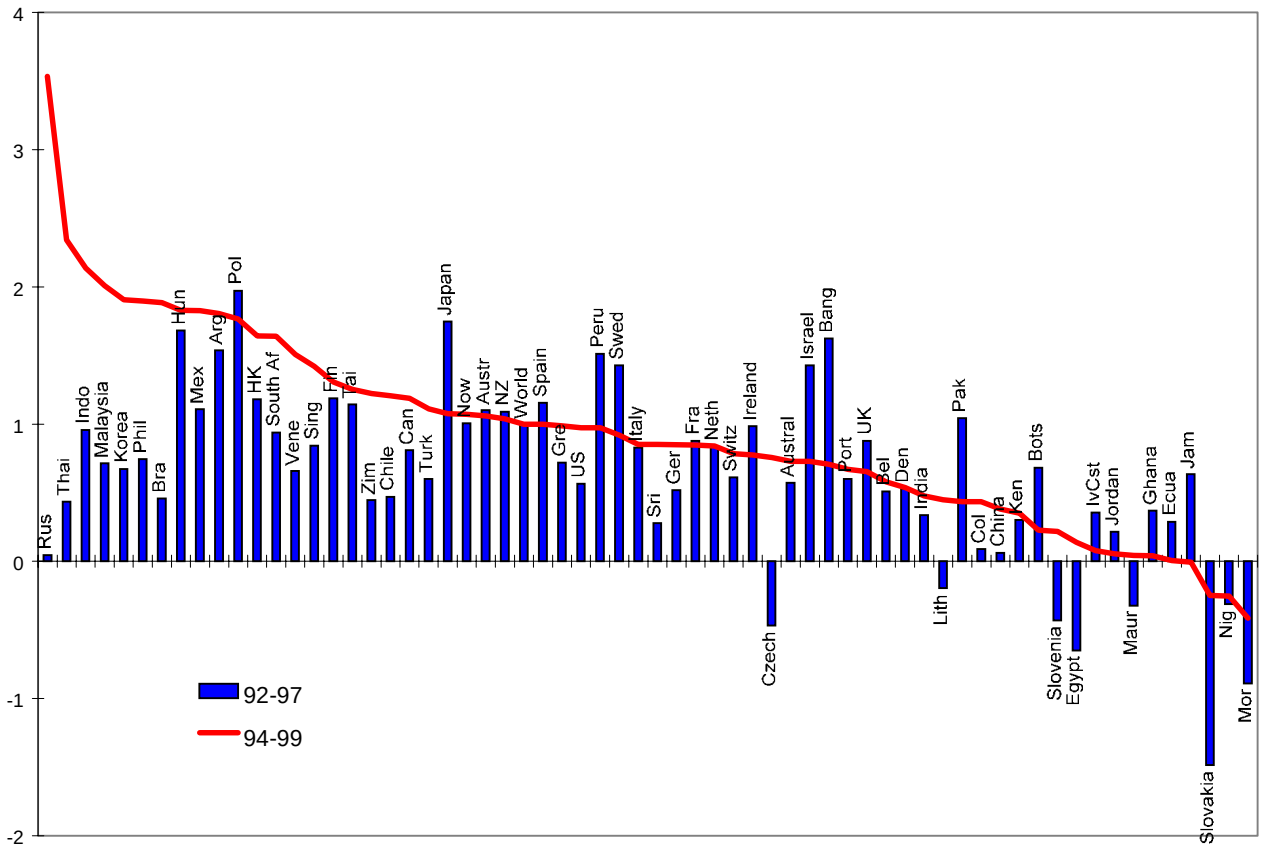
Summary

- To calculate benchmark estimates of the cost of capital for foreign investments or activities, begin with CAPM.
- Make several adjustments:
  - add a credit spread for the country in question,
  - beta to equal 0.6 times country's relative volatility
  - incorporate additional sector/industry factor.

Appendix

- Model performance over time:

Estimated CAPM Betas



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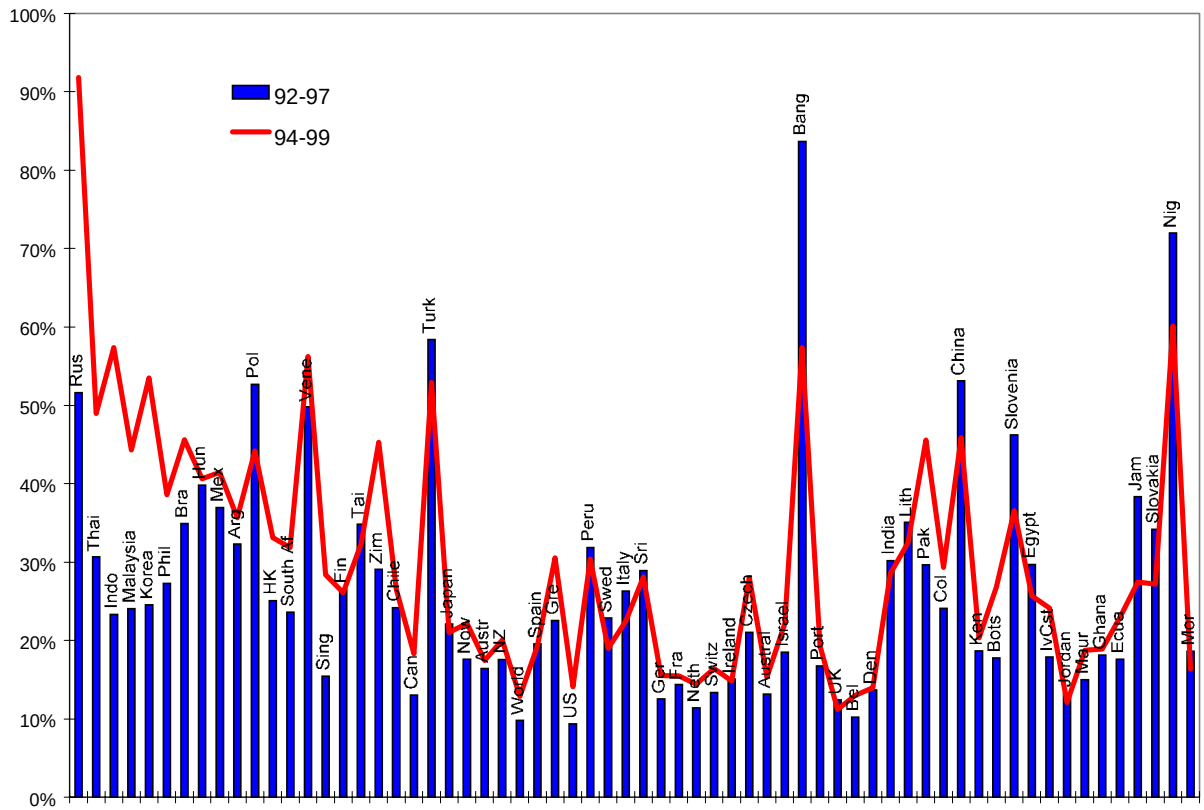
Appendix

- Model performance over time:
  Slightly Changed Volatilities



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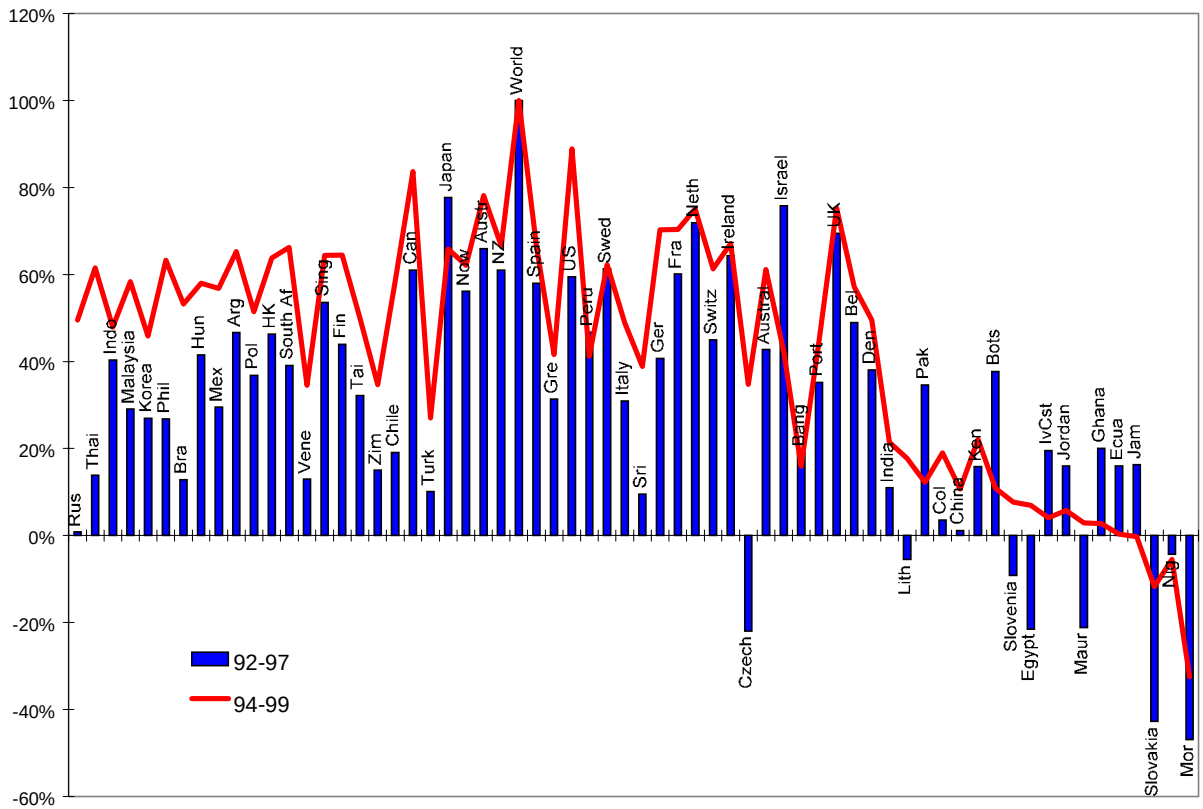
Appendix

- Model performance over time:
  Plus Changes in Correlation



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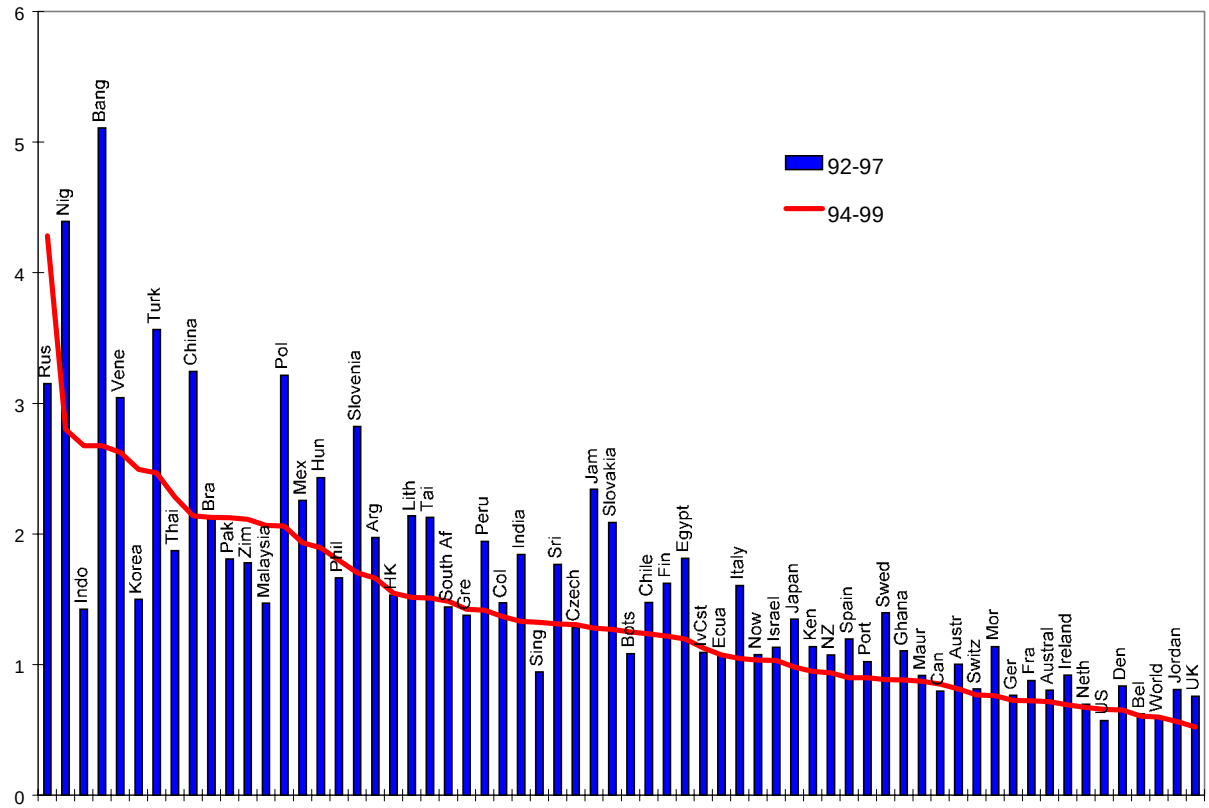
Appendix

- Model performance over time:

  Changes in Adjusted Beta



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