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Applied Corporate Finance

Cross-Border Valuation

Rui Silva

Plan Of Attack

- Basic Parity Relationships: A Review
- Evaluating International Investments: Two Methods.
- International CAPM
  - What is the appropriate “market” portfolio?
    - The foreign-market portfolio?
    - The home-market portfolio?
    - The global-market portfolio of all countries?
- Discussion of:
  - Exchange Rate Risk.
  - Country/Sovereign/Political risk.

Basic Parity Relationships: Notation

- $S_{\$£}$ = USD-GBP *spot* exchange rate.
  - Number of USD obtained for one GBP.
- $F_{\$£}$ = USD-GBP *forward* exchange rate.
  - A rate agreed today for an exchange of USD for GBP in the future.

- $r_{£}$ = Nominal interest rate on GBP.
- $r_{\$}$ = Nominal interest rate on US.

- $i_{£}$ = UK inflation rate.
- $i_{\$}$ = USA inflation rate.

Basic Parity Relationships

Parity Relationships In *Integrated* Capital Markets

- **Difference** In Nominal Interest Rates: $(1 + r_{\$}) / (1 + r_{£})$

EQUALS

- **Difference** Between Spot and Forward Rate: $F_{\$£} / S_{\$£}$

EQUALS

- **Expected** Change in Spot Rate: $E(S_{\$£}^{t+1}) / S_{\$£}$

EQUALS

- **Expected Difference** In Inflation Rates: $(1 + i_{\$}) / (1 + i_{£})$

$$\frac{1 + r_{\$}}{1 + r_{£}} = \frac{F_{\$£}}{S_{\$£}} = \frac{E\left[S_{\$£}^{t+1}\right]}{S_{\$£}} = \frac{1 + i_{\$}}{1 + i_{£}}$$

Covered Interest Parity (CIP)

- CIP states that the difference in the nominal interest rates for securities of similar *risk* and *maturity* equals the difference between the spot and the forward rates.

$$\underbrace{\frac{1+r_{\$}}{1+r_{£}} = \frac{F_{\$£}}{S_{\$£}}}_{CIP} = \frac{E\left[S_{\$£}^{t+1}\right]}{S_{\$£}} = \frac{1+i_{\$}}{1+i_{£}}$$

- Example:
  - If the pound is expected to depreciate, one GBP will buy fewer USD in 3 months than it does now.
  - The $r_{£}$ must therefore be greater than $r_{\$}$ in order for investors to hold the GBP in spite of its expected depreciation.
- Bottom Line: Arbitrage relationship! Will always hold.

Expectation Theory Of Exchange Rates (1)

- The Expectation Theory of Future Spot Rates states that the difference between the spot and the forward rates equals the expected change in the spot rate.

$$\frac{1+r_{\$}}{1+r_{£}} = \underbrace{\frac{F_{\$£}}{S_{\$£}} = \frac{E\left[S_{\$£}^{t+1}\right]}{S_{\$£}}}_{\text{Expectation Theory}} = \frac{1+i_{\$}}{1+i_{£}}$$

- The relationship is clearly true when the forward rate equals the future spot rate (i.e., there is *no uncertainty*).

$$F_{\$£} = E\left[S_{\$£}^{t+1}\right]$$

- What happens in the presence of uncertainty?

Expectation Theory Of Exchange Rates (2)

- Under the presence of uncertainty:
  - The above relationship holds only approximately.
  - Arbitrage that is risk-less in the absence of uncertainty becomes risky in its presence.

- Note that we can make use of both CIP and the Expectation Hypothesis to obtain the Uncovered Interest Parity (UIP):
  - In the absence of forward exchange rates, an investor can obtain an estimate of future spot rates by using the present spot rate and the difference in interest rates.

$$\frac{1+r_{\$}}{1+r_{£}} = \frac{F_{\$£}}{S_{\$£}} \approx \frac{E\left[S_{\$£}^{t+1}\right]}{S_{\$£}} \Rightarrow E\left[S_{\$£}^{t+1}\right] \approx \frac{1+r_{\$}}{1+r_{£}} S_{\$£}$$

Purchasing Power Parity (PPP)

- If the identical product can be sold in two different markets, and *no restrictions exist on the sale or transportation costs* of moving the product between markets,
  - the product price should be the **same** in both markets.
  - This is an application of the **"Law Of One Price"**.

- If the two markets are two different countries, the product's price may be stated in different currency terms, but the "real" price of the product should still be the same.

$$P^{£} S_{\$£} = P^{\$}$$

- Therefore the exchange rate can be deduced from the relative local product price levels

$$S_{\$£} = \frac{P^{\$}}{P^{£}}$$

Relative Purchasing Power Parity

- *Absolute* PPP connects FX rates to price levels
  - the spot exchange rate is determined by the relative price levels of similar baskets of goods.
- *Relative* PPP connects changes in FX rates to changes in price level.
  - Changes in FX rates are determined by *differences in inflations* (i.e., changes in price levels).

$$\frac{1+i_{\$}}{1+i_{£}} = \frac{E\left[S_{\$£}^{t+1}\right]}{S_{\$£}}$$

Do These Relationships Really Hold?

- Covered Interest Parity – Always Holds
- Expectation Theory of Forward Interest Rates – Not Perfect.
  - forward rates typically exaggerate the likely change in the spot rates.
    - When the forward rate appears to predict a sharp rise (fall) in the spot rate, the forward rate tends to overestimate the rise (fall) in the spot rate.
    - It is not an arbitrage relationship since FX rates are uncertain.
- Purchasing Power Parity – Usually holds over the long run
  - Deviations will always exist because of changing of relative prices within countries due to:
    - Changes in tastes and production.
    - Frictions such as transportation costs, tariffs, and trade barriers.

Evaluating International Investments

Evaluating International Investments

- Suppose a UK company is considering building a plant in the US.
  - The plant will be used to a produce a good that will be sold mainly in the US.
- The cash flows from the plant will be in USD.
- The UK company needs an NPV in GBP in order to assess the project.
- Let's consider two possible methods in order to obtain the NPV in pounds of the project.

Two Methods for Cross-Border Valuation

- Method I [C-D]: **C**onvert all foreign currency cash flows to domestic currency before **D**iscounting.
  - In our example;
    1. Obtain after-tax cash flows in USD.
    2. Convert cash flows to GBP.
    3. Discount as in the case of any other (similar) UK project.
- Method II [D-C]: **D**iscount foreign cash flows using foreign rates and then **C**onvert NPV to domestic currency.
  - Discount after-tax cash flows using appropriate rates.
  - Convert present values at spot exchange rate.
  - In our example;
    1. Obtain cash flows in USD.
    2. Discount at the US cost of capital.
    3. Translate the obtained NPV into GBP at the spot rate.

Executing Method I [C-D] (1)

Convert Foreign Currency Cash Flows To Own Currency

- There are 3 possible ways to determine the exchange rate and the conversion of foreign cash flows to local currency.
  - Version I: Using Forward Currency Rates.
  - Version II: Using Long-Term Interest Rate Parity (UIP).
  - Version III: Using Relative PPP.

Executing Method I [C-D] (2)

- **Version I:** Using Forward Currency Rates.
- **Version II:** Using Long-Term Interest Rate Parity (UIP).
  - The current spot exchange rate is forecasted to change over time by the long-term risk-free interest rate differential.

$$E\left[S_{\$£}^{t+1}\right] \approx \frac{1 + r_{\$}^{LT}}{1 + r_{£}^{LT}} S_{\$£}$$

Executing Method I [C-D] (3)

- **Version III:** Relative PPP.
  - Convert foreign cash flows using expected inflation differentials.

$$E\left[S_{\$£}^{t+1}\right] = S_{\$£}^{t}\frac{1+i_{\$}}{1+i_{£}}$$

  - This method assumes that:
    - The real exchange rate remains constant.
    - Relative price levels between countries remain constant.
    - Goods can be freely traded across borders.
  - While the previous methods rely on *market* interest rates to determine exchange rates forecasts, this method relies on assumptions of *expected inflation*.
    - Therefore, this is likely less reliable.

Method I [C-D]: Discussion

- If the forward rate is available, you should always use it.
- If it is not available, you should use the exchange rate forecast from expectations theory (UIP)
- If you do not have a long-term risk-free interest rate, then use expected inflation differentials
  - May be necessary in countries that do not have a long-term risk-free interest rate.

Note:

- An extra difficulty that often arises with an international valuation concerns taxes**.**
  - Appropriate tax rate depends on the tax laws on the foreign and home country.
  - In practice, an expert on tax conditions will be required.

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Integrated vs. Segmented Markets: International CAPM

Integrated vs. Segmented Markets

- When talking about integrated and segmented markets, we should distinguish between two types of integration:
  - *Product* markets are integrated.
    - PPP holds and there is no exchange rate risk.
  - *Financial* markets are integrated.
    - Investors can buy shares wherever they want.
    - This is often the case.

- When financial markets are integrated, the market portfolio no longer needs to be the home-country portfolio.
  - Investors can diversify some of the risk by buying shares abroad.
  - Therefore, they should use the "global" market portfolio.

Single-Country CAPM (1)

Recall:

- With the standard single-country CAPM, the market portfolio is defined as the aggregate asset holdings of all investors in a particular group in one country.

- This set of investors is assumed to have:
  - "Homogeneous Opportunities": equal access to the same list of assets.
  - "Homogenous Expectations": Equal perceptions about the return characteristics of the assets.

- Because of these homogeneity assumptions, all investors agree about the composition of the tangency portfolio.

Single-Country CAPM (2)

- The beta of a company captures the non-diversifiable risk of a company
  - risk an investor cannot diversify by holding the market portfolio.
- The market portfolio is equal to all assets issued by firms from that country alone.
- Investors diversify their portfolios by holding shares in their *own* country but *cannot diversify by holding shares abroad*.

- Note: β-service companies often provide estimates of betas for various industries using the single-country CAPM.
  - The beta of the UK computer industry is computed by regressing the returns from a portfolio of UK computer firms on the FTSE index.

International CAPM (1)

- If investors have access to international assets, then it is no longer acceptable to use a CAPM-equation with its benchmark portfolio being the local stock index.
  - Such a benchmark omits/ignores:
    - Foreign assets, which represent an important part of the local investor's asset holdings and diversification benefits.
    - A substantial part of the stocks issued by local corporations are, in fact, held by non-residents.
- In integrated capital markets, we wish to determine the expected return on risky assets with respect to the integrated financial market, which will give us a cost of capital.
  - This is the International CAPM (ICAPM)

International CAPM (2)

- We can observe a reasonable proxy for the world market portfolio
  - E.g., the portfolio of the area with free capital movements, which coincides roughly with the OECD.

- A very simple approach would be to interpret the OECD as one huge country and apply the CAPM.
  - Use the OECD market portfolio or other similar index as the benchmark.

- Bottom Line: Amend the single-country CAPM to a global CAPM by replacing the local-market benchmark portfolio with the world market portfolio.

Product Market Integration (1)

Real Exchange Rate Risk

- There is, however, one prominent reason why international asset pricing in integrated capital markets cannot be simply reduced to an as-if-one-country CAPM.
  - Even though international *capital* transactions are unrestricted and have low costs, transactions in the *product* markets are still difficult and costly.
  - These imperfections in the goods market can lead to substantial deviations from relative purchasing power parity and to *real exchange rate risk.*

- This violates the homogeneous expectations assumption of the CAPM
  - All investors *do not agree* on the probability distribution of the (real) asset returns.

Product Market Integration (2)

- In the presence of exchange rate risk, investors in different countries:
  - Will not face the same efficient frontier of risk assets.
  - Will not have the same tangency portfolio.

- Investors will care about not just world-market risk but also about exchange rate risk.
  - This would lead to a two-factor asset pricing model.
  - However, in practice, the correction for exchange rate risk is close to zero, and so the effect of exchange rate risk on the discount rate is often ignored.

- Bottom Line: Product Market segmentation can result in real exchange rate risk, which we will largely ignore since it has been difficult to actually estimate a non-zero premium.

Financial Markets
Segmentation Example (1)

- Suppose the Indian capital market is fairly segmented:
  - The relevant benchmark for Indian investors:
    - the market portfolio consisting of only Indian stocks.
  - The single-country CAPM may provide a reasonable way to estimate the cost of capital

- Suppose there are no rules that prevent Canadian investors from buying US or European assets:
  - The index of stocks issued by Canadian firms may be a poor proxy for the portfolio held by the average Canadian investor.
  - A Canadian firm should not use a single-country CAPM to set the cost of capital for an investment project.

Financial Markets
Segmentation Example (2)

- The cost of capital for a Canadian firm is likely to be different from the cost of capital for an Indian firm.
  - This will be the case even when these companies are evaluating similar investments.

- Recall that it is *the correlation of the project's payoffs with the relevant benchmark market return* that will shape the cost of capital
  - This may be very different for different countries

Cost Of Capital (1)

- There are four broad cases for determining the cost of capital based on product market (PM) and capital market (CM) integration:

	PM Integrated	PM Segmented
CM Integrated	Case I	Case II
CM Segmented	Case III	Case IV

1. Both product and capital markets are **integrated**.
2. Product markets **segmented**; capital markets **integrated**.
3. Product markets **integrated**; capital markets **segmented**.
4. Product markets **segmented**; capital markets **segmented**.

Cost Of Capital (2)

- **Case I:** Product (PM) and Capital Markets (CM) *Integrated*.
  - Use your home currency risk free rate.
  - Use a "global" index as proxy for market portfolio.
    - Compute β of cash flows with respect to this index.
    - Use risk premium on this index.
  - No exchange rate risk because product markets are integrated.

- **Case II:** PM *Segmented*. CM *Integrated*.
  - The only difference from Case I is that now, in theory, we should incorporate exchange rate risk in the cost of capital.
  - In practice, however, that correction is almost zero and therefore we will likely ignore it.

Cost Of Capital (3)

- **Case III:** PM *Integrated*. CM *Segmented*. (not very likely!)
  - Because PM are integrated, do not have to worry about exchange rate risk.
  - Because CM are segmented, use your home market portfolio as the benchmark portfolio: back to the usual single-country CAPM.
    - Use your home risk-free rate.
    - Compute the β against the home market portfolio.
    - Use the premium on the home market portfolio.

- **Case IV:** PM *Segmented*. CM *Segmented*.
  - The only difference from Case III is that now, in theory, we should incorporate exchange rate risk
  - In practice, people do not adjust for exchange rate risk in the discount rate.

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Sovereign Risk

Transfer Risk (1)

- Until now we focused on "business risk"
  - the business volatility that cannot be diversified and is captured in a company beta.
- We also need to take into account *transfer risks* (from IMF):
  - The risk that a borrower will not be able to convert local currency into foreign exchange, and so be unable to make debt-service payments in foreign currency. The risk normally arises from exchange restrictions imposed by the government in the borrower's country.
  - This is a particular kind of political risk
- Examples:
  - War
  - Outright expropriation
  - Parent may not be able to repatriate interests, dividends, or royalties it earned abroad, or funds held in a foreign bank account opened by a branch office.
  - http://expropriation.jltgroup.com/

Transfer Risk (2)

Three ways we can account for this risk:

1. Adjust Free Cash Flows.
2. Use Market Information to Adjust APV.
3. Adjust Discount Rate.

Transfer Risk (3)

1. Adjust Free Cash Flows

- If we have an idea about the probability of the funds being blocked and about how much value will be lost if the funds are actually blocked, we can adjust expected cash flows.
  - However, quantifying this information is not easy.
  - Also, difficult to know at what discount rate the (adjusted) expected cash flow are to be discounted.

2. Use Market Information to Adjust APV

- Transfer risks can typically be insured by private or government insurance companies (e.g., Lloyd's).
  - Use PV of (after-tax) insurance premium as the risk-adjusted value of transfer risks.
- This approach may be the best because it uses readily available market information.

Transfer Risk (4)

3. Adjust Discount rate

- Add an extra risk premium to the project's discount rate.
- Two potential problems with this type of adjustment.
  1. While business risk tends to be symmetric (it has similar upside and downside impact on cash flows), sovereign risk tends to be asymmetric.
     - Potential downside impact is greater
  2. We have little guidance how to determine this risk premium. Most of the methods used in practice are ad hoc.

A Discount Adjustment for Sovereign Risk (1)

- One way is to adjust the home country government bond rate by the sovereign credit spread.
- Difference in the yields on the public debt of the two countries reflects
  - the expected change in the exchange rates and
  - the difference in country risk premia.
- If you can focus on sovereign debt denominated in a common currency and maturity, you can isolate the credit spread.
- Note: this is a default premium, not a systematic risk premium.

A Discount Adjustment for Sovereign Risk (2)

1. Add the USD sovereign spread over US Treasuries to obtain a discount rate adjusted for political risk.
   - Ex: Peru (May 2015):
     - Peru ~5 year $ bond yield: 2.24%
     - US 5 year $ bond yield: 1.46%
     - Spread = 0.78%
2. Use the sovereign's credit ratings and use the mean default spread from that rating as an adjustment.
     - Peru's Moody's Rating: A3
     - Mean A3 sovereign default spread: 1.20%
3. Use the sovereign's CDS spread over the safest sovereign.
     - Peru's CDS: 129bps
     - Safest sovereign's CDS (Norway/Sweden): 14bps
     - Spread: 115bps

A Discount Adjustment for Business Risk

- In the practice, firms often adjust for business risk with an ad hoc adjustment instead of using the Int'l CAPM
  - These lack theoretical support, but it is useful to know them.

- One way to adjust the beta:

$$\beta_{foreign\ project} = \beta_{home-country\ firm} \times \beta_{foreign\ country}$$

- Facts about international volatilities and correlations:
  - If we rank countries by return volatility, emerging equity markets have considerably higher levels of volatility.
  - If we regress equity returns of individual countries against a world equity portfolio we see that all developed countries have betas higher than 0.5 and most emerging markets have betas below 0.5.

Country Betas: Market Model Regression (1)

- Compute the country β using the CAPM formulation we are familiar with:
  - Run the following regression:

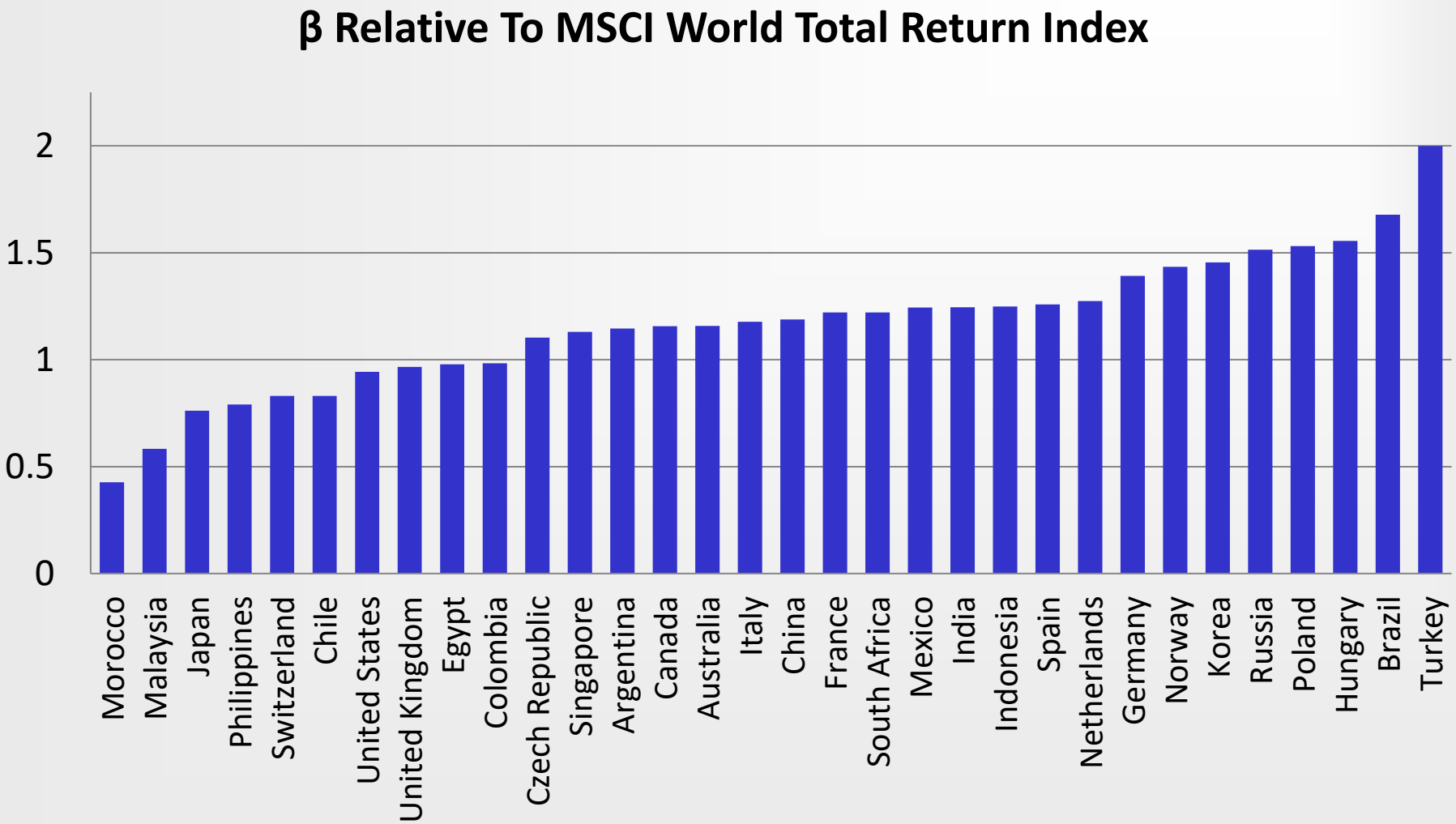
$$z_{i,t} = \alpha_i + \beta_i z_{M,t} + \epsilon_{i,t}$$

  - Where
    - $z_{i,t}$ are excess equity market returns in country i
    - $z_{M,t}$ are excess returns on an index of world returns
      - E.g., MSCI World Total Return Index

Country Betas (2000-2010)

Country	β	Country	β	Country	β	Country	β
Argentina	1.15	Egypt	0.98	Korea	1.45	Russia	1.51
Australia	1.16	France	1.22	Malaysia	0.58	Singapore	1.13
Brazil	1.68	Germany	1.39	Mexico	1.24	South Africa	1.22
Canada	1.16	Hungary	1.56	Morocco	0.43	Spain	1.26
Chile	0.83	India	1.25	Netherlands	1.27	Switzerland	0.83
China	1.19	Indonesia	1.25	Norway	1.43	Turkey	2.00
Colombia	0.98	Italy	1.18	Philippines	0.79	United Kingdom	0.97
Czech Republic	1.10	Japan	0.76	Poland	1.53	United States	0.94

Country Betas (2000-2010)



Source: Donadelli & Prosperi (2011)

Adjusting Discount Rates By Practitioners

- Another approach leads to an equation will look like:

$$r_{foreign\ project} = r_f + \delta_{country\ risk\ spread} + \beta_{foreign\ project} * MRP$$

where:

$$\beta_{foreign\ project} = \beta_{home-country\ firm} \times \beta_{foreign\ country} \times (1 - 0.40)$$

or

$$\beta_{foreign\ project} = \frac{\sigma_{foreign}}{\sigma_{world}}(1 - 0.40)$$

  - In this way, the company is taking into account the ***total*** risk of the project, rather than only the ***non-diversifiable*** risk.
  - Although the equation used looks very much like CAPM, you should bear in mind that it is not compatible with CAPM theory.

- Multiply β by $(1 - 0.40)$: to avoid the double counting of the risk in both country bond default spread and beta computation for emerging markets.
  - GS method replaces the (1-0.40) with $(1 - \rho_{stock\ mkt,bond\ mkt})$