Global Risk Analysis and Valuation

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Duke University
and
National Bureau of Economic Research

Global Risk Analysis and Valuation
1. Setting

- International hurdle rates are critical for
  - Evaluation of acquisitions
  - Performance evaluation
  - EVA analysis

- Each country has its own risk characteristics which need to be taken into account.
Global Risk Analysis and Valuation

1. Setting

- Unfortunately, there is widespread disagreement over approaches to international valuation

- Different methods provide sharply different hurdle rates in international context

Global Risk Analysis and Valuation

1. Setting

- Disagreement comes at a bad time with growth in global investment
Global Risk Analysis and Valuation

2. Goals

- Motivation
- Defining Country Risk
- Separating Out Currency Risk
- Methods of Calculating Hurdle Rates
- Implementing the International Cost of Capital
- Country Risk

Global Risk Analysis and Valuation

3. Motivation

- Dramatic internationalization of world
  - Economic integration through increased trade.
  - Financial integration through liberalization of capital markets
Global Risk Analysis and Valuation

3. Motivation

(Exports+Imports)/GDP Developed Countries

Global Risk Analysis and Valuation

3. Motivation

(Exports+Imports)/GDP Emerging Countries
Global Risk Analysis and Valuation

3. Motivation

Value of US Acquisitions of Foreign Firms

USD Billions

Number of US Acquisitions of Foreign Firms

Data through 1997.

Global Risk Analysis and Valuation

3. Motivation

• Advantages:
  – A broader selection of company targets
  – Increased access to growth and innovation
  – Lower operating costs
  – Reduced taxes in selected markets
  – Reduced borrowing costs
  – Investment incentives
  – Reduced risk: Diversification among less correlated markets
Global Risk Analysis and Valuation

3. Motivation

- Advantages: Diversification arguments
  - Traditional view: shareholders can do their own diversification.
  - Modern view: diversification reduces the volatility of a company's cash flows and gives it the flexibility to pursue the most profitable projects
    - That is, if a company was not diversified, a negative current cash flow might exclude it from investing in high value projects (because the cost of debt and equity financing is high)

Global Risk Analysis and Valuation

3. Motivation
Correlations of World Returns and Developed Markets

Data through June 1998
Global Risk Analysis and Valuation

3. Motivation

Correlations of World Equity Returns and Emerging Markets

- Since 1980
- Since 1990

Data through June 1998

Global Risk Analysis and Valuation

3. Motivation

- Disadvantages
  - Increased operating cost expectations
    - Taxes, tariffs and quotas
    - Transportation/shipping costs
    - Infrastructure costs
    - Organizational costs
  - Increased or different risk expectations
    - Lack of information
    - Different equity return premiums
    - Currency fluctuations and liquidity risk
    - Sovereign risk (e.g. expropriation repatriation risk)
3. Motivation

Investment of $100 in three Korean companies

- Anam Electronics
- Korean Air
- Tongyang Moolsan

4. Valuation Approaches

<table>
<thead>
<tr>
<th>Valuation Method</th>
<th>Calculation</th>
<th>Value Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Tangible Assets</td>
<td>$V = \text{Assets} - \text{Liabilities}$</td>
<td>Break Up</td>
</tr>
<tr>
<td>Comparable Multiple</td>
<td>$V = P/E \times \text{Earnings}$</td>
<td>Current</td>
</tr>
<tr>
<td>- Price/Earnings</td>
<td>$V = M/B \times \text{Book}$</td>
<td></td>
</tr>
<tr>
<td>- Market/Book</td>
<td>$V = P/Sales \times \text{Sales}$ (Prices are current)</td>
<td></td>
</tr>
<tr>
<td>- Price/Sales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparable Transaction</td>
<td>$V = \text{Price/Book} \times \text{Book}$</td>
<td>Acquisition</td>
</tr>
<tr>
<td>- Premium to market</td>
<td>$V = \text{Price/Market} \times \text{Market}$</td>
<td></td>
</tr>
<tr>
<td>- Premium to book</td>
<td>$V = P/E \times \text{Earnings}$</td>
<td></td>
</tr>
<tr>
<td>- Acquisition multiple</td>
<td>$V = P/E \times \text{Earnings}$</td>
<td></td>
</tr>
<tr>
<td>DCF with Synergies</td>
<td>$V = \frac{\text{CF}}{(1+K)}$</td>
<td>Acquisition</td>
</tr>
<tr>
<td></td>
<td>Cash flows include anticipated synergies and all real options</td>
<td></td>
</tr>
</tbody>
</table>
Global Risk Analysis and Valuation

4. Valuation Approaches

Ratios often not comparable across countries

<table>
<thead>
<tr>
<th>Country</th>
<th>P/E Ratio</th>
<th>P/B Ratio</th>
<th>Div. Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>27.22</td>
<td>4.67</td>
<td>1.42</td>
</tr>
<tr>
<td>Japan</td>
<td>123.96</td>
<td>1.82</td>
<td>0.89</td>
</tr>
<tr>
<td>UK</td>
<td>19.48</td>
<td>3.75</td>
<td>2.45</td>
</tr>
<tr>
<td>Germany</td>
<td>32.48</td>
<td>4.08</td>
<td>1.66</td>
</tr>
<tr>
<td>France</td>
<td>28.97</td>
<td>3.07</td>
<td>1.98</td>
</tr>
<tr>
<td>Argentina</td>
<td>12.93</td>
<td>1.43</td>
<td>3.27</td>
</tr>
<tr>
<td>Brazil</td>
<td>8.57</td>
<td>0.75</td>
<td>4.42</td>
</tr>
<tr>
<td>Mexico</td>
<td>12.74</td>
<td>1.83</td>
<td>1.82</td>
</tr>
<tr>
<td>Korea</td>
<td>226.53</td>
<td>0.45</td>
<td>2.36</td>
</tr>
</tbody>
</table>

MSCI data as of June 1998

Global Risk Analysis and Valuation

5. Global DCF Analysis

- DCF can be used to calculate business plan, capital investment, and acquisition values

- The same factors affect value around the globe
  - Cash flows
  - Timing
  - Risk
Global Risk Analysis and Valuation

5. Global DCF Analysis

Applying DCF to international opportunities requires adjustments to each component of value

- **Cash Flow**
  - Currency Translation
  - Accounting Adjustments
  - Taxes

- **Timing**
  - Liquidity
  - Repatriation Limits

- **Risk**
  - Systematic
  - Currency
  - Information
  - Sovereign/Credit Risk

Global Risk Analysis and Valuation

5. Global DCF Analysis

Multistep process to apply DCF analysis to international opportunities

- **Step 1**
  Determine "nominal" or "real" forecast basis

- **Step 2**
  Forecast local currency cash flows

- **Step 3**
  Adjust cash flows for specific risks

- **Step 4**
  Translate into U.S. cash flows using forward rates

- **Step 5**
  Compute discount rate, adjust residual value, calculate present value

  - Calculate cash flows for international investment
  - Reflect systematic risks
Global Risk Analysis and Valuation
5. Global DCF Analysis

Step 1:
Determine "nominal" or "real" forecast basis

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Global Risk Analysis and Valuation
5. Global DCF Analysis

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Global Risk Analysis and Valuation
5. Global DCF Analysis

Where to Reflect Risks

<table>
<thead>
<tr>
<th>Risk</th>
<th>Risk Description</th>
<th>Type</th>
<th>Cash Flow</th>
<th>WACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sovereign: country credit rating</td>
<td>A country's government might take actions that reduce the value of a firm to its owners (e.g. expropriation, tax hikes)</td>
<td>Country</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Liquidity</td>
<td>The owners might not be able to sell assets when desired</td>
<td>Specific</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>(Re) Devaluation</td>
<td>The value of a firm's currency will impact the firm's value</td>
<td>Country</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Currency</td>
<td>Volatility in currency exchange rates causes a target's value to fluctuate</td>
<td>Specific</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>Inflation will rise unexpectedly, reducing the present value of future international cash flows</td>
<td>Country</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Interest Rate</td>
<td>Interest rates will rise unexpectedly, reducing the present value of future international cash flows</td>
<td>Country</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>Limited or biased information might lead you to over value a target</td>
<td>Specific</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
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Global Risk Analysis and Valuation

5. Global DCF Analysis

• International specific risks can be incorporated into expected cash flows using scenario analysis

• Steps for Scenario Analysis
  1. Identify risks and estimate their probabilities of occurrence
  2. Estimate when they are most likely to occur
  3. Identify the impact of each risk on expected cash flows
  4. Calculate expected value of cash flows by weighting the cash flows in each scenario by the probability the scenario occurs

Note: The same should be done for NOPAT when calculating residual value using the perpetuity method

Global Risk Analysis and Valuation

5. Global DCF Analysis

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Global Risk Analysis and Valuation
5. Global DCF Analysis

• Forward Rates
  – Used to bring cash flows to U.S. dollars
  – Determined by differences in interest rates

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5. Global DCF Analysis

Forward Rates: Covered Interest Rate Parity is enforced by arbitrage.

\[
F_{S/Y,t} = S_{S/Y,t} \left[ \frac{1 + i_{S,t}}{1 + i_{Y,t}} \right]^{t}
\]

\(F_{S/Y,t}\) = Forward exchange rate ($/Y) for delivery in \(t\) years in the future

\(S_{S/Y,t}\) = Current spot exchange rate ($/Y)

\(i_{S,t}, i_{Y,t}\) = Dollar and Yen pure discount bond yields with maturity of \(t\) years
Global Risk Analysis and Valuation
5. Global DCF Analysis

Forward Rates Example:
• Suppose a German 12-month T-bill yield is 8% and the U.S. 12-month T-bill yield is 4%.
• Does it make sense for the U.S. investor to invest in the higher yielding German T-bill?

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5. Global DCF Analysis

Forward Rates Answer: NO
• If you invest in the German T-bill, you will take on some currency risk.
  – Suppose you invested 100m DM and at the end of the year you will receive 108m DM.
  – To hedge this risk, you will sell forward 108m DM today.
  – The forward rate will guarantee that you lock in a 4% return - which is no different than buying the U.S. T-bill!
Global Risk Analysis and Valuation

5. Global DCF Analysis

• **Forward Rates Sources**
  - Rates are readily available for the major currencies from major banks and trading houses.
  - Example: Bloomberg screen for $/DM
Global Risk Analysis and Valuation
5. Global DCF Analysis

• **Forward Rates Sources:**
  – If no quoted *forward* rates:
    Use forward rate equation and interest rates to back out forward rates.
  – If no quoted *interest* rates:
    Use inflation forecasts and add real economic growth forecast to create nominal interest rates.

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Global Risk Analysis and Valuation
5. Global DCF Analysis

**Example: Converting Forecast Peso Cash Flows into US$ Cash Flows**

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>US$ Inflation*</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Mexican Peso Inflation*</td>
<td>15.3</td>
<td>15.3</td>
<td>15.3</td>
<td>15.3</td>
</tr>
<tr>
<td>Parity Factor = ( \frac{1 + i_{US$}}{1 + i_{Peso}} )</td>
<td>0.8794</td>
<td>0.7733</td>
<td>0.6801</td>
<td>0.5981</td>
</tr>
<tr>
<td>Spot US$/Peso Rate</td>
<td>0.1177</td>
<td>0.1177</td>
<td>0.1177</td>
<td>0.1177</td>
</tr>
<tr>
<td>Forward US$/Peso Rate (Parity Factor x Spot Rate)</td>
<td>0.1035</td>
<td>0.0910</td>
<td>0.0801</td>
<td>0.0704</td>
</tr>
<tr>
<td>Peso Cash Flows</td>
<td>320</td>
<td>500</td>
<td>730</td>
<td>1020</td>
</tr>
<tr>
<td>US$ Cash Flows</td>
<td>33</td>
<td>46</td>
<td>58</td>
<td>72</td>
</tr>
</tbody>
</table>

*For calculation simplicity, same inflation rates were used each year*
## Global Risk Analysis and Valuation

### 5. Global DCF Analysis

#### Assumptions:
- US Inflation Rate: 1.4%
- Mexican Inflation Rate: 15.3%
- US Cost of Capital: 10.0%
- Mexican Cost of Capital: 25.1%
- Spot Rate (US$/Peso): 0.1177

#### US Dollar Forecast (Using Forward Rates)

<table>
<thead>
<tr>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Forward Rates</td>
<td>0.1035</td>
<td>0.0910</td>
<td>0.0801</td>
</tr>
<tr>
<td>Cash Flows</td>
<td>33</td>
<td>46</td>
<td>58</td>
</tr>
<tr>
<td>Residual Value</td>
<td>286</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discount Factor</td>
<td>0.9091</td>
<td>0.8264</td>
<td>0.7513</td>
</tr>
<tr>
<td>Present Value</td>
<td>30</td>
<td>38</td>
<td>44</td>
</tr>
</tbody>
</table>

#### Cumulative PV

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$556</td>
</tr>
<tr>
<td></td>
<td>$356</td>
</tr>
</tbody>
</table>

**Equivalence at 0.1177 US$/Peso spot exchange rate**

*Source: "Economist" May 5, 1998*

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## Global Risk Analysis and Valuation

### 5. Global DCF Analysis

#### US Dollar Forecast (using Today's Spot Rate)

<table>
<thead>
<tr>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Spot Rate</td>
<td>0.1177</td>
<td>0.1177</td>
<td>0.1177</td>
</tr>
<tr>
<td>Cash Flows</td>
<td>38</td>
<td>59</td>
<td>86</td>
</tr>
<tr>
<td>Residual Value</td>
<td>478</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discount Factor</td>
<td>0.9091</td>
<td>0.8264</td>
<td>0.7513</td>
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<td>34</td>
<td>49</td>
<td>65</td>
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**18**
Global Risk Analysis and Valuation

5. Global DCF Analysis

Step 1: Determine "nominal" or "real" forecast basis
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Global Risk Analysis and Valuation

6. Weighted Average Cost of Capital

- Many different approaches:
  - Identical Cost of Capital (all locations)
  - World CAPM or Multifactor Model (Sharpe-Ross)
  - Segmented/Integrated (Bekaert-Harvey)
  - Bayesian (Ibbotson Associates)
  - Country Risk Rating (Erb-Harvey-Viskanta)
  - CAPM with Skewness (Harvey-Siddique)
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

• Many different approaches:
  – Goldman-integrated sovereign yield spread model
  – Goldman-segmented
  – Goldman-EHV hybrid
  – CSFB volatility ratio model
  – CSFB-EHV hybrid

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Identical Cost of Capital
• Ignores the fact that shareholders require different expected returns for different risks
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Identical Cost of Capital
• Risky investments get evaluated with too low of a discount rate (and look better than they should)
• Less risky investments get evaluated with too high of a discount rate (and look worse than they are)
• Hence, method destroys value
⇒ Avoid

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

World CAPM
• Sharpe’s Capital Asset Pricing Model is the mainstay of economic valuation
• Simple formula
• Intuition is that required rate of return depends on how the investment contributes to the volatility of a well diversified portfolio
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

World CAPM

- Expected discount rate (in U.S. dollars) on investment that has average in a country
  \[ \text{risk-free} + \beta_i \times \text{world risk premium} \]
- Beta is measured relative to a “world” portfolio
- OK for developed markets if we allow risk to change through time (Harvey 1991)

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

World CAPM

- Strong assumptions needed
- Perfect market integration
- Mean-Variance analysis implied by utility assumptions
- Fails in emerging markets
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6. Weighted Average Cost of Capital
Returns and Beta from 1970

Should be a positive relation, with higher risk associated with higher return! But perhaps we should look at a more recent sample of data.

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital
Returns and Beta from 1990

Still goes the wrong way - even with data from 1990!
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6. Weighted Average Cost of Capital

Returns and Beta from 1990 through 1998:03

Incorporating the Asian crisis makes the model helps little

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

World CAPM
• OK to use in developed markets
• May give unreliable results in smaller, less liquid developed markets
Global Risk Analysis and Valuation

6. Weighted Average Cost of Capital

Segmented/Integrated CAPM

- CAPM assumes that markets are perfectly integrated
  - foreign investors can freely invest in the local market
  - local investors can freely invest outside the local market
- Many markets are not integrated so we need to modify the CAPM

Global Risk Analysis and Valuation

6. Weighted Average Cost of Capital

Segmented/Integrated CAPM

- Bekaert and Harvey (1995)
- If market integrated, world CAPM holds
- If market segmented, local CAPM holds
- If going through the process of integration, a combination of two holds
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6. Weighted Average Cost of Capital

Segmented/Integrated CAPM

- Estimate world beta and expected return
  \[= \text{risk-free} + \beta_{iw} \times \text{world risk premium}\]

- Estimate local beta and expected return
  \[= \text{local risk-free} + \beta_{il} \times \text{local risk premium}\]

Segmented/Integrated CAPM

- Put everything in common currency terms
- Add up the two components.
  \[\text{WACC} = w[\text{world WACC}] + (1-w)[\text{local WACC}]\]
- Weights, w, determined by variables that proxy for degree of integration, like size of trade sector and equity market capitalization to GDP
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Segmented/Integrated CAPM
- Weights are dynamic, as are the risk loadings and the risk premiums
- Downside: hard to implement; only appropriate for countries with equity markets

→ Recommendation: Wait

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Ibbotson Associates
(Recognized expert in cost of capital calculation)
- Approach recognizes that the world CAPM is not the best model
- Ibbotson approach combines the CAPM’s prediction with naïve prediction based on past performance.
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Ibbotson Associates

- STEPS
  1. Calculate world risk premium = U.S. risk premium divided by the beta versus the MSCI world (=7.8%)
  2. Estimate country beta versus world index
  3. Multiply this beta times world risk premium

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Ibbotson Associates

4. Add in 0.5 times the ‘intercept’ from the initial regression.
   - “This additional premium represents the compensation an investor receives for taking on the considerable risks of the emerging markets that is not explained by beta alone.”
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Ibbotson Associates
- Gives unreasonable results in some countries
- Only useful if equity markets exist
- Ibbotson Associates does not even use it

⇒ Recommendation: Do not use this version. Ibbotson is working on a better model to be available soon

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

CAPM with Skewness
- For years, economists did not understand why people spend money on lottery tickets and horse betting
- The expected return is negative and the volatility is high
- Behavioral explanations focused on "risk loving"
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6. Weighted Average Cost of Capital

CAPM with Skewness

- But this is just preference for positive skewness (big positive outcomes)
- People like positive skewness and dislike negative skewness (downside)

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6. Weighted Average Cost of Capital

CAPM with Skewness

- Most are willing to pay extra for an investment that adds positive skewness (lower hurdle rate), e.g. investing in China?
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6. Weighted Average Cost of Capital

CAPM with Skewness
- Harvey and Siddique (1998) tests of a model that includes time-varying skewness risk
- Bekaert, Erb, Harvey and Viskanta detail the implications of skewness and kurtosis in emerging market stock selection

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

CAPM with Skewness
- Model still being developed
- Skewness similar to many “real options” that are important in project evaluation
→ Recommendation: Wait
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6. Weighted Average Cost of Capital

Goldman-Integrated
- This model is widely used by McKinsey, Salomon and many others.
- Addresses the problem that the CAPM gives a discount rate too low.
- Solution: Add the sovereign yield spread

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Integrated
- The sovereign yield spread is the yield on a U.S. dollar bond that a country offers versus a U.S. Treasury bond of the same maturity
- The spread is said to reflect "country risk"
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Integrated
- STEPS
  - Estimate market beta on the S&P 500
  - Beta times historical US premium
  - Add sovereign yield spread plus the risk free

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Integrated-EHV Hybrid
- Goldman model only useful if you have sovereign yield spread
- Use Erb, Harvey and Viskanta model to fit ratings on yield spread
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6. Weighted Average Cost of Capital

Real Yields and Institutional Investor Country Credit Ratings from 1990 through 1998:03

\[ R^2 = 0.8784 \]

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Integrated-EHV Hybrid

- You just need a credit rating (available for 136 countries now) and the EHV model will deliver the sovereign yield
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Integrated-EHV Hybrid
- Even adding this yield spread delivers a cost of capital that is unreasonably low in many countries
- While you can get the yield spread in 136 countries with the EHV method, you can only get risk premiums for those countries with equity markets

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Segmented
- Main problem is the beta
- It is too low for many risky markets
- Solution: Increase the beta
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Segmented

- Modified beta = standard deviation of local market return in US dollars divided by standard deviation of the US market return
- Beta times historical US premium
- Add sovereign yield spread

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Segmented

- Strange formulation. The usual beta is:

\[ \text{Beta}_{i, \text{World}} = \text{Correlation}_{i, \text{World}} \times \frac{\text{Std.dev}_i}{\text{Std.dev}_{\text{World}}} \]

⇒ Using volatility ratio implies that the Correlation=1 !!
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Goldman-Segmented
• No economic foundation for modification
• No clear economic foundation for method in general
→ Recommendation: Not recommended

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Country Risk Rating Model
• Erb, Harvey and Viskanta (1995)
• Credit rating a good ex ante measure of risk
• Impressive fit to data
6. Weighted Average Cost of Capital

Country Risk Rating Model

- Erb, Harvey and Viskanta (1995)
- Explore risk surrogates:
  - Political Risk,
  - Economic Risk,
  - Financial Risk and
  - Country Credit Ratings

Country Risk Rating Model

- Sources
  - Political Risk Services’ International Country Risk Guide
  - Institutional Investor’s Country Credit Rating
  - Euromoney’s Country Credit Rating
  - Moody’s
  - S&P
### 6. Weighted Average Cost of Capital

#### Global Risk Analysis and Valuation

<table>
<thead>
<tr>
<th>Country Risk Guide</th>
<th>Political Risks</th>
<th>Points</th>
<th>% of Individual Index</th>
<th>% of Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic expectations vs. reality</td>
<td>12</td>
<td>12%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Economic planning failures</td>
<td>12</td>
<td>12%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Political leadership</td>
<td>12</td>
<td>12%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>External conflict</td>
<td>10</td>
<td>10%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Corruption in government</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Military in politics</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Organized religion in politics</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Law and order tradition</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Racial and nationality tensions</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
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<tr>
<td>Political terrorism</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Civil war</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Political party development</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Quality of the Bureaucracy</td>
<td>6</td>
<td>6%</td>
<td>3%</td>
<td></td>
</tr>
</tbody>
</table>

**Total Political Points**

| | 100 | 100% | 50% |

---

### Global Risk Analysis and Valuation

6. Weighted Average Cost of Capital

#### Financial Risks

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan Default or unfavorable loan restructuring</td>
<td>10</td>
<td>20%</td>
</tr>
<tr>
<td>Delayed payment of suppliers’ credits</td>
<td>10</td>
<td>20%</td>
</tr>
<tr>
<td>Repudiation of contracts by governments</td>
<td>10</td>
<td>20%</td>
</tr>
<tr>
<td>Losses from exchange controls</td>
<td>10</td>
<td>20%</td>
</tr>
<tr>
<td>Expropriation of private investments</td>
<td>10</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Total Financial Points**

| | 50 | 100% | 25% |
Global Risk Analysis and Valuation

6. Weighted Average Cost of Capital

<table>
<thead>
<tr>
<th>Country Risk Guide:</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Economic Risks</td>
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</tr>
<tr>
<td>Inflation</td>
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<td>20%</td>
<td>5%</td>
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<tr>
<td>Debt service as a % of exports of goods and services</td>
<td>10</td>
<td>20%</td>
<td>5%</td>
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<tr>
<td>International liquidity ratios</td>
<td>5</td>
<td>10%</td>
<td>3%</td>
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<tr>
<td>Foreign trade collection experience</td>
<td>5</td>
<td>10%</td>
<td>3%</td>
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<tr>
<td>Current account balance as a % of goods and services</td>
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<td>30%</td>
<td>8%</td>
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<tr>
<td>Parallel foreign exchange rate market indicators</td>
<td>5</td>
<td>10%</td>
<td>3%</td>
</tr>
</tbody>
</table>

| Total Economic Points | 50 | 100% | 25% |

| Overall Points | 200 | 100% |

Global Risk Analysis and Valuation

6. Weighted Average Cost of Capital

Institutional Investor's Country Credit Ratings

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Economic Outlook</td>
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<td>2</td>
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<td>4</td>
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<tr>
<td>Debt Service</td>
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<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Financial</td>
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<td>3</td>
<td>4</td>
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<td>3</td>
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<tr>
<td>Reserves/Current Account</td>
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<tr>
<td>Fiscal Policy</td>
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<td>4</td>
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<td>7</td>
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<td>Political Outlook</td>
<td>3</td>
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<td>Access to Capital Markets</td>
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<td>6</td>
<td>7</td>
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<td>8</td>
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<tr>
<td>Trade Balance</td>
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<td>7</td>
<td>5</td>
<td>5</td>
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<td>Inflow of Portfolio</td>
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<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
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<tr>
<td>Investment</td>
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<tr>
<td>Foreign Direct Investment</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>7</td>
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</tbody>
</table>
6. Weighted Average Cost of Capital

Ratings are correlated:

<table>
<thead>
<tr>
<th>S&amp;P Sovereign Ratings</th>
<th>AA+</th>
<th>AA-</th>
<th>A</th>
<th>BBB+</th>
<th>BBB-</th>
<th>BB</th>
<th>B+</th>
<th>NR</th>
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<tbody>
<tr>
<td>Institutional Investor CCR</td>
<td>100</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
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</table>

Global Risk Analysis and Valuation

6. Weighted Average Cost of Capital

Ratings are correlated:

<table>
<thead>
<tr>
<th>Risk Measure Changes</th>
<th>IICCR</th>
<th>ICRGC</th>
<th>ICRGP</th>
<th>ICRGF</th>
<th>ICRGE</th>
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<tbody>
<tr>
<td>II CCR</td>
<td>-0.03</td>
<td>0.01</td>
<td>0.03</td>
<td>-0.09</td>
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<td>ICRGC</td>
<td>0.35</td>
<td>0.79</td>
<td>0.54</td>
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<td>ICRGP</td>
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<td>0.83</td>
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<td>0.06</td>
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<tr>
<td>ICRGF</td>
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<td>0.60</td>
<td>0.35</td>
<td>0.05</td>
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<tr>
<td>ICRGE</td>
<td>0.10</td>
<td>0.52</td>
<td>0.24</td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>

Risk Measure Levels
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Ratings predict inflation:

![Graph showing inflation expectations for 1997 versus II Rating September 1996.](image)

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Ratings correlated with wealth:

![Graph showing relationship between II ratings for 74 countries and per capita real GDP.](image)
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6. Weighted Average Cost of Capital

Time-series of ratings:

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6. Weighted Average Cost of Capital

Returns and Institutional Investor Country
Credit Ratings from 1990

Fit is as good as it gets - lower rating (higher risk) commands higher expected returns. Even in among US firms, our best model gets about 30% explanatory power.
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Returns and Institutional Investor Country Credit Ratings from 1990 through 1998:03

Even with the turbulent Asian crisis returns, we still get an impressive fit.

Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Country Risk Rating Model
- Intuitive
- Can be used in 136 countries, that is, in countries without equity markets
- Fits developed and emerging markets
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Country Risk Rating Model

STEPS:
- WACC = risk free + 0.898 - 0.177 Log(IICCR)
- Where Log(IICCR) is the natural logarithm of the Institutional Investor Country Credit Rating

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6. Weighted Average Cost of Capital

Easy to use:

![Graph showing hurdle rate vs rating for ICRGC, IICCR:84, and IICCR:79]
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6. Weighted Average Cost of Capital

Also predicts volatility:

\[ R^2 = 0.5033 \]

And correlation:

\[ R^2 = 0.6809 \]
Global Risk Analysis and Valuation
6. Weighted Average Cost of Capital

Beginning of Asian crisis

ICRG rating

Value of US$100:

Beginning of Asian crisis

Value of $100

- Korea
- Malaysia
- Russia

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Global Risk Analysis and Valuation

6. Weighted Average Cost of Capital

Value of local currency:
(indexed at 100)

Beginning of Asian crisis

Global Risk Analysis and Valuation

7. Comparison of WACCs
Global Risk Analysis and Valuation

7. Comparison of WACCs

Excel version

Global Risk Analysis and Valuation

WACC for Brazil (local) manufacturer:

EXAMPLE

WACC = 21%
Global Risk Analysis and Valuation

8. Summary

Multistep process to apply DCF analysis to international opportunities

Step 1: Determine "nominal" or "real" forecast basis
Step 2: Forecast local currency cash flows
Step 3: Adjust cash flows for specific risks
Step 4: Translate into U.S. cash flows using forward rates
Step 5: Compute discount rate, adjust residual value, calculate present value

Calculate cash flows for international investment
Reflect systematic risks