Global Financial Management
Duke University
November 4-6, 1996.
I. Recent Advances in Cost of Capital Measurement
II. GFM and Shareholder Value

Campbell R. Harvey
Duke University, Durham, NC
National Bureau of Economic Research, Cambridge, MA

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Dynamic Global Financial Management

1. Goals

1. Quantification of risk in global markets.
2. Pitfalls of past approaches.
3. Elements of country risk.
4. Risk ratings and cost of capital
5. The role of real options.
6. Why have a globally diversified portfolio of operations?
7. Shareholder value.
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2. Quantification of Risk

Easily quantifiable definitions:

- Volatility = average squared deviation from what is expected.

\[ \sigma_i = \sqrt{\frac{\sum (R_i - E(R_i))^2}{\text{# observations}}} \]
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2. Quantification of Risk

Average Volatility: Developed and Emerging Markets

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Distribution of Returns
MSCI USA - US$
Monthly: January 1976-March 1996

Number of Monthly Observations

Monthly Total Return

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Distribution of Returns

MSCI USA / IFCG Argentina - US$

Monthly: January 1976-March 1996

Number of Monthly Observations

Monthly Total Return

+ 1 obs at 180%
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2. Quantification of Risk

- Volatility also known as "total risk"

This risk is not necessarily compensated by investors if they are able to diversify their portfolios.
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2. Quantification of Risk

Easily quantifiable definitions:
• Beta=average sensitivity to movements in benchmark

\[ \beta = \frac{\text{Covariance}(R_i, \text{Benchmark})}{\text{Variance}(\text{Benchmark})} \]
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2. Quantification of Risk

- Beta also known as "systematic or nondiversifiable risk"

Assumes that investors hold well diversified portfolios.

Assumes that all risk can be captured by "exposure" to one or more benchmark returns.
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2. Quantification of Risk

Easily quantifiable definitions:
- Skewness=average cubed deviation from what is expected.

\[ Skew_i = \frac{\sum (R_i - E(R_i))^3}{(\# \text{observations})} \]
Emerging Markets Skewness
IFC Global Indices

Skewness

*Sample starts after April 1991.

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2. Quantification of Risk

- Skewness weighs the possible asymmetric outcomes

It is difficult to measure (so called "Peso problem").
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3. Pitfalls of Previous Methods

Capital Asset Pricing Model.

1. Choose benchmark: Say MSCI world index.

2. Estimate beta of project against the MSCI index (all in U.S. dollar returns).

3. Multiply beta times the "risk premium" for beta, traditionally, about 8%.

4. Add the Treasury bill rate.
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3. Pitfalls of Previous Methods

Capital Asset Pricing Model.

5. To convert to local currency, add in the difference between local expected inflation and U.S. expected inflation.

Note: If inflation is expected to change, then you will have a different discount rate for each year.
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3. Pitfalls of Previous Methods

Capital Asset Pricing Model.

Example: Project beta=2.0

Hurdle rate = 5% + 2\times(13\%-5\%) = 21\%

where 13\% is the expected benchmark return, 5\% is the T-bill return and 8\% is the "risk premium."
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3. Pitfalls of Previous Methods

Capital Asset Pricing Model.

Does it work?

Should it work?
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3. Pitfalls of Previous Methods

Annual Excess US$ Total Return

Adjusted R-Square: 1.3%

Beta (3 Year Trailing) with MSCI AC World

Annual Observations: 1980:03-1996:03
Unhedged US$ returns in excess of US Treasury Bill.
Source: MSCI & IFCG (first three annual IFC observations eliminated).

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3. Pitfalls of Previous Methods

Volatility - Not Much Better

What is the reward for volatility?
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Annual Excess US$ Total Return

Annual Observations: 1980:03-1996:03
Unhedged US$ returns in excess of US Treasury Bill.
Source: MSCI & IFCG (first three annual IFC observations eliminated).

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A Fix?

Hurdle Rate = FF + Tbill + beta \times (risk premium)

Popular to "add in" FF which some define as

FF = Local government bond rate (in U.S. dollars)
- U.S. Treasury Bond rate
A Fix?

Add in is meant to represent country risk:

However,
- Only available if country has bonds in U.S. dollars
- Same factor is applied to all companies in country
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3. Pitfalls of Previous Methods

Another Fix?

Hurdle Rate = FF + Tbill + beta x (risk premium)

Ibbotson Associates would define:

FF = (Average return in country - Tbill - beta x risk premium)/2

- This increases the hurdle rate
- Why divide by two?
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3. Pitfalls of Previous Methods

**Case discussion:**

1. What are the opportunities?

2. What are the risks?

3. What should the cost of capital be?

4. Was the price right? (in ball park terms)
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4. Elements of Country Risk

Table 4
Critical Factors in Institutional Investor's Country Credit Ratings

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

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4. Elements of Country Risk

Factors Used in Euromoney Country Risk Rankings

<table>
<thead>
<tr>
<th>Factor</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Data (Projections)</td>
<td>25%</td>
</tr>
<tr>
<td>Political Risk (Consensus)</td>
<td>25%</td>
</tr>
<tr>
<td>Debt Indicators (External)</td>
<td>10%</td>
</tr>
<tr>
<td>Debt in Default or Rescheduled</td>
<td>10%</td>
</tr>
<tr>
<td>Credit Ratings (S&amp;P, Moody's, and IBCA)</td>
<td>10%</td>
</tr>
<tr>
<td>Access to Bank Finance</td>
<td>5%</td>
</tr>
<tr>
<td>Access to Short-Term Finance</td>
<td>5%</td>
</tr>
<tr>
<td>Access to International Bond and Syndicated Loan Markets</td>
<td>5%</td>
</tr>
<tr>
<td>Access to and Discount on Forfaiting</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
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</table>

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4. Elements of Country Risk

Primary Components of Country Ratings

<table>
<thead>
<tr>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Account/Balance of Payments</td>
</tr>
<tr>
<td>Debt</td>
</tr>
<tr>
<td>Deficit</td>
</tr>
<tr>
<td>Economic Structure and Growth</td>
</tr>
<tr>
<td>(export concentration, reliance on imports)</td>
</tr>
<tr>
<td>Foreign exchange/Currency convertibility</td>
</tr>
<tr>
<td>GDPPC/GDP</td>
</tr>
<tr>
<td>Liquidity</td>
</tr>
<tr>
<td>Parallel Market</td>
</tr>
<tr>
<td>Reserves</td>
</tr>
<tr>
<td>Savings Rate</td>
</tr>
<tr>
<td>Inflation</td>
</tr>
<tr>
<td>Access to capital markets</td>
</tr>
</tbody>
</table>
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4. Elements of Country Risk

Inflation in Developed and Emerging Economies

Some countries' inflation rates truncated at 25%.
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### 4. Elements of Country Risk

<table>
<thead>
<tr>
<th>Factionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>(political, ethnic, religious, ideological, linguistic)</td>
</tr>
<tr>
<td>Social conditions/Conflict/History</td>
</tr>
<tr>
<td>Attitudes/Expectations</td>
</tr>
<tr>
<td>Coercive regime/Legitimacy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bureaucratic/Technocratic competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corruption/Policy flexibility</td>
</tr>
<tr>
<td>Criminal/Military insurgency</td>
</tr>
<tr>
<td>International commitment/integration</td>
</tr>
<tr>
<td>Legal framework</td>
</tr>
<tr>
<td>Nationalization</td>
</tr>
<tr>
<td>Policy environment</td>
</tr>
<tr>
<td>Regional politics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infrastructure and local service management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor costs/productivity</td>
</tr>
</tbody>
</table>
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4. Elements of Country Risk

Index Subcomponents
Political and Policy
Financial
Economic
Operations
Remittances and Repatriation of Capital
Security
Lending & Trade
Export
Direct Investment

Index Type

Data Sources
Expert Panel
Survey
Staff Analysis
Published Data
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4. Elements of Country Risk

Institutional Investor Country Credit Ratings

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5. Risk Ratings and Cost of Capital

Ratings:

1. Capture a diverse set of information

2. Available on a timely basis

3. Cover all countries

4. Are dynamic, in that they change with local conditions
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5. Risk Ratings and Cost of Capital

Model:

Hurdle rate = T-bill + 0.85 + -0.17 x LN(IICCR)

where LN=natural log
IICCR=Institutional Investor's Country Credit Rating
-0.17=slope or "reward for rating"
0.85=intercept "average excess cost of capital"
Example:

Hurdle rate = T-bill + 0.85 + -0.17 x LN(IICCR)

Rating=50

Hurdle rate = .05 + 0.85 + -0.17 x 3.9102
= .05 + 0.85 - 0.66504
= 23.5%
## Dynamic Global Financial Management

### 5. Risk Ratings and Cost of Capital

<table>
<thead>
<tr>
<th>Regression</th>
<th>Period</th>
<th>Attribute</th>
<th>Intercept</th>
<th>Log Attribute</th>
<th>Change in Attribute</th>
<th>Obs</th>
<th>Adjusted R-Square</th>
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<tbody>
<tr>
<td>Total Return</td>
<td>1984:04-</td>
<td>ICRGC</td>
<td>0.87</td>
<td>-0.17</td>
<td>1.95</td>
<td>431</td>
<td>6.6%</td>
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<tr>
<td></td>
<td>1996:03</td>
<td>1.68</td>
<td>-1.43</td>
<td>2.50</td>
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<tr>
<td></td>
<td>1984:04-</td>
<td>IIICCR</td>
<td>0.81</td>
<td>-0.16</td>
<td>0.38</td>
<td>431</td>
<td>2.5%</td>
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<tr>
<td></td>
<td>1996:03</td>
<td>3.04</td>
<td>-2.58</td>
<td>0.51</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>1979:04-</td>
<td>IIICCR</td>
<td>0.85</td>
<td>-0.17</td>
<td>0.48</td>
<td>504</td>
<td>3.4%</td>
</tr>
<tr>
<td></td>
<td>1996:03</td>
<td>3.29</td>
<td>-2.88</td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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5. Risk Ratings and Cost of Capital

Expected Annual Return

*See Table __ for model details.
ICRGC: International Country Risk Guide Composite Ratings
IICCR: Institutional Investor Country Credit Rating
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5. Risk Ratings and Cost of Capital

Example: Mexico February 1992

\[ \begin{align*}
    \text{IICCR} & = 38.6 \\
    \text{Tbill} & = 6.0\% \\
    \text{Hurdle rate} & = 0.06 + 0.85 - 0.17 \times \ln(\text{IICCR}) \\
    & = 0.06 + 0.85 - 0.17 \times \ln(38.6) \\
    & = 0.05 + 0.85 - 0.62105 \\
    & = 28.9\%
\end{align*} \]
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5. Risk Ratings and Cost of Capital

Example: Mexico February 1992

Modified CAPM with FF=2.5%
Tbill = 6.0%
Beta = 1.1
Risk premium = 8.5%

Hurdle rate = 0.025 + 0.06 + 1.1 \times 0.085
= 17.85\%
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6. The Role of Real Options

Present Value Approach to Capital Budgeting often ignores the strategic value of project.

While PV method is sound, it is often implemented incorrectly. Important sources of value are sometimes ignored.

Options are well suited to quantify the "ignored sources of value".
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6. The Role of Real Options

Flexibility

Definition: Options available to management as part of the project.

Sometimes known as operating options.
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6. The Role of Real Options

Example:

Electric utility has choice of building a power plant that:

- (1) Burns oil
- (2) Burns either oil or coal

Plant (1) is cheaper to construct.
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6. The Role of Real Options

Example:

Naive implementation of present value might suggest that plant (1) be constructed.

While (2) costs more, it also provides greater flexibility.

- Management has the ability to select which fuel to use and can switch back and forth depending on energy conditions.
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6. The Role of Real Options

1. Input Mix Options:

Electric utility example.

Many operating facilities (such as oil refineries and chemical plants) can use different mixes of inputs to produce same output.

2. Output Mix Options:

Some facilities can use the same inputs to produce different arrays of outputs.
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6. The Role of Real Options

3. Abandonment Options (or Termination Options)

Traditional capital budgeting assumes that a project will operate in each year of its lifetime.

Two type of options:
- 3A. Option to completely terminate
- 3B. Option to stop production temporarily
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6. The Role of Real Options

4. Intensity Options:

Closely related to the Abandonment Options. Intensity Options is the flexibility to expand or contract the scale of the project.

Examples--

- Change output rate per unit of time.

- Change total length of production run time.
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6. The Role of Real Options

5. Initiation Options:

Just as Abandonment Option is valuable, so is the option to initiate the project.

Example:

Purchaser of off-shore lease can choose when, if at all, to develop property. This option has significant value.
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6. The Role of Real Options

6. Sequencing Options:

Important strategic issue is the sequencing of projects.

Example:

Being first into China.
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6. The Role of Real Options

7. Intra vs. Interproject Options:

Interproject options are created whenever management makes an investment that places the firm in a position to use new technology to enter a different industry or product line.
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6. The Role of Real Options

8. Growth Options:

Value of the firm can exceed the market value of the projects currently in place because the firm may have the opportunity to undertake positive NPV projects in the future.
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6. The Role of Real Options

9. Shadow Costs

Standard tools may overvalue some projects because they fail to recognize the losses in flexibility to the firm result from implementation.
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7. Why have a globally diversified portfolio of operations?

Similar to question of why do we hedge

Should we let shareholders worry about hedging? Shareholders might prefer to have a particular risk exposure that we are thinking of hedging away.

1. Hedging away risks that we cannot control (i.e. FX) provides a clearer picture of manager performance.

2. Hedging reduces or eliminates the possibility that positive NPV projects are passed over because of cash flow constraints arising from an unhedged position.
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7. Why have a globally diversified portfolio of operations?

Globally diversified portfolio of operations reduces overall variance and makes it less likely that good projects will be passed over.

Risk of portfolio of projects less than any single project.
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8. Implications for Shareholder Value

Shareholder value increased in two ways:

1. Accept projects which have positive NPV (when discounted at correct cost of capital and factoring in real options).

2. Allow for sufficient flexibility, such that future positive NPV projects can be undertaken (growth option).
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9. Lessons

1. To enhance shareholder value, we must work hard to understand country risk and its role in determining project discount rates.

2. A structure needs to be established in each corporation to quantify country risk and to feed information to the project evaluation process.

3. While it is obvious that 'timing is important', the firm's capital must be tactically allocated to capture the highest value opportunities in a changing global environment.
4. Real options can not be ignored in the project evaluation process.

5. Shareholder value will be enhanced if care is taken in the project evaluation process to quantify all risks (and potential upsides).

6. Shareholders value flexibility and speed to seize new value enhancing projects.