Country Risk & Topics in International Corporate Finance

(for private use, not to be posted/shared online)

• **Last Class**

• Asset Allocation in International Markets:

- Passive vs Active allocations.
- Decompose performance of active managers into segments that measure skills in picking stocks and market weights
- Performance metrics, incorporating risk-return trade-off.
- Optimal Portfolio Construction: Maximizing RVOL

• *Country Risk* (CR): Risk attached to a borrower/investment by virtue of its **location** in a particular country.

• CR is a **broad risk** concept. It includes economic risk, financial risk, political risk, etc.

• We think of CR as a **weighted average** of risk factors.

• Last Class

• Methods to measure CR. We emphasize Quantitative Method: Get data, analyze data (through a computer model or experts), produce measure.

• Usually reported as a **letter**. It determines a government **risk free rate** – i.e. borrowing costs. Thus, it also affects **discount rates** for projects.

• Big Con: **Lack of predictive power**.

• Main implication: MNCs need to account for country risk when evaluating the NPV of international projects.

• This Class – Several & Diverse Topics

Country Report (& Analysis)

Country Risk (Continuation)

• Incorporation of CR into a firm's valuation of a project/investment.

• Some country ("Political") Risk can be hedged by buying insurance.

Topics in International Corporate Finance

- DFI: A controlling ownership in a business enterprise in one country by an entity based in another country. Q: Why DFI instead of exports?

- Multinational Capital Budgeting. Follow standard NPV process, incorporating taxes (local and foreign) and exchange rates. Use discount rates specific to the (systematic) risk of the country.

- Capital Structure & Cost of capital

International Stock Markets: Info Problems & Valuation

Country Analysis

• Active allocation strategy requires the forecast of changes in macroeconomic variables: currencies, interest rates, & stock markets.

Key variable: Choice of a country (currency).

⇒ But currency forecasting is difficult.

• Q: How do we **select** a country to invest?

To help this process, economists monitor a large number of variables:

- **anticipated real growth** (probably major influence on a national mkt.)
- monetary and fiscal policy
- wage and employment rigidities
- social and political situations
- competitiveness

• Investment banks and consulting firms produce "*Country Reports*," trying to summarize all the relevant information that an investor/firm needs to make an investment decision in a given country.

• **Country reports** are **brief** and they give an investor an **overall idea** of the business, political, and economic climate.

• This is the **Class Project**: Write a professional country report.

Country Report

• **Country Report: Due on April 6**

Goal: Learn about investment environment in a country.
Target of Report: A busy U.S. investor.

Usual style:
(1) Very brief historical & current political details of chosen country.
(2) Description of economic, financial environment, & investment opportunities (usually, competitive sectors).
(3) Based on analysis, a couple of recommendations.

A. Necessary Information
• GDP or GNP growth.
• Monetary policy: Evaluation of inflationary prospects and interest rates.
• Wages & employment conditions: Productivity and Health of economy.
• Social and political situation: Goal is to evaluate political/country risk.
• Fiscal situation and taxes: Implications government budget situation.
• Sector analysis: Competitiveness of sectors in world/region.

• **Country Report**

B. Figures or Graphs

1. Macroeconomic Indicators (**4 years of history** + **forecasts**):

• GDP growth (GDP forecast is a must)
• Inflation & Government interest rates (yields)
• Trade Account (imports, exports and current account balance)
• Exchange rate against the USD
• Unemployment

2. Market Indicators (**4 years of history** + forecasts, if available):

• Stock Market Index (level, returns, P/E, if available)
• Government Bond yields (short-term and long-term)

3. Stocks (**4 years of history** for individual stocks + analysts' forecasts, if available): **10 largest stocks** (price, PE or EPS, if available)

• **Country Report**

C. Text

Report should include:
• Current events
• Macroeconomics (economic growth, monetary policy, government deficit, labor markets, etc.)
• Sectorial analysis
• Country risk
• Taxes
• Exchanges rates
• Equilibrium P/E (fair valuation)

D. Practical Issues

• The text cannot have more than **five pages**.
• Do not include irrelevant information as appendices.
• There are over 3,000 ADRs in the U.S.
• Need to include **fair P/E Valuation**
• Provide and justify **two stock recommendations**.

• **Country Report**

E. Some Grading Issues
Maximum Grade: 5 points.

• Incomplete discussion will be penalized. (Up to 2 points off.)

• Incomplete information -info suggested above-- up to 2 points off.

• Irrelevant information will be penalized. (1/2 point off).

• Current data is a must. If your latest data is from 2017, you lost 1 point.

• If current news is important (covid-19 or a recent devaluation), you should include it in your report. (Up to 1 point off.)

• If no equilibrium P/E calculated included, you'll lose 1/2 point.

• Long papers are penalized (1/2 point off, though if the paper is long because of irrelevant info, you'll be penalized only once.)

• Recommendations should come out logically from your country analysis.

• Copying a professionally written report is considered cheating.

• **Country Risk : Implications**

• Country/Political risk affects the expected cash flows of an investment. MNCs need to account for this type of political risk when evaluating international projects.

• In general, companies try to **adjust** the **expected cash flows** by decreasing them by an amount that reflects the probability of a loss due to country/political risk.

• It is complicated how to calculate the probability distribution associated with country/political risk.

Example: Suppose HAL, a U.S. MNC, is considering a project in Hong Kong with an initial investment of **USD 10 million** and a duration of 4 years with the following expected cash flows (in USD), including liquidation/sale at the end of Year 4:

	Year 1	Year 2	Year 3	Year 4
Free CF	**1.114M**	**1.486M**	**1.811M**	**13.524M**

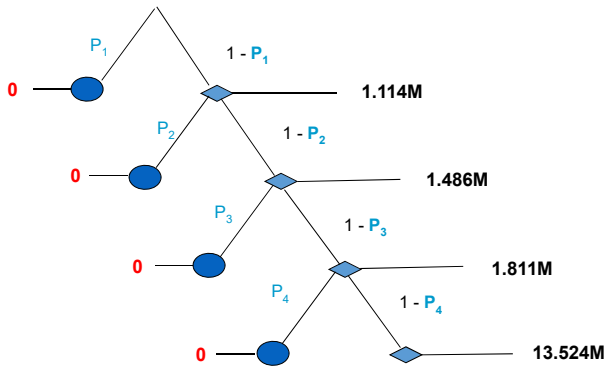
The MNC uses the usual **15%** discount rate for this type of project. Then,

$$\textbf{NPV (in M)} = -10 + \left\{\frac{1.114}{(1+.15)} + \frac{1.486}{(1+.15)^2} + \frac{1.811}{(1+.15)^3} + \frac{13.524}{(1+.15)^4}\right\}$$

$$= \textbf{USD 1.0155 M} > 0 \quad \Rightarrow \text{Yes, HAL undertakes project.}$$

But, we have ignored country/political risk. Suppose the MNC thinks there is a P_i probability of expropriation every year. Assume, for simplicity, that after expropriation the CFs = 0 –that is, there is no recovery.

CFs for the next 4 year are given by the following diagram:



Assume that $P_i = P$ –that is, a constant– and set **P = 5%**. Then,

$$\textbf{NPV (in M)} = -10 + \left\{\frac{1.114}{(1+.15)} * .95 + \frac{1.486}{(1+.15)^2} * (.95)^2 + \frac{1.811}{(1+.15)^3} * (.95)^3 + \right.$$

$$\left. + \frac{13.524}{(1+.15)^4} * (.95)^4\right\} = \textbf{- USD 0.746653M} < 0 \quad \Rightarrow \text{No!}$$

In practice, it is difficult to compute the P_i's in the previous Example.

Sometimes, it is easier to calculate *break-even probabilities* and, then, compare them with other the probabilities used in other projects or with the experience of a company or expert.

In the previous example, the break-even probabilities, p_{BE}, can be derived from solving the following equation:

$$\textbf{NPV (in M)} = -10 + \{\frac{1.114}{(1+.15)} * (1 - p_{BE}) + \frac{1.486}{(1+.15)^2} * (1 - p_{BE})^2 + \\ + \frac{1.811}{(1+.15)^3} * (1 - p_{BE})^3 + \frac{13.524}{(1+.15)^4} * (1 - p_{BE})^4\}$$

Example: Using trial and error (or Excel or R), HAL determines

$$p_{BE} = 0.027964$$

MNC's rule: If $p_{BE} < .03 \Rightarrow$ The U.S. MNC undertakes the project. ¶

• Country Risk : Insurance

• NPV calculations are easier if there is insurance: MNC just **adjust** the expected cash flows by the **cost of insurance** and proceed as usual.

• There is an active market for Country Risk Insurance.

- Sovereign Risk can be insured by the private market or CDS (swaps).
- Political Risk can be insured by international organizations (**World Bank**), governments and private insurance companies (**AIG**, **Zurich**, etc.)

• Political risk is available for different events:

◊ Political violence: Revolution, civil unrest, terrorism, war, etc.
◊ Expropriation or confiscation of assets.
◊ Repudiation of contracts.
◊ Cancellation of credit or guarantees.
◊ Business interruptions.
◊ Currency inconvertibility, blockage of funds.

• **Country Risk: Insurance**

• Political risk insurance policies tend to be standardized, but can be adapted for specific situations. For larger investments or complex situations, tailor-made policies are common, with a syndicate of several insurers providing coverage.

• The **private market** is usually used for complex investments that require a great deal of customization.

• The **U.S. government**, through the ***Overseas Private Investment Corporation*** (**OPIC**) has been providing political risk insurance to U.S. international investors since **1971**.

• The **World Bank** also offers political risk insurance through its ***Multilateral Investment Guarantee Agency*** (**MIGA**), which was established in **1988**.

• **Country Risk: Insurance**

Example: Suppose HAL gets fully insured against political risk. It insured the full amount for each year. The premium is **1.5%** annual. That is,

$$\textbf{NPV (in M)} = -10 + \left\{\frac{1.114 * .985}{(1 + .15)} + \frac{1.486 * .985}{(1 + .15)^2} + \frac{1.811 * .985}{(1 + .15)^3} + \right.$$
$$\left. + \frac{13.524 * .985}{(1 + .15)^4}\right\} = \textbf{USD 0.8502} > 0$$

$\Rightarrow$ Yes! HAL undertakes project. ¶

• The example is very simple. In practice, MNCs cannot get insurance for 100% of cash flows, usually they can get covered from 50% to 90%.

• **Country Risk: Insurance**

In practice, MNCs cannot get insurance for 100% of cash flows, usually they can get covered from 50% to 90%.

Example (continuation): Now, HAL gets insurance against political risk for **70%** of the CFs. The premium is **1.5%** annual and **P = 5%**. That is,

$$\begin{aligned}\textbf{NPV (USD M)} &= -10 + \left\{ \frac{1.114 * .985}{(1+.15)} + \frac{1.486 * .985}{(1+.15)^2} + \frac{1.811 * .985}{(1+.15)^3} + \right. \\ &\left. + \frac{13.524 * .985}{(1+.15)^4} \right\} * .70 + \\ &+ \left\{ \frac{1.114}{(1+.15)} * .95 + \frac{1.486}{(1+.15)^2} * (.95)^2 + \right. \\ &\left. + \frac{1.811}{(1+.15)^3} * (.95)^3 + \frac{13.524}{(1+.15)^4} * (.95)^4 \right\} *. 30 \\ &= \textbf{USD 0.37122} > 0 \Rightarrow \text{YES! } \P\end{aligned}$$

Remark: In many situations, once expropriation happens, the company files a claim and the company gets a **one-time payment**.

• **Country Risk: Insurance**

In many situations, once expropriation happens, the company files a claim and the company gets a **one-time payment**.

I. DFI

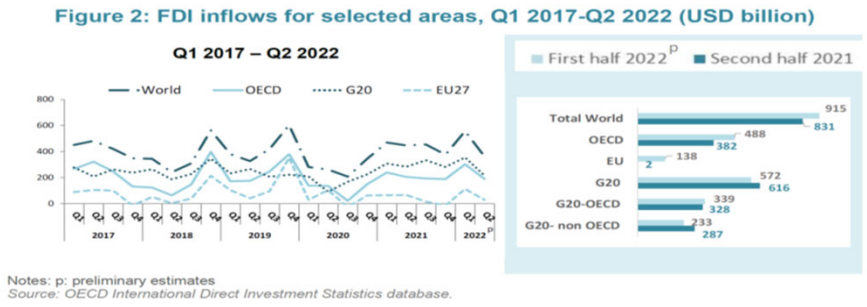
Definition: A *Direct Foreign Investment (*DFI*)* is a controlling ownership in a business enterprise in one country by an entity based in another country. Also called FDI.

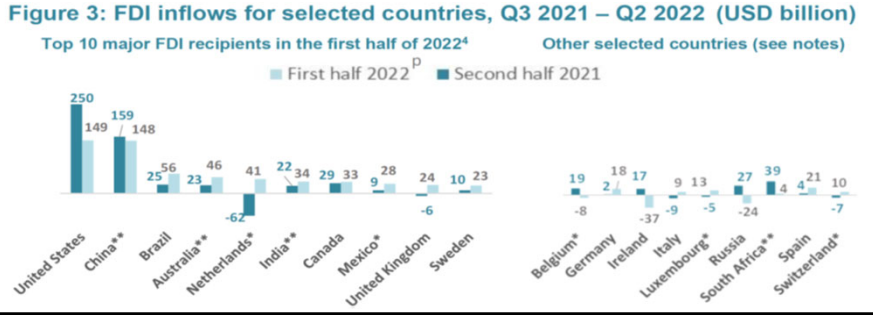
- Controlling ownership: 10%+ of voting stock (World Bank/OECD).
- DFI is different from portfolio investing abroad.
- DFIs: Greenfield investments (building a new operational facility), mergers & acquisitions, a joint venture, etc.
- Instruments: Equity, Reinvestment of earnings, Debt.

• According to OECD, global DFI in 2022 was **USD 1.01 trillion**. In **2020** (pandemic year), DFI was down **34%.**

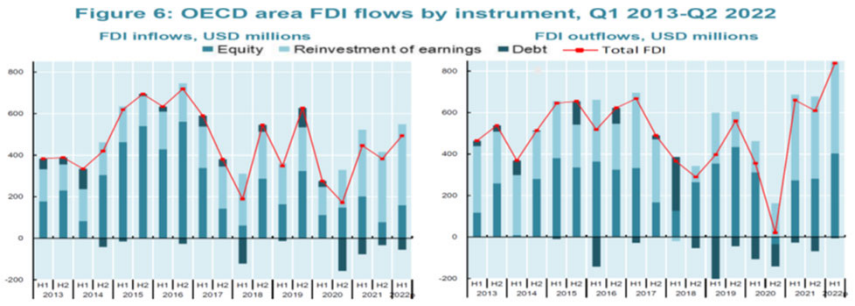
- US biggest recipient of DFI, followed by China, Brazil, Australia, Canada.
- High income countries receive almost half DFI flows.

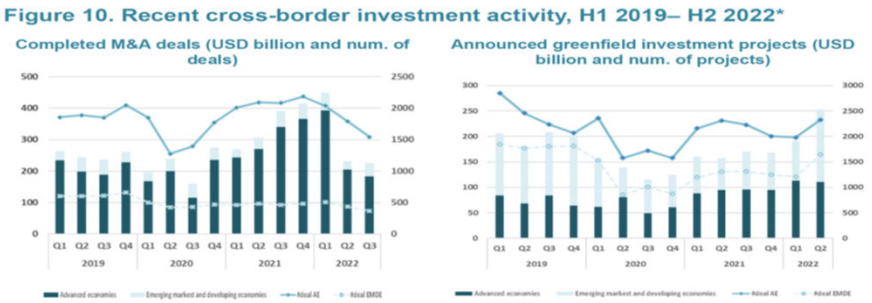
• DFI: Global Flows





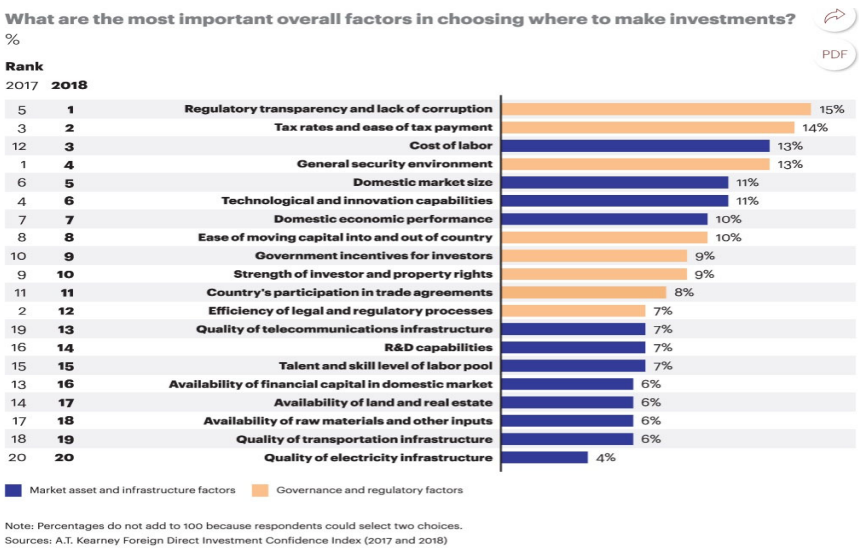
- **DFI: Global Flows**





- **Factors behind DFI**:

According to the annual DFI survey of A.T. Kearney, the main drivers are *regulatory transparency/ lack of corruption*, *taxes*, and *labor costs*.



• **DFI: Why?**

• A domestic firm can sell a product abroad by:

- Producing at home and exporting production.
- Producing abroad (& do a DFI) and selling abroad.

• Q: Why DFI instead of exports?

A: Usual reasons:

◊ Access to cheap inputs (labor, energy, etc.)
◊ Avoid tariffs, quotas & reduce transportation costs
◊ Local management
◊ Take advantage of government subsidies
◊ Access to new technology
◊ Access to local expertise (including: contacts, red tape, etc.)
◊ Real option (investment today to make investments elsewhere later).
◊ *Reduce economic exposure*
◊ *Diversification*

• **Diversification through DFI**

MNCs have **many DFI projects**. MNCs select the project that improves their **risk-reward profile**.

• Popular risk-adjusted performance measures (RAPM):

Reward to variability (Sharpe ratio):	$RVAR_i = \mathrm{E}[(r_i - r_f)]/\sigma_i$.
Reward to volatility (Treynor ratio):	$RVOL_i = \mathrm{E}[(r_i - r_f)]/\beta_i$.
Risk-adjusted ROC (BT):	$RAROC_i = r_i$/Capital-at-risk.
Jensen's alpha measure:	Estimated constant (α_i) on a CAPM-like linear regression

• We focus on RVAR & RVOL to evaluate projects.

Note: RVAR & RVOL can produce different rankings.

• Diversification through DFI: RVAR and RVOL

• Compute E[r] & Var[r] for a portfolio, compose by X & Y, as:

$E[r_{p=x+y}] = \omega_x * E[r_x] + (1 - \omega_x) * E[r_y]$

$Var[r_{p=x+y}] = \sigma^2_{x+y} = \omega_x^2 * \sigma_x^2 + \omega_y^2 * \sigma_y^2 + 2\,\omega_x\,\omega_y\,\rho_{x,y}\,\sigma_x\,\sigma_y$

$RVAR_p = (r_p - r_f)/\,\sigma_p$

• Compute β of the X+Y portfolio:

$\beta_{p=x+y} = \omega_x * \beta_x + (1 - \omega_x) * \beta_y$

$RVOL_p = (r_p - r_f)/\,\beta_p$.

Note: If project is added, MCN becomes X+Y

Y = Project MNC is considering

X = Existing portfolio of MNC –i.e., the "rest of the MNC."

• Diversification through DFI: RVAR and RVOL

$RVAR_i = E[(r_i - r_f)]/\sigma_i$ = Sharpe Ratio (SR)

$RVOL_i = E[(r_i - r_f)]/\beta_i$ = Treynor Ratio (TR)

• Q: RVAR or RVOL?

- RVAR (SR) uses total risk (σ); appropriate for *undiversified* portfolios.

When asset *i* is a small part of a diversified portfolio; σ is inappropriate.

- RVOL (TR) emphasizes *systematic risk*, appropriate measure of risk, according to the CAPM, when a portfolio is diversified.

Example: A US company considers two DFIs: Colombia & Brazil.

The firm has the following data, assuming r_f = **3%**:

	$E[r_i]$	$SD[r_i] = \sigma_i$	β_i	$\rho_{US,i}$	Weight
US firm (EP)	**13%**	**12%**	**.90**	-	-
Colombia	18%	25%	.60	0.40	.30
Brazil	23%	30%	.30	0.05	.35

ω_{Col} = .30, $\Rightarrow (1 - \omega_{Col}) = \omega_{EP}$ = **.70**

ω_{Brazil} = .35, $\Rightarrow (1 - \omega_{Brazil}) = \omega_{EP}$ = .65

Q: Which project is better? Calculate a RAPM for each project:

- SR = $E[(r_i - r_f)]/\sigma_i$
- TR = $E[(r_i - r_f)]/\beta_i$

For the US company:

$SR_{EP} = (.13 - .03)/.12 = .833$

$TR_{EP} = (.13 - .03)/.90 = .111$

Example (continuation):

• Colombia – Calculation of SR and TR

$E[r_{EP+Col} - r_f] = \omega_{EP} * E[r_{EP} - r_f] + \omega_{Col} * E[r_{Col} - r_f]$

$= .70 * .10 + .30 * .15 = 0.115$

$\sigma^2_{EP+Col} = \omega^2_{EP} * \sigma^2_{EP} + \omega^2_{Col} * \sigma^2_{Col} + 2 * \omega_{EP} * \omega_{Col} * \rho_{EP,Col} * \sigma_{EP} * \sigma_{Col}$

$= (.70)^2 * (.12)^2 + (.30)^2 * (.25)^2 + 2*.70*.30*0.40*.12*.25$

$= 0.017721$

$\sigma_{EP+Col} = (\sigma^2_{EP+Col})^{1/2} = (0.017721)^{1/2} = 0.1331$

$\beta_{EP+Col} = \omega_{EP} * \beta_{EP} + \omega_{Col} * \beta_{Col} = .70 * .90 + .30 * .60 = 0.81$

◊ $SR_{EP+Col} = E[r_{EP+Col} - r_f] / \sigma_{EP+Col} = 0.115/0.1331 = 0.8640$

◊ $TR_{EP+Col} = E[r_{EP+Col} - r_f] / \beta_{EP+Col} = 0.115/0.81 = 0.14198$

Example (continuation):

• Colombia – Interpretation of Ratios:

◊ $SR_{EP+Col} = E[r_{EP+Col} - r_f] / \sigma_{EP+Col} = \mathbf{0.115}/\mathbf{0.1331} = 0.8640$

Interpretation of SR: An additional unit of total risk (1%) increases returns by .864%.

◊ $TR_{EP+Col} = E[r_{EP+Col} - r_f] / \beta_{EP+Col} = \mathbf{0.115}/\mathbf{0.81} = 0.14198$

Interpretation of TR: An additional unit of systematic risk increases returns by .142%.

Example (continuation):

• Brazil

$E[r_{EP+Brazil} - r_f] = 0.135$

$\sigma_{EP+Brazil} = 0.1339$

$\beta_{EP+Brazil} = 0.69$

$SR_{EP+Brazil} = 0.135/0.1339 = 1.0082 > SR_{EP+Col} = 0.8640$

$TR_{EP+Brazil} = 0.135/0.69 = 0.19565 > TR_{EP+Col} = 0.14198$

$\Rightarrow$ Under both measures, Brazilian project is superior.

• Existing portfolio of the company (to compare to Brazilian project):

$SR_{EP} = (.13 - .03)/\mathbf{.12} = .833 < SR_{EP+Brazil} = 1.0082$

$TR_{EP} = (.13 - .03)/\mathbf{.90} = .111 < TR_{EP+Brazil} = 0.19565$

$\Rightarrow$ Using both measures, diversify internationally!

Q: Why? Because it improves the risk-reward profile for the company.

II. Multinational Capital Budgeting

• **Q: How to evaluate a project?**

A: NPV. The evaluation of MNC's projects is similar to a **domestic one**.

• **Data Needed for Multinational Capital Budgeting**:

1. CFs (Revenues[P & Q] and Costs[VC & FC])
2. Maturity (T)
3. Salvage Value (SV_T)
4. Depreciation
5. Taxes (local and foreign, withholding, tax credits, etc.)
6. Exchange Rates (S_t)
7. Required Rate of Return (k)
8. Restrictions to Capital Outflows

• **Data Needed for Multinational Capital Budgeting**:

- Taxes.

MNCs pay taxes twice: - Local level
- Parent level.

Different rules and **tax treaties** are in place to avoid double taxation –i.e., paying taxes for the same income twice.

- CF Uncertainty.

CFs are **difficult to estimate**. A point estimate (a single number) is usually submitted by subsidiary. Then, Parent "adjusts" for CFs uncertainty.

Usual adjustment: Discounting at rate k: CF's uncertainty ↑, higher k ↑.

2.A International Taxation

- **Taxes on Investments**
  1. Capital gains,
  2. Income (dividends, etc.),
  3. Transactions.

• Key question for international investors:
Q: Do they tax foreigners? If so, what are the withholding taxes?

- **Two Tax principles**
  - *Residence*: *Residents* taxed on their **worldwide** income.
  - *Source*: Only income earned **inside** the country is taxed.

When entire income is earned in the country of residence, both principles agree. Otherwise, principles do not agree.

Example:
Situation: A U.S. consultant works 3 months a year in Greece.
Residence principle: She pays taxes on her Greek income in the U.S.
Source principle: She pays taxes on her Greek income in Greece.
⇒ Greek income can be taxed twice. ¶

• Foreign investments may be taxed in two locations:
1. the investor's country,
2. the investment's country

Convention: Make sure that taxes are paid in at least one country.
⇒ This is why withholding taxes are levied on dividend payments.

• **Tax Neutrality**

Tax neutrality: No tax penalties associated with international business.

Two approaches:

(1) Capital import neutrality

(2) Capital export neutrality.

(1) Capital Import Neutrality

– **No penalty/advantage** attached to **foreign-owned** capital

– Foreign and domestic capital compete on equal basis.

⇒ Local taxes exempt foreign-source income from local taxes.

⇒ For U.S. MNC: Exclusion of foreign branch profits from U.S. taxable income (*Exclusion method*).

(2) Capital Export Neutrality

– **No tax incentive** for firms to **export capital** to a low tax country.

– Same overall tax whether capital remains in the country or not.

⇒ Local authorities "*gross up*" the after-tax income with all foreign taxes; then, apply home-country tax rules to that income, with credit for foreign taxes paid.

⇒ For U.S. MNC: Inclusion of "*pre-tax*" foreign branch profits in U.S. taxable income. A tax credit is given for foreign paid taxes (*Credit method*).

Example: Bertoni Bank, a U.S. bank, has a branch in Hong Kong.
Hong Kong branch income: USD 100.
U.S. tax rate: 35%
Hong Kong tax rate: 17%

	Double Taxation	Exclusion Method	Credit Method
• Hong Kong			
Branch profit	**100**	**100**	**100**
(17% tax) (i)	17	17	17
Net profit	83	83	83
• U.S.			
Net Hong Kong profit	**83**	**83**	**83**
Gross up	0	0	17
Taxable income	83	0	100
(35% tax)	29.05	0	35
Tax credit	0	0	(17)
Net Tax due (ii)	**29.05**	**0**	**18**
Total taxes (i)+(ii)	**46.05**	**17**	**35**

• **Agency Problem: Subsidiary vs Parent**

In general, CFs are **difficult** to estimate. **Point estimates** (a single estimated number) is usually submitted by the subsidiary. The Parent will attempt to adjust for CFs uncertainty.

Usually, this is done through the discount rate, k. But, many other methods can be used.

Typical problem for an MNC: Agency Problem - Subsidiary vs. Parent.

- Subsidiary wants to undertake more projects.
- Parent only cares about Profitability.

⇒ Subsidiary can misstate Revenues, VC, and SV.

• **Agency Problem**

Example: Project in Hong Kong (Data provided in HKD)

T = 4 years

CF_0= **HKD 70M** (=**USD 10M**)

Revenue: Year 1 (Price per unit (HKD), Quantity)) - 20; 1.00M = 20M
Year 2 (25; 0.95M) = 23.75M
Year 3 (30; 0.90M) = 27M
Year 4 (35; 0.85M) = 29.75M

Cost - VC = HKD 5/unit
- FC = HKD 3M

Depreciation = 10% of initial outlay (HKD 7M/year)

S_t = 7 HKD/USD (use RW to forecast future S_t's)

Taxes: - Income: HK 17%, US 35% (Gross-up, Credit for foreign taxes)
- Withholding tax (in Hong Kong) = 10%

Note: U.S. collects taxes based on worldwide income.

Example (continuation):

SV_4 = HKD 25M

k **= 15%**

1. Subsidiary's NPV (in HKD including local taxes)

	T=1	**2**	**3**	**4**
Revenues	20M	23.75M	27M	29.75M
Cost	5M	4.75M	4.5M	4.25M
	3M	3M	3M	3M
Profit	**12M**	**16M**	**19.5M**	**22.5M**
Dep.	7M	7M	7M	7M
EBT	**5M**	**9M**	**12.5M**	**15.5M**
Taxes	.85M	1.53M	2.125M	2.635M
EAT	**4.15M**	**7.47M**	**10.375M**	**12.865M**
Free CF +SV	**11.15M**	**14.47M**	**17.375M**	**44.865M**

Example: (continuation)

	T=1	2	3	4
Free CF +SV	**11.15M**	**14.47M**	**17.375M**	**44.865M**

NPV (in HKD) = **-70M** + **11.15M**/**1.15** + **14.47M**/**1.15**^{2} +
+ **17.375M**/**1.15**^{3} + **44.865M**/**1.15**^{4} = - **HKD 12.2869M** < 0

Note: If **SV_4** is changed to **HKD 80M**, then NPV = **19.16M** > 0!
⇒ Subsidiary would submit the project.

• Subsidiary **never** submits a project with **NPV<0**. SV is important!

2. MNC's NPV (in USD, including all taxes)

	Year 1	Year 2	Year 3	Year 4
CFs to be remitted (HKD)	11.15M	14.47M	17.375M	19.865M+**25M**
S_t = 7 HKD/USD				
CFs in USD	1.59M	2.067M	2.48M	2.84M+3.57M
Withholding	(.159M)	(.2067M)	(.248M)	(.284M)
CFs remitted	1.431M	1.86M	2.3M	2.56M+3.57M
(US Tax)	(.6M)	(.8M)	(.975M)	(1.125M)
Tax Credit	.281M	.425M	.552M	.376M
Net Tax	**(.319M)**	**(.425M)**	**(.423M)**	**(.749M)**
EAT	**1.114M**	**1.486M**	**1.811M**	**2.09M+3.57M**

NPV = **- USD 10M** + 6.5195M **= - USD 3.48M** < 0. ⇒ No!

Note: Subsidiary will **never** submit a project like this! Subsidiary will inflate some numbers, for example, SV_T.

If SV_T = **HKD 80M**, then

NPV (USD M) = -**10** + {1.114/**1.15** + 1.486/**1.15**^{2} + 1.811/**1.15**^{3}
+ (2.095 + **80**/**7**)/**1.15**^{4}} = **USD 1.01181 M** > 0 ⇒ Yes. ¶

• **Real Options View**

Original HK (with **SV_4** = **HKD 25M**) project has **NPV<0**. Usual view: MNC **rejects** project.

But, MNCs may undertake NPV<0 projects if there are **future benefits** associated with the initial investment. For example, an expansion, development of contacts, power to influence future political events, etc.

An MNC may view the DFI as an option –a *real option*. The initial investment plays the role of a premium paid:

$p = NPV_{\text{Initial Investment}} < 0$

The MNC sets some targets for initial investments (revenue, market share, etc.) that play role of a *strike price, X:*

If Realized Target > X ⇒ Expand (exercise *real option*).

• Real Options View

Overall, MNC undertakes project if

$$E[NPV] = NPV_{\text{Initial Investment}} + \text{Option Value of Expansion}$$

• Think of a real option as a two-phase project:

1) First phase: **Test the Market**
2) If test is successful: **Expand**

In many applications, the initial investment also gives a company the option to **delay** further investments. These options have **value**.

Financial options are not complicated to value, inputs (P_t, X, σ) are easy to get. In general, these inputs are not very precise value for real options.

⇒ Real options tend to be difficult to value. Simulations are used.

Example: Malouf Coffee considers expansion to Mexico with two stores: S & B.

♦ Expansion is done **simultaneously** (S&B together)

- Upfront investment is **230.**
- Probability of failure (F) = **70%**
- k = **.15**:
- CFs for S: **60** (if F) & **140** (if not F)
- CFs for B: **120** (if F) & **280** (if not F).

E[NPV] = **-230** + [(**.70**) * (**60**+**120**) + (**.30**) * (**140**+**280**)]/1.15 = -10.87 < 0

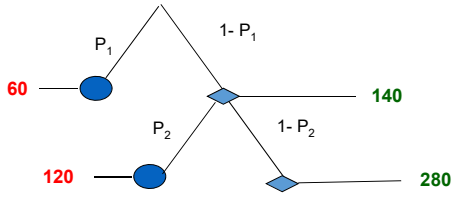
⇒ No!

Example (continuation):

♦ CFs for a 2-phase expansion (1st S; 2nd B):

- Initial Investment = **100**
- Expansion Investment = **70** if X (CFs) > 120.
- Probability of failure (F) for S = P_1 = **.70%**
- Probability of failure (F) for B = P_2 = **.50**;
- k = **.15**

Learning: Lower expansion investment & lower P_2.



• If S (1st-phase) is valued individually:
$E[NPV_{1st\text{-}phase}]$ = **-100** + [(**.70**) * **60** + (**.30**) * **140**]/**1.15** = -26.96<0 ⇒ No!

Example (continuation):

• If we evaluate **2-phase investment**:
⇒ E[NPV] = **-100** + (**.70**) * **60**/**1.15** + (**.30**) * {(**140**-**70**)/**1.15** +
+ [(**120**) * **.50** + (**280**) * **.50**]/**1.15**^{2}} = 0.1512 > 0 ⇒ YES!

Higher valuation when real option (flexibility) is introduced.

Technical Note: Discount rate in 2nd-phase should be lower! ¶

• Technical Issues: Not easy to determine P_1 & P_2, and future CFs.

• Value of the Real Option: Firm **learns** from 1st-phase & adapts (expand, delay, or close the project). Limiting downside.

• Many MNCs went to China in the early 1990s with NPV<0 projects. Years later, some expanded, some closed projects and left market.

• Adjusting Project Risk

MNCs have many ways methods to adjust for CF uncertainty.

• Adjusting discount rate, *k*

In general, CF's uncertainty is incorporated through the discount rate, k: Higher uncertainty, $k\uparrow$.

k also incorporates economic & political uncertainty in local country.

But k is a point estimate, an *average risk*. An average risk may cost an MNC: It may wrongly reject projects that have a below average risk.

An MNC may use a range for k, say $\{k_{LB},\ k_{UB}\}$.

Using a range $\{k_{LB},\ k_{UB}\}$ creates a range for $\{\text{NPV}(k_{LB}), \text{NPV}(k_{UB})\}$.

Example: Based on $\{k_{LB},\ k_{UB}\}$ for the HK project, MNC builds an NPV range

Range for k : $\{k_{LB} = .135, k_{UB} = .165\}$ (with **SV_4 = HKD 80M**, NPV > 0)

$\Rightarrow$ Range for NPV: {**USD 0.535M**; **USD 1.519M**}.

Note: Range is always positive. Good for a project. ¶

• **Sensitivity Analysis/Simulation**

MNCs can use sensitivity analysis to evaluate proposals.

1) Sensitivity Analysis of the impact of CFs on the NPV of project

◊ Play with **different scenarios/Simulation**

Steps: a. Assign a probability to each scenario

b. Get an NPV for each scenario.

c. Calculate a weighted average (weight=probability) NPV
⇒ E[NPV]

d. If possible, use a risk-reward measure (say, a Sharpe Ratio).

◊ Breakeven Analysis (same as what we do below for SV).

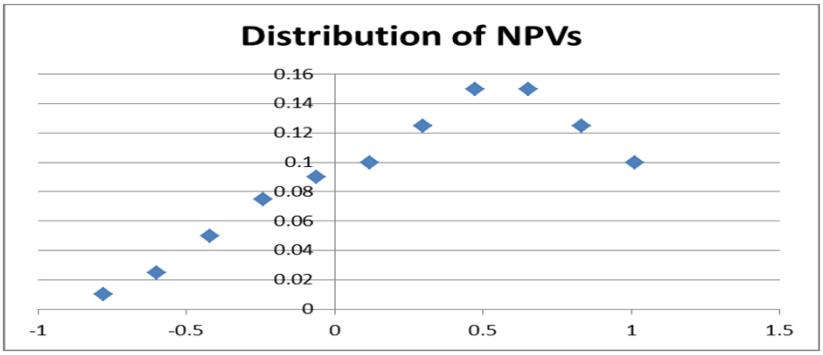
• **Sensitivity Analysis/Simulation**

Example: Compute E[NPV] & SD[NPV] for HK project

We create different scenarios for CFs (as a % of submitted CFs)

% of CFs	Probability	NPV (in M)
0.60	0.01	-0.77918
0.64	0.025	-0.60009
0.68	0.05	-0.42099
0.72	0.075	-0.24189
0.76	0.09	-0.06279
0.80	0.10	0.116313
0.84	0.125	0.295412
0.88	0.15	0.474512
0.92	0.15	0.653611
0.96	0.125	0.832711
1	0.10	1.01181
E[NPV]		0.35541
SD[NPV]		0.64477
Prob[NPV<0]	0.25	

• **Sensitivity Analysis/Simulation**



• *Descriptive Stats*
E[NPV] = **USD 0.355411 M**
SD[NPV] = **USD 0.644769 M**
Prob[NPV < 0] = 0.250000
SR = E[.]/SD[.] = 0.551221
95% C.I. (Normal): (-0.90834M; 1.61916M)

• **Sensitivity Analysis/Simulation - Decisions**

Parent can base a decision on some **risk-reward rule**.

For example, a firm may look at the SR (using E[NPV] and SD[NPV]), a range, establishing some ad-hoc tolerable level for the probability of negative NPV, etc.

• *Decisions*

Rule: Among projects with E[NPV] > 0, Parent compares the SRs (or CIs) for different projects. Then, select project with higher SR (or the CI with the smallest negative part).

• **Sensitivity Analysis/Simulation**

2) Sensitivity Analysis of the impact of SV on NPV

◊ Different scenarios based on original SV. For example:

% of SVs (in HKD)	Probability	NPV (in M)
0.60 (=HKD 48)	**0.05**	**-1.60192**
0.64 (=HKD 51.2)	**0.065**	**-1.34055**
0.68 (=HKD 54.4)	**0.085**	**-1.07917**
0.72 (=HKD 57.6)	**0.1**	**-0.8178**
0.76 (=HKD 60.8)	**0.125**	**-0.55643**
0.80 (=HKD 64)	**0.15**	**-0.29505**
0.84 (=HKD 67.2)	**0.125**	**-0.03368**
0.88 (=HKD 70.4)	0.1	0.227692
0.92 (=HKD 73.6)	0.085	0.489064
0.96 (=HKD 76.8)	0.065	0.750437
1.00 (=HKD 80)	0.05	1.01181
E[NPV]		**-0.29505**
SD[NPV]		**0.866876**
Prob[NPV<0]	**0.70**	

• **Sensitivity Analysis/Simulation**

◊ Breakeven Analysis: Calculate SV^{BE}, such that $NPV(SV^{BE}) = 0$.

$$\Rightarrow SV^{BE} = \{ IO - \sum_t \frac{CF_t}{(1+k)^t} \} * (1 + k)^T$$

The higher SV^{BE}, the more dependent project is on an uncertain SV: ⇒ To make the NPV > 0, we need $SV_T > SV^{BE}$. (Not good!)

Q: Is the SV_T reasonable? SV^{BE} helps to answer this question.

Example: Calculate SV^{BE} for HK project.

$$SV^{BE} = -10 + \{\frac{1.114}{(1+.15)} + \frac{1.486}{(1+.15)^2} + \frac{1.811}{(1+.15)^3} + \frac{2.09}{(1+.15)^4}\} * (1+.15)^4 =$$

$$= \textbf{USD 9.65891} \text{ (or } \textbf{HKD 67.61236M}\text{)}$$

Check NPV (in USD M) is zero when SV = **USD 9.65891**:

$$NPV = -10 + \{\frac{1.114}{(1+.15)} + \frac{1.486}{(1+.15)^2} + \frac{1.811}{(1+.15)^3} + \frac{2.09 + 67.61236/7}{(1+.15)^4}\} = 0.$$

A parent company compares the SV^{BE} with the reported SV value:

SV^{BE} = **HKD 67.61236M** < SV_4 = **HKD 80M**. (Too big!) ¶

Note: If $SV^{BE} < 0 \Rightarrow$ Good for project. Profitability does not depend on SV.

• **Judgment call**

In practice, there is a lot of **subjective** judgment.

Experience (MNC's own and consultants) also are incorporated.

Example: Ad-hoc decision

Based on past experience, Parent requires:

(1) E[NPV] > 0

(2) Prob[NPV < 0] < 30%.

In HK example, Prob[NPV < 0] = 25% ⇒ Accept!

Note: This ad-hoc rule double counts risk, since NPV is calculated using risk-adjusted discount rates! ¶

II.3 Capital Structure and Cost of Capital

• Cost of Capital

Cost of capital (k_c) = Discount rate for CFs.

Q: How do MNCs set discount rates for projects in foreign countries?

• Recall, Country Risk affects discount rates & NPVs:
- Because of CR, different countries have different risk-free rates (k_f).
- High CR, lower NPVs for projects.

• k_c depends on the debt (D) & equity (E) mix of a firms & nature (diversified firm/diversified ownership) of firm.

• Brief Review: Capital Structure

• Firms raise new capital by:

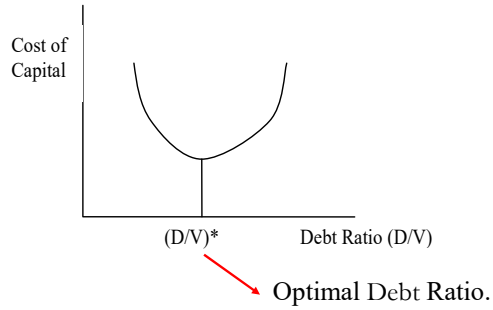
- Issuing **new equity** (E) –firms give away ownership; pay dividends
- Issuing **debt** (D) –firms borrow; pay interest.

Firms can use retained earnings, also E. (According to the *pecking order theory*, retained earnings are the first source of funds for firms.)

• Trade-off Theory of Capital Structure

- D has its (tax) advantages (reduces taxes), but also disadvantages (cost: bankruptcy).
- Firms use the E & D mix that minimizes cost of capital.

There is a U-shape relation between cost of capital & D relative to value of firm (V=E+D).



- There is an optimal Debt Ratio, (D/V)*:
  - Before (D/V)*, tax advantages dominate & k_c decreases.
  - After (D/V)*, probability of bankruptcy dominates & k_c increases.

- Desired capital structure is called *target capital structure*. It should be close to (D/V)*.

• Measuring the cost of capital

We use weighted average cost of capital (WACC).

WACC: $$k_c = \frac{D}{D+E} * k_d * (1-t) + \frac{E}{D+E} * k_e$$

• k_d

- k_d: Cost of debt of a project. Interest rate a firm pays to borrow.
- Easy to determine: A firm calls a bank or an investment bank.

Q: How does a bank set the interest rate for a given firm?

A: Base rate (a risk-free rate, k_f) + *spread* (reflecting risk of project)

Note: Interest payments are tax deductible:

$\Rightarrow$ After-tax cost of debt = $k_d * (1-t)$

• **Measuring the cost of capital**

• k_e

- k_e: Cost of equity of a project. The *required* (**expected**) return on equity.

- A **model is needed**. There are many models. We can use the **CAPM** or the popular **Fama-French** versions with 3 (or 4, or 6) factors.

- Let's use the CAPM to value the cost of equity:

$$k_e = \text{E[r]} = r_f + \beta\, \text{E}[r_m - r_f]$$

r_f (= k_f): Risk-free rate (a government rate).

r_m (= k_m): Expected return on a market portfolio (long-run return on a well-diversified market index).

β: Systematic Risk of the project/firm = Cov(k_e,r_m)/Var(r_m) (a coefficient estimated by a regression).

E[$r_m - r_f$] : Estimated risk premium (ERP).

• k_e: World or Domestic CAPM?

Many versions of the CAPM:

- World CAPM: $k_{e,W} = \text{E[r]} = r_{f,W} + \beta_W\, \text{E}[r_m - r_f]_W$

- Domestic CAPM: $k_{e,D} = \text{E[r]} = r_{f,D} + \beta_D\, \text{E}[r_m - r_f]_D$

Example: GE wants to calculate k_e for an investment in Brazil. GE decides to use **Domestic CAPM**.

Data:

$r_{f,D}$ = **7.40%** (Government Risk-free rate in Brazil)

$\text{E}[r_{M,D}]$ = 12% (Return of the BOVESPA Index in past 10 years)

$\Rightarrow \text{E}[r_m - r_f]_D = .12 - 7.40\% = .0460$

$\beta_{D,\text{GE-Brazil}}$ = **1.1** (Similar projects in Brazil)

$k_e = r_{f,D} + \beta_D\, \text{E}[r_m - r_f]_D$ = **7.40%** + **1.1** * **.0460** = **0.1246** (12.46%). ¶

• k_e: World or Domestic CAPM?

- World CAPM: $k_{e,W} = \text{E[r]} = r_{f,W} + \beta_W \, E[r_m - r_f]_W$

- Domestic CAPM: $k_{e,D} = \text{E[r]} = r_{f,D} + \beta_D \, E[r_m - r_f]_D$

Q: Which one should be used?

A: In theory, it **depends on the view** that a company has regarding capital markets or expected compensation to **shareholders**.

If capital markets are:

- Integrated (or **shareholders worldwide diversified**) ⇒ World

  $E[r_m - r_f]_W$ driven by world factors (world benchmark used)

- Segmented (or **shareholders hold domestic portfolios**) ⇒ Domestic

  $E[r_m - r_f]_D$ driven by domestic factors (domestic benchmark used)

Remark: Beta differs in both specifications.

• k_e: World or Domestic CAPM?

Differences can be significant:

- **5.55%** absolute difference in EM
- **3.58%** absolute difference in Developed Markets (DM).
- β_W & β_D also show significant absolute differences: **0.44** for EM & **0.21** for DM.

Evidence for integrated capital markets is weak. We think of capital markets as **partially integrated**. Then:

- Partially Integrated CAPM: $k_{e,D} = \omega_D \; k_{e,D^*} + (1 - \omega_D) \; k_{e,W}$

where,

k_{e,D^*}: FC-adjusted domestic cost of capital $k_{e,D}$ (both k_e in same currency)

ω_D: Weight of Domestic Market in world capital markets.

Note: Similar ideas can be extended to 3- or 4-Fama-French factor models.

In general, we find that **World CAPM** produces **low expected returns**.

Fama-French factor models tend to produce higher (more realistic) expected returns.

Many **ad-hoc adjustments** are used. For example, estimate World CAPM and add a CR premium (sovereign yield spread).

Example: Cost of capital Adjustment for project in Brazil

$E[r_m - r_f]_{US}$ = **0.0382**

β_W = **0.8**

CR_{Brazil} = **2.80%** (= YTM of Brazilian bonds – YTM of US bonds)

$r_{f,US}$ = **4.50%**

k_e = [**0.0450** + **0.8** * **0.0382**] + **.0280** = **10.36%** (in USD). ¶

Details behind WACC:

WACC: $k_c = \frac{D}{D+E} * k_d * (1 - t) + \frac{E}{D+E} * k_e$

- Dividends are not tax deductible. Advantage of using debt!
- Time-consistency between k_e & k_d. **Same maturity** should be used for k_e & k_d.
- In practice, many EM governments bonds should not be considered risk-free. Then, government bond rate includes a default spread, which, should be subtracted to get r_f.
- β is estimated by the slope of a regression against a market index. **Many estimation issues**: Choice of index, noisy data, adjustment by leverage, mean reversion, etc.

• **Issues:**

Q: Real or Nominal?

If CFs are **nominal** (usual situation), k_c should be also in nominal terms.

Q: Which r_f to use? Local or Foreign?

The r_f that reflects the **risk of the cash flows**.

Q: Which maturity for r_f to use?

The maturity that reflects the **duration of the cash flows**.

Q: Which β to use? The β of the company or the β of the project?

The β should reflect the **systematic risk of the project**.

Q: How do we calculate $E[r_{m,t}]$?

We need to determine a market portfolio (S&P? MSCI World?) and a method (and sample period) to compute the expectation.

◊ Calculating $E[r_{m,t}]$

There are three different ways to compute $E[r_{m,t}]$:

1) Surveys. Usually an average of ERPs provided by individual investors, institutional investors, managers and, even, academics.

2) Historical data. Expectations are computed using past data. This is the most popular approach. For example, compute $E[r_{m,t}]$ with $\bar{X}$. If we use this approach, it pays to use as much data as possible –more data, lower S.E. We think of $E[r_{m,t}]$ as a *long-run* average of market returns.

3) Forward-looking data. An (implied) ERP is derived from market prices, for example, market indexes, options & futures on market indexes, etc. Of course, we also need a model (a formula) that extracts the ERP from market prices.

• Once we compute $E[r_{m,t}]$ and chose a corresponding r_f, we are ready to determine the ERP. But, we make decisions along the way.

• Every time we compute an ERP, we make decisions along the way.

For example, using Shiller's monthly data, with **150 years of data**, we can produce an estimate of the ERP = E[($r_m - r_f$)]. Decisions made:

– Computation of returns (log returns)

– Method of computing ERP (Historical data)

– Sample period (1871-2021)

– Market portfolio (S&P Composite Index)

– Risk-free rate (10-year U.S. bond rate).

Then,

Annualized Market return = **0.007378** * 12 = **0.088536**

Annualized risk-free rate = **0.04511**

ERP = **0.088536** - **0.04511** = **0.043426** (**4.34%**)

Aside: Many economists consider this estimated ERP as "*too high*." Why? The degree of risk aversion to justify it is unreasonable high. 73

Example: GE wants to do an investment in Brazil.

Data:

Equity investment = **E** = **BRL 100M**

Debt issue = **D** = **BRL 150M**

Value of Brazil investment = **D** + **E** = **BRL 250M**

Brazilian Tax Rate = t = 35%

$r_{f,Brazil}$ = **7.40%**

$\mathbf{E[r_m - r_f]_D}$ = **.0460**

$\beta_{\mathbf{D,GE\text{-}Brazil}}$ = **1.1** (Similar projects in Brazil)

Cost of project = k_c = ?

• Cost of debt (k_d)

GE can borrow in Brazil at 60 bps over Brazilian Treasuries (r_f)

k_d = r_f + spread = **.0740** + .0060 = **.08** (8%)

Example (continuation):

• Cost of debt (k_d)

$k_d = r_f$ + spread = **.0740** + .0060 = **.08** (8%)

• Cost of equity (k_e)

GE decides to use Domestic CAPM

$k_e = r_{f,Brazil} + \beta_D \, E[r_m - r_f]_D$ = **.0740** + **1.1** * **.0460** = **0.1246** (12.46%)

• Cost of Capital –WACC– (k_c)

$k_c = \frac{D}{D+E} * k_d * (1 - t) + \frac{E}{D+E} * k_e$

k_c = (.60) * **.08** * (.65) + (.40) * **0.1246** = **.08104** (**8.104%**)

Note: This is the discount rate that GE should use to discount CFs in Brazil. That is, GE requires an **8.104%** rate of return on the investment in Brazil. ¶

Remark: When $k_c \uparrow$ $\Rightarrow$ NPV of projects $\downarrow$.

Anything that affects k_c, also affects the profitability (NPV) of a project.

Application: Argentina defaults.

Argentina's CR $\uparrow$ $\Rightarrow r_{f,Arg} \uparrow$ & $k_{c,Arg} \uparrow$.

$\Rightarrow$ Some projects in Argentina become NPV<0 projects.

$\Rightarrow$ MNCs suddenly abandon Argentine projects.

Estimating ERP, $E[r_m - r_f]$:

ERPs are estimated with error. To minimize the problem, the historical data method use many years to build the long-run average. Remember, the sample average, $\bar{X}$, comes with an associated standard error:

$$\text{S.E.}(\bar{X}) = {}^{s}/_{\sqrt{T}}$$

where s is the standard deviation (SD) and T is the length of the data.

Remark: More data ($T \uparrow$) $\Rightarrow$ lower S.E. –i.e., more precision.

But, even with **100+ years** of data for DM there is no consensus on an ERP. For the U.S. market, Duarte and Rosa (2015) list over **20 approaches** to estimate ERP in the U.S. With **1960-2013** data, they report estimates from **-0.4%** to **13.1%,** with a **5.7%** average for all models. A wide range!

Table X.4 reports estimates for Developed Markets from 0.88% (Italy) to 11.56% (HK), using the average US T-Bill rate for the period (≈ **4.5%**).

Table X.5 reports estimates for EM, with, as expected, higher numbers.

Estimating ERP, $E[r_m - r_f]$: From Duarte and Rosa (2015), wide range:

Table VII: ERP models

		Mean	Std. dev.	PC coefficients $\hat{w}^{(m)}$	Exposure to PC $\widehat{load}_1^{(m)}$
Based on historical mean	Long-run mean	9.3	1.3	0.78	-0.065
	Mean of previous five years	5.7	5.8	0.42	-0.160
DDM	Gordon (1926): E/P minus nominal 10yr yield	-0.1	2.1	-0.01	0.001
	Shiller (2005): 1/CAPE minus nominal 10yr yield	-0.4	1.8	-0.10	0.011
	Gordon (1962): E/P minus real 10yr yield	3.5	2.1	0.69	-0.077
	Gordon (1962): Expected E/P minus real 10yr yield	5.3	1.7	-0.78	0.208
	Gordon (1962): Expected E/P minus nominal 10yr yield	0.4	2.3	-0.79	0.077
	Panigirtzoglou and Loeys (2005): Two-stage DDM	-1.0	2.3	0.07	-0.011
	Damodaran (2012): Six-stage DDM	3.4	1.3	-0.26	0.032
	Damodaran (2012): Six-stage free cash flow DDM	4.0	1.1	-0.62	0.053
Cross-sectional regressions	Fama and French (1992)	12.6	0.7	0.80	-0.040
	Carhart (1997): Fama-French and momentum	13.1	0.8	0.81	-0.042
	Duarte (2013): Fama-French, momentum and inflation	13.1	0.8	0.82	-0.044
	Adrian, Crump and Moench (2014)	6.5	6.9	-0.05	0.114
Time-series regressions	Fama and French (1988): D/P	2.4	4.0	-0.27	0.069
	Best predictor in Goyal and Welch (2008)	14.5	5.2	-0.07	0.023
	Best predictor in Campbell and Thompson (2008)	3.1	9.8	-0.12	0.081
	Best predictor in Fama French (2002)	11.9	6.8	-0.72	0.321
	Baker and Wurgler (2007) sentiment measure	3.0	4.7	-0.32	0.184
Surveys	Graham and Harvey (2012) survey of CFOs	3.6	1.8	0.72	0.264
	All models	5.7	3.2	0.78	-0.065

Estimating $E[r_m - r_f]$: The international evidence (wide range too!)

Table X.4

MSCI Index USD Equity Returns and ERP: (1970-2017)

Market	Equity Return	Standard Deviation	ERP
U.S.	8.19	15.04	0.0345
Canada	8.22	19.35	0.0349
France	9.02	22.17	0.0427
Germany	9.37	21.67	0.0462
Italy	5.08	25.38	0.0079
Switzerland	10.44	17.83	0.0567
U.K.	7.77	21.44	0.0302
Japan	9.94	20.74	0.0520
Hong Kong	16.80	33.72	0.1206
Singapore	12.26	27.79	0.0752
Australia	7.68	23.79	0.0293
World	7.70	14.58	0.0295
EAFE	8.00	16.78	0.0326

Estimating $E[r_m - r_f]$: The international evidence (wide range too!)

Table X.4

MSCI Index USD Equity Returns and ERP: (1970 - 2021)

Market (*T*=620)	Equity Return	Standard Deviation	ERP
U.S.	8.31	15.01	0.0382
Canada	7.95	19.21	0.0346
France	8.80	21.95	0.0431
Germany	8.80	21.48	0.0431
Italy	5.37	25.25	0.0088
Switzerland	10.34	17.64	0.0585
U.K.	7.37	21.20	0.0288
Japan	9.56	20.46	0.0506
Hong Kong	16.06	33.23	0.1156
Singapore	11.71	27.48	0.0722
Australia	7.35	23.42	0.0273
World	7.66	14.54	0.0317
EAFE	7.69	16.64	0.0306

Estimating $E[r_m - r_f]$: The international evidence (wide range too!)

Table X.5

MSCI Index USD Equity Returns and ERP: (1987* - 2021)

Market (T)	Equity Return	Standard Deviation	ERP
Argentina (404)	24.21	51.49	0.1972
Brazil (404)	**22.23**	**47.67**	**0.1774**
Mexico (404)	17.67	29.26	0.1318
Poland (344)	15.88	43.24	0.1139
Russia (320)	**21.09**	**47.54**	**0.1660**
India (344)	**12.10**	**28.35**	**0.0760**
China (344)	**4.90**	**31.94**	**0.0041**
Korea (404)	11.75	34.08	0.0726
Thailand (404)	11.58	32.24	0.0606
Egypt (320)	11.61	31.69	0.0862
South Africa (344)	9.47	26.31	0.0498
World (620)	**7.66**	**14.54**	**0.0317**
EM Asia	8.85	23.13	0.0436

Estimating $E[r_m - r_f]$: Precision of estimates

We use the SE as a measure of precision of an estimate. For the sample mean, $\bar{X}$, we have:

$$\text{S.E.}(\bar{X}) = s/\sqrt{T}$$

where s is the SD.

Using the previous data, we calculate the S.E.($\bar{X}$) for several markets:

U.S.: **15.01**/sqrt(620/12) = 2.0882%

Germany: 21.48/sqrt(620/12) = 2.9883%

Hong Kong: **33.23**/sqrt(620/12) = 4.6230 % ⇐ Effect of T

Brazil: **47.67**/sqrt(404/12) = 8.2157 %

Russia: **47.54**/sqrt(320/12) = 9.2061%

India: **28.35**/sqrt(344/12) = 5.2950%

China: **31.94**/sqrt(344/12) = 5.9654%

⇒ Big difference in precision between Developed and EM.

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Estimating $E[r_m - r_f]$:

• **Short history** & **quality** of data are problematic for EM.

• For these markets, say Country J, it is easier to adjust the ERP from a developed market, say, the U.S., to estimate the ERP_J.

• Several ad-hoc adjustments:

◊ ***Relative Equity Market Approach*:**

U.S. risk premium is **modified by volatility** of the Country J's equity market, σ_J, relative to volatility of U.S equity market, σ_{US}:

$$E[r_m - r_f]_J = \mathbf{E[r_m - r_f]_{US}} * \sigma_J / \sigma_{US}$$

(Potential problem: σ_J is also an indicator of liquidity!)

Remark: The estimated $E[r_m - r_f]_J$ is a USD rate.

Estimating $E[r_m - r_f]$:

◊ ***Country Bond Approach*:**

The **bond spread** is **added** to the U.S. market risk premium:

$$E[r_m - r_f]_J = \mathbf{E[r_m - r_f]_{US}} + CR_J \text{ (bond spread)}$$

◊ ***Mixed Approach*:**

Since we expect equity spreads to be higher than debt spread, we **adjust** the CR upward **using volatilities** as a measure of risk:

$$E[r_m - r_f]_J = \mathbf{E[r_m - r_f]_{US}} + CR_J * \sigma_J / \sigma_{J,bond}.$$

Note: We may have very different numbers from these three approaches.

Remark: We produced **USD rates**. For the **local currency** rate, **IFE** (+PPP) can be used.

Estimating $E[r_m - r_f]$:

◊ Judgement calls/adjustments may be needed to pick $E[r_m - r_f]_J$.

◊ Following the idea of CR from bond markets, a *country equity risk premium* (*CER*) can be easily derived for Country J:

$$CER_J = E[r_m - r_f]_J - E[r_m - r_f]_{US}.$$

◊ We construct a market risk premium for Country J based on USD rates.

To change to a local currency premium, we can use IFE combined with relative PPP to estimate $E[s_t]$. Using the linearized version of both formulas, we get:

$$E[r_m - r_f]_J \text{ (in local currency)} \approx E[r_m - r_f]_J + (I_J - I_{US}).$$

Example: GE adjusts $E[r_m - r_f]_{J=Brazil}$, using U.S. as a benchmark.

Data:

$E[r_m - r_f]_{US} = 0.0382$

$r_{f,US} = 4.50\%$

$\sigma_{US} = 15.01\%$

$\sigma_{Brazil} = 37.3\%$ (based on past 15 years)

$\sigma_{Brazil,bond} = 23.1\%$ (based on past 15 years)

$CR_{Brazil} = 2.80\%$

◊ *Relative Equity Market Approach*:

$E[r_m - r_f]_{Brazil} = 0.0382 * .373/.1501 = 0.093741$

$\Rightarrow k_{e,Brazil} = r_f + \beta\, E[r_m - r_f]_{Brazil} = .0450 + 1.1 * 0.093741 = 0.1481.$

◊ *Mixed Approach*:

$E[r_m - r_f]_{Brazil} = 0.0382 + .028 *.373/.231 = 0.08341$

$\Rightarrow k_{e,Brazil} = r_f + \beta\, E[r_m - r_f]_{Brazil} = .0450 + 1.1 * 0.08341 = 0.1368.$

◊ *Relative Equity Market Approach*:

$E[r_m - r_f]_{Brazil}$ = **0.0382** * .373/.1501 = **0.093741**

Example (continuation): Suppose GE decides to use the Relative Equity Market Approach. Now, GE wants to translate the cost of capital in USD to BRL, using linearized PPP.

Data for average inflation rates:

$E[I_{Brazil}]$ = 8%

$E[I_{US}]$ = 3%

◊ *Relative Equity Market Approach*:

$E[r_m - r_f]_{Brazil}$ = **0.0382** * .373/.1501 = **0.093741**

$E[r_m - r_f]_{Brazil}$ (in BRL) ≈ **0.093741** + (0.08 – 0.03) = **0.1437**. ¶

• Target Debt-Equity Ratio in Practice

Suppose GE's target debt-equity ratio is 70% – 30%.

It is unlikely that GE will raise funds with 70-30 debt-equity split for every project. For example, for Brazilian project, GE used a 60–40 split.

The target (D/V)* reflects an *average*; it is not a hard target for each project. That is, for other projects GE will use D/E to compensate and be close to the (D/V)*.

Determinants of Cost of Capital for MNCs

Intuition: Factors that make CFs more stable reduce the k_c.

1) *Size of Firm* (larger firms get better rates)

2) *Access to international markets* (better chances of finding lower rates)

3) *Diversification* (more diversification, lower rates)

4) *Fixed costs* (the higher the proportion of fixed costs, the higher the β)

5) *Type of firm* (cyclical companies have higher βs)

6) *FX exposure* (more FX exposure, worse rates)

7) *Exposure to CR* (more exposure to CR, worse rates).

Example: Cost of Capital (**Nov 2014**):

General Electric (GE): Huge, internationally diversified company

Disney (DIS): Large, moderate degree of international diversification

The GAP (GPS): Medium cap, low international diversification.

US Treasuries (r_f): 1.63% (5-year T-bill rate, from Bloomberg)

S&P 500 return (E[r_m]): 8.43% (30 years: 1984-2014, from Yahoo)

tax rate (t): 27.9% (effective US tax rate, per World Bank)

Recall: $$k_c = \frac{D}{D+E} * k_d * (1 - t) + \frac{E}{D+E} * k_e$$

	E	D	Rating	Spread	β	k_d	k_e	WACC
GE	135B	313B	AA-	27	1.24	1.90	10.07	**3.99**
DIS	45.5B	16.1B	A+	30	0.96	1.93	8.16	**6.39**
GPS	3B	1.4B	BBB-	168	1.65	3.31	12.86	**9.53**