

CHAPTER X

TOPICS IN INTERNATIONAL CORPORATE FINANCE

In this chapter we study how firms select projects in an international environment. So far, we have studied FX Markets and how firms are affected by them. In this chapter, we study how firms are affected by the international context, not just the FX Market.

I. Direct Foreign Investment

A domestic firm has a choice regarding selling goods abroad: the firm can produce at home and export production; or, alternatively, the firm can invest to produce abroad (do a *Direct Foreign Investment*, DFI). Depending on the author/organization, DFI can also be called Foreign Direct investment (FDI).

DFI

Definition: It is a controlling ownership in a business enterprise in one country by an entity based in another country.

DFI is different from investing in foreign stocks, which is a more passive investment.

The World Bank/OECD defines DFI as the net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. DFIs can be done through mergers & acquisitions, setting up a subsidiary, a joint venture, etc.

From the point of view of national accounts, DFI is calculated as the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments.

According to the World Bank, the total DFI in 2016 was USD 2.3 trillion (almost unchanged from 2015), with the U.S. getting the biggest part (USD 479.4 billion), followed by the U.K. (USD 293.0 billion), China (USD 170.6 billion) and Netherlands (USD 154.0 billion). High income countries receive the lion share of DFI flows: USD 1.7 trillion.

1.A DFI or exports?

A DFI requires capital, sometimes a lot of capital, and, thus, DFI decisions are difficult to reverse. In spite of this potentially big disadvantage, why does a MNC choose a DFI over the simpler option of producing at home and then export the production? The usual reasons that justify a DFI decision are listed below:

- ◊ Avoid tariffs and quotas
- ◊ Access to cheap inputs
- ◊ Reduce transportation costs & trade frictions
- ◊ Local management
- ◊ Take advantage of government subsidies
- ◊ Access to new technology

- ◊ Access to local expertise (including: local contacts, dealing with red tape, etc.)
- ◊ Reduce economic exposure
- ◊ Diversification
- ◊ Real option (an investment today helps to make investments elsewhere later).

Diversification, developing local relations and contacts, and reduction of economic exposure are the main advantages of a DFI.

The main disadvantage of a DFI is the large initial investment, which it is difficult to revert. This difficulty makes a DFI a big risk relative to exports, where the decision to export can easily be changed. To limit this risk, licensing agreements and joint ventures (a “limited DFI”) are used by MNCs.

1.B Diversification through DFI

Diversification is a risk-reduction management tool. For a domestic firm, investing abroad will reduce the risk of the overall company. MNCs have many DFI projects and they will select DFI projects that will improve the company’s risk-reward profile (think of a company as a portfolio of projects). We will evaluate projects according to risk-adjusted performance measures (RAPM). We will use two RAPM: the *Sharpe ratio* and the *Treynor ratio*. (More on this topic on Chapter XVII.)

We need to know how to calculate expected return, $E[r]$, and the expected risk, measured by the variance, $\text{Var}[r]$, for a portfolio. Suppose X and Y are two investments, then the return on the portfolio of the two investments (X+Y):

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

$$\text{Var}[r_{x+y}] = \sigma_{x+y}^2 = w_x^2(\sigma_x^2) + w_y^2(\sigma_y^2) + 2 w_x w_y \rho_{x,y} \sigma_x \sigma_y$$

We need given this information, we can evaluate the risk-reward profile of the portfolio using the *Sharpe Ratio* (SR), also called *reward-to-variability ratio* (RVAR), defined as:

$$\text{SR} = \text{Reward-to-variability ratio} = E[r_i - r_f] / \sigma_i = \text{RVAR}$$

But, total volatility (σ) may not be the appropriate measure of risk for a portfolio. Another measure of a portfolio’s risk is β . To calculate the β of the X+Y portfolio, you should remember that the [beta](#) of a portfolio is the weighted sum of the betas of the individual assets:

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

Now, we can define another RAPM, the *Treynor Ratio* (TR), or *reward-to-volatility ratio* (RVOL):

$$\text{Treynor Ratio} = \text{TR} = \text{Reward-to-volatility ratio} = E[r_i - r_f] / \beta_i = \text{RVOL}$$

Note: The SR uses total risk (σ), this measure is appropriate when total risk matters –i.e., when most of an investor's wealth is invested in asset i. When the asset i is only a small part of a diversified portfolio, measuring risk by total volatility is inappropriate. The TR emphasizes systematic risk, the appropriate measure of risk, according to the CAPM.

Example X.1: A US company $E[r] = 13\%$; $\text{SD}[r] = 12\%$ (recall $\text{SD} = \sigma$), $\beta = .90$

Two potential DFIs: Colombia and Brazil

(1) Colombia: $E[r_c] = 18\%$; $\text{SD}[r_c] = 25\%$, $\beta_c = .60$

(2) Brazil: $E[r_b] = 23\%$; $SD[r_b] = 30\%$, $\beta_b = .30$

$$r_f = 3\%$$

$$\rho_{\text{ExistPort, Col}} = 0.40$$

$$\rho_{\text{EP, Brazil}} = 0.05$$

$$w_{\text{Col}} = .30, \quad \Rightarrow (1 - w_{\text{Col}}) = w_{\text{EP}} = .70$$

$$w_{\text{Brazil}} = .35, \quad \Rightarrow (1 - w_{\text{Brazil}}) = w_{\text{EP}} = .65$$

The U.S. company evaluates the Projects according to SR and TR.

We need to calculate for each project $E[r]$, $\sigma = SD[r]$, β :

$$E[r_{\text{EP+Col}}], \text{Var}[r_{\text{EP+Col}}], \beta_{\text{EP+Col}}$$

$$E[r_{\text{EP+Brazil}}], \text{Var}[r_{\text{EP+Brazil}}], \beta_{\text{EP+Brazil}}$$

Recall: The higher the SR or RVOL, the better the project

Calculate the SR for both countries (we'll work with excess returns, directly):

1. Colombia

$$\begin{aligned} E[r_{\text{EP+Col}} - r_f] &= w_{\text{EP}} * E[r_{\text{EP}} - r_f] + (1 - w_{\text{EP}}) * E[r_{\text{Col}} - r_f] \\ &= .70 * .10 + .30 * .15 = \mathbf{0.115} \end{aligned}$$

$$\begin{aligned} \sigma_{\text{EP+Col}} &= (\sigma_{\text{EP+Col}}^2)^{1/2} \\ \sigma_{\text{EP+Col}}^2 &= w_{\text{EP}}^2 (\sigma_{\text{EP}}^2) + w_{\text{Col}}^2 (\sigma_{\text{Col}}^2) + 2 w_{\text{EP}} w_{\text{Col}} \rho_{\text{EP, Col}} \sigma_{\text{EP}} \sigma_{\text{Col}} \\ &= (.70)^2 * (.12)^2 + (.30)^2 * (.25)^2 + 2 * .70 * .30 * 0.40 * .12 * .25 = \mathbf{0.0177210} \\ \Rightarrow \sigma_{\text{EP+Col}} &= (\mathbf{0.0177210})^{1/2} = \mathbf{0.1331} \end{aligned}$$

$$\begin{aligned} \beta_{\text{EP+Col}} &= w_{\text{EP}} * \beta_{\text{EP}} + w_{\text{Col}} * \beta_{\text{Col}} \\ &= .70 * .90 + .30 * .60 = \mathbf{0.81} \end{aligned}$$

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

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

Interpretation of SR: An additional unit of total risk (1%) increases returns by **0.864%**

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

2. Brazil

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

$$\sigma_{\text{EP+Brazil}} = 0.1339$$

$$\beta_{\text{EP+Brazil}} = 0.69$$

$$SR_{\text{EP+Brazil}} = 0.135 / 0.1339 = 1.0082$$

$$TR_{\text{EP+Brazil}} = .135 / .69 = 0.19565$$

Interpretation of SR: An additional unit of total risk increases returns by 1.0082%

Under both measures, Brazilian project is superior.

Now, compare existing portfolio of the company with the Brazilian project

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

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

Using both measures, the company should diversify internationally through DFI in Brazil Why? Because it improves

the risk-reward profile for the company. ¶

II. Multinational Capital Budgeting

Multinational corporations (MNCs) routinely receive project proposals from foreign subsidiaries. In general, they have several competing ones. In this section we will go over how MNCs evaluate different projects.

2.A Evaluation of Projects in International Markets: NPV

MNCs use similar techniques to evaluate projects as purely domestic firms. The main tool is to produce a net present value (NPV) for the project. Some simple definitions:

EBIT = Revenue – Cost of goods – Selling and general administrative expenses – Depreciation

NOPLAT (Net operating profit less adjusted taxes) = EBIT * (1-t) – t: corporate tax rate

Gross CF = GCF = NOPLAT + Depreciation

FCF (Free Cash Flows) = GCF – CAPEX – Δ NWC – NWC: Net Working Capital

In many applications, especially of ongoing ventures, capital expenditures (CAPEX) is assumed equal to depreciation. But, recall that depreciation is “accounting depreciation,” not the economic depreciation that CAPEX represents.

A typical evaluation calculates the NPV of the project, discounting all future FCF, using a constant *appropriate* –i.e., reflecting the risk of the CFs- discount rate.

An evaluation may also add a project’s financial side effects (subsidies & additional tax advantages not reflected in CFs, etc.) and any associated value from real options (option to expand, delay or cancel).

The data required to produce an NPV for a project involves:

1. Cash flows (CFs), mainly Revenues (Price & Quantity) and Costs (Variable & Fixed costs).
2. Initial Outlay (I.O. or CF₀)
3. Maturity (T)
4. Salvage Value (SV_T), also called Terminal Value.
5. Depreciation
6. Taxes (local and foreign, withholding, tax credits, etc.)
7. Exchange Rates (S_t)
8. Required Rate of Return (*k*)
9. Restrictions to Capital Outflows

Exchange rates and local restrictions to capital outflows are the only pure international inputs in the process. All the other inputs are the same required for a domestic NPV calculation.

In general, future cash flows are difficult to estimate. A point estimate (a single estimated number) is

usually submitted by the subsidiary. The parent company will attempt to adjust for cash flow uncertainty. Usually, this is done through the discount rate, k : Higher cash flow uncertainty, higher k .

2.B International Taxation

Taxes are an explicit transfer of wealth. Even though, tax laws tend to be complex, the principles of taxation are easy to understand. In this section we focus on taxes on investments. Taxes on investments are applied in three areas: transactions, and income (dividends, coupon payments, etc.) and capital gains.

In general, taxes on transactions are small, from 0.01% to 0.50% of nominal amount traded. Many countries, however, impose domestic no transactions tax, for example, Canada, Israel, and Sweden. Countries like France and Finland impose transactions taxes on domestic residents only, foreigners are exempt. Some countries also impose a VAT (Value Added Tax) on the commission paid to a broker, for instance, Morocco imposes a 7% VAT on commissions.

Taxes on income are collected based on two principles:

(1) The *residence* principle: All *residents* of the country can be taxed on their *worldwide* income. This is the principle applied in the U.S. and the U.K.

(2) The *source* or *territorial* principle: All income earned *inside* the country, whether by residents or nonresidents, is taxable in this country. This is the principle applied in the majority of countries, including Canada, Hong Kong, and Singapore.

Residency based systems have to provide a definition of residency and characterize the income of nonresidents. Such definitions vary by country and type of taxpayer. The U.S. provides very detailed rules for individual residency covering: periods establishing residency, exceptions for transitory visits, medical conditions, etc. The U.K. establishes three categories: non-resident, resident, and resident but not ordinarily resident. Switzerland residency may be established by having a permit to be employed in Switzerland for an individual who is so employed.

On the other hand, source based systems need to provide a clear definition of where income is considered to arise. The determination of source of income depends on the nature of income. Income from the performance of services –for example, wages- is generally treated as arising where the services are performed. Financing income –for example, interest and dividends- is generally treated as arising where the user of the financing resides. Income related to use of tangible property –for example, rents- is generally treated as arising where the property is situated. Income related to the use of intangible property –for example, royalties- is generally treated as arising where the property is used. Gains on sale of real state are generally treated as arising where the property is situated.

The key problem associated with the source principle is the ability to avoid taxation on portable income, by moving it offshore. For example, Canada's top tax rate is 48%, while the U.S. top rate is only 37%; Canada taxes individuals based on the source principle, while the U.S. taxes individuals based on the residence principle. As a result, it is usually advantageous for Canadian NHL players to move to the U.S.; as long as they do not have Canadian-source income, they do not have to pay Canadian taxes, saving 13% on every USD earned. Because of situations like this one, countries tend

to use *hybrid* systems to recover lost revenue.

The two principles are in perfect agreement when the entire income of a resident is earned in the country of residence. In an international context, however, the two principles have different implications.

Example X.2: A U.S. computer consultant works three months a year in Canada. According to the residence principle, she may have to pay taxes on her Canadian labor income in the U.S. According to the source principle, she may have to pay taxes on her Canadian labor income in Canada. Therefore, the Canadian income can be taxed twice, unless some form of tax relief against double taxation is in place. ¶

According to the above taxation principles, income from foreign investments may be taxed in two locations: the investor's country and the investment's country. Bilateral *tax treaties* exist between many countries to avoid double taxation. For example, the tax treaty between the United States and Canada prevents double taxation for those who cross the border for work, as is the case of NBA, NHL and MLB players. In some countries, tax treaties are also known as double taxation agreements, double tax treaties, or *tax information exchange agreements* (TIEA).

Capital gains are normally taxed using the residence principle. In this way, local authorities try to avoid creating an incentive to export capital, as would occur if a foreign country taxes capital gains at a lower rate than the domestic rate. In other words, domestic and international investments are taxed the same way.

The international convention on taxing income is to make certain that the investor in at least one country pays taxes. For this reason, withholding taxes are usually levied on dividend payments.

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In practice, countries use a *hybrid* system, for all or only certain classes of taxpayers, adopting a combination of territorial, and residency, with a lot of exceptions and exclusions. There is no clear pattern to these hybrid tax systems. Following are examples:

- The U.S. allows individuals earning income from their personal services outside the U.S. an exclusion of up to USD 80,000 (in 2008, indexed for inflation) from compensation for such services. Compensation income in excess of this amount is fully taxable to citizens and residents.
- The U.K. imposes a charge to tax on individuals “resident but not ordinarily resident” in the U.K. based on income earned in or remitted to the U.K.
- Singapore imposes income tax on resident individuals and companies on all income earned in or remitted to Singapore.

2.B.1 International Taxation: Tax Neutrality

Direct foreign investments (DFIs) are subject to foreign and/or local taxes. All countries attempt to eliminate double taxation to achieve *tax neutrality*, that is, there are no tax penalties associated with international business.

There are two approaches to achieve tax neutrality:

- (1) Capital import neutrality (CIN), based on territorial income.
- (2) Capital export neutrality (CEN), based on worldwide income.

(1) CIN Approach (most European countries, Canada, Hong Kong, Singapore)

- No penalty or advantage attached to the fact that capital is foreign-owned
 - Foreign capital competes on an equal basis with domestic capital.
 - Local tax authorities exempt foreign-source income from local taxes.
- ⇒ For MNCs: Exclusion of foreign branch profits from U.S. taxable income (*exclusion method*).

(2) CEN Approach (U.S., Brazil, South Korea, Israel, India, Mexico)

- No tax incentive for firms to export capital to a low tax foreign country.
 - Overall tax is the same whether the capital remains in the country or not.
 - Local authorities "gross up" the after-tax income with all foreign taxes; then apply the home-country tax rules to that income, and give credit for foreign taxes paid.
- ⇒ For MNCs: Inclusion of "pre-tax" foreign branch profits in U.S. taxable income (gross-up income). A tax credit is given for foreign paid taxes (*credit method*).

Example X.3: Bertoni Bank, a U.S.-based bank, establishes a branch in Hong Kong. The income of the Hong Kong branch, after translation into USD, is USD 100. Suppose the applicable tax rate is 35% in the U.S. and 17% in Hong Kong. The Table IX.1 shows Bertoni Bank's cash flows under different taxation situations.

TABLE X.1
International Taxation: Double Taxation, Exclusion Method and Credit Method

	Double Taxation	Exclusion Method	Credit Method
Hong Kong			
Branch profit	100	100	100
(17% tax) (i)	17	<u>17</u>	<u>17</u>
Net profit	83	83	83
U.S.			
Net Hong Kong profit	83	83	83
Gross up	0	<u>0</u>	<u>17</u>
Taxable income	83	0	100
(35% tax)	29.05	0	35
Tax credit	0	<u>0</u>	<u>(17)</u>
Net Tax due (ii)	29.05	0	18
Total taxes (i)+(ii)	46.05	<u>17</u>	<u>35</u>
Net income	53.95	83	65

That is, under the exclusion method, the overall tax is just the Hong Kong tax (USD 17), while under the credit method, the overall tax is the U.S. tax (USD 35). ¶

Usually, investors receive a dividend net of withholding tax plus a tax credit from the foreign tax government (capital export neutrality principle). The investor's country of residence imposes its tax on the gross foreign dividends, but the amount of this tax is reduced by the withholding tax credit. In other words, the foreign tax credit is applied against the home taxes. To a tax-free investor, such as a pension fund, this tax credit is worthless, since the investor does not pay taxes at home. In this case, the investor can reclaim the tax withheld in the foreign country. Reclaiming a withholding tax is often a lengthy process (from a few months to a couple of years).

Example IX.4: Tax credit in the U.S.

Ms. Sternin, a U.S. investor, buys 1,000 shares of Nestle listed in Zurich for CHF 62. The current exchange rate is 0.58 USD/CHF. Her total cost is USD 35,960 or USD 35.96 per share of Nestle. Six months later, a dividend of CHF 0.5 is declared and paid. Ms. Sternin sells the Nestle shares. Currently, Nestle shares are trading at CHF 60. During this period the CHF has appreciated against the USD, and is trading at 0.65 USD/CHF. The same exchange rate is used in the dividend payment date. Here is the cash flow she received in USD:

Dividend Payment Minus Withholding Tax ($S_t = 0.65$ USD/CHF):

	Net dividend	Tax credit
CHF per share	0.450	0.05
USD per share	0.2925	0.0325
Net (in USD)	292.50	32.50

Sale of Nestle shares ($S_t = 0.65$ USD/CHF)

CHF per share	60.00
USD per share	39.00

Net (in USD) 39,000

Ms. Sternin has made a capital gain of USD 3,040, which will be taxed in the U.S. at the U.S. capital-gain tax rate. She will also declare a total gross dividend of USD 325 as income, which will be taxed at her income tax rate. She can deduct from her income tax a tax credit of USD 32.50 thanks to the U.S.-Swiss tax treaty. ¶

The median withholding tax rate across countries is 15%. In general, these nations also allow tax-credits for taxes on capital gains and dividends paid on foreign countries. Many nations like the U.K., Hong Kong, the Russian Federation, and Singapore do not withhold taxes on capital gains and dividends earned by foreigners. Some investors such as public funds can obtain complete exemption from withholding taxes.

Withholding taxes are completely different for bonds. No withholding tax is applied to Eurobonds, and many countries have removed withholding taxes on domestic bonds purchased by nonresidents. (More about this later, in Chapter XII.)

2.C Agency Problem: Subsidiary vs. Parent

A typical problem for the evaluation of international projects is that the subsidiary may have incentives to undertake projects that are not NPV positive for the parent company. There are many reasons for this behavior: prestige of subsidiary in host country, local political pressure, pay incentives based on local revenue, etc. On the other hand, the parent company only cares about profitability in the parent company's currency.

By looking at the previous list of inputs, a subsidiary can misstate revenues, Costs, and Salvage Value to create a positive NPV project. MNCs are aware of this agency conflict. They try to institute rules to minimize the incentive of a subsidiary's management to undertake negative NPV projects.

Example X.5: A U.S. MNC is considering a project in Hong Kong (Data provided in HKD)

Inputs:

- $T = 4$ years

- $CF_0 = \text{HKD } 70\text{M}$

- Revenue (Price in HKD, Quantity (Q) in Million units):

Year 1: Price= 20; Q = 1.00

Year 2: Price=25; Q = 0.95

Year 3: Price=30; Q = 0.90

Year 4: Price=35; Q = 0.85

- Cost

Variable Cost (VC): HKD 5/unit

Fixed Cost (FC) = HKD 3M

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

- Taxes:

Income tax: HKD 17%, US 35% (CEN system: Gross-up, credit for foreign taxes)

Withholding tax: 10%

- $S_t = 7 \text{ HKD/USD}$ (use RW to forecast future S_t 's)

- Salvage Value (SV_4): HKD 25M

- Discount rate (k): 15%

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

	Year 1	Year 2	Year 3	Year 4
Revenues	20M	23.75M	27M	29.75M
Cost VC	5M	4.75M	4.5M	4.25M
FC	3M	3M	3M	3M
Gross Profit	12M	16M	19.5M	22.5M
Depreciation				
http://www.derf.com.ar/despachos.asp?cod_des=576517			<u>7M</u>	<u>7M</u> <u>7M</u> <u>7M</u>
EBT	5M	9M	12.5M	15.5M
Taxes	<u>.85M</u>	<u>1.53M</u>	<u>2.125M</u>	<u>2.635M</u>
EAT	4.15M	7.47M	10.375M	12.865M
Free CFs (EAT + Dep)	11.15M	14.47M	17.375M	19.865M
Free CF +SV	11.15M	14.47M	17.375M	44.865M

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

Note: If SV_4 is changed to HKD 80M, then $\text{NPV} = 19.16\text{M} \Rightarrow$ Subsidiary would accept the project. (This is likely to happen: the subsidiary will never submit a project to the parent company with a $\text{NPV} < 0$.) Thus, SV is very important!

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

	Year 1	Year 2	Year 3	Year 4
CFs to be remitted	HKD 11.15	14.47	17.375	19.865+25
$S_t = 7 \text{ HKD/USD}$				
CFs in USD	1.59M	2.067M	2.48M	2.84M+3.57M
Withholding	<u>.159M</u>	<u>.2067M</u>	<u>.248M</u>	<u>.284M</u>
CFs remitted	1.431M	1.86M	2.3M	2.56M+3.57M
(US Tax)	(.6M)	(.8M)	(.975M)	(1.125M)
Tax Credit	.281M	.425M	.552M	.660M
Net Tax	<u>.319M</u>	<u>.375M</u>	<u>.423M</u>	<u>.465M</u>
EAT	1.114M	1.486M	1.811M	2.09M+3.57M

$$\text{NPV} = -\text{USD } 10\text{M} + 6.5195\text{M} = -\text{USD } 3.48\text{M} < 0 \Rightarrow \text{No to the project.}$$

A subsidiary will never submit a project like this, with an $\text{NPV} < 0$; after all they want to undertake the project. A subsidiary can inflate some numbers, for example, SV_T .

If $SV_{T=4} = \text{HKD } 80\text{M}$, then

$$\begin{aligned} \text{NPV(USD M)} &= -1010 - (1.114/1.15 \cdot .95 + 1.486/1.15^2 \cdot .95^2 + 1.811/1.15^3 \cdot .95^3 + 13.524/1.15^4 \cdot .95^4) \\ &+ \{1.114/1.15 + 1.486/1.15^2 + 1.811/1.15^3 + (2.095+80/7)/1.15^4\} \\ &= \text{USD } 1.0155 \text{ M} > 0 \Rightarrow \text{Yes.} \end{aligned}$$

Note: Computation of US Tax, using the credit method:

	Year 1	Year 2	Year 3	Year 4
Gross-up	12.0	16.0	19.5	22.5
US-tax	4.20	5.60	6.83	7.88
Foreign Tax credit	1.97	2.98	3.86	4.62
Net US tax (in HKD M)	2.235	2.623	2.963	3.254
US-tax (in USD M)	0.600	0.800	0.975	1.125
Foreign Tax credit (in USD M)	0.281	0.425	0.552	0.660
Net US tax (in USD M)	0.3193	0.3747	0.4232	0.4648

Remark: Not all the countries collect taxes like in the U.S., based on worldwide income. ¶

2.D Real Options View

An MNC may view an initial DFI as an option –a *real option*–, with the initial investment being the premium paid, p :

$$p = NPV < 0$$

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

If Realized Target $> X \Rightarrow$ Expand (exercise *real option*).

Finally, the MNC undertakes project if

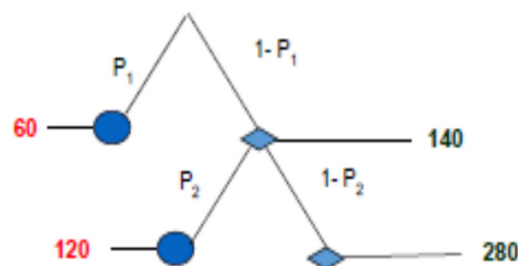
$$E[NPV] = NPV_{\text{Initial Investment}} + \text{Option Value of Expansion}$$

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

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

Example X.6: Suppose Malouf Coffee is considering expanding to Mexico by opening two stores: a small one and a big one. If the expansion is done simultaneously, the upfront investment is **230**. There is a 70% probability of failure. The associated CFs under failure and success are **60** and **140**, respectively, for the small store; and double the CFs under both scenarios for the big store.

Alternatively, Malouf Coffee can also do the expansion in two phases, with an Initial Investment = **100** & Expansion Investment = **70** if X (CFs) > 120 ($k=.15$) and the following CFs:



Suppose $P_1 = .70$ & $P_2 = .50$.

The numbers reflect the fact that Malouf Coffee can double the CFs in the second phase at a lower investment cost (70), taking advantage of the initial investment and successfully learning about the business. Learning (improving marketing, distribution, local contacts, etc) also appears in the form of a lower the probability for the bad outcome (120). Then:

$$\begin{aligned} E[\text{NPV}] &= -100 + (.70) * 60/1.15 + (.30) * \{(140 - 70)/1.15 + [120 * .50 + 280 * .50]/1.15^2\} \\ &= 0.1512 > 0. \end{aligned}$$

Notice that ex-ante, the NPV of opening one store in Mexico is negative:

$$E[\text{NPV}] = -100 + [(.70) * 60 + (.30) * 140]/1.15 = -26.9565.$$

But, Malouf Coffee decides to do the initial NPV<0 investment because it allows Malouf Coffee to learn about the Mexican market.

Clearly, if Malouf Coffee does not use the option approach and evaluates the expansion in Mexico under the scenario of opening the stores simultaneously, we get:

$$\begin{aligned} E[\text{NPV}] &= \{-200 + [(.70) * (60 + 120) + (.30) * (140 + 280)]/1.15\} = -10.86957 < 0, \\ &\Rightarrow \text{Malouf Coffee does not expand to Mexico.} \end{aligned}$$

The valuation is substantially higher when the real option is introduced. A standard NPV approach is not able to give a correct value to the flexibility that is embedded in investments in real world applications. ¶

In general, it is not easy to determine P₁ & P₂ and future CFs. It is difficult to do NPV analysis, as done in Example X.6. Option valuation methods, which are also difficult to apply in many applications, are used to get an idea of the value of the option to expand.

The value of the real option comes from the fact that the firm learns from observing the CFs in the real world during the testing phase and, then, adapts the behavior (expand, delay, or close the project) accordingly. It is an attempt to limit the downside. Note that the discount rate in the second-phase should be lower, since the first-phase results reduce the uncertainty of the second-phase cash flows!

Many MNCs went to China in the early 1990s with negative NPV projects. Years later, many of them substantially expanded their initial investment (BMW, Nike, Starbucks), while many others closed the projects and left the market (Home Depot, Mattel).

2.E Adjusting Project for Risk and Scenarios

MNCs use different techniques to adjust for the uncertainty in the estimated CFs submitted by the subsidiaries. The simplest way is to adjust the discount rate, *k*. More sophisticated techniques, for example, sensitivity analysis or simulations can be done.

2.E.1 Adjusting the Discount Rate, *k*

In general, CF's uncertainty is incorporated in the evaluation process through the discount rate, k : The higher the uncertainty, the higher k . In general, k incorporates economic and political uncertainty in the local country. But k is a point estimate, an *average risk*. Using an average risk may cost an MNC: it may wrongly reject (accept) projects that have a below (above) average risk.

Sometimes, it is better not to work with a point estimate (k), but a range instead. In this case, an MNC may construct a range for k , say $\{k_{LB}, k_{UB}\}$, to create a range for $\{NPV(k_{LB}), NPV(k_{UB})\}$.

Example X.7: A range for NPV based on $\{k_{LB}, k_{UB}\}$ for the HK project.

Suppose the Parent decides to build a range for NPVs based on $\{k_{LB}=.135, k_{UB}=.165\}$ (using $SV_4 = \text{HKD } 80\text{M}$ to get $NPV > 0$):

⇒ Range for NPV: $\{\text{USD } 0.535\text{M}; \text{USD } 1.519\text{M}\}$.

The lower end of the range is positive (under the higher $k_{UB}=.165$). This is good for the project. ¶

2.E.2 Sensitivity Analysis/Simulation

In addition to adjusting k , an MNC may use sensitivity analysis for CFs to derive an expected value for the CFs, and then an $E[NPV]$. You may remember that calculating an $E[CF]$ is not the same as adjusting for risk (recall the St. Petersburg paradox).

Sensitivity analysis when CF uncertainty is introduced by the subsidiaries can be very informative to evaluate proposals from subsidiaries. Recall the agency problem: Subsidiaries may not be forthcoming about true profitability of projects.

1) Sensitivity Analysis of the impact of Revenues and Costs on the NPV of project

◊ Play with different scenarios/Simulation

Steps: a. Assign a probability to each scenario/Simulate from a distribution

b. Get an NPV for each scenario.

c. Calculate a weighted average (weight=probability) $NPV \Rightarrow E[NPV]$

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

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

Note: Decisions

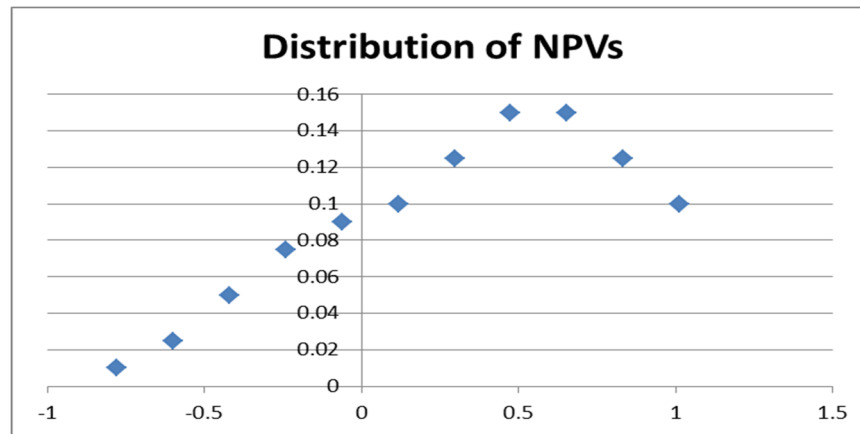
A Parent can base a decision using some risk-reward rule. For example, a firm may look at the SR (using $E[NPV]$ and $SD[NPV]$), the range –i.e., the difference between best and worst case scenarios–, establishing some ad-hoc tolerable level for the probability of negative NPV, etc. Experience tends to play an important role in an MNC's decisions.

Example X.8: Scenarios for CFs and $E[NPV]$ & $SD[NPV]$ for HK project

In Table X.2, we present different scenarios for the CFs (as a percentage of the CFs submitted by the subsidiary):

TABLE X.2
Sensitivity of NPV for Different Scenarios Cash Flow Scenarios

% 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	



• *Descriptive Stats*

E[NPV] = **USD 0.355411 M**

SD[NPV] = USD 0.644769 M

Prob[NPV<0] = 0.25

SR= E[NPV]/SD[NPV] = 0.551221

95% C.I. (Normal) = {USD -0.90834M; USD 1.61916M}

• *Decision*

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

2) Sensitivity Analysis of the impact of SV on NPV

◊ Try different scenarios with different values for SV (same as above for CFs). For example, in Table X.3, we present similar scenarios to the ones presented in Table X.2:

TABLE X.3
Sensitivity of NPV for Different Scenarios Salvage Value Scenarios

% 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	

◊ Breakeven Analysis: Calculate SV^{BE} , such that $NPV(SV^{BE}) = 0$.
 $\Rightarrow SV^{BE} = \{IO - \sum_t CF_t/(1+k)^t\} * (1+k)^T$

The higher SV^{BE} , the more dependent the project is on an uncertain CF. 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 X.9: Calculate SV^{BE} for HK project.

$$SV^{BE} = \{10M - \{1.114M/1.15 + 1.486M/1.15^2 + 1.811M/1.15^3 + 2.09M/1.15^4\} * 1.15^4 = \text{USD } 9.65891 \text{ (or HKD } 67.61236M)\}$$

Check:

$$NPV(\text{USD M}) = 10 - \{1.114/1.15 + 1.486/1.15^2 + 1.811/1.15^3 + (2.09 + 67.61236/7)/1.15^4\} = 0$$

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

$$SV^{BE} = \text{HKD } 67.61236M < SV_4 = \text{HKD } 80M. \text{ (Too big!)}$$

Note: You can find the whole set of examples regarding the HK project (and play with different values) in my homepage: www.bauer.uh.edu/rsusmel/7386/npv-int2.xls ¶

Remark: If SV^{BE} is negative, it is good for the evaluation of the project. Its profitability does not depend at all on an uncertain –and difficult to estimate- future CF.

2.E.3 Judgment call

We presented several techniques that can be used by an MNC to measure and evaluate a project's risk. But, in practice there is a lot of subjective judgment. MNCs also incorporate their own and/or a consultant's experience to make a decision. Introducing a judgment call in the process is acceptable, given that in building scenarios, changing k , assuming distributions, experience also plays a very important role.

Example X.10: Ad-hoc decision

Rule: The Parent not only requires $E[NPV] > 0$, but as an additional control for risk that the probability of $NPV < 0$ be lower than 30%. In the HK example, the probability of a negative NPV is 25%, which would be acceptable under this ad-hoc risk-reward rule.

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

III. The Cost of Capital

A very important input in the evaluation of projects is the discount rate, k . In the previous section, we took k as given. In this section, we will use the Weighted Average Cost of Capital (WACC) to measure k , which will be used to discount the cash flows of a project.

3.A Brief Review: Capital Structure

A firm can raise new capital by:

- ◊ Issuing new equity (E) –a firm gives away ownership and has to pay dividends
- ◊ Issuing debt (D) –a firm borrows and has to pay interest payments.

The firm can also use retained earnings, which we will consider E. (According to the *pecking order theory*, retained earnings are the first source of funds for a company.)

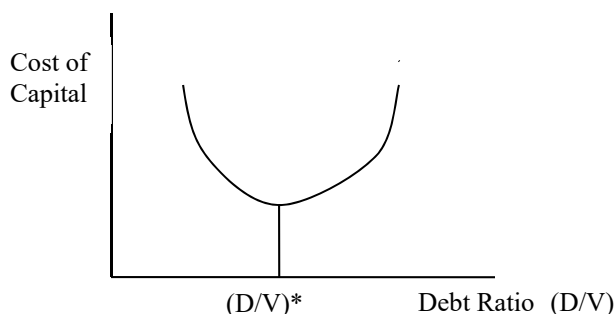
Recall that the *investment decision* (NPV evaluation based on the cash flows and risk of project) is separate from the *financing decision* (selection of E and D).

3.A.1 Trade-off Theory of Capital Structure

Firms will use the E and D mix that minimizes the cost of capital, k_c . There is a U-shape relation between cost of capital and the amount of debt relative to the total value of the firm ($V=E+D$).

The trade-off arises from the fact that debt is tax-deductible –i.e., this is the (tax) advantage of debt-, but more debt increases the likelihood of bankruptcy –i.e., this is the disadvantage of debt. E and D need to be combined optimally.

Before the optimal Debt Ratio, $(D/V)^*$, the tax advantages dominate and decrease the cost of capital; after $(D/V)^*$, the increased probability of bankruptcy dominates and increases the cost of capital.



The capital structure that a firm desires is called their *target structure*. It should be close to $(D/V)^*$.

3.A.2 Target Debt-Equity Ratio in Practice

Suppose that GE's target debt-equity ratio is 70%-30%. It is unlikely that GE will raise funds with a 70-30 debt-equity split for every project. For example, for a Brazilian project, GE may use a 60-40 D/E 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 in order to compensate and be close to the target debt-equity ratio.

It is expensive to issue shares for each project. It is common for companies to finance projects using retained earnings first (the easiest and cheapest form of E) and then use debt for the remaining part—following the *Pecking order theory*.

3.B Measuring the Cost of Capital: WACC

The cost of capital (discount rate) used should reflect both the riskiness and the type of cash flows under consideration. If the cash flows are cash flows to E (D), then the appropriate cost of capital is the cost of equity, k_e (cost of debt, k_d). In general, firms use both E & D to finance projects.

We will use weighted average cost of capital (WACC):

$$k_c = k_{WACC} = k_e (E/V) + (1-t) k_d (D/V),$$

where k_{WACC} is the WACC, k_e is the cost of equity (usually, it's risk-adjusted), k_d is the before-tax cost of debt, t is the marginal tax rate, E is the market value of the company's equity, D is the market value of the company's debt, and V is the market value of the firm ($E+D$).

3.B.1 Cost of Debt

The cost of debt of a project (k_d) is the interest a firm has to pay to borrow from a bank or the bond market to fund a project. Sometimes k_d is called *pre-tax cost of debt*. Since interest payments are tax deductible, the after-tax cost of debt is equal to $k_d(1-t)$.

It is easy to determine for a firm: A firm calls a bank/investment bank to find out the interest rate it has to pay to borrow capital.

It is also easy to determine for companies that borrow from debt markets, which are rated. If the company is not rated or most of the debt is old bank debt, it is more difficult to calculate a current k_d . In these cases, we benchmark k_d with similar companies (similar size, similar industry, similar D/V, etc.)

A bank sets the interest rate for a given firm following the usual credit risk analysis and, thus, sets a spread representing the risk of the company/project over the risk-free rate, r_f .

3.B.2 Cost of Equity

The cost of equity, k_e , involves some assumptions, since it requires an asset pricing model such as the Capital Asset Pricing Model (CAPM) or the Fama-French 3-factor model. For example, using the CAPM:

$$k_e = \text{Cost of equity} = r = \text{expected return } E[r] = r_f + \beta E[r_m - r_f]$$

where r_f represents the risk-free (government) rate; $E[r_m - r_f]$ represents the expected excess market return or equity risk premium (ERP), usually calculated using long-run data for a well-diversified market index; and β represents the systematic risk of the company, given by $\text{Cov}(k_e, r_m) / \text{Var}(r_m)$; which, in practice, is a coefficient estimated by a regression against excess market returns or risk premium, $(k_M - k_f)$, using 5 years of data.

There are several versions of the CAPM, the most popular are the world CAPM and the domestic CAPM. The $E[r_m - r_f]$ and β used depends on the view that an investor or a company has regarding capital markets. If capital markets are integrated (or if the shareholders are world-wide diversified) the appropriate equity risk premium should reflect a world benchmark (say, MSCI World Index), $E[r_m - r_f]_w$. But, if markets are segmented (or if the shareholders hold domestic portfolios), then the appropriate equity risk premium should be based on a domestic benchmark (say, the Bovespa Index for Brazilian companies), $E[r_m - r_f]_D$. The risk-free rate should also be adjusted accordingly. Then,

- World CAPM: $k_e = k_{e,W} = r_{f,W} + \beta_W E[r_m - r_f]_w$
 - Domestic CAPM: $k_e = k_{e,D} = r_{f,D} + \beta_D E[r_m - r_f]_D$

The difference between these two models can be significant. According to Bruner et al. (2008), on average, there is a 5.55% absolute difference for emerging markets and a 3.58% absolute difference for developed markets. The betas (β_W and β_D) tend to be different: the average absolute difference is 0.44 for emerging markets and 0.21 for developed markets.

Given that the evidence for integrated capital markets is weak (see Chapter XI), especially for emerging markets; we tend to think of financial markets as partially integrated. Then, a weighted average can be used to calculate k_e , where the domestic and world weights (w_D & w_W , respectively) can be ad-hoc or represent some measure of integration, say, based on international trade or international investments of a country as a proportion of GDP. When we use a weighted average, we need to put both expected returns in the same currency, usually adjusting using linear IFE and linear

PPP. Suppose we adjust $k_{e,D}$ to the currency used in the calculation for $k_{e,W}$; we call the adjusted domestic cost of capital k_{e,D^*} :

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

In general, we tend to find that World CAPM produces low expected returns. The Fama-French 3-factor model tends to produce higher (and more realistic) expected returns. Many ad-hoc adjustments are used in the private sector.

The ERP $E[r_m - r_f]$, used to calculate expected returns for a project depends on the view that a company has regarding capital markets. If capital markets are integrated (or if the shareholders of the company are world-wide diversified) the appropriate market benchmark is a world benchmark (say, MSCI World Index). But, if markets are segmented (or if the shareholders of the company hold domestic portfolios), then the appropriate market benchmark is a domestic benchmark (say, the Bovespa Index for Brazilian companies).

Example X.11: GE is considering a joint venture in Brazil, with a 3 year horizon ($T=3$ years). GE uses the following data:

Equity investment: BRL 100M

Debt issue: BRL 150

Value of Brazilian investment = $D + E = \text{BRL } 250$ (\Rightarrow 60-40 D/E split)

Brazilian Tax Rate = $t = 34\%$ (25% corporate rate + 9% social contribution on net profits)

Cost of capital project = $k_c = ?$

• Cost of debt (k_d)

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

$r_f = 11.90\%$ (3-year Brazilian government bond yield)

k_d (for GE) = $.1190 + .0060 = \mathbf{.1250}$ (12.50%)

• Cost of equity (k_e)

GE decides to use the domestic CAPM with the following data:

Similar projects in Brazil have a beta of 1.1 ($\beta_{GE-Brazil} = 1.1$)

Return of the Brazilian market (BOVESPA) in the past 20 years: 14% ($r_M = 14\%$)

$k_e = r_f + \beta E[r_m - r_f] = .1190 + 1.1 * (.14 - .1190) = \mathbf{0.1421}$ (14.21%)

• Cost of Capital –WACC- (k_c)

$k_c = D/(E+D) k_d(1-t) + E/(E+D) k_e$

$k_c = (.60) * \mathbf{.1250} * (.66) + (.40) * \mathbf{.1421} = \mathbf{.10634}$ (10.634%)

This is the discount rate that GE should use to discount the cash flows of the Brazilian project. That is, GE will require a **10.634%** rate of return on the investment in Brazil. ¶

Notes on estimating the cost of capital:

- ◊ Dividends are not tax deductible. There is an advantage to using debt!
- ◊ Time-consistency with r_f . The same maturity should be used for k_c and k_d . That is, if you use long-term bonds to calculate k_d , you should also use long-term data to calculate k_e .
- ◊ For practical purposes, many emerging market government bonds may not be considered risk-free. Thus, the government bond rate includes a default spread, which, in theory, should be subtracted to get r_f . Country risk analysis plays a role here.

- ◊ If the company is publicly traded, getting β is simple: β is estimated by the slope of a regression against a market index. If the company is not publicly traded, we need to benchmark β . That is, we use the β s of publicly traded similar companies.
- ◊ There are many issues associated with the estimation of β : choice of index, noisy data, adjustment by leverage, mean reversion, etc.

3.B.2.i Estimating $E[r_m - r_f]$

To compute the ERP, we need to determine a market portfolio (S&P? MSCI World?), and a method (and sample period) to compute the expectation. There are three different methods 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. For example, using Robert Shiller’s monthly data, with **150 years of data**, we produce an estimate of the $ERP = E[r_{m,t} - r_f]$.

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,

$$\text{Annualized Market return} = 0.007378 * 12 = 0.088536$$

$$\text{Annualized risk-free rate} = 0.04511$$

$$\text{ERP} = 0.088536 - 0.04511 = 0.043426 \quad (4.34\%)$$

Aside: Many economists consider this estimated ERP as “*too high*.” Why? The degree of risk aversion to justify it, in standard neoclassical macroeconomic models, is unreasonable high.

3.B.2.ii Estimating $E[r_m - r_f]$: Historical Method and Precision of Estimates

Risk premiums are estimated with error. To deal with this issue, practitioners, using the historical data method, like to use as many years as possible 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.

Thus, more data means a lower standard error -i.e., more precision. This may be a problem for emerging markets, where there is limited reliable return data. But, note that even with more than **100 years of data** for developed markets there is no consensus on an ERP. As a matter of fact, in a recent review paper, by two Federal Reserve economists, Duarte and Rosa (2015) list over 20 different approaches to estimate the ERP in the U.S. Using data from 1960 to 2013, Duarte and Rosa (2015) report estimates from -0.4% to 13.1%, with a 5.7% average for all model. A wide range!

Table X.4 presents ERP estimates in international markets, translated to USD, using monthly data from 1970 to 2021. The estimates range from 0.88% (Italy) to 11.55% (Hong Kong), with a 3.17% world average. Again, a wide range.

Table X.4

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

Market	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

Table X.5 reports equity returns and ERP estimates for EM, with, as expected, higher numbers.

Table X.5
 MSCI Index USD Equity Returns and ERP for Emerging Markets: (1987*-2021)

Market	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

Above, we mentioned that the S.E. is a measure of precision of an estimate. 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 %
- 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.

3.B.2.iii Estimating $E[r_m - r_f]$: Ad-hoc Adjustments

Given the imprecision of ERP estimates, for a market with limited reliable return history, say Brazil, Hungary or a generic Country J, it is sometimes easier to adjust a $E[r_m - r_f]$ from a well-established market, say, the U.S., to get a more precise estimate of that market's ERP_J . There are several ways to do this adjustment. These approaches are mainly intuitive, with simplicity in mind (taken from Damodaran (2012)):

◊ *Country Risk Approach*: The U.S. market risk premium is increased by country risk, CR_J , as measured by the sovereign default spread of the bond issued by Country J):

$$E[r_m - r_f]_J = E[r_m - r_f]_{US} + CR_J \quad (\Rightarrow \text{no distinction between bond and equity risk!})$$

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

$$E[r_m - r_f]_J = E[r_m - r_f]_{US} * \sigma_J / \sigma_{US} \quad (\Rightarrow \text{problem: } \sigma_J \text{ is also an indicator of liquidity!})$$

◊ *Mixed Approach*: The U.S. market risk premium is increased by combining Country J's CR, equity market volatility and bond market volatility. We expect equity spreads to be higher than debt spread. Then, we need to adjust the country risk upward. One way to do this is to use the relative volatility of Country J's equity market to the volatility of Country J's bond market, $\sigma_{J,bond}$:

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

Notes:

◊ We may have very different numbers from these three approaches. Judgement calls and/or adjustments may be needed.

◊ Following the idea of country risk 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 convert this premium into a **local currency** premium, we can use IFE combined with relative PPP to estimate $E[e_f]$. That is, 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 X.12: Suppose the limited returns history of Brazil's equity markets makes GE's risk manager uncomfortable. She wants to adjust $E[r_m - r_f]_{\text{Brazil}}$ using different methods, using the U.S. market as a benchmark: the relative equity market approach and the mixed approach. GE uses the following data:

$$E[r_m - r_f]_{US} = \mathbf{0.0382} \quad (\text{from Table X.4})$$

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

$$\sigma_{US} = \mathbf{15.01\%}$$

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

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

$$CR_{\text{Brazil}} = \mathbf{2.80\%}$$

$$I_{\text{Brazil}} = 8\%$$

$$I_{US} = 3\%$$

◊ *Relative Equity Market Approach*:

$$E[r_m - r_f]_{\text{Brazil}} = \mathbf{0.0382} + \mathbf{.028} * .373 / .231 = \mathbf{0.093741}$$

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

If we want the ERP in local currency (BRL), then:

$$E[r_m - r_f]_{\text{Brazil}} \text{ (in BRL)} \approx \mathbf{0.093741} + (0.08 - 0.03) = \mathbf{0.093741} + 0.05 = \mathbf{0.1437}$$

◊ *Mixed Approach*:

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

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

Note: We can calculate CER_{Brazil} from any of these approaches. For example, using the Mixed Approach:

$$\text{CER}_{\text{Brazil}} = 0.08341 - 0.0382 = 0.04521 \quad (\text{in USD!}) \quad \P$$

3.C CER as a factor in the estimation of k_e

We can think of the country risk premium, CER, as another factor affecting the cost of equity. The question is then, how to adjust CER to reflect the sensitive or exposure of a company to that risk factor. There are different ways to incorporate CER into k_e , which are based on the CAPM, therefore delivering an easy to use two-factor model.

◊ *Beta as a Measure of Exposure:*

We assume that CER exposure is proportional to the β of the company/investment. That is, the sensitivity to CER is treated in the same way as the sensitivity to market risk. (This is the implicit assumption of the CAPM used above). Then,

$$k_{e,J} = r_{f,US} + \beta E[r_m - r_f]_J = k_{f,US} + \beta [E[r_m - r_f]_{US} + \text{CER}_J].$$

◊ *Using different weights for CER Exposure (“lambda approach”):*

We can allow each project/investment to have its own sensitivity to CER. This sensitivity is called lambda, λ . Similar to β , λ is scaled around 1 ($\lambda=1$, average exposure).

$$k_{e,J} = k_{f,US} + \beta E[r_m - r_f]_{US} + \lambda \text{CER}_J.$$

There is no consensus on how to estimate λ . The easier way to do this is to estimate λ using the proportion of revenue generated by the company/project in the country relative to the rest of the companies in the country. It is possible to adjust this estimate by where the production facilities are located, by a company’s risk-management, etc..

A regression (say, returns against a CR indicator) can also be used to estimate λ .

◊ *Equal CER Exposure:*

A popular alternative method to estimate k_e is to estimate k_e as a U.S. company/project and, then, add CER. Very simple method that treats all companies/projects as equally exposed to CER:

$$k_{e,J} = r_{f,US} + \beta E[r_m - r_f]_{US} + \text{CER}_J.$$

Example X.13: Suppose that GE’s risk manager wants to re-estimate $k_{e,\text{Brazil}}$ using the lambda approach. She uses the following additional data:

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

$$\text{CER}_{\text{Brazil}} = 0.04521 \quad (\text{using the Mixed Approach})$$

Revenue from Brazil: 50%

Exports contribution to Brazil’s GDP: 13% \implies average revenue for a typical Brazilian firm: 87%

$$\lambda_{\text{GE-Brazil}} = .50/.87 = 0.5747$$

$$\begin{aligned} k_{e,\text{Brazil}} &= r_{f,US} + \beta E[r_m - r_f]_{US} + \lambda_{\text{GE-Brazil}} \text{CER}_{\text{Brazil}} \\ &= .0450 + 1.1 * (.0382) + .5747 * (.04521) = 0.1130 \end{aligned}$$

If we want to express the cost of capital into BRL, we proceed as usual (linearized IFE+PPP):

$$k_{e,\text{Brazil}} \text{ (in BRL)} = 0.1130 + .05 = 0.1630 \text{ (16.30\%)}. \quad \P$$

3.D Determinants of the Cost of Capital for MNCs

The economic factors that affect the cash flows of a firm have an impact on the cost of capital. In general, the factors that make the cash flows more stable reduce the cost of capital, k_c :

- 1) Size of firm: Larger firms get better rates from creditors and have lower β s.
- 2) Access to international markets: Better access, more chances of finding lower interest rates.
- 3) Diversification: More diversification, more stable cash flows, lower rates. Also, β s closer to β_M .
- 4) Fixed costs: The higher the proportion of fixed costs, the higher the β .
- 5) Type of firm: Cyclical companies have higher β s.
- 6) FX exposure: More exposure, less stable cash flows, worse interest rates.
- 7) Exposure to country risk: Again, more exposure to CR, less stable CFs, worse rates.

Example X.14: Calculating the Cost of Capital (March 2015)

General Electric (GE): Huge, internationally diversified company

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

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

Data:

T = Medium-term, say 5 -years

US Treasuries (k_f): 1.70% (5-year T-bill rate, from Bloomberg)

S&P 500 return (k_M): 8.15% (39 years: 1976-2015, downloaded data from Yahoo)

tax rate (t): 27.9% (effective U.S. tax rate, according to World Bank)

Recall: $k_c = D/(E+D) k_d(1-t) + E/(E+D) k_e$

	E	D	Rating	Spread	β	k_d	k_e	<u>WACC</u>
GE	109B	260B	AA-	87	1.58	2.57	11.89	4.82
DIS	46B	15B	A+	55	1.50	2.25	11.38	8.98
GPS	2.9B	1.4B	BBB-	154	1.31	3.24	10.15	7.60

For comparison, before the financial crisis, in Nov 2006, we got the following numbers:

US Treasuries (k_f): 4.25%

S&P 500 return (k_M): 9.02% (1976-2006)

tax rate (t): 25%

	E	D	Rating	Spread	β	k_d	k_e	<u>WACC</u>
GE	111B	410B	AAA	92	0.65	5.17	7.35	4.62
DIS	31B	13B	A-	140	0.93	5.65	8.69	7.37
GPS	5B	0.5B	BBB-	213	0.91	6.38	8.59	8.24

Note: k_d went down and β s increased from 2006 to 2014. We see simple results at work:

- ◊ Lower interest rates \Rightarrow lower WACC
- ◊ Higher betas \Rightarrow higher WACC. ¶

Example X.15: Country risk matter.

According to The Economist (Sep 20, 2014), Western oil firms operating in Kurdish-run Iraq in mid-

2014, after ISIS seized the city of Mosul, increased the assumed cost of capital from 12.5% to 15%. ¶

IV. Looking Ahead

In this chapter we have presented a simple framework that allows companies to evaluate DFI projects. We presented two RAPM that allow companies to select the projects that deliver the best bang for the risk taken. In the next chapters, we will expand our study to all types of international investments (stocks, bonds, derivatives, etc), not just DFI.

Exercises:

1. **Benefits of International Diversification.** Boyd Inc., a U.S. firm, plans to invest in a new project that will be located either in Venezuela or in Colombia. If the Venezuelan project is selected, it will constitute 45% of the firm's total funds invested in itself. If the Colombian project is selected, it will constitute only 15% of the firm's total funds. Assume the U.S. risk free rate is 4%. You have the following data on expected returns for each project:

	Boyd	Venezuela	Colombia
Expected return	11%	25%	35%
Standard deviation	20%	30%	55%
Correlation with existing Boyd's portfolio	1.00	.40	.10
Weight on overall portfolio	-	.45	.15
Beta	.90	1.20	1.40

- Based on the Sharpe Ratio, which project would you recommend to Boyd?
- Based on the Treynor Ratio, which project would you recommend to Boyd?
- Is Boyd, under both criteria, better off without adding any project?

2. **Multinational Capital Budgeting.** Kelly Corp, a U.S.-based MNC, has a subsidiary in Argentina that produces and sells organic agricultural products. The subsidiary believes it could also enter into the wheat market. The following data has been compiled for the wheat project -in pesos (ARS):

- Initial outlay: ARS 300 million
- Life of the project: 3 years
- Sales per year: ARS 250 million
- Cost of Goods per year: ARS 120 million
- Salvage value: ARS 100 million
- The maximum annual depreciation allowed is 10% of initial outlay.
- Exchange rate: 10 ARS/USD
- Forecasted exchange rates: $E[S_{t+1}] = 12$ ARS/USD; $E[S_{t+2}] = 15$ ARS/USD; $E[S_{t+3}] = 20$ ARS/USD.
- The Argentine government imposes a 10% tax on profits.
- The Argentine government also imposes a 20% withholding tax on any funds remitted to the U.S. parent house (including salvage value).
- The U.S. government imposes a 10% tax on remitted funds, excluding salvage value. No tax credit is allowed.
- The required rate of return is 15%.

- What is the evaluation of the project for Kelly Corp's Argentine subsidiary?
- What is the evaluation of the project for Kelly Corp?
- Would you recommend the project to Kelly Corp?
- Does Kelly Corp's decision depend on the salvage value? (Hint: calculate the break even salvage value.)
- Suppose Kelly Corp believes the subsidiary Salvage value has the following distribution:

Inflated by	Probability
0%	30%
20%	30%

40 % 30%
60% 10%

Does Kelly Corp decision change?

3. Cost of Capital. Suppose JRV Corp is considering a project in Colombia (T=5 years), which requires an investment of COP 2000M (COP: Colombian peso). JRV is planning to use the usual 70/30 D/E split. Colombia has a 25% effective corporate tax rate. To calculate the cost of capital, JRV gathers the following data (all annualized):

JRV can borrow in Colombia at 8% and in the U.S. at 2.5%.

5-year government (risk-free) rates: 6.5% in Colombia and 1.5% in the U.S.

Effective corporate tax rate in Colombia: 25%

Expected Colombian stock market return: 13%

U.S. stock market return: 8%

Beta of project: 1.3

$E[I_{Col}] = 5\%$

$E[I_{US}] = 2\%$

Stock market volatility: 35% in Colombia, 15% in the U.S.

Bond market volatility: 26% in Colombia, 12% in the U.S.

- a. Using WACC, calculate the cost of capital for the Colombian project.
- b. Suppose JRV does not trust the expected return reported for Colombia and decides to use the Relative Equity Market Approach to estimate the Colombian risk premium ($k_M - k_f$). Recalculate the cost of capital for the Colombian project.
- c. JRV believes the project would not have full exposure to Colombian country risk, since 80% of its production would be exported to the U.S. Assume that exports contribute 18% to Colombian GDP. Recalculate the cost of equity and the cost of capital under this scenario.

4. Real Options. 3. Suppose Fox Sports is considering buying the soccer league TV rights of Panamá, El Salvador, Guatemala, Nicaragua and Honduras. The success of the investments depends on the number of subscribers. If the number is “high”, the total expected return (in USD) is 40% for Fox Sports per market; if the number is “low,” the total expected return (in USD) is -20% for Fox Sports per market. Suppose, the probability of a high return is 60%. To simplify suppose the upfront initial investment per market is USD 100. Evaluate the investment under 2 situations, using a discount rate of 11%:

- a.- Fox Sports decides to test one market, say Panama. If successful in test market, assume Fox will be successful in all the other markets.
- b.- Fox Sports decides to buy all TV rights simultaneously.

CHAPTER X - BONUS COVERAGE 1: Cost of Debt – GE Data (2014)

From Morningstar we can get Debt, Equity, bond yields & rating, and beta. For example:
(<http://quicktake.morningstar.com/StockNet/bonds.aspx?Symbol=GE&Country=usa>):

General Electric Co GE | ★★★

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Bonds

Morningstar Credit Rating AA-
Amt Outstanding \$759.2 Bil
Issuer Type Corporate
Issuer Domicile United States
Debt/Assets 42.04 %
Sector Industrials

Capital Structure

Most Recent (Mar 2015)



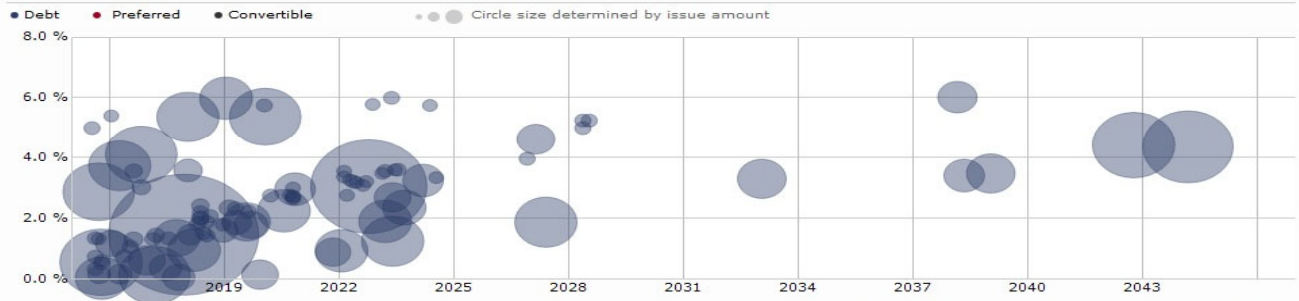
Historical



Type	%	Amount
Debt	70.5	259.6 Bil
Preferred	---	---
Equity	29.5	108.6 Bil

Type	%	Amount
Debt	70.2	302.1 Bil
Preferred	---	---
Equity	29.8	128.2 Bil

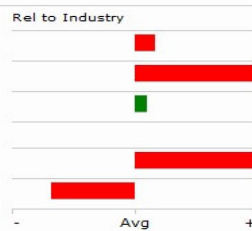
Yield to Maturity



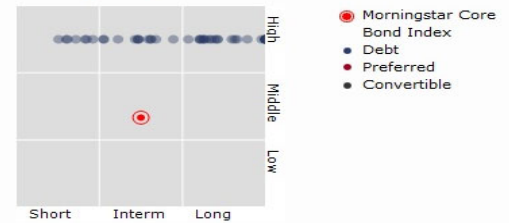
Name	Maturity Date	Amount \$(Mil)	Credit Quality	Price	Coupon %	Coupon Type (Fixed/Floating)	Callable	Rule 144A	Yield to Maturity %
Ge Cap Europea 0.728%	08/08/2018	11,204.5	---	---	0.728	---	No	---	---
General Elec 5.25%	12/06/2017	4,000.0	---	109.1	5.250	Fixed	No	No	1.46
General Elec 2.7%	10/09/2022	3,000.0	---	97.7	2.700	Fixed	No	No	3.05
General Elec 4.5%	03/11/2044	2,250.0	---	102.1	4.500	Fixed	No	No	4.37
Ge Cap Retail Bk Draper Utah	03/07/2017	2,000.0	---	---	1.050	Fixed	No	No	---
General Elec 0.85%	10/09/2015	2,000.0	---	100.1	0.850	Fixed	No	No	0.56
Ge Cap Retail Bk Draper Utah	03/07/2019	2,000.0	---	---	1.950	Fixed	No	No	---
Ge Cap Bk Inc Retail	08/24/2016	2,000.0	---	---	1.350	Fixed	No	No	---
Ge Cap Retail Bk Draper Utah	03/08/2021	2,000.0	---	---	2.650	Fixed	No	No	---
Ge Cap Retail Bk Draper Utah	03/09/2020	2,000.0	---	---	2.300	Fixed	No	No	---

Debt & Coverage Ratios

	Firm	Ind Avg	Rel to Industry
Debt/Assets	0.42	0.36	+
Debt/Equity	2.39	0.98	++
Current Assets/Current Liability	2.30	2.07	+
EBITDA/Interest	3.04	---	---
Debt/EBITDA	9.48	3.98	++
Cashflow Ops/Total Debt	0.11	0.36	-



Credit Quality



CHAPTER X – BONUS 2: ISSUING BOND DEBT – GOOGLE

Google debuts in high-grade bond market with \$3 billion deal

On Monday May 16, 2011, 1:04 pm EDT

BRADENTON/NEW YORK, May 16 (IFR) - Google Inc hit the U.S. bond market on Monday with its high grade market debut, announcing a \$3 billion sale of 3-year, 5-year and 10-year notes that will take advantage of low borrowing rates.

Proceeds of the SEC-registered deal will be used to repay commercial paper and for general corporate purposes, the company said in a statement. Citigroup, Goldman Sachs and JP Morgan are joint lead managers on the deal, which garnered an Aa2 rating from Moody's Investors Service, the third-highest rating in the agency's scale.

Google is one of the few large-cap technology companies to actually have debt on its balance sheet -- albeit at about \$2 billion of commercial paper, a tiny sum compared to its \$169 billion market cap. The company is the latest in a spate of new or rare technology company borrowers coming to the corporate bond market this year, as they look to take advantage of low interest rates and realize that having some debt makes sense.

"We are seeing some of the large cap tech companies deciding that having debt on the balance sheets is an appropriate way of having a capital structure and running a company, which is relatively new to them," said one banker.

"Generally most of these large cap tech companies have only used the debt markets to finance their acquisitions. They typically don't use the debt markets for anything else." Now, with rates so low and their own industries having reached a level of maturity, many are using the debt markets as a way of returning value to shareholders, at a time when they have large levels of cash trapped overseas.

Microsoft, for instance, raised funds in the bond market in February in part to buy back shares, while Google is improving its debt profile by extending the maturity of its debt. Both have large levels of cash overseas.

Cisco Systems in March sold \$4 billion of three-year fixed and floating rate notes and six-year bonds; eBay in October last year sold \$1.5 billion of three, five and 10 year notes.

Google is planning to sell \$1 billion of 3-year notes, that launched at 33 basis points over comparable Treasuries. The company will sell \$1 billion of 5-year notes at 43 basis points over Treasuries and \$1 billion of 10-year notes at 58 basis points over Treasuries. That compares with market "whispers" that put the 3-year in the mid 30s, the 5-year in the high 40s and the 10-year in the mid 60s. Pricing is expected later on Monday.

At the guidance stage, sources heard book size on the deal was already up to \$8-\$9 billion, with sources originally hearing there was little chance of an increase.

Google may grab the lowest coupon levels seen so far this year. The 2011 coupon to beat in 3-years is

1.25 percent, with both IBM and Colgate-Palmolive pricing deals with a 1.25 percent coupon. The 2011 coupon to beat in 5-years is 2.50 percent set by Microsoft on Feb 3. The 2011 coupon to beat in 10-years is 3.85 percent, set by Berkshire Hathaway's Pacificorp last week.

While at the lowest levels seen since December 2010, benchmark Treasury rates are still not in a spot which would allow any all-time low coupon records to be hit, with the all-time low coupon record in 3-years at 0.75 percent, in 5 years at 1.375 percent and in 10-years at 2.95 percent.

Google's strong debt protections measures are backed up by its almost \$11 billion of operating profit and \$7 billion of free cash flow for fiscal 2011, ended March, according to Moody's Senior Vice President Richard Lane. The company also has nearly \$37 billion in cash balances, he said. "These strengths, combined with solid business execution, will drive strong profitability, significant free cash flow generation, and ample financial flexibility," Lane said.

However, the company is facing challenges from well-funded rivals, including Microsoft, rated Aaa, and Apple, which is not rated, along with private companies such as Facebook, he said. "An additional rating constraint considers the still developing nature of Internet technologies, usage, and behavioral patterns, all of which pose challenges to constantly invest and innovate," he said.

(Reporting by IFR senior analysts Andrea Johnson and Danielle Robinson; Additional reporting by Reuters reporter Jennifer Saba; Editing by Ciara Linnane.)

Exercise:

1. Given the correlations in Table X.1, what are the best candidates for international diversification?
2. How can you take advantage of the closed-end country fund puzzle? Describe an arbitrage strategy.
3. You are the CFO of an MNC. International stock markets seem segmented. Where would you raise capital?
4. Can you provide a transaction costs explanation to the co-movements in Table X.8? Explain.