

Last Lecture

International diversification pays. Firms select projects to improve their risk/return profile. The projects were sent to us (evaluated by somebody else) with risk and returns attached to them.

This Lecture

We study how firms undertake the evaluation of projects (NPV) and do sensitivity analysis.

Chapter 14 - Multinational Capital Budgeting

MNCs receive project proposals from foreign subsidiaries. In general, they have several competing ones. In this chapter we will go over how MNCs evaluate different projects.

Q: How to Evaluate the Desirability of Projects?

A: NPV. The evaluation of an MNC's project is similar to the evaluation of a domestic one.

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

A typical evaluation of a project will discount future FCF, using a constant *appropriate* –i.e., reflecting the risk of the CFs- discount rate. An evaluation may also add a project's benefits not reflected in CFs (subsidies, additional tax advantages, etc.) and any associated value from real options (option to expand, delay or cancel).

• Data Needed for Multinational Capital Budgeting:

1. CFs (Revenues[P & Q] and Costs[VC & FC])
2. Initial Outlay (I.O. or CF₀)
3. Maturity (T)
4. Salvage Value (SV_T)
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

In general, CFs are difficult to estimate. A point estimate (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*: Higher CF's uncertainty, higher *k*.

• International Taxation: Tax Neutrality

DFIs are subject to foreign and/or local taxes. All countries attempt to eliminate double taxation to achieve *tax neutrality*:

⇒ Tax neutrality: No tax penalties associated with international business.

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*).

• **Typical Problem:** Agency Problem - Subsidiary vs. Parent

The subsidiary will want to undertake projects (prestige of subsidiary in host country, local political pressure, incentives for local revenue, etc), whereas the Parent only cares about Profitability.

Subsidiary can misstate Revenues, Costs, and Salvage Value.

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

• $T = 4$ years

• $CF_0 = \text{HKD } 70\text{M}$

Price for Product = HKD	20	Year 1	Quantity =	1.00M
	25	Year 2		0.95M
	30	Year 3		0.90M
	35	Year 4		0.85M

• $VC = \text{HKD } 5/\text{unit}$

• $FC = \text{HKD } 3\text{M}$

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

• Taxes: 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)

• $SV_4 = \text{HKD } 25\text{M}$

• $k = 15\%$

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	5M	4.75M	4.5M	4.25M
	3M	3M	3M	3M
Gross Profit	12M	16M	19.5M	22.5M
Dep.	<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	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 $S_t = 7 \text{ HKD/USD}$	HKD 11.15	14.47	17.375	19.865+25
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	.319M	.375M	.423M	.465M
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 (they want to undertake the project.) A subsidiary will inflate some numbers, for example, SV_T .

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

$$\begin{aligned} \text{NPV(USD M)} &= 10 - \{1.114/1.15 + 1.486/1.15^2 + 1.811/1.15^3 + (2.095 + 80/7)/1.15^4\} \\ &= \text{USD } 1.01181\text{M} > 0 \Rightarrow \text{Yes.} \end{aligned}$$

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. ¶

Adjusting Project for Uncertainty

MNCs use different techniques to adjust for uncertainty in the estimated CFs submitted by the subsidiaries.

• Adjusting 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: 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. ¶

• 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:
- Assign a probability to each scenario/Simulate from a distribution
 - Get an NPV for each scenario.
 - Calculate a weighted average (weight=probability) $NPV \Rightarrow E[NPV]$

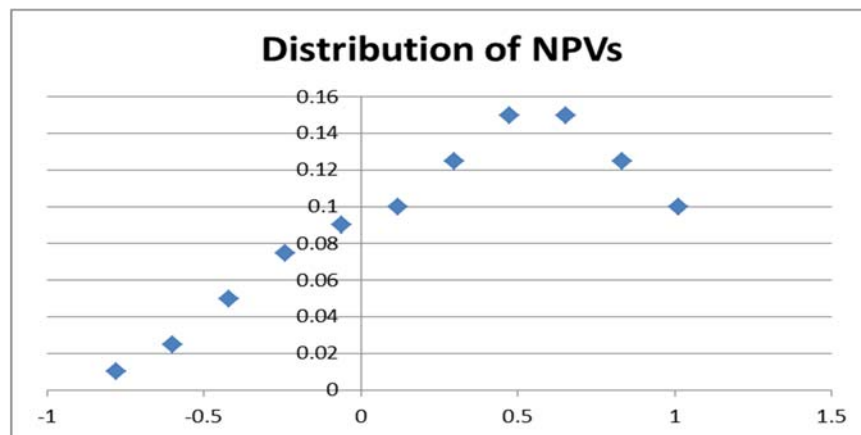
- d. If possible, calculate a risk-reward measure (RAPM), say a Sharpe Ratio.
- ◊ Breakeven Analysis (same as what we do below for SV).

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: Scenarios for CFs and $E[NPV]$ & $SD[NPV]$ for HK project
 We create different scenarios for the CFs (as a percentage of the CFs submitted by the subsidiary).

% 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*

$E[NPV] = \text{USD } 0.355411 \text{ M}$

$SD[NPV] = \text{USD } 0.644769 \text{ M}$

$Prob[NPV < 0] = 0.25$

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:

% 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: 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:

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

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/4386/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.

• 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: Ad-hoc decision

Rule: The Parent not only requires $E[\text{NPV}] > 0$, but as an additional control for risk that the probability of $\text{NPV} < 0$ 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! ¶

Real Options View

The original HK project (with $SV = \text{HKD } 25\text{M}$) has an $\text{NPV} < 0$. Under the usual view, a company will reject this project. But, an MNC may undertake a negative NPV project if there may be future benefits to the company associated with the project. For example, an expansion, development of contacts, power to influence future political events, etc.

An MNC may view a DFI as an option –a *real option*. The initial investment is a sunk cost needed to have the option to expand later, similar to an option premium, p :

$$p = \text{NPV}_{\text{Initial Investment}} < 0$$

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

$$\text{If Realized Target} > X \quad \Rightarrow \text{Expand (exercise real option).}$$

Finally, the MNC undertakes project if

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

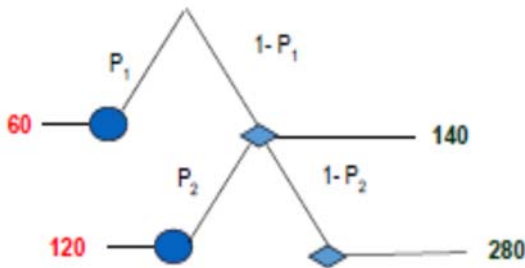
Think of a real option as a two-phase project:

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

These real options are different from financial call options. In general, it is difficult to value these options, since, unlike a call option on a stock, there is no underlying, liquid, financial asset. In addition, real options –in our case, the option to expand- can have a very long life (even perpetual).

Example: 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 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 (better marketing, distribution, Mexican contacts, etc) also appears in the form of a lower the probability for the bad outcome (**120**). Then:

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

$$= 0.1512 > 0.$$

⇒ Malouf Coffee expands to Mexico.

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

$$E[\text{NPV}] = -100 + [(.70)*60 + (.30)*140]/1.15 = -26.9565 < 0.$$

But, Malouf Coffee decides to do the initial $\text{NPV} < 0$ 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:

$$E[\text{NPV}] = \{-(100+130) + [(.70)*(60+120) + (.30)*(140+280)]/1.15\} = -10.86957 < 0.$$

⇒ Malouf Coffee does not expand to Mexico.

Note: The valuation is higher when the real option is introduced. The option has value! ¶

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.

Technical Note: The discount rate in the second-phase should be lower!

In general, it is not easy to determine P_1 & P_2 and future CFs –i.e., not easy to calculate the expectation $E[NPV]$. Option valuation methods are used to get an idea of the value of the option to expand. In general, simulation methods are used.

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).

CHAPTER 14 – BRIEF ASSESMENT

1. Dennis Corporation, a U.S.-based MNC, has a subsidiary in Nicaragua that manages coffee fields. The subsidiary believes it could also enter into the sugar export business. The following data has been compiled for the analysis (in córdobas (NIO), Nicaragua's currency):

- Initial outlay: NIO 60 million
- Life of the project: 3 years
- Revenue per year: NIO 40 million
- Cost of Goods per year: NIO 10 million
- Interest expense per year: NIO 2 million
- Depreciation: 10% of initial outlay
- Salvage value: NIO 15 million
- Exchange rate: 25 NIO/USD
- Forecasted exchange rates:
 $E_t[S_{t+1}] = 24$ NIO/USD; $E_t[S_{t+1}] = 22$ NIO/USD; $E_t[S_{t+1}] = 20$ NIO/USD.
- The Nicaraguan government imposes a 20% tax on profits.
- The Nicaraguan government also imposes a 10% withholding tax on funds remitted to the U.S. parent house (excluding salvage value).
- The U.S. government imposes a 10% tax on remitted funds, excluding salvage value. Tax credit is allowed.
- All the cash flows will be remitted to the parent company.
- The required rate of return is 12%.

- i.- What is the evaluation of the project for Dennis Corporation's Nicaraguan subsidiary?
- ii.- What is the evaluation of the project for Dennis Corporation?
- iii. Calculate SV^{BE} .
- iv.- Would you recommend the project to Dennis Corporation?

2. Following the previous exercise, what happened to the evaluation of the project if:

- (A) Dennis decides to increase required rate of return to 15%.
- (B) Dennis decides to decrease SV to NIO 5 million
- (C) Dennis decides to use the RW model to forecast exchange rates.
- (D) Dennis adds NIO 10 million to the net present value, as the value of the option to expand.
- (E) Dennis believes there are four scenarios regarding annual revenue:
 - 50% probability annual revenue will be as stated by subsidiary –i.e., NIO 40 million.
 - 25% probability annual revenue will be 10% lower.
 - 15% probability annual revenue will be 20% lower.
 - 10% probability annual revenue will be 30% lower.

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 5-year return (in USD) is 40% for Fox Sports per market; if the number is “low,” the total expected 5-year return (in USD) is -20% for Fox Sports per market. Suppose, the probability of a high number of subscribers is 60%. To

simplify suppose the upfront initial investment per market is USD 100. Evaluate the investment under 2 situations (a & b below), using a discount rate of 14%:

- a.- Fox Sports decides to test one market, say Panamá. If successful in test market, Fox Sports will enter the others (& assume Fox Sports now knows it will be successful in all the other markets).
- b.- Fox Sports decides to buy all TV rights simultaneously.
- c.- Explain why the results are different.