

Multinational Capital Budgeting

Multinational Capital Budgeting

• **Q: How to evaluate a project?**

A: NPV. The evaluation of an MNC's projects is similar to the evaluation of 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:**

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 .

• **Agency Problem**

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

The subsidiary wants to undertake more projects. The 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

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

Revenue: Year 1 (Price for Product (in HKD, Quantity) - 20; 1.00M

Year 2 (25; 0.95M); Year 3 (30; 0.90M); Year 4 (35; 0.85M)

Cost - VC = HKD 5/unit

- FC = HKD 3M

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

Taxes: - Income: HK 17%, US 35% (Gross-up, Credit for foreign taxes)

-Withholding tax (in Hong Kong) = 10%

Note: The U.S. collects taxes based on worldwide income. It grosses up remitted income with paid taxes and charges the U.S. tax (35%). A company deduces the foreign paid taxes from the U.S. tax.

Example (continuation):

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

$SV_4 =$ 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.	<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

Example: (continuation)

Free CF +SV 11.15M 14.47M 17.375M 44.865M

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

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)	11.15M	14.47M	17.375M	19.865M+25M
$S_t = 7 \text{ HKD/USD}$				
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	1.811	2.09M+3.57M

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

Note: 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 $SV_T = \text{HKD } 80\text{M}$, then

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

• Real Options View

The original HK project has an $NPV < 0$. Under the usual view, a company will reject this project. But, an MNC company may undertake a negative NPV project if there maybe 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 an initial DFI as an option –a *real option*–, with the initial investment being the premium paid. The MNC will have some targets for the initial investments (revenue, market share, etc.) that will play the role of a strike price. If the strike price is reached, the MNC will exercise the option and expand.

Many MNCs went to China in the early 90s with negative NPV projects. Years later, many of them substantially expanded their initial investment.

• Adjusting Project Risk

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 to use a range instead for k , say $\{k_{LB}, k_{UB}\}$.

Sometimes, it is better to use a range instead 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 $NPV > 0$):
 \Rightarrow Range for NPV: $\{\text{USD } 0.535\text{M}; \text{USD } 1.519\text{M}\}$. ¶

• Sensitivity Analysis/Simulation

Subsidiaries may not be forthcoming about true profitability of projects. MNCs will use sensitivity analysis to study the subsidiaries' 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
 $\Rightarrow E[NPV]$

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

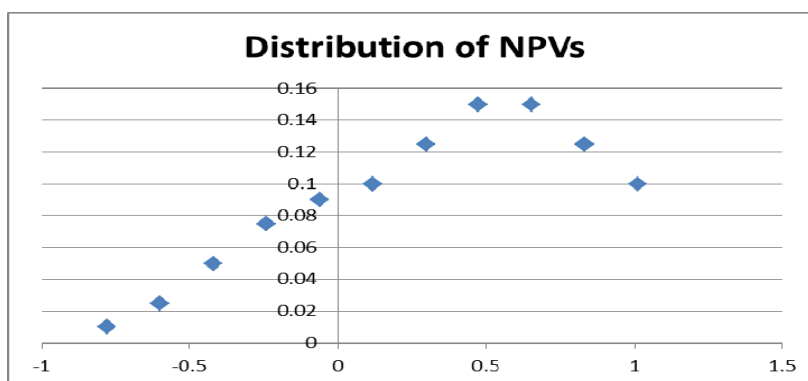
◊ Breakeven Analysis (same as what we do below for SV).

• Sensitivity Analysis/Simulation

Example: Scenarios for CFs and E[NPV] & SD[NPV] for HK project
 We create different scenarios for the 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 - Decision**

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.

• *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). ¶

• **Sensitivity Analysis/Simulation**

2) *Sensitivity Analysis of the impact of SV on NPV*

◊ Try different scenarios with different values for 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 $NPV(SV^{BE}) = 0$.
 $\Rightarrow SV^{BE} = \{IO - \sum_t CF_t / (1+k)^t\} * (1+k)^T$

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:

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

Note: 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.

• Judgement 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

Based on past experience, 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. ¶