Chapter 14
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

International Taxation

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

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

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

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

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

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

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

• **Tax Neutrality**

Tax neutrality: No tax penalties associated with international business.

Two approaches:

(1) Capital import neutrality

(2) Capital export neutrality.

(1) Capital Import Neutrality

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

– Foreign and domestic capital compete on equal basis.

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

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

Example: A U.S. MNC's subsidiary pays income tax in Hong Kong (17%), then, the remitted after-tax profits are not taxed in the U.S.. The only tax paid is the foreign tax.

(2) Capital Export Neutrality

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

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

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

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

Example: A U.S. MNC's subsidiary makes a profit in Hong Kong. The overall tax burden will be given by the U.S. tax rate (35%).

- MNC pays income taxes in HK at 17%. It remits after-tax profits to U.S.
- Remitted after-tax profits are grossed-up to original level.
- Grossed-up after-tax profits are taxed in the U.S. at 35%.
- Tax credit for the 17% paid in HK is given.
- Total tax paid: 35% (17% in HK & 18% in US).

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

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

• **Agency Problem: Subsidiary vs Parent**

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

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

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

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

⇒ Subsidiary can misstate Revenues, VC, and SV.

• **Agency Problem**

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

T = 4 years

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

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

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

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

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

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

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

Example (continuation):

SV_4 = HKD 25M

k = **15%**

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

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

Example: (continuation)

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

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

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

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

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

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

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

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

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

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

• **Real Options View**

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

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

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

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

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

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

• **Real Options View**

Overall, MNC undertakes project if

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

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

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

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

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

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

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

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

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

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

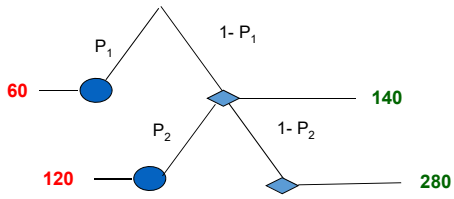
⇒ No!

Example (continuation):

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

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

Learning: Lower expansion investment & lower P_2.



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

Example (continuation):

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

Higher valuation when real option (flexibility) is introduced.

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

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

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

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

• **Adjusting Project Risk**

MNCs have many ways methods to adjust for CF uncertainty.

• **Adjusting discount rate, k**

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

k also incorporates economic & political uncertainty in local country.

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

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

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

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

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

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

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

• **Sensitivity Analysis/Simulation**

MNCs can use sensitivity analysis to evaluate proposals.

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

◊ Play with **different scenarios/Simulation**

Steps: a. Assign a probability to each scenario

b. Get an NPV for each scenario.

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

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

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

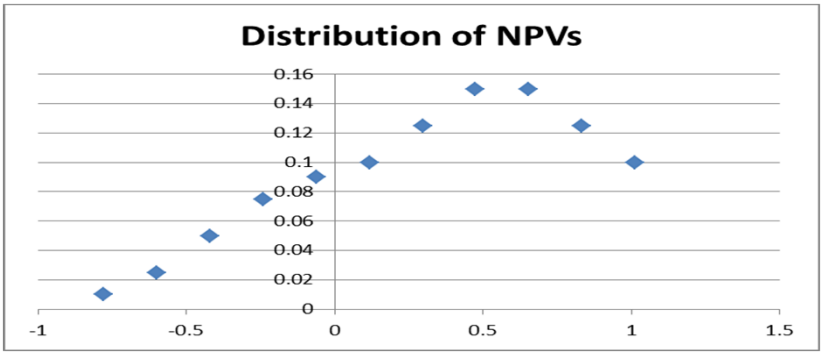
• **Sensitivity Analysis/Simulation**

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

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

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

• **Sensitivity Analysis/Simulation**



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

• **Sensitivity Analysis/Simulation - Decisions**

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

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

• *Decisions*

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

• Sensitivity Analysis/Simulation

2) Sensitivity Analysis of the impact of SV on NPV

◊ Different scenarios based on original SV. For example:

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

• Sensitivity Analysis/Simulation

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

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

The higher SV^{BE}, the more dependent project is on an uncertain SV:

$\Rightarrow$ To make the NPV > 0, we need $SV_T > SV^{BE}$. (Not good!)

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

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

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

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

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

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

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

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

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

• **Judgment call**

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

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

Example: Ad-hoc decision

Based on past experience, Parent requires:

(1) E[NPV] > 0

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

In HK example, Prob[NPV < 0] = 25% $\Rightarrow$ Accept!

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