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

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

- Taxes.

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

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

- CF Uncertainty.

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

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

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. This method is called the **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 Parent's profitability.

⇒ Subsidiary can misstate Revenues, VC, and Salvage Value (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 (using credit method).

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 (**17%**)	**.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**	**19.865M+25M**

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!

Example: (continuation)

Net Tax Worksheet: Gross-up, Compute U.S tax, Subtract Tax Credit.

Data:

	T=1	2	3	4
Profit	**12M**	**16M**	**19.5M**	**22.5M**
Taxes (**17%**)	**.85M**	**1.53M**	**2.125M**	**2.635M**
Withholding (**10%**)	**1.115M**	**1.447M**	**1.7375M**	**1.9865M**

	Year 1	Year 2	Year 3	Year 4
Gross-up	**12.0**	**16.0**	**19.5**	**22.5**
US-tax (35%)	4.20	5.60	6.83	7.88
Foreign Tax credit	1.97	2.98	3.86	4.62
Net US tax (in HKD)	2.235	2.623	2.963	3.254
US-tax (in USD)	**0.600**	**0.800**	**0.975**	**1.125**
Foreign Tax credit (in USD)	0.281	0.425	0.552	0.660
Net US tax (in USD)	0.319286	0.374714	0.423214	0.464786

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

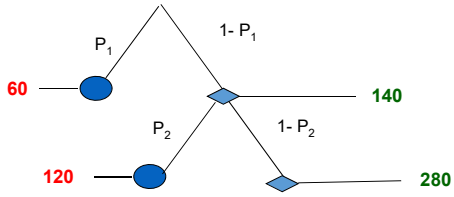
⇒ No!

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).

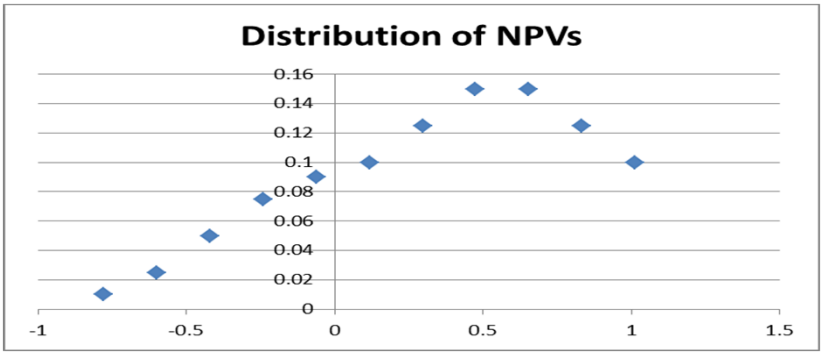
• **Sensitivity Analysis/Simulation**

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! ¶