Chapter 15
Cross-Border Capital Budgeting

"Domestic" NPV calculations

$NPV_0 = \Sigma_t \; E[CF_t] \,/\, (1+i)^t$

1. Estimate future cash flows $E[CF_t]$
2. Identify risk-adjusted discount rates
3. Calculate NPV_0
   - Based on expected future cash flows and the appropriate risk-adjusted discount rate

Cross-border capital budgeting

Foreign projects generate foreign currency cash flows.

Recipe 1

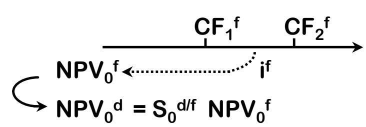
Discount in the foreign currency and convert the foreign currency NPV to a domestic currency value at the spot exchange rate.

Recipe 2

Convert foreign cash flows into the domestic currency at expected future spot rates and then discount in the domestic currency.

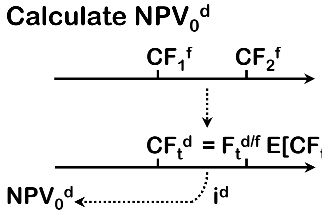
Recipe 1
Discount in the foreign currency

1. Estimate CF_t^f
2. Identify i^f
3. Calculate NPV_0^d
   - Calculate $NPV_0^f = \Sigma_t \; E[CF_t^f] \,/\, (1+i^f)^t$
   - Convert to NPV_0^d



Recipe 2
Discount in the domestic currency

1. Estimate $CF_t^d = F_t^{d/f} \, E[CF_t^f]$
2. Identify i^d
3. Calculate NPV_0^d



Equivalence of the two recipes

Recipe 2: Discount in the domestic currency

$NPV_0^d = \Sigma_t \, E[CF_t^d] \,/\, (1+i^d)^t$

with $E[CF_t^d] = F_t^{d/f} \, E[CF_t^f]$

$\Rightarrow \; NPV_0^d = \Sigma_t \, F_t^{d/f} \, E[CF_t^f] \,/\, (1+i^d)^t$

Recipe 1: Discount in the foreign currency

with $(1+i^d)^t = (1+i^f)^t \, (F_t^{d/f} / S_0^{d/f})$ ...from IRP

$\Rightarrow \; NPV_0^d = \Sigma_t \, F_t^{d/f} \, E[CF_t^f] \,/\, ((1+i^f)^t \, (F_t^{d/f} / S_0^{d/f}))$

$= S_0^{d/f} \, \Sigma_t \, E[CF_t^f] \,/\, (1+i^f)^t$

$= S_0^{d/f} \, NPV_0^f$

An example
Wendy's Neverland restaurant project

	U.S.	Neverland
Nominal T-bill rate	$i_F^{\$} = 10\%$	$i_F^{Cr} = 37.5\%$
Real required T-bill return	$\iota_F^{\$} = 1\%$	$\iota_F^{Cr} = 1\%$
Expected inflation	$p^{\$} \approx 8.91\%$	$p^{Cr} \approx 36.14\%$
Nominal required project return	$i^{\$} = 20\%$	$i^{Cr} = 50\%$
Real required project return	$\iota^{\$} \approx 10.18\%$	$\iota^{Cr} \approx 10.18\%$

Spot exchange rate $S_0^{Cr/\$} = Cr4/\$$

If the int'l parity conditions hold…

$F_1^{Cr/\$}/S_0^{Cr/\$} = (1+i_F^{Cr}) / (1+i_F^{\$}) = (1.375) / (1.100)$

$= (1+i^{Cr}) / (1+i^{\$}) = (1.50) / (1.20)$

$= (1+p^{Cr}) / (1+p^{\$}) = (1.3614) / (1.0891)$

$= E[S_1^{Cr/\$}] / S_0^{Cr/\$} = 1.2500$

$\Rightarrow$ 25% forward premium on the dollar

Forward exchange rates and expected future spot rates

- Forward exchange rates will reflect the 25 percent difference in nominal interest rates
- Expected future spot rates should reflect the 25 percent difference in expected inflation

Time	$E[S_t^{Cr/\$}]$
0	Cr4.0000/$
1	Cr5.0000/$
2	Cr6.2500/$
3	Cr7.8125/$
4	Cr9.7656/$

Details of the Neverland project

- $10,000 (Cr40,000) investment for the ship at time t=0
- $6,000 (Cr24,000) investment for inventory at time t=0
- Expected nominal revenues of Cr30,000, Cr60,000, Cr90,000, and Cr60,000 in years 1 through 4
- Variable operating costs are 20% of sales
- Cr2,000 of fixed operating costs at the end of the first year increase at the rate of inflation thereafter
- The ship is expected to retain its Cr40,000 real value
- Income & capital gains taxes are 50% in each country
- Inventory sold for Cr24,000 in real terms at t=4
- The ship is owned by the foreign affiliate and depreciated straight-line to a zero salvage value
- All cash flows occur at year-end

Investment & disinvestment CFs
(in Neverland crocs)

	t=0	. . .	t=4
Ship	-40,000		
Inventory	-24,000		
Sale of ship			137,400
- Tax on sale			-68,700
Sale of inventory			82,440
- Tax on sale			-29,220
Balance sheet cash flows	-64,000		121,920

Operating cash flows
(in Neverland crocs)

	t=1	t=2	t=3	t=4
Revenues	30,000	60,000	90,000	60,000
- Variable costs	-6,000	-12,000	-18,000	-12,000
- Fixed cost	-2,000	-2,723	-3,707	-5,046
- Depreciation	-10,000	-10,000	-10,000	-10,000
Taxable income	12,000	35,277	58,293	32,954
- Taxes	- 6,000	-17,639	-29,147	-16,477
Net income	6,000	17,639	29,147	16,477
+ Depreciation	10,000	10,000	10,000	10,000
Operating CFs	16,000	27,639	39,147	26,477

Recipe 1: Discounting in crocs

	t=0	t=1	t=2	t=3	t=4
Bal sheet CFs	-64,000				121,920
Operating CFs		16,000	27,639	39,147	26,477
$E[CF_t^{Cr}]$	-64,000	16,000	27,639	39,147	148,397

NPV_0^{Cr} = -Cr137 at i^{Cr} = 50%

or $NPV_0^{\$}$ = -\$34 at $S_0^{Cr/\$}$ = Cr4/\$

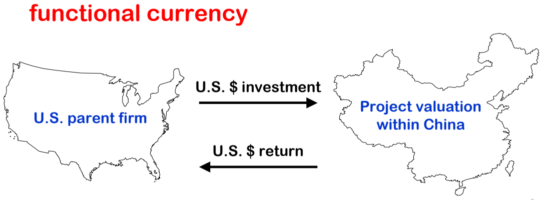
Recipe 2: Discounting in dollars

	t=0	t=1	t=2	t=3	t=4
$E[CF_t^{Cr}]$	-64,000	16,000	27,639	39,147	148,397
$F_t^{Cr/\$}$	4	5	6.25	7.8125	9.7656
$E[CF_t^{\$}]$	-16,000	3,200	4,422	5,011	15,196

$NPV_0^{\$}$ = -\$34 at $i^{\$}$ = 20%

Valuing an investment in China

- The parent firm wants a return in its functional currency



Valuation when the international parity conditions do not hold

- The project's (local) perspective
  - Let $NPV(i^f)$ represent the value of a foreign project when discounted in the foreign currency
- The parent's (domestic) perspective
  - Let $NPV(i^d)$ represent the value of a foreign project when discounted in the domestic currency

These two NPVs may not be equal when the international parity conditions do not hold

when parity doesn't hold...

$NPV(i^f) > 0$

$\Rightarrow$ The project has value from the perspective of a foreign investor (that is, relative to local financial market alternatives)

$NPV(i^d) > 0$

$\Rightarrow$ The project has value from the perspective of the parent

Local winners: Somebody's gotta want this...

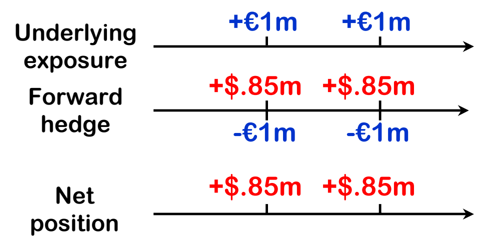
Parent's perspective

Project's perspective	$NPV(i^d) < 0$	$NPV(i^d) > 0$
$NPV(i^f) < 0$	Reject	Look for better projects in the foreign currency
$NPV(i^f) > 0$	Try to lock in the time 0 value of the project	

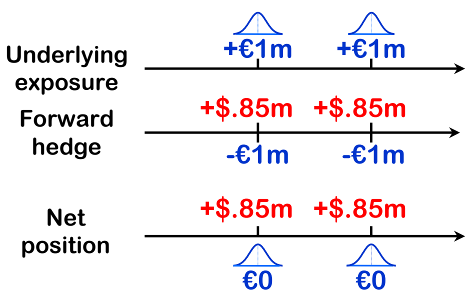
Alternatives for capturing the time t=0 value of a foreign project

- In the asset markets
  - Sell the project to a local investor
  - Bring in a joint venture partner from the local market
- In the financial markets
  - Hedge the cash flows from the project against currency risk
  - Finance the project with local currency debt or equity

If foreign cash flows are certain you can create a perfect hedge



If foreign cash flows are uncertain forward hedges are imperfect hedges



Winners: Structuring the deal…

Parent's perspective

Project's perspective	NPV(i^d) < 0	NPV(i^d) > 0
NPV(i^f) < 0	Reject	Look for better projects in the foreign currency
NPV(i^f) > 0	Try to lock in the time 0 value of the project	Accept, then structure the deal

NPV(i^f) > NPV(i^d) > 0

The project has more value locally than it does from the parent's perspective

⇒ You should hedge

Hedging provides the parent with higher expected value and lower exposure to currency risk

NPV(i^d) > NPV(i^f) > 0

The project has more value from the parent's perspective than it does to local investors

⇒ Whether you hedge will depend on the firm's hedging policy

Hedging the project cash flows lowers currency exposure risk but also lowers the expected NPV of the project

Special circumstances

$V_{\text{PROJECT WITH SIDE EFFECT}}$

$= V_{\text{PROJECT WITHOUT SIDE EFFECT}} + V_{\text{SIDE EFFECT}}$

Side effects that are commonly attached to international projects include:

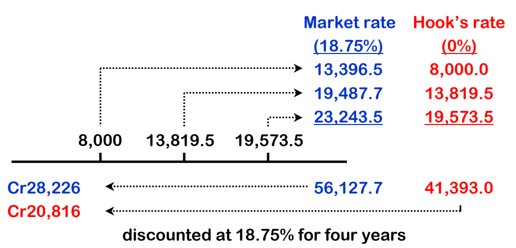
- Blocked funds
- Subsidized financing
- Negative-NPV tie-in projects
- Expropriation risk
- Tax holidays

Blocked funds

	t=0	t=1	t=2	t=3	t=4
$E[CF_t^{Cr}]$	-64,000	16,000	27,639	39,147	148,397

- Suppose Hook requires 50% of operating cash flows in years 1-3 be retained in Hook's treasure chest at a 0% interest rate
- The opportunity cost of capital on riskless croc cash flows is 37.5%(1-0.5) = 18.75%

An example of blocked funds
50% of operating CF blocked during years 1-3



An example of blocked funds
50% of operating CF blocked during years 1-3

After-tax opportunity cost of blocked funds

= Cr28,226 - Cr20,816 = Cr7,410

$V_{\text{PROJECT W/ SIDE EFFECT}}$

$= V_{\text{PROJECT W/O SIDE EFFECT}} + V_{\text{SIDE EFFECT}}$

= (-Cr137) + (-Cr7,410)

= -Cr7,547 < Cr0

or -\$1,887 at $S_0^{Cr/\$}$ = Cr4/\$

Subsidized financing: The market's required return

Base Case: Suppose Wendy can borrow Cr40,000 at the prevailing croc corporate bond rate of 40%

⇒ (0.40)(Cr40,000) = Cr16,000 in annual interest expense

Subsidized financing: A subsidized alternative

Alternative: Suppose Hook will loan Wendy Cr40,000 at Hook's borrowing rate of 37½%

⇒ (0.375)(Cr40,000) = Cr15,000 in annual interest expense

or an after-tax annual interest savings of Cr500

Subsidized financing: The value of the financing subsidy

Net result: Annual after-tax interest savings of Cr500

Valuing Wendy's annual after-tax interest savings at the

40%(1-0.5) = 20% after-tax cost debt,

this is worth Cr1,295 today

Expropriation risk: An example

Suppose there is an 80% chance Hook will expropriate the ship at time t=4

	Actual	Expected
Ship	Cr0	+Cr137,400
Tax on ship	Cr0	-Cr68,700
Total	Cr0	+Cr68,700

The expected after-tax loss is then
= (Probability of loss)(actual – expected)
= (0.8)(-Cr68,700) = -Cr54,960

Expropriation risk: An example

The expected loss in value can be found by discounting in crocs or pounds

PV(E[after-tax loss])

$= [E[CF_4^{Cr}]/(1+i^{Cr})^4] / S_0^{Cr/£}$ at i^{Cr}

$= [(-Cr54,960)/(1.50)^4] / (Cr4.00/£)$

$= [E[CF_4^{Cr}]/E[S_4^{Cr/£}]] / (1+i^{£})^4$ at $i^{£}$

$= [(-Cr54,960)/(Cr9.7656/£)] / (1.20)^4$

= -£2,714