

CAPITAL BUDGETING

Domestic Capital Budgeting

Net Present Value

Discounted Cash flows

- Cash flows vs. profits: a *timing* difference
- Upfront investment vs. depreciation
- Investments in working capital

order raw				
materials		produce	inventory	
pay A/P	pay wages	sell	customer pays	
$t - 0.5$	$t - 0.4$	t	$t + 0.25$	

Discounting at a risk-adjusted rate—assuming constant or, at least, known risk per period

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Base Case NPV Computations: an Illustration

Example

Weltek's 5-year project:

Investment up front: takes 1 year

Land: ESP 100m no depreciation; $E_0(V_6) = 130m$

P&E: ESP 350m 5-year linear depr., zero scrap

Entry: ESP 250m 5-year linear depr

Total I_0 : ESP 700m paid at time 0.5, on average

Timing operational cash flows for the t-th year:

	pay fixcosts		
<u>pay varcosts</u>	<u>sell</u>	<u>cash in</u>	<u>pay tax ></u>
t + 0.25	7 + 0.5	t + 0.75	t + 1

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Example (cont.)

Discounting of operating cash flows at 20% *p.a.*, compound;
discounting of I_0 at 12% *p.a.*

	(a1)	(a2)	(b)	(c)	(d)	(e)	(5)
year(t)	goods sold	sale of land	variable costs	over-head	depre- ciation	taxable	tax (35%)
1	650	—	260	105	120	165	58
2	1000	—	400	110	120	370	129
3	1100	—	440	116	120	424	148
4	600	—	240	122	120	118	41
5	300	—	120	128	120	-68	-24
6	—	130	—	—	—	30	8
PV	1993	38	872	311	—	—	198

$$NPV = 1993 - 872 - 311 - 198 - + 38 = ESP -13$$

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- ***Sensitivity analysis***

Vary sales, varcosts, fixcosts, discount rate, E(S) if required.

Adjusted Net Present Value

Two-step NPV:

Step 1: 100%-equity finances, no issuing cost, asset b

Focus is on the inherent economic value of the project

Step 2: financing aspects of the project: issuing costs, capital grants or interest subsidies

Example

Weltek raises new equity at a cost of 15, and obtains a capital grant of 40

$$\text{ANPV} = \text{ESP } 58 - 15 + 40 = \text{ESP } 83$$

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- *The Interest Tax Shield Controversy*

Debt financing typically reduces corporate taxes

$$PV = \sum_{t=0}^T \frac{[\sum \text{Borrowing capacity} \times R_d \times \tau_c]}{(1 + R_d)^t} \quad ?? \text{ — but:}$$

- Not all tax shields can be used every year: postponed, or lost
- Personal taxes may partly/wholly undo the corporate tax gain
- Even if we would know the total subsidy, we would not know how much accrues to the shareholders

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- **Why we use ANPV rather than the Weighted Average Cost of Capital**

$$WACC = \frac{\text{Debt}}{\text{Equity} + \text{Debt}} \infty R_{\text{debt}}(1 - \tau) + \frac{\text{Equity}}{\text{Equity} + \text{Debt}} \infty E(R_{\text{equity}})$$

This assumes, heroically, that

- corporate tax savings are not offset by any fiscal discrimination at the personal level
- all of these savings to the shareholders
- a one-period project or for a perpetuity
- if b_{equity} is based on existing stock data: project has same risk as other activities

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International issues:

- ***Incremental cash flows:*** often many interactions with the cashflows of the company's other units, and tax complications
- ***Political risks:*** blocked funds (*transfer risk*), *expropriation risk*
- ***Exchange risk and capital market segmentation:***
 - Legal restrictions on inward/outward portfolio investment
 - (Pervasive) restrictions on foreign ownership through by-laws (CH, Scandinavia)
- ***International taxation:***
 - Transfer pricing, or profit allocation across branches?
 - remittance policy: equity transactions, loans, dividends (and their timing), interest payments, royalties, or management fees

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A Checklist for an NPV Analysis

1. Incremental Cash flows:

(+) profits when a related company sells to the new subsidiary, or when it buys from the new subsidiary and then re-sells the goods to other customers

(–) project may take away sales and profits from an existing business

2. Integrated or segmented markets:

When the host and home capital markets are well integrated, the value of the project is the same to all investors in these countries

In segmented markets, however, one has to discount CFs in the parent's currency, at the rate required in the home market

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A Checklist for an NPV Analysis (cont.)

3. Taxes:

Analysis should include also withholding taxes and the home-country corporate taxes—not found in the subsidiary's *pro forma* P&L statements

4. Separate the operating and financing issues

5. Inflation:

it is not necessary for the rate to be constant over time
inflation is not necessarily the same for all cash flow items

6. Profits versus cash flows:

think of investments in working capital

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A Checklist for an NPV Analysis (cont.)

7. Terminal value:

Set equal to the book value? simple, and likely to be conservative

Value the WOS as a going concern, using a long-term average price/cash flow ratio for comparable firms

Compute, by trial-and-error, the break-even liquidation value

8. Sensitivity analysis

9. NPV is just one element:

NPV ignores non-quantifiable aspects.

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Capital Market Segmentation and Exchange risk: The Risk-free Case

Link between Market Segmentation and X-Risk

Prices in any given country are sticky and to a large extent independent of exchange rate changes. Thus:

- start from currently prevailing prices and costs *in foreign currency*
- then predict future prices and costs *in foreign currency* on the basis of expectations about foreign inflation

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Capital Market Segmentation and Exchange risk: The Risk-free Case

Link between Market Segmentation and X-Risk (cont.)

But we want to find out whether the project is valuable to the parent company's shareholders:

These shareholders use the cost of capital that is relevant *to themselves*

This cost of capital can be observed in the shareholders' *home* capital market (which possibly comprises many countries); that is, the cost of capital is naturally expressed in terms of *home* currency

Thus, the cash flows to be discounted at this cost of capital must be expressed in units of *home* currency

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Capital Market Segmentation and Exchange risk: The Risk-free Case

Link between Market Segmentation and X-Risk (cont.)

At one point we have to make the transition from foreign currency to home currency? — or can we value the project in foreign currency, as if the owner were a host country investor?

*Valuation in host currency terms is correct if the host and home country financial markets are **integrated**, i.e. when there are no restrictions on cross-border portfolio investment between the two countries.*

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The Valuation of Risk-free Foreign Currency Cash flows

Assume $C_T = 1$ unit of foreign currency. Three procedures:

- compute the present value of the foreign cash flow in the foreign market, and then translate this foreign-currency value into domestic units at the current spot rate:

$$(1) \quad S_t PV_t^*(1_T) = S_T / (1 + r_t^*, T)$$

- translate C^* into an expected cash flow in home-currency terms, and compute its present value using a HC discount rate $E_t(r_{t,T})$ that takes into account the risk of S_T :

$$(2) \quad PV_t(S_T) = E_T(S_T) / (1 + E_T(r_t^*, T))$$

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The Valuation of Risk-free Foreign Currency Cash flows (cont.)

- value the hedged cash flow. Selling forward the one unit of foreign currency replaces the risky home-currency cash flow, S_T , by a riskless inflow $F_{t,T}$. The project's present value can be computed by discounting $F_{t,T}$ at the home risk-free rate, $r_{t,T}$

$$(3) \quad PV_t(F_{t,T}) = (F_{t,T}) / (1 + r_{t,T})$$

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The Valuation of Risk-free Foreign Currency Cash flows (cont.)

- **In integrated capital** markets all three approaches lead to the same valuation

(3) = (1)? In unrestricted markets, $F_{t,T} = S_t^*[(1 + r_{t,T})/(1 + r_t^*,T)]$.
Thus:

$$\begin{aligned} \mathbf{(3)} &= (F_{t,T}) / (1 + r_{t,T}) = (S_t^*[(1 + r_{t,T})/(1 + r_t^*,T)]) / (1 + r_{t,T}) = \\ &= S_T / (1 + r_t^*,T) = \mathbf{(1)} \end{aligned}$$

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The Valuation of Risk-free Foreign Currency Cash flows (cont.)

(2) = (3)? In free and unrestricted capital markets, the forward contract has zero value (at t). Thus

$$\begin{aligned} \mathbf{(3)} &= (F_{t,T}) / (1 + r_{t,T}) = V_{\text{unhedged}} + V_{\text{forw contr}} \\ &= E_T (S_T) / (1 + E_T (r_t^*, T)) + 0 = E_T (S_T) / (1 + E_T (r_t^*, T)) = \end{aligned}$$

(2)

Interpretation: $F_{t,T} = \text{CEQ}_t(S_T)$, the *certainty equivalent* or *risk-adjusted expectation*. Thus, in **(2)** we correct for risk in the denominator, while in **(3)** the risk-correction is in the numerator

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The Valuation of Risk-free Foreign Currency Cash flows (cont.)

In segmented markets,

- there is no mechanism that equates the home value of an asset with its translated foreign value. Thus, (1) \neq (2)
- When access to forward markets (or to foreign money markets) is rationed, there will generally be an unsatisfied demand for either forward sales or forward purchases. Therefore, a forward hedge will generally not have a zero market value. Thus, (3) \neq (2)
- So: make explicit exchange rate forecasts, and discount them at a rate that reflects the corresponding risk