APV Illustrations

- A. Finite Term
- B. Flotation Costs
- C. Interest Rate Subsidies

Worldwide Trousers, Inc. is considering a $5 million expansion of their existing business. The initial capital investment will be depreciated straight-line over 5 years to zero salvage value; and will be sold for $500,000 at the termination. The project will generate pretax earnings of $650,000 per year, and will not change the risk level of the firm. The firm can obtain a 5-year $3,000,000 loan at 12.5% to partially finance the project. If the project were financed with all equity, the cost of capital would be 18%. The corporate tax rate is 34%, and the risk-free rate is 4%. The project will require a $100,000 investment in net working capital. Calculate the APV.

APV Example: NPV (unlevered project with all equity financing)

$$APV = NPV + PV_{\substack{\text{interest} \\ \text{tax shield}}}$$

See the spreadsheet image on the next slide for the NPV calculation using the CF(A) framework to estimate CFs!

-- Note that EBT replaces EBIT in the calculation of OCFs.

NPV = **($443,315.65)**

Note - Reference Chapter 6 for your review of related topics!

Cash Flow Estimation for NPV Analysis -Worldwide Trousers Inc.

DATA:

Tax Rate	34%		Cost of Unlevered Firm, Ro		18%	
Machine Cost	$ 5,000,000		Selling Price at Termination		$ 500,000	
Year	0	1	2	3	4	5
Depreciation Rate		20.00%	20.00%	20.00%	20.00%	20.00%
Depreciation (Dep)	$ -	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
Pretax Earnings (EBT)	$ -	$ 650,000	$ 650,000	$ 650,000	$ 650,000	$ 650,000
Taxes	$ -	$ 221,000	$ 221,000	$ 221,000	$ 221,000	$ 221,000
OCF	$ -	$1,429,000	$1,429,000	$1,429,000	$1,429,000	$1,429,000
Capital Spending (CE) (as a cash flow)	$ (5,000,000)	$ -	$ -	$ -	$ -	$ 330,000
Change in NWC (as a cash flow)	$ (100,000)	$ -	$ -	$ -	$ -	$ 100,000
Cash Flow (CF)	$ (5,100,000)	$1,429,000	$1,429,000	$1,429,000	$1,429,000	$1,859,000
NPV	$(443,315.65)		(Reject the project because its NPV is negative!)			

APV Example: *PV interest tax shield*

Turning our attention to the valuation to debt financing effects:

$$APV = -\$443{,}315.65 + PV_{\substack{\text{interest} \\ \text{tax shield}}}$$

The $PV_{interest\ tax\ shield}$ is the present value of the tax savings on interest expenses, discounted at the firm's cost of debt capital, $r_D = 12.5\%$

$$PV_{\substack{\text{interest} \\ \text{tax shield}}} = \sum_{t=1}^{5} \frac{T_C \times r_D \times \$3M}{(1+r_D)^t} = \sum_{t=1}^{5} \frac{0.34 \times 0.125 \times \$3M}{(1.125)^t}$$

$$PV_{\substack{\text{interest} \\ \text{tax shield}}} = \sum_{t=1}^{5} \frac{\$127{,}500}{(1.125)^t} = \$453{,}972.46$$

APV Example: *PV interest tax shield*

$$APV = -\$443{,}315.65 + PV_{\substack{\text{interest} \\ \text{tax shield}}}$$

$PV_{interest\ tax\ shield}$: Financial Calculator Approach

Input: N=5; I/Y=12.5; FV=$3M
PMT=0.125*$3M*(1-0.34)=$247,500

➔ PV = $2,546,027.54, i.e., the PV of debt obligations, compared to the $3M proceeds.

Hence, $(3,000,000-2,546,027.54)=**$453,972.46** is the value of the interest tax shield!

APV Example: Adding it all up

$$APV = -\$443{,}315.65 + \$453{,}972.46$$

➔ **APV = $10,656.81**

Note – With the inclusion of the interest tax shield, the valuation of the project, its adjusted present value (APV), becomes positive and hence an acceptance recommendation follows.

B. Incorporating Flotation Costs

- Previous example – Worldwide Trousers
  - Borrow $3 million
  - Suppose firm pays 1% flotation fee.
  - $3M / (1-1%) = $3M / 0.99 = $3,030,303
    - Flotation fee in $ = $3,030,303*1% = $30,303

Reference: Chapter 13!

Bi. Net Flotation Costs

- = -$30,303 + $7,336.91 = -$22,966
  - where $30,303 is the flotation cost
  - and $7,336.91 is the value of the flotation cost tax shield
    - N=5; I/Y=12.5; PMT=2,060.60; FV=0
    - ==> PV = $7,336.91!
      - where $2,060.60 is the annual flotation cost tax shield, i.e., 0.34*($30,303/5)!
- The project value is reduced by the amount of NET flotation costs!

Bii. Interest Tax Shield When Flotation Costs Present

- 0.125 * $3,030,303 = $378,788
- Annual interest tax shield
  - 0.34 * $378,788 = $128,788
  - Valuation of the 5-year interest tax shield:

N=5; I/Y=12.5; PMT=128,788; FV=0

→ PV = **$458,558**, i.e., interest tax shield

Note that the interest tax shield has a higher value because of the larger loan amount that includes the flotation costs. (compared to $453,972.46 on slide #6)

APV recalculated with flotation costs and revised value of interest tax shield

- APV = NPV+ (PV interest tax shield - PV flotation costs)
- ➔ APV = -$443,315.65 + [$458,558 - $22,966]
- ➔ **APV = ($7,723.65)**

Note – After taking into account the flotation costs associated with the bond issuance, the valuation of the project, its adjusted present value (APV), becomes negative and hence a NO GO recommendation follows.

C. Incorporating the effects of loan rate subsidies

- Loan Amount $3 million
- Subsidized interest rate is 10%.
- Market interest rate is 12.5%.
- PV of the loan subsidy is calculated by finding the NPV of the loan, using the market interest rate as the discount rate.

- Note: It is assumed that there is no flotation fee in the following analysis of the subsidized loan. Such assumption will be removed in the follow-up exercise!

C. PV of subsidized loan

Amt of loan $3M @ 10%						
	$ interest paid = $300,000	-$300K	-$300K	-$300K	-$300K	-$300K
	A-t interest payment = (1-.34)* interest amount = $198,000	-$198K	-$198K	-$198K	-$198K	-$198K
						Repay loan -$3M

C. PV of subsidized loan

- Discount at the market rate of 12.5% to find PV of after tax interest payments and principal amount. Subtract this from the loan proceeds of $3 million.
  - $3 million – $2,369,779.40 = $630,220.60

    i.e., the value of the interest tax shield on the subsidized loan! (compared to $453,972.46 on slide #6)

- Financial Calculator Approach – (ref.: slide #6)
- Input: N=5; I/Y=12.5; FV=$3,000,000
  - PMT=0.10*$3M*(1-0.34)=$198,000
  - ➔ PV = $2,369,779.40, i.e., the PV of subsidized debt obligations, to be subtracted from the $3 million proceeds.

C. NPV of Subsidized Loan

NPV of subsidized loan will be larger than the NPV of a market rate loan.

- APV = NPV + PV subsidized loan
- → APV = -$443,315.65 + $630,220.60

→ APV = $186,904.95

Note – This illustration implicitly assumes that there is no flotation cost associated with the subsidized loan. However, subsidized loans could incur flotation costs!

* **Exercise: Recalculate APV assuming that the 1% flotation fee also applies to the subsidized loan, and the corporate tax rate is 21%!** <Canvas Discussion>