

International Capital Budgeting

Chapter 18

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Review of Domestic Capital Budgeting

- Identify the *size* and *timing* of all relevant cash flows on a time line.
- Identify the *riskiness* of the cash flows to determine the appropriate discount rate.
- Calculate the NPV by discounting the cash flows at the appropriate discount rate.
- Compare the value of competing cash flow streams at the same point in time.

Review of Domestic Capital Budgeting

The basic net present value equation is

$$NPV = \sum_{t=1}^T \frac{CF_t}{(1+K)^t} + \frac{TV_T}{(1+K)^T} - C_0$$

Where:

CF_t = expected incremental after-tax cash flow in year t

TV_T = expected after-tax terminal value including return of net working capital

C_0 = initial investment at inception

K = weighted average cost of capital

T = economic life of the project in years

The NPV rule is to accept a project if $NPV \geq 0$

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Review of Domestic Capital Budgeting

For our purposes it is necessary to expand the NPV equation.

$$CF_t = (R_t - OC_t - D_t - I_t)(1 - \tau) + D_t + I_t(1 - \tau)$$

R_t is incremental revenue

I_t is incremental interest expense

OC_t is incremental operating cash flow

τ is the marginal tax rate

D_t is incremental depreciation

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Review of Domestic Capital Budgeting

We can use $CF_t = (OCF_t)(1 - \tau) + \tau D_t$
to restate the *NPV* equation,

$$NPV = \sum_{t=1}^T \frac{CF_t}{(1+K)^t} + \frac{TV_T}{(1+K)^T} - C_0$$

as:

$$NPV = \sum_{t=1}^T \frac{(OCF_t)(1 - \tau) + \tau D_t}{(1+K)^t} + \frac{TV_T}{(1+K)^T} - C_0$$

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The Adjusted Present Value Model

$$NPV = \sum_{t=1}^T \frac{(OCF_t)(1 - \tau)}{(1+K)^t} + \sum_{t=1}^T \frac{\tau D_t}{(1+K)^t} + \frac{TV_T}{(1+K)^T} - C_0$$

can be converted to **adjusted present value (APV)**

$$APV = \sum_{t=1}^T \left(\frac{(OCF_t)(1 - \tau)}{(1+K_u)^t} + \frac{\tau D_t}{(1+i)^t} + \frac{\tau I_t}{(1+i)^t} \right) + \frac{TV_T}{(1+K_u)^T} - C_0$$

by appealing to Modigliani and Miller's results.

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The Adjusted Present Value Model

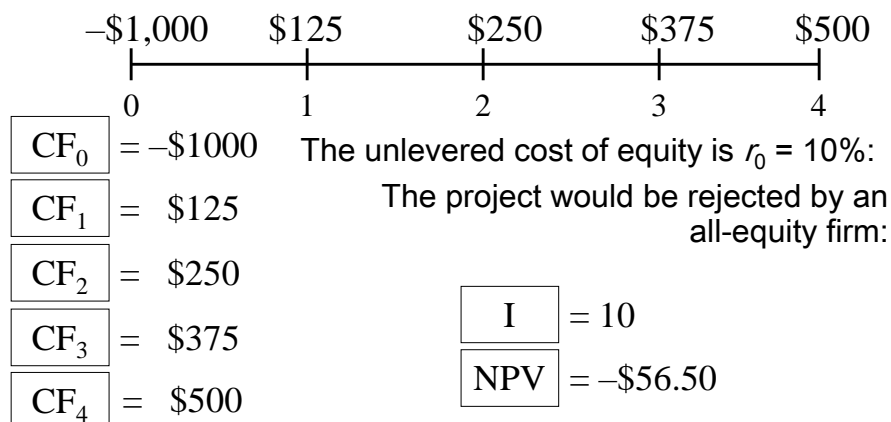
$$APV = \sum_{t=1}^T \left(\frac{(OCF_t)(1 - \tau)}{(1 + K_u)^t} + \frac{\tau D_t}{(1 + i)^t} + \frac{\tau I_t}{(1 + i)^t} \right) + \frac{TV_T}{(1 + K_u)^T} - C_0$$

- The APV model is a *value additivity* approach to capital budgeting. Each cash flow that is a source of value to the firm is considered individually.
- Note that with the APV model, each cash flow is discounted at a rate that is appropriate to the riskiness of the cash flow.

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Domestic APV Example

Consider a project where the timing and size of the incremental after-tax cash flows for an all-equity firm are:



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Domestic APV Example (continued)

- Now, imagine that the firm finances the project with \$600 of debt at $r = 8\%$.
- The tax rate is 40%, so each year they have an interest tax shield worth \$19.20:

$$\begin{aligned}\tau \times I &= .40 \times (\$600 \times .08) \\ &= .40 \times \$48 \\ &= \$19.20\end{aligned}$$

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The APV of the project under leverage is:

$$APV = \sum_{t=1}^T \left[\frac{(OCF_t)(1 - \tau)}{(1 + K_u)^t} + \frac{\tau D_t}{(1 + i)^t} + \frac{\tau I_t}{(1 + i)^t} \right] + \frac{TV_T}{(1 + K_u)^T} - C_0$$

$$\begin{aligned}APV &= \frac{\$125}{1.10} + \frac{\$250}{(1.10)^2} + \frac{\$375}{(1.10)^3} + \frac{\$500}{(1.10)^4} \\ &\quad + \frac{\$19.20}{1.08} + \frac{\$19.20}{(1.08)^2} + \frac{\$19.20}{(1.08)^3} + \frac{\$19.20}{(1.08)^4} - \$1,000\end{aligned}$$

$APV = \$7.09$ *The firm should accept the project if it finances with debt.*

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Capital Budgeting from the Parent Firm's Perspective: Translate to Home Currency

- One recipe for international decision makers:
 - Estimate future cash flows in foreign currency.
 - Convert to the home currency at the predicted exchange rate.
 - Use PPP, IRP, *et cetera* for the predictions.
 - Calculate *NPV* using the home currency cost of capital.

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Capital Budgeting from the Parent Firm's Perspective: Alternative Method of Converting the Discount Rate

- Another recipe for international decision-makers:
 - Estimate future cash flows in the foreign currency.
 - Estimate the foreign currency discount rate.
 - Calculate the foreign currency *NPV* using the foreign cost of capital.
 - Translate the foreign currency *NPV* into dollars using the spot exchange rate.

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International Capital Budgeting

- You have two equally valid approaches:
 - Change the foreign cash flows into dollars at the exchange rates expected to prevail. Find the \$NPV using the dollar cost of capital.
 - Find the foreign currency NPV using the foreign currency cost of capital. Translate that into dollars at the spot exchange rate.
- *If you watch your rounding*, you will get exactly the same answer either way.
- Which method you prefer is your choice.

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Risk Adjustment in the Capital Budgeting Process

- Clearly risk and return are correlated.
- Political risk may exist along side of business risk, necessitating an adjustment in the discount rate.
- We can measure this risk with sensitivity analysis, where different estimates are used for expected inflation rates, cost and pricing estimates, and other inputs to give the manager a more complete picture of the planned capital investment.
- Lends itself to computer simulation.

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Real Options

- The application of options pricing theory to the evaluation of investment options in real projects is known as *real options*.
 - A *timing option* is an option on when to make the investment.
 - A *growth option* is an option to increase the scale of the investment.
 - A *suspension option* is an option to temporarily cease production.
 - An *abandonment option* is an option to quit the investment early.

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Summary

- The APV model separates the operating cash flows from the cash flows due to financing.
 - Additionally, each cash flow is discounted at a rate of discount commensurate with the inherent risk of the individual cash flow.
- The APV model was further expanded to make it amenable for use by a MNC parent analyzing a capital project of a foreign subsidiary.
 - The cash flows were converted into the parent firm's home currency, and additional terms were added to the model to handle cash flows that are frequently encountered in international capital projects.
 - You can also adjust the discount rate from domestic to foreign.

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