Capital budgeting

Corporate Finance

The idea

- A company creates value by investing in a new asset/project if the present value of *incremental cash-flows* at the appropriate discount rate exceeds the acquisition cost

- Discount rate: opportunity cost of capital (= return on foregone projects)

Unlevered free cash flows to the firm

$$Unlevered\ FCFF =$$
$$EBIT(1-\tau)$$
$$+Dep$$
$$-Investment\ in\ fixed\ assets$$
$$-\Delta Working\ Capital$$

- τ is the tax rate the corporation faces on its income

- $I = Investment\ in\ fixed\ assets + \Delta Working\ Capital$

- These are the cash-flows a debt-free corporation would have available for distribution to all its stake-holders'

Free cash flows to equity

$$FCFE = Unlevered\ FCFF$$
$$-Interest(1-\tau)+Net\ Borrowing$$

- These are the cash-flows the corporation would have available for distribution to equity holders

Project level incremental FCF (operations)

Incremental *Unlevered* FCFF =

Change in EBIT$(1-\tau)$

+Change in Dep

-Change in fixed investment

-Change in ΔWK

Project level incremental FCFE (operations)

Incremental FCFE =

Incremental *Unlevered* FCFF

-Change in Interest$(1-\tau)$

-Change in Net Borrowing

Cash flows from reversion

Incremental *Unlevered* FCFF from reversion =

Net disposition/salvage price

- Transaction costs (broker fee, e.g.)

-Capital gains taxes

-Depreciation recapture taxes

Incremental FCFE from reversion =

Incremental *Unlevered* FCFF from reversion

- Debt principal due on sale

Bottom line

1. Invest if the present value of incremental $Unlevered\ FCFF$ discounted at $WACC$ exceeds the cost of the investment

2. Invest if the PV of incremental $FCFE$ discounted at the required return on equity exceeds the equity cost (=cost of the investment –investment by debt-holders)

3. That is, either way you measure NPV, invest if:

$$NPV\ of\ the\ investment \geq 0$$

Capital budgeting credo

1. ## Ignore sunk costs

    Ex: marketing study performed two years ago is not part of NPV calculation today

2. ## Include all opportunity costs

    Ex: value of land the corporation already owns is part of NPV calculation today

3. ## Get a good tax accountant

    Ex: cost segregation or default schedule?

4. ## Spend your time on make-or-break assumptions (= assumptions about which you are most uncertain AND move the dial)

Example 1: building a plastic injection plant

- Download case from my webpage
- Build the corresponding pro-forma

Example 2: buy or lease

- In our plastic injection plant example, assume that the corporation can lease the facility instead of building it
- Lease set-up (brokers, repurpose…) costs are $1M
- Lease is $1.2m a year
- Corporation could finance 100% of facility purchase at 8%
- Should the corporation buy or lease?
- Two steps (this part never changes):
    1. What are incremental cash flows?
    2. What is the appropriate discount rate?

Example 3: Leveraged buy-outs (LBOs)

Multiple projects

- Among mutually exclusive projects, pick the one with the highest NPV
- Even if the projects are of very different sizes, this is a (tautologically) sound decision rule as long as the opportunity cost of capital is properly measured
- Why?
- All independent projects with positive NPV should be undertaken

Company WACC vs project WACC

- Using a company WACC in capital budgeting makes intuitive sense if:
    1. The project is typical for the company
    2. The project's financing matches the company's preferred/target capital structure
- When the project is not typical, one solution (*pure play*) is:
    1. Measure the unlevered beta's of company's that invest in this type of project
    2. Relever that beta using the target capital structure and measure the cost of equity accordingly
    3. Build WACC using resulting equity cost, our cost of debt, and target financing mix
- This is approximated in practice by using division or segment WACCs

Project financing

- If a financing mix different from our target structure is used for a particular project, should we use that mix in building WACC?

- Standard answer is no, and that answer mostly makes sense

- What are possible exceptions to that textbook logic?

Mid-point convention

- We have treated (=discounted) cash-flows as if they come at the end of each accounting period

- In reality, of course, they come throughout the period

- If cash-flows are uniform during period $[t, t+1]$ the exact discount rate is

$$\int_t^{t+1} e^{-rs} ds = \frac{e^{-rt}}{r}(1 - e^{-r})$$

- For r small, this is decently approximated by

$$\frac{1}{(1+r)^{t-0.5}}$$

Accuracy of mid-point convention

Chart plotting $\dfrac{1}{(1+r)^{0.5}}$ (solid line) and $\dfrac{1}{r}(1-e^{-r})$ (dashed line) against r from 0 to 0.5. Vertical axis ranges from 0 to 1.2.