Wrap-up of Valuation

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Finance Theory II

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Final Exam

- Rules of the game:
  - No laptops
  - Closed books
  - Cheat sheet

Valuation

Valuation tools:

- Free cash flows
- Cost of capital: WACC and APV
- Real options

Valuing companies

- DCF analysis:
  - Forecast horizon and terminal values
  - EVA: When is growth good?
- Comparables, Multiples

Estimating the FCF

- Free cash flows (FCF) are the ***expected*** after-tax cash flows that the firm would generate if it were 100% equity financed.

  $FCF = EBIT^*(1-t) + Dep. - CAPX - \Delta NWC$

  $FCF = EBITD^*(1-t) + t * Dep. - CAPX - \Delta NWC$

  $FCF = EBIT^*(1-t) - \Delta NA$

Recall:

- NWC = Current assets – Current liabilities
- NA = Assets – Current liabilities.

FCF = EBIT*(1-t) + Dep. - CAPX - ∆WC

- This expression amends EBIT(1-t) which is an accounting measure of cash flow into an economic measure.
- CAPX not reported as cash outflow but is one ⇨ - CAPX
- Depreciation
  - is reported as cash outflow but is not one ⇨ Add (1-t)*Dep
  - however, depreciation does imply a cash inflow of t*Dep.
  - Altogether ⇨ + Dep
- Working capital has an opportunity cost ⇨ - ∆NWC

Other Things to Keep In Mind

- Formulas need to be adapted in particular situations
  - Need to understand the economics (e.g., Southland's asset sales)

- Use ***all incremental*** cash flows:
  - Ignore sunk costs, Count opportunity costs, Avoid "accounting illusions"…

- Don't forget FCF at the end of the project's life:
  - If liquidated: SV*(1-t) + t * PPE
  - Even if not liquidated, recoup WC

- FCF ignores the tax shield provided by the firm's debt.
- We deal with it separately in APV or WACC. Do not include the effects of financing at this stage: You would count them twice!

APV Step 1: Value if 100% equity

1. ***Identify comps***, i.e., publicly traded pure plays in same business.
2. ***Unlever each comp's β_E*** to estimate its β_A using

$$\beta_A = \beta_E \frac{E}{E+D}$$

(OK if the comp's D not too high (+ can assume their D/V is stable))

3. Use the comps' β_A to estimate the ***project's β_A*** (e.g., as average).

4. Use estimated β_A to calculate the ***all-equity cost of capital k_A***

$$k_A = r_f + \beta_A \cdot \text{Market Risk Premium}$$

5. Use k_A to ***discount the project's FCF***

Why We Need to Unlever

- Comps may have different leverage

- Equity in a firm with debt is more risky than equity in a firm without debt because debt receives some of the safe cashflows.

Note: Business Risk and Financial Risk

- Financial risk has nothing to do with costs of financial distress!
- Similar firms have similar business risk (β_A) but can have different financial risk (β_E-β_A) if they have different leverage.
- As leverage increases, equity becomes riskier (i.e. β_E ↗).

APV Step 2: Add PV (Tax Shield)

- If the project's D is constant over time, then

$$\mathbf{PV(TS)} = t*D*k_D / k_D \mathbf{= t*D}$$

- If the project's D/V is constant, then

$$\mathbf{PV(TS) = t*D*k_D / k_A}$$

- If there is a known debt policy or repayment schedule
  - you can simply forecast actual debt levels and discount by a rate between k_D and k_A

APV Step 2: Add PV (Tax Shield), Remarks

- Count only ***debt attributed to the project***
  - Recall: If a project is 100% debt finance, some of the debt is probably issued against firm's other assets
- Make sure to discount ***expected*** not maximum tax shields
  - This is particularly important for high D/V
- For high D/V, should count costs of financial distress
- Recall: Use the marginal (as opposed to the average) tax rate

Weighted Average Cost of Capital (WACC)

- Approach: Adjust the discount rate to account for the tax shield.

$$WACC = \frac{D}{D+E} k_D (1 - t) + \frac{E}{D+E} k_E$$

- Most widely used DCF analysis method.
- The aim is to avoid 1st order mistakes:
  - A priori, WACC is project-specific (except for tax rate t)
  - Firm-wide WACC is OK only if project comparable to the firm

Leverage ratio: D/(D+E)

- What we want: The debt that is incremental to the project, i.e., that could not be raised w/o the project.

- 1st-order mistakes we want to avoid:
  - Use the deal's leverage ratio;
  - Use the "acquirer"'s leverage ratio.

- Imperfect approach to what we want:
  - Target leverage ratio if project/firm were a stand-alone

- How we get there:
  - Get D/V from comps, business plan, checklist, etc.

Cost of debt capital: k_D

- What we want: Expected return for creditors if project were a stand-alone with leverage ratio D/(D+E) estimated above.

- Imperfect approach to what we want: k_D close the interest rate charged to project as stand-alone (unless debt is very risky).

- How we get there:
  - Find comps with similar leverage + recent interest rate.
  - Estimate the debt rating and examine corporate yield curve.

- 1st-order mistakes we want to avoid:
  - Use the interest rate in the deal or of the “acquirer”;

Effective Marginal Tax Rate t

- Marginal tax rate of firm undertaking the project: t

Using CAPM to Estimate k_E

1. ***Find comps*** for the project under consideration.

2. ***Unlever*** each comp's β_E (using its D/(D+E)):

$$\beta_A = \beta_E \frac{E}{E + D}$$

3. Use the comps' β_A to estimate the ***project's β_A*** (e.g. average).

4. ***Relever*** the project's estimated β_A (using its own D/(D+E)):

$$\beta_E = \frac{E + D}{E}\beta_A = \left[1 + \frac{D}{E}\right]\beta_A$$

5. Use the estimated β_E to calculate the ***project's cost of equity k_E***:

$$k_E = r_f + \beta_E \cdot \text{Market Risk Premium}$$

Note: These (un-) levering formulas are OK only if the (comp) firm's debt is not too risky and its D/V is reasonably stable.

Remarks

- WACC can be used only if D/V is reasonably stable
- Use APV when debt is very risky and/or when D/V is unstable (recall the Southland LBO case)
- WACC is an attribute of the project, not the firm (except tax rate)
- OK to use the firm's WACC when project is very much like the firm (because the firm happens to be a comp for the project).
- Few companies have WACC that they can use for all projects (recall our discussion of GE).

Real options

Embedded options

- Follow-up investments
- Option to abandon the project
- Option to wait before investing
- Option to expand / change production methods

Key issues

- Identification
- Valuation

Identify *significant* options

- Look for clues in project's description and cash flow pattern
  - "Phases", "Strategic investment", "Scenarios"…
  - Large expenditures are likely discretionary

- Is there an option? Verify two conditions:

  (1) News will possibly arrive in the future;

  (2) When it arrives, the news may affect decisions.

- Search for the uncertainty that managers face:
  - What is the main thing that managers will learn over time?
  - How will they exploit that information?

Practical Issue: Simplifications

- Search for ***significant*** options
  - E.g., option to shut down the plant may not be very valuable (why?)
  - Look for primary sources of uncertainty
- Cut the projects into ***simple*** options
  - You might want to ignore nested options (difficult to value)
- Use ***European*** rather than American option
- Ignoring some adverse effects of waiting (e.g. possible entry)

A simplified model that is dominated by the project gives a ***lower bound*** for the project's value (and vice versa).

Value the options

Step 1:

- Start with the simple DCF analysis
  - Pretend that there is no option embedded in the project
  - This benchmark constitute a ***lower bound*** for the project's value

Step 2:

- Value the option
  - Decision trees (dynamic DCF)
  - Option pricing models (Black-Scholes)

Mapping: Project → Call Option

Project		Call Option
Expenditure required to acquire the assets	X	Exercise price
Value of the operating assets to be acquired	S	Stock price (price of the underlying asset)
Length of time the decision may be deferred	T	Time to expiration
Riskiness of the operating assets	σ^2	Variance of stock return
Time value of money	r	Risk-free rate of return

Practical Issue: What Volatility?

What do we want?

- Standard deviation of returns for the underlying asset
- In case of real options, the underlying is the PV of the project's CFs

Imperfect ways to get it?

- **Informed guess**
  - 20-30% per year is not remarkably high for a single project.
- **Data**
  - Historical return volatilities on comparable traded assets
  - Implied volatilities can be computed from quoted option prices
- **Simulations**

Valuing Companies

- Terminal values:
  - Liquidation
  - Flat, growing, or decreasing perpetuity
- EVA: When is growth good?
- Comparables, Multiples.

Terminal Values

- **Liquidation:** Should be adjusted (e.g. if cannot recoup all A/R, etc.)

$$SV * (1-t) + t*PPE + WC$$

- **Growing perpetuity:** Take EBIT and NA in last year of forecast

$$TV = [(1+g)*EBIT*(1-t) - g*NA] / (k-g)$$

- **Flat perpetuity:**

$$TV = EBIT*(1-t) / k$$

Terminal Values, Remarks

- Growing perpetuity formula assumes a linear relationship between EBIT and NA
- Don’t forget to take PVTV
- Forecast horizon: Company is reasonably stable afterwards

EVA

- Growth is valuable when (very roughly!):

$$EVA = EBIT^*(1-t) - k^*NA > 0 \quad \textbf{or} \quad EBIT^*(1-t) / NA > k$$

- Growth is good if the cost of scaling up NA is offset by the value of increased revenues.

Remarks:

- Assumes linearity between EBIT and NA and that NA is a good measure of marginal “replacement cost”, now and in the future.
- **EVA has nothing to do with sustainable growth.**

EVA: Bottom Line

Use EVA as…

- … a simple measure of whether a business is generating value and whether growth is enhancing value
- … as a way of setting goals to enhance value

Beware of EVA for...

- … young companies
- … companies in rapidly changing business environment
- … companies in which book values are not accurate measures of marginal replacement cost.

Multiples

- Assess the value based on that of publicly traded comps

- **Cash-flow based Value multiples**
  - MV(firm)/Earnings, MV(firm)/EBITDA, MV(firm)/FCF,...

- **Cash-flow based Price multiples:**
  - Price/Earnings, Price/EBITDA, Price/FCF,...

- **Asset-based multiples:**
  - MV(firm)/BV(assets), MV(equity)/BV(equity),...

Motivation for Multiples?

- **Assumption 1:**
  - E = CF to shareholders
  - E is a perpetuity

$$P = \frac{E}{k_E - g} \quad \Rightarrow \quad \boxed{\frac{P}{E} = \frac{1}{k_E - g}}$$

- **Assumption 2**:
  - Comps have the same k_E => *This requires similar leverage!*
  - Comps are growing at a similar rate g

Multiples: Pros and Cons

Pros:

- Incorporates simply a lot of information from other valuations
- Embodies market consensus
- Can provide discipline for DCF valuation: Ask yourself “How do I explain the difference?”
- Sometimes, what you care about is what the market will pay, not the fundamental value (e.g., Venture firm will want out).

Cons:

- Hard to incorporate firm specific information.
- Relies on accounting measures being comparable too.

Other Things to Think About

Control:

- With a controlling stake, influence operations, implement synergies and capture (part of) their value
- Also, entrepreneur might care about “the vision”

Large individual shareholder (e.g., entrepreneur):

- Maybe very undiversified, at least for a while

Liquidity:

- Especially for private companies
- Note: Need to account for IPO plans

Valuation: Conclusion

- Main merit of DCF analysis: Forces to argue where value comes from ⇨ Most important step is a **reasonable** forecast of FCF.

- Sales forecasts: Reasonable given the firm's resources, the industry, and competition? What market share is needed?
- Margin forecasts: Reasonable given potential competition/entry barriers and bargaining position with suppliers and customers?
- CAPX and other investment forecasts: Consistent with the sales and margin forecasts?
- Terminal value: Does it make sense?
- Sensitivity analysis: What variables and assumptions are crucial to the value? Get more information about these levers.

Valuation: Conclusion

- The different methods are not mutually exclusive.
- Comparables and multiples are important but:
  - don't tell you where value comes from;
  - whether comparables are really comparable.
- DCF analysis (+ Real options) forces to justify valuation but:
  - only as good as the data input;
  - relies on imperfect models.
- Go back and forth between the two approaches.

Course: Conclusion

What We Have Been About

- Acquire a few general tools:
  - Capital structure
  - DCF analysis
  - Comparales and multiples
- Avoiding 1st order misconceptions (list your own below if any):
  -
  -
  - etc.
- Developing a healthy skepticism.

Financing

- The bulk of the value is created on the LHS by making good investment decisions.
- You can destroy much value by mismanaging your RHS: Financial policy should be supporting your business strategy.
- You cannot make sound financial decisions without knowing the implications for the business.
- Avoid one-size-fit-all approaches.
- Finance is too serious to leave it to finance people.

Valuation

- Making sound business decisions requires valuing them.
- This involves mostly knowing the business (to make appropriate cash-flow forecasts and scenario analysis, etc.)
- But also some finance:
  - What discount rate?
  - Valuation exercises can indicate key value levers,...
- Avoid one-size-fit-all approaches.
- Business is too serious to leave it to business people.