New Venture Valuation

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What is Different About Valuing New Ventures?

- Higher risks and higher uncertainty
- Potential rewards higher? Option Values?
- Exit and liquidity more important
- Not just a go-no/go decision; the actual valuations matter

Valuation Approaches

- Discounted Cash Flow/ Adjusted Present Value
- The Venture Capital Method
  →Comparables
- Real Options

These lecture notes draw from three sources: S. Kaplan, "A Note on Valuation in Entrepreneurial Settings," University of Chicago; J. Lerner, "A Note on Valuation in Private Equity Settings," HBS Note 9-297-050; and W. Sahlman, "A Method for Valuing High-Risk, Long-Term Investments," HBS Note 9-288-006.

Discounted Cash Flow/Adjusted Present Value (APV)

- Use APV not WACC
  → Capital structure involves hybrid securities not easily classified as debt or equity
  → Capital structure changes over time
  → Interest tax shields change over time as company's tax status changes
- APV is a more flexible method that can accommodate these features of new venture valuation.

APV Approach for New Ventures

- The Standard APV Calculations:
  - **Step 1:** Calculate *Free Cash Flows* (FCFs) to an "all-equity" firm for a period of years until company reached a "steady-state."
  - **Step 2:** Discount these FCFs at the discount rate of an all-equity firm (k).
  - **Step 3:** Calculate a *Terminal Value* as the present value of a growing perpetuity of FCFs assuming some growth rate in FCFs and discounting by k.
  - **Step 4:** Value tax shields of debt financing separately (trD) and discount by a rate that reflects the riskiness of those cash flows.
  - **Step 5:** Steps 1-4 give you the Enterprise Value. To determine the Equity Value subtract the market value of debt (the present value of interest payments).

Cost of Capital for All-Equity Firm (k)

k = risk-free rate + β * market risk premium

→Risk-free rate = Long-term bond rate

→beta = "unlevered" beta of comparable firms in the industry

→$\beta_U = \beta_L * E_{co} / [E_{co} + D_{co}]$

→Market risk premium = 7%

Where Can We Find Beta?

- Standard to look at publicly-traded comparable firms in same industry.
- But often there aren't many that are in similar stage of development.
- Later stage companies will tend to have lower betas (all else equal) than early stage companies because start-up expenses in early stage companies (e.g. R&D) tend to be more fixed than in later stage companies.

Terminal Value Calculation

- Run out Free Cash Flows until they reach a stable pattern
- Assume a growth rate of g% from then on; use conservative growth rates

- The terminal value formula is:

$$TV = FCF*[1+g] / [k-g]$$

$$PV(TV) = TV / [1+k]^n$$

Wrinkles on Standard APV Calculations

- Company may not have taxable income for many years.
  - → Tax rate in these years is 0. Tax losses can be carried forward for up to 15 years to lower taxable income in profitable years.
  - → What discount rate should be applied?
- Interest expense is not deductible in years when the company has tax losses.
  - → Carry forward interest expense to years when it can be deducted (up to three years carry forward).
- Explicit modeling of idiosyncratic uncertainty is particularly important.
  - → Take expected value of cash flows over various scenarios

APV Example: Medical Diagnostics, Inc.

	"Medical Diagnostics, Inc"				
	($000)				
	2002	2003	2004	2005	2006
Revenue	734	6,475	22,445	55,960	110,402
Cost of Goods Sold	318	2,406	7,175	16,723	32,564
R&D	1,191	1,343	1,665	3,555	8,630
Sales and Marketing	2,517	4,908	8,805	16,815	25,745
Regulatory and Clinical	704	904	1,199	1,345	1,595
Other Expense	2,137	3,397	4,733	6,740	9,394
Total SG&A	6,549	10,552	16,402	28,455	45,364
EBITDA	(6,133)	(6,483)	(1,132)	10,782	32,474
Depreciation	184	334	544	579	723
EBIT	(6,317)	(6,817)	(1,676)	10,203	31,751
Taxes	0	0	0	0	10,858
Depreciation Addback	184	334	544	579	723
Capital Expenditures	543	567	742	880	959
NWC	(364)	1,410	6,416	16,316	32,315
Ch. In NWC	(364)	1,774	5,006	9,900	15,999
Free Cash Flow	(6,312)	(8,824)	(6,880)	2	4,658
Discount Rate	13%	Growth	3%	7%	
PVFCF			(14,735)	(14,735)	
TVFCF			18,410	17,870	
TV			184,096	297,826	
PVTV			99,920	161,648	
Value			85,185	146,913	

Notable Features of this Valuation

- ***Tax Losses*.** No taxes until year 5; use accumulated net tax losses from previous years to offset taxable income in year 5.
- ***Equity Value*.** In general we subtract a measure of the market value of debt (MVD) at the time of the initial valuation to get equity value. Here it is zero; so enterprise value equals equity value.
- ***Terminal Values and Growth Rates.*** Note that we have assumed relatively slow terminal value growth rates: 3% or 7%. Still, the value of the business in the second case is nearly twice that of the first case. Most of the value of this firm comes from the terminal value!!
  - → Model cash flows explicitly until the firms is in steady state
  - → This may be reasonable if there is IP protecting profits or barriers to entry, but we need to be careful

The Venture Capital Method

The Standard calculations:

- **Step 1**: Forecast sales or earnings for a period of years.
- **Step 2**: Estimate the time at which the VC will exit the investment (typically through an IPO or sale to strategic buyer).
- **Step 3**: Value the exit price based on an assumed multiple of earnings or sales or customers, etc. The multiple is typically based on comparable public companies or comparable transactions.
- **Step 4**: Discount interim cash flows and exit value at rates ranging from 25% - 80%.
- **Step5:** Determine the VC's stake

Example: MIT.com, Inc.

- **Step 1:** Forecast Sales or revenues

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Earnings	-5	0	0	0	0	100

- **Step 2:** Assume company exits after 5 years
- **Step 3:** Assume that the company will have earnings of 5 and it will go public at a multiple of 20x earnings for a value of $100M.
- **Step 4:** Valuation at 50% Discount Rate
  - → Post-money = $100M/$(1.50)^5$ = $13.2M
  - → Pre-money value = $8.2M

Example: MIT.com (cont.)

- **Step 5:** VC share
  - → VC will ask for 5/13.2 = 38.0% equity stake to invest $5M
  - → Assume N_0= 1M shares outstanding prior to financing. How many new shares, N_1, does the VC get?
    - → $N_1/(N_0 + N_1) = s$ ⟹ $N_1 = \frac{s}{1-s} N_0$
      - → N_1 = 0.612M shares
      - → Stock price = $5M/0.612M = $8.17

Stock Option Pool

- If the firm needs to reserve 15% of the equity (by the exit date) to recruit management team, then we need to adjust the number of shares. The VC still gets 38% of the equity.
- If *m* is the stock option pool percentage, and N_m is the number of shares issued to the stock option pool, then we know that the shares issued to the VC and the option pool (N_1+ N_m) are:

$$\frac{s+m}{1-s-m} N_0$$

- The shares held by the VC investor, N_1, are then:

$$\frac{s}{1-s-m} N_0$$

Stock Option Pool (cont.)

- Thus in our example:

→ N_1 = 0.38/(1 - 0.38 - 0.15) * 1M = 0.809M shares
→ N_m = 0.15/(1 - 0.38 - 0.15) *1M = 0.319M shares.

→Price per share is $6.18.

New Investor in Follow-on Round (with Lower Discount Rate)

- Forecast Earnings

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Earnings	-5	0	-3	0	0	100

- New investor (discount rate of **30%**):
  - → Values company at end of year 2 at \$100M/1.3^3 = \$45.5M
  - → Requires share, s_2, \$3M/\$45.5M = 6.6% of firm in second round.
  - → First-round VC still requires 38% of firm at exit, but will start off with more shares and greater percentage (which will then be diluted). $N_1 = \frac{s_1}{1 - s_1 - s_2 - m} N_0$

New Investor in Follow-on Round (cont.)

- Initial VC:
  - → N_1 = 0.38/(1 - 0.38 - 0.066 - 0.15)* 1M= 0.941M;
  - → p_1= \$5M/0.941M=\$5.33
- Follow-on Investor:
  - → N_2 = .066/(1 - 0.38 - 0.066 - 0.15)*1M=0.163;
  - → p_1= \$3M/0.163M=\$18.40
- Option Pool
  - → N_m=0.15/(1 - 0.38 - 0.066 - 0.15)*1M = 0.371M

New Investor (cont.)

- Note that the first round VC investor starts off with a 40.7% equity stake, which then gets diluted to 38% ownership when the second round VC investor comes on board.
- If development time slips by two years then the second round investors require 11.1% equity share, since their valuation at this point is \$26.9M = 100/1.3^5. If we still have to give 15% in option pool, this implies that:

$$N_2 = \frac{s_2}{1 - s_2 - m}(N_0 + N_1)$$

  which is (0.111/(1 - 0.111 - 0.15))*1.940M = 0.291M shares.
- The first-round VC ends up with only 35.8% of the shares at the exit date and the IRR on the investment falls to 32.5% from 50%.

Comparable Multiples For Exit Values

- Find exit values by looking at similar companies
  → Take multiples of EBITDA, sales, customers, eyeballs etc.
- **Strength:**
  → Tells you what the market thinks about growth potential.
- **Weaknesses**:
  → Tells you what the market thinks about growth potential.
  → May be hard to find real comparable firms at similar stages that are already public and for whom data are available.

Caveats About Multiples

- Industry Cycles
  - → Young industries might have high multiples for firms that enter the market today, since they have first mover advantage
- Mean Reversion
  - → High multiples for firms that enter the market during a "hot" market need not apply for firms that go public in a few years
  - → How well can you "market time"?
- Vesting Period
  - → IPO multiples overstate gains due to long term under-performance

→ **Choose your multiples wisely!!**

Why Are Discount Rates so High?

- Such high discount rates cannot be explained as being a reward for systematic risk.
- In most practical cases, CAPM would give discount rates well below 25%, let alone 80%.
- Three (limited) "rationales":
  - → Compensate VC for illiquidity of investment;
  - → Compensate VC for adding value;
  - → Correct for optimistic forecasts and idiosyncratic risk.

Rationale I: Investments Are Illiquid

- Investments in a private companies cannot be sold as easily as stock in public companies.
  - → All else equal, this lack of marketability makes private equity investments less valuable than easily-traded public investments.
- Caveat: How much less valuable?
  - → Practitioners in private equity investments often use liquidity discounts of 20%-30%, i.e., they estimate the value to be 20% to 30% less than an equivalent stake in a publicly traded company.

Rationale II: VC Adds Value

- VCs are active investors and bring more to the deal than just money:
  - → spend a large amount of time,
  - → reputation capital,
  - → access to skilled managers,
  - → industry contacts, network,
  - → and other resources.
- A large discount rate is a crude way to compensate the VC for this investment of time and resources.
- Caveat: Why not compensate the VC explicitly for services?

Rationale III: Optimistic Forecasts

- VC method assumes that the firm hits its targets.
  - → Forecasts tend to rely on cash flows in the best case
- A higher discount rate is a crude way to correct forecasts that are too optimistic.
- Caveat:
  - → Build uncertainty into the cash flow estimates
  - → 80% of 0 is still 0
  - → This is not the time to be lazy!

Rationale IV: VC Market Power

- Valuations are influenced by the distribution of bargaining power between VC and entrepreneur
  - → Affects the rent distribution between VC and entrepreneur
- Factors that influence bargaining power:
  - → Supply and demand for capital; when a lot of capital flows into the VC market, valuations are higher
  - → Valuations increase with the number of active VC firms in the market
  - → Reputation and track record of VC / entrepreneur; repeat entrepreneurs get better valuations

An Alternative to High Discount Rates: Scenario Analysis

- Since VCs certainly use this method, you need to know how to use it!
  - →But it does not preclude you from taking a more sophisticated approach to the problem.
- Explicitly model cash flows and sources of uncertainty.
  - →Allows you to better understand the sources of risk and their implications for value
  - →Reduces your reliance on "guessing" terminal values
  - →Allows you to value an investment's "real options" - the ability to change plans as new information arrives

Appendix

Some Useful Calculations

Free Cash Flows to an All-Equity Firm

- Equivalent Approach 1
  FCF = EBIT x(1-t) + DEPR - CAPX - ΔNWC
- Equivalent Approach 2
  FCF = EBITDx(1-t) + t x DEPR - CAPX - ΔNWC
- Equivalent Approach 3
  FCF = EBITx(1-t) - ΔNet Assets
- Note*:*
  EBIT = Earnings before interest and taxes
  EBITD = Earnings before interest, taxes and depreciation

Example of Free Cash Flow Calculation (2000)

	('99)	('00)
• Sales	1000	1200
• Cost of Goods Sold	700	850
• Depreciation	30	35
• Interest Expense	300	200
• Capital Expenditures	40	40
• Accounts Receivable	50	60
• Inventories	50	60
• Accounts Payable	20	25

- tax rate=40%

- FCF = EBIT(1-t) + Depr. - CAPX - Ch. NWC
  → EBIT = 1200 - 850 - 35 = 315
  → Ch. NWC = (60+60-25) - (50+50-20) = 15
  → FCF = 315 (1-.40) + 35 - 40 - 15 = 169

Example of A Tax Loss Carry Forward

- FCF_1= 270 x (1- 0.4) + 30 - 40 + 0 = 152
- ITS_1 = min(**0.4 x 270**, 0.4 x 300) = 108
- $CCF_1 = FCF_1 + ITS_1$ = 260
- cannot use $30 of our interest expenses = $12 interest tax shield

- FCF_2 = 315 x (1-.40) + 35 - 40 - 15 = 169
- ITS_2 = min(0.4 x 315, **0.4 x 200 + 12**) = 92
- CCF_2 = 261
- If interest expenses + tax shield were greater than tax expense ($125.6), tax shield would be carried forward again

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