



Foundations of Finance



Equity Valuation I



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Partial Review of the Last Class

- ▶ A 1-year zero yields 4% and a 2-year zero yields 5%. What does the curve imply about the 1-year rate next year?
- ▶ Under the expectations hypothesis, what is an inverted curve saying?
- ▶ A bank funds 10-year bonds with overnight deposits and yields rise 300 basis points. What happens to its equity?
- ▶ Why is interest rate risk not a property of the bond?

Today

- ▶ What a share is, and why it is harder to value than a bond
- ▶ Book value, liquidation value, replacement value, Tobin's q
- ▶ Book-to-market: value firms and growth firms
- ▶ Fundamental value, and the expected holding period return
- ▶ The dividend discount model
- ▶ Zero growth, and the Gordon growth model

From Bonds to Shares

- ▶ For six sessions the price of anything has been the present value of its cash flows. Nothing changes today
- ▶ **$P_0 = \sum E[CF_t] / (1 + r)^t$ — the same formula, with two much harder inputs**
- ▶ What is different about a share:
 - ▶ the cash flows are not promised — a dividend is decided, not owed
 - ▶ there is no maturity and no face value — the stream never ends
 - ▶ the discount rate is not quoted anywhere, and we cannot work it out until Session 19
- ▶ A bond's uncertainty is whether it pays. A share's uncertainty is how much, for ever
- ▶ So equity valuation is the growing perpetuity from Session 4, with the growth rate doing all the work

Four Ways to Value a Company

- ▶ Accounting alone — what the books say the firm is worth
 - ▶ book value, liquidation value, replacement value
- ▶ Accounting next to market prices — what the market pays per unit of book
 - ▶ Tobin's q , book-to-market, comparable companies and transactions
- ▶ Intrinsic valuation — the present value of everything the firm will ever pay out
 - ▶ dividend discount models (today), discounted free cash flow (Sessions 11–12)
- ▶ Option-based valuation — equity as a claim that can be walked away from
 - ▶ Sessions 25 and 26
- ▶ **Today is the first and the third. They disagree, and the disagreement is the interesting part**

Book Value vs Market Value

- ▶ How can we value a company by just looking at its balance sheet?
- ▶ Book Value of Equity: Book assets minus non-equity liabilities
- ▶ Recall that accountants measure book assets as the cost of acquiring them net of depreciation
- ▶ Market Value of Equity (aka Market Capitalization):
share price x shares outstanding
- ▶ Cost of buying all of company's stock at the current price

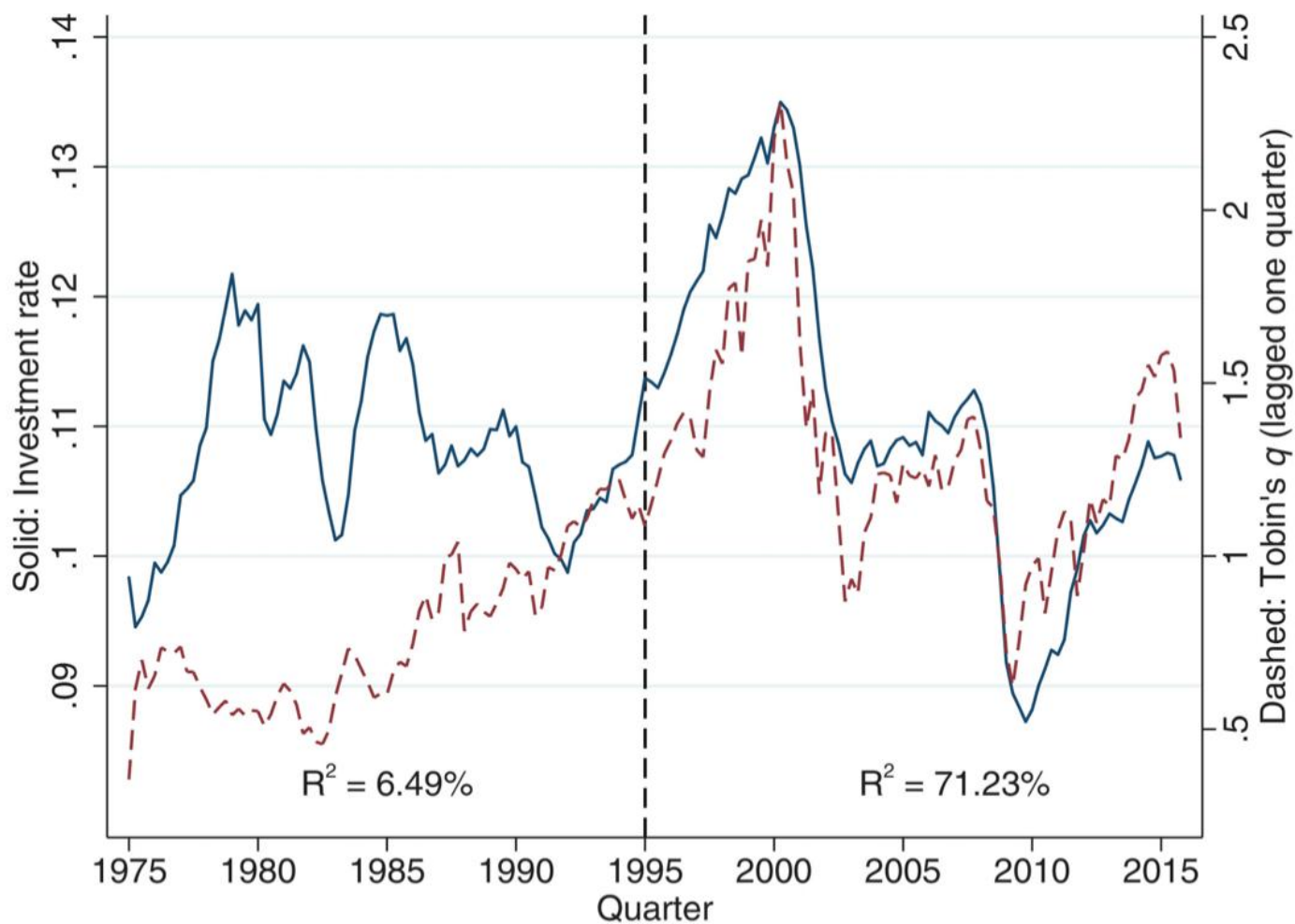
Liquidation Value

- ▶ Liquidation value measures the residual value of the firm when
 - ▶ The firm is closed
 - ▶ All assets are sold at the realizable value
 - ▶ All the liabilities are paid off
 - ▶ Need to factor in additional costs such as legal costs, fire sales
- ▶ Considered lower bound on market value (otherwise a great takeover target).
- ▶ The bankruptcy court takes into account liquidation value when deciding fairness of distribution to creditors, not so useful for healthy firms

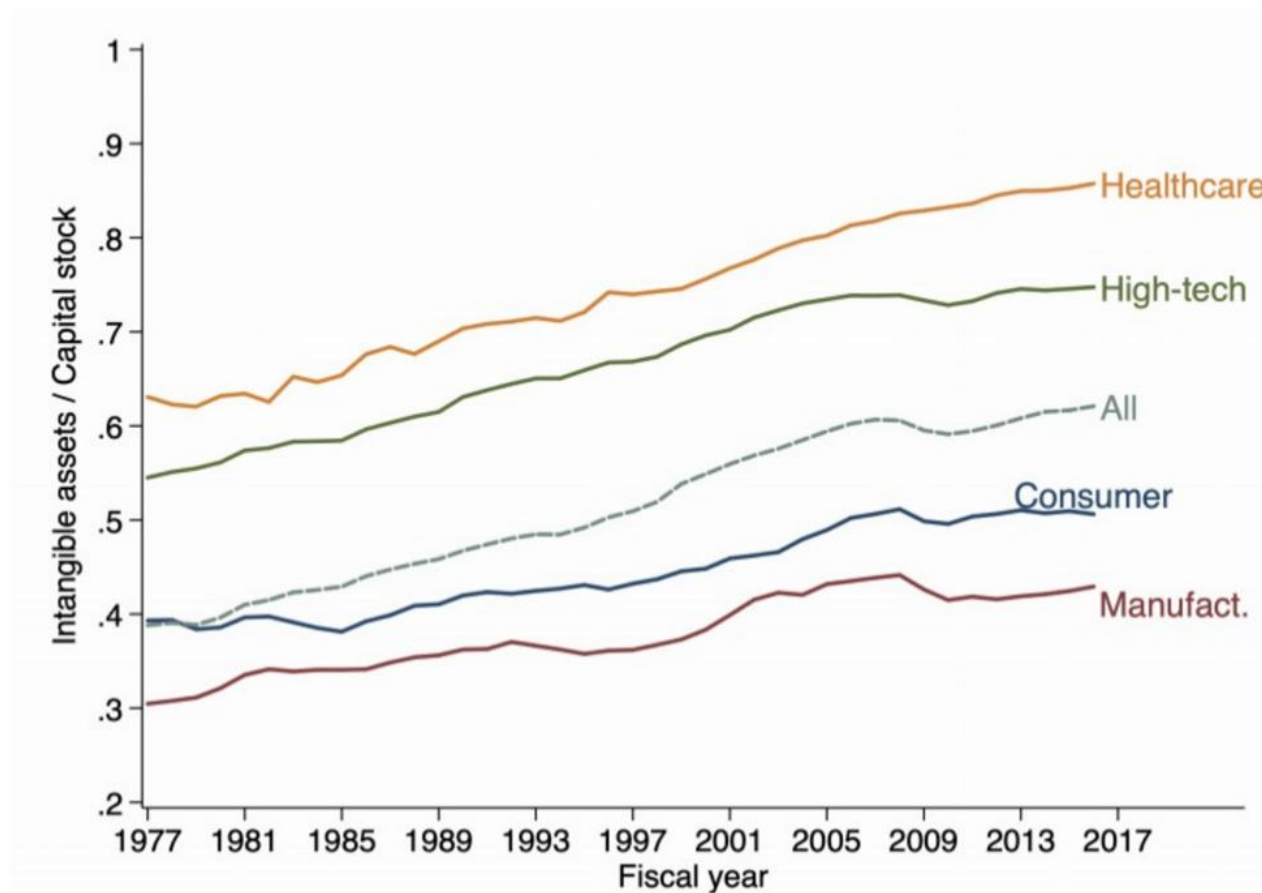
Replacement Value

- ▶ Replacement value: cost of replacing (buying again) all the firm's assets, net of debt
- ▶ Similar to book value but at current prices
- ▶ Often considered the upper bound on the market value
- ▶ if market price is far above replacement cost, competitors are likely to move into this business
- ▶ Tobin's q —the ratio between market and replacement cost
 - ▶ By logic above, should equal ~ 1 in the long run

Tobin's Q



Intangible Capital



Measuring Intangible Capital with Market Prices by Michael Ewens,
Ryan H. Peters, and Sean Wang.

Book and Market Value of a Share

- ▶ Balance sheet of a firm needs to balance
- ▶ $\text{Book Assets} = \text{Book Liabilities} + \text{Book Equity}$
- ▶ See quarterly data (forms 10-Q):

Ticker	Name	Data Date	Assets	Liabilities	Book Equity
AAPL	APPLE INC	12/2025	379,297	291,107	88,190
KHC	KRAFT HEINZ CO	9/2025	81,695	40,116	41,572
NVDA	NVIDIA	10/2025	161,148	42,251	118,897
T	ATT INC	10/2025	423,213	296,458	126,755

Market Value

- ▶ **Market value of equity = share price × shares outstanding**
- ▶ The same four firms, now at what the market will actually pay for them

Ticker	BE	ME	Shares	BE/Share	Market Price
AAPL	88,190	4,088,000	14,774	5.96	278.12
KHC	41,572	29,165	1,184	35.11	24.64
NVDA	118,897	4,514,000	24,555	4.84	185.41
T	126,755	192,337	7,169	17.68	27.13

Book to Market Value

- ▶ Calculate Book-to-Market ratios for the firms
- ▶ Which are value firms, which are growth firms?

Ticker	BE	ME	B/M
AAPL	88,190	4,088,000	0.022
KHC	41,572	29,165	1.425
NVDA	118,897	4,514,000	0.026
T	126,755	192,337	0.66

- ▶ KHC, T - value; AAPL, NVDA - growth
- ▶ Historically, investing in value, shorting growth has earned a premium.

Markets: Warren Buffett

- ▶ *“Intrinsic value (or fundamental value) is an all-important concept that offers the only logical approach to evaluating the relative attractiveness of investments and businesses. Intrinsic value can be defined simply: It is the discounted value of the cash that can be taken out of a business during its remaining life.”*
- ▶ Example: Book value / Intrinsic value of a college education

Fundamental/Intrinsic Value

- ▶ The fundamental or the intrinsic value of the stock is
 - ▶ the present discounted value of the future cash flows that the stock will pay
 - ▶ Discounted at the appropriate risk-adjusted discount rate
- ▶ Consider the distribution of next year's (uncertain) dividend, D_1 , and (uncertain) ex-dividend price, P_1 .
- ▶ The discount rate, also known as the required return, reflects the expected returns on other similarly risky investments
- ▶ Fundamental value of the stock at time 0 is

$$V_0 = \frac{E[D_1] + E[P_1]}{1 + r}$$

Fundamental/Intrinsic Value

- ▶ If current price P_0 equals the fundamental value, what is the expected HPR (Holding Period Return) for this stock?

$$E[1 + HPR] = \frac{E[D_1] + E[P_1]}{P_0} = \frac{E[D_1] + E[P_1]}{V_0} = 1 + r$$

- ▶ Suppose there is a mispricing in the market, and $V_0 > P_0$
 - ▶ What is the expected HPR?
 - ▶ Is the security over or underpriced?

$$E[1 + HPR] = \frac{E[D_1] + E[P_1]}{P_0} > \frac{E[D_1] + E[P_1]}{V_0} = 1 + r$$

Fundamental vs Actual Value

- ▶ Suppose the current stock price is \$48. The expectations of next year's price and dividend are \$52 and \$4, respectively.
- ▶ The stock's required return is 8%
- ▶ Compute
 - ▶ The stock's fundamental value
 - ▶ expected holding period return
- ▶ Is the stock over- or under-valued?

Fundamental vs Actual Value — Answer

- ▶ **$V_0 = (E[D_1] + E[P_1]) / (1 + r) = (4 + 52) / 1.08 = \51.85**
- ▶ **$E[HPR] = (E[D_1] + E[P_1]) / P_0 - 1 = 56 / 48 - 1 = 16.67\%$**
- ▶ The share trades at \$48 and is worth \$51.85, so it is undervalued
 - ▶ equivalently: you expect 16.67% on something that only has to pay you 8%
- ▶ The two statements are the same statement. A share is cheap exactly when its expected return exceeds its required return
- ▶ And notice what we have not done: nobody told us r . Where 8% comes from is Session 19

Dividend Discount Model (DDM)

- ▶ Our previous calculation relied on the stock price at $t=1$.
- ▶ Let's now apply the same formula to the stock price at $t=1$, at $t=2$ and so on.
- ▶ Assume the market is efficient and P_0 equals the fundamental value V_0

$$\begin{aligned} V_0 &= \frac{E[D_1] + E[P_1]}{1 + r} \\ &= \frac{E[D_1]}{1 + r} + \frac{E[P_1]}{1 + r} \\ &= \frac{E[D_1]}{1 + r} + \frac{E[D_2] + E[P_2]}{(1 + r)^2} \\ &= \frac{E[D_1]}{1 + r} + \frac{E[D_2]}{(1 + r)^2} + \frac{E[D_3] + E[P_3]}{(1 + r)^3} + \dots \end{aligned}$$

DDM Case 1: Zero Dividend Growth

- ▶ Suppose that expected dividends are constant for all $t \geq 0$

$$D_0 = E[D_t]$$

or $D_0 = E[D_1] = E[D_2] = E[D_3] = \dots$

- ▶ Let's use the Dividend Discount Model

$$\begin{aligned} V_0 &= \frac{E[D_1]}{1+r} + \frac{E[D_2]}{(1+r)^2} + \frac{E[D_3]}{(1+r)^3} + \dots \\ &= \frac{D_0}{1+r} + \frac{D_0}{(1+r)^2} + \frac{D_0}{(1+r)^3} + \dots \\ &= \frac{D_0}{r} = \frac{E[D_1]}{r} \end{aligned}$$

Recall our perpetuity formula!

Zero Dividend Growth

- ▶ Ex: JPMorgan Chase's perpetual preferred stock pays a \$1.20 dividend. What is its value if JPM's required return is 6%?
- ▶ If the stock trades for $P_0 = \$15$, what is its expected return?

Zero Dividend Growth — Answer

- ▶ **$V_0 = D / r = 1.20 / 0.06 = \20.00**
 - ▶ a preferred share with a fixed dividend and no maturity is a perpetuity — Session 4, unchanged
- ▶ **If it trades at \$15, the expected return is $r = D / P_0 = 1.20 / 15 = 8.00\%$**
- ▶ Same instrument, same \$1.20. Pay less and you earn more
 - ▶ exactly the relationship you already know from bonds: price up, yield down
- ▶ Which of the two numbers is the truth, \$20 or \$15? That question is Session 2!

DDM Case 2: Constant Growth — Gordon's Growth Model

- ▶ Suppose instead that expected dividends grow at a rate g

$$E[D_t] = (1 + g)^t D_0$$

- ▶ Use the Dividend Discount Model:

$$\begin{aligned} V_0 &= \frac{E[D_1]}{1 + r} + \frac{E[D_2]}{(1 + r)^2} + \frac{E[D_3]}{(1 + r)^3} + \dots \\ &= \frac{D_0(1 + g)}{1 + r} + \frac{D_0(1 + g)^2}{(1 + r)^2} + \frac{D_0(1 + g)^3}{(1 + r)^3} + \dots \\ &= \frac{D_0(1 + g)(1 + r)}{(1 + r)(r - g)} = \frac{E[D_1]}{(r - g)} \end{aligned}$$

Gordon's Growth Model

- ▶ A stock is expected to pay a dividend of \$2 next year. Its long-term expected growth rate is 4% and its required return is 8%
- ▶ What is the stock's fundamental value?
- ▶ How will the value change if growth slows to 3%?
- ▶ How will it change if the required return rises to 9%?

Gordon's Growth Model — Answer

- ▶ **$V_0 = D_1 / (r - g) = 2 / (0.08 - 0.04) = \50.00**
- ▶ **If growth slows to 3%: $2 / (0.08 - 0.03) = \$40.00$, a fall of 20%**
- ▶ **If the required return rises to 9%: $2 / (0.09 - 0.04) = \$40.00$, again a fall of 20%**
- ▶ One percentage point, from either direction, costs a fifth of the company
 - ▶ the denominator is a small number, so small changes in it are large changes in the price
- ▶ This is why equity prices move so much on news that changes nothing this year
- ▶ **And as g approaches r the value goes to infinity — the warning from Session 4 and from Problem Set I**

The Gordon Model and the IBEX

- ▶ **Rearrange Gordon and you get the return: $r = D_1 / P_0 + g$**
 - ▶ the required return is the dividend yield plus the growth rate
- ▶ Two very different ways for a share to deliver the same r :
 - ▶ a high dividend yield and little growth — the Spanish banks and utilities that dominate the IBEX
 - ▶ almost no dividend, with the whole value sitting in g — US technology
- ▶ So a high dividend yield is not by itself a cheap share. It is a share whose value is in D_1 rather than in g
- ▶ It is also why the IBEX 35 and the IBEX 35 con dividendos drift so far apart over a decade

Summary

- ▶ A share is still priced as the present value of its cash flows. Only the cash flows and the rate are harder
- ▶ Accounting brackets the answer: liquidation below, replacement above, Tobin's q compares the two
- ▶ Book-to-market separates value firms from growth firms, and it is largely a statement about intangibles
- ▶ Fundamental value: $V_0 = (E[D_1] + E[P_1]) / (1 + r)$, compared with the price
- ▶ Iterate it for ever and you get the DDM: constant dividends give a perpetuity, constant growth gives Gordon
- ▶ $V_0 = D_1 / (r - g)$ — and the closer g gets to r , the less the number is worth
- ▶ **Next class: Equity Valuation II (BMAE 4.4–4.6)**