How to Value a Stock

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Code	Name	Currency	Market cap (m)	Price	Change	Change %
SHEL	SHELL PLC ORD EUR0.07	GBX	172,380.30	2,337.50	34.00	1.48%
AZN	ASTRAZENECA PLC ORD SHS $0.25	GBX	159,377.87	10,466.00	180.00	1.75%
HSBA	HSBC HLDGS PLC ORD $0.50 (UK REG)	GBX	100,864.94	498.55	-2.85	-0.57%
ULVR	UNILEVER PLC ORD 3 1/9P	GBX	95,800.32	3,732.50	-14.50	-0.39%
GSK	GLAXOSMITHKLINE PLC ORD 25P	GBX	89,244.09	1,798.40	43.00	2.45%
DGE	DIAGEO PLC ORD 28 101/108P	GBX	87,697.61	3,867.00	43.50	1.14%
BP.	BP PLC $0.25	GBX	80,699.90	418.35	3.65	0.88%
BATS	BRITISH AMERICAN TOBACCO PLC ORD 25P	GBX	77,928.34	3,458.00	29.00	0.85%
RIO	RIO TINTO PLC ORD 10P	GBX	66,461.81	5,339.00	19.00	0.36%
GLEN	GLENCORE PLC ORD USD0.01	GBX	60,690.10	477.00	15.65	3.39%
RKT	RECKITT BENCKISER GROUP PLC ORD 10P	GBX	46,171.89	6,426.00	-32.00	-0.50%
NG.	NATIONAL GRID PLC ORD 12 204/473P	GBX	44,488.52	1,228.50	8.50	0.70%
AAL	ANGLO AMERICAN PLC ORD USD0.54945	GBX	44,200.26	3,348.50	44.00	1.33%
REL	RELX PLC ORD 14 51/116P	GBX	44,172.19	2,308.00	15.00	0.65%

How to Value a Stock

- Today's focus will be on stocks, but the insights will be applicable to all investments

		Person	**Company**
Real	*Tangible*	Renovate a new kitchen	Build a new factory
	Intangible	Attend university / this lecture	Increase parental leave
Financial		Buy shares	Buy back shares

- We'll go beyond Lecture 3 in two ways
  - Take into account risk (apply Lecture 4)
  - Take into account more realistic cash flows

The Cash Flows From A Stock

- Lecture 3: the value of any investment is the present value of its future cash flows: $\sum_{t=1}^{\infty} \frac{C_t}{(1+r)^t}$

- What are the cash flows from a stock?

The Cash Flows From A Stock

	Company
Revenues	1000
Expenses	(300)
Profit Before Tax	700
Tax @ 20%	(140)
Profit After Tax / Net Income / Earnings	560
Earnings Per Share (100 shares)	5.6

→ 3.6 reinvested

→ 2 paid as dividends

How to Value a Stock

- Lecture 3: the value of any investment is the present value of its future cash flows: $\sum_{t=1}^{\infty} \frac{C_t}{(1+r)^t}$

- For a stock, its future cash flows are its dividends: $P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$

- But what if you don't intend to hold onto the stock forever?

How to Value a Stock

- Say you wish to sell the stock after 2 years
- $P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{P_2}{(1+r)^2}$
- The price you get at year 2 depends on the dividends from year 3
- $P_2 = \sum_{t=3}^{\infty} \frac{D_t}{(1+r)^{t-2}}$

- $P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{\sum_{t=3}^{\infty} \frac{D_t}{(1+r)^{t-2}}}{(1+r)^2}$

- $P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \sum_{t=3}^{\infty} \frac{D_t}{(1+r)^t}$

- $P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$

A Practical Shortcut

- $P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$ seems to suggest that you need to forecast dividends forever

- Lecture 3: value of a growing perpetuity is $\frac{D_1}{r-g}$
    - g is the constant growth rate, from year 1 onwards
    - r is given by the Capital Asset Pricing Model (Lecture 4)

An Example

- Tesco has just paid a dividend of 3p per share and its beta is 0.5
- Analysts are expecting the dividend to grow by 2% each year forever
- The current risk-free rate is 1% and the expected excess return on the FTSE All-Share is 4%
- What should Tesco's share price be?

An Example

- Tesco has just paid a dividend of 3p per share and its beta is 0.5
- The current risk-free rate is 1% and the expected excess return on the FTSE All-Share is 4%

- $r_T - r_f = \beta_T(r_m - r_f)$
- $r_T - 1\% = 0.5(4\% - 1\%)$

An Example

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- $r_T - r_f = \beta_T(r_m - r_f)$
- $r_T - 1\% = 0.5(4\%)$
- $r_T = 3\%$

An Example

- Tesco has just paid a dividend of 3p per share and its beta is 0.5
- Analysts are expecting the dividend to grow by 2% each year forever

- $P_0 = \dfrac{D_1}{r-g}$
- $P_0 = \dfrac{3}{3\%-2\%} = 300p$

An Example

- Tesco has just paid a dividend of 3p per share and its beta is 0.5.
- Analysts are expecting the dividend to grow by 2% each year forever

- $P_0 = \dfrac{D_1}{r-g}$

- $P_0 = \dfrac{3(1.02)}{3\%-2\%} = 306p$

TESCO

Company page   Our story

Equity   ⓘ What's this?

Price (GBX)

286.70 ↑ 1.96% (5.50)

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An Example

- Tesco has just paid a dividend of 3p per share and its beta is 0.5.
- Analysts are expecting the dividend to grow by 1% each year forever

- $P_0 = \dfrac{D_1}{r-g}$
- $P_0 = \dfrac{3(1.01)}{3\% - 1\%} = 151.5p$

How to Value a Stock in Practice

- So far, we've developed two "extreme" methods
  - The exact "academic" formula: $P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$
  - The "back-of-the-envelope" constant growth formula: $P_0 = \frac{D_1}{r-g}$
- In practice, use a bit of both
  - Forecast dividends over the next T years
  - Then estimate a "terminal value" for the remainder of the business after T years
- $P_0 = \sum_{t=1}^{T} \frac{D_t}{(1+r)^t} + \frac{TV_T}{(1+r)^T}$

How to Estimate Terminal Value?

How to Estimate Value?

How to Estimate Value of a House?

- *Fundamentals*: How much you could rent it out for, and how much the rent will grow in the future
- *Comparables*: The price of similar houses

How to Estimate Terminal Value? (1)

- *Perpetual growth method*. Assume that, from year *T+1*, dividends grow at a constant rate g forever. Then:

$$TV_T = \frac{D_{T+1}}{r - g}$$

- and so

$$P_0 = \sum_{t=1}^{T} \frac{D_t}{(1+r)^t} + \frac{1}{(1+r)^T} \frac{D_{T+1}}{r - g}$$

A More Realistic Example

- Tesco has just paid a dividend of 3p per share and its beta is 0.5
- Analysts are expecting the dividend to grow by 2% **in the next two years due to recovery from the pandemic, before settling into a long-term growth rate of 1.5%**
- The current risk-free rate is 1% and the expected excess return on the FTSE All-Share is 4%
- What should Tesco's share price be?

A More Realistic Example

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Year	Dividend	Growth
0	3	2%
1	3.06	2%
2	3.1212	1.5%
3	3.16802	1.5%
...	....	1.5%
∞		1.5%

A More Realistic Example

- $P_0 = \sum_{t=1}^{T} \frac{D_t}{(1+r)^t} + \frac{1}{(1+r)^T} \frac{D_{T+1}}{r-g}$

- T=2

- $P_0 = \frac{3.06}{1.03} + \frac{3.1212}{1.03^2} + \frac{1}{(1+r)^T} \frac{3.16802}{3\%-1.5\%}$

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A More Realistic Example

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- T=2

- $P_0 = \frac{3.06}{1.03} + \frac{3.1212}{1.03^2} + \frac{1}{(1+r)^T}\frac{3.16802}{3\%-1.5\%}$

- $P_0 = 205p$

Year	Dividend	Growth
0	3	2%
1	3.06	2%
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Company page   Our story

Equity ⓘ What's this?

Price (GBX)

286.70 ↑ 1.96% (5.50)

How to Estimate Terminal Value? (2)

Whimple, Exeter

£295,000

🛏 3   🛁 1   🛋 1

📐 847 sq ft (78.69 sq m)

£348/sq ft

How to Estimate Value of a House?

- Square foot = value driver
- Price per square foot = multiple
- A 1,000 square foot house should cost (approximately) 1,000 × £348 = £348,000

- Applied to companies, this is the *comparable companies method*

Value Drivers for a Company

- Book value: the value of a firm's tangible assets
  - Multiple = market / book
- Earnings: the net income of a company
  - Multiple = price / earnings

GLAXOSMITHKLINE PLC (GSK)

Previous close: **1,755.40p**

Adjusted EPS (p): 113.20

P/E ratio: **15.51**

A More Realistic Example

- Tesco has just paid a dividend of 3p per share and its beta is 0.5
- Analysts are expecting the dividend to grow by 2% in the next two years due to recovery from the pandemic
- **They're unable to forecast dividends beyond two years, but they estimate its earnings at the end of year 2 will be 12p**
- **Other supermarkets are trading at a P/E ratio of 20**
- The current risk-free rate is 1% and the expected excess return on the FTSE All-Share is 4%
- What should Tesco's share price be?

A More Realistic Example

- $P_0 = \sum_{t=1}^{T} \frac{D_t}{(1+r)^t} + \frac{TV_T}{(1+r)^T}$

- $P_0 = \frac{3.06}{1.03} + \frac{3.1212}{1.03^2} + \frac{20 \times 12}{1.03^2}$

- $P_0 = 232p$

- They estimate its earnings at the end of year 2 will be 12p
- Other supermarkets are trading at a P/E ratio of 20

What Determines the Price-Earnings Ratio?

- NatWest generates earnings of £10 per share forever, which it pays out entirely as dividends
- Its cost of equity is 10%. What is its share price?
- $P_0 = \dfrac{D_1}{r-g} = \dfrac{10}{10\% - 0\%} = 100$
- Its P/E is $100/10 = 10$

What Determines the Price-Earnings Ratio?

- Now NatWest has the opportunity to reinvest 20% of its earnings each year at a return of 15%
- g = reinvestment rate × return on investment
- g = 20% × 15% = 3%
- $P_0 = \frac{D_1}{r-g} = \frac{10(1-20\%)}{10\%-3\%} = 114$
- P/E = 114/10 = 11.4
  - Looks "expensive", but is justified by its higher growth opportunities. Like a house with planning permission to extend it

What Determines the Price-Earnings Ratio?

- If no reinvestment, $P_0 = \frac{E_1}{r} = \frac{10}{10\%} = 10$

- If reinvestment, $P_0 = \frac{E_1}{r} + \text{growth} = 11.4$
  - Price is higher since return on investment is 15%, versus cost of equity of 10%
  - If ROI < 10%, growth has negative value
- Companies have higher P/E if they have more growth opportunities

Industry	Banks	Pharma	Internet	Biotech
P/E	13	34	48	75

Dividends vs. Earnings

- If the value of a company is its future *dividends*, why do companies trade on a price-*earnings* ratio?
- $P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$ depends on entire stream of future dividends
- P_0 / D_1 is less meaningful as
  - Company may not yet be paying dividends
  - Dividends may be expected to rise a lot in the future
  - Dividends can easily be changed, making P/D volatile
- P_0 / E_1 is more meaningful as
  - Most companies generate earnings
  - Earnings are unaffected by dividend policy
- Price per inhabited square foot vs. price per square foot

Summary

- Earnings are how much shareholders are better off by; dividends are how much shareholders actually receive
- The price of a stock depends on its entire stream of future dividends: $P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$
- In practice, people forecast dividends for a few years and then estimate a *terminal value* based on either
  - Perpetual growth methodology
  - Comparable companies analysis based on a value driver, e.g. P/E
- P/E is a measure of how "expensive" a company is
  - Study P/E as P/D less meaningful
  - P/E is justifiably higher if a company has higher growth opportunities