

Student learning outcomes

- 8.1 Compare and contrast the free cash flow to the firm (FCFF) and free cash flow to equity (FCFE) approaches to valuation.
- 8.2 Contrast the ownership perspective implicit in the FCFE approach to the ownership perspective implicit in the dividend discount approach.
- 8.3 Discuss the appropriate adjustments to net income, earnings before interest and taxes (EBIT), earnings before interest, taxes, depreciation and amortisation (EBITDA), and cash flow from operations (CFO) to calculate FCFF and FCFE.
- 8.4 Calculate FCFF and FCFE.

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Student learning outcomes

- 8.5 Discuss approaches for forecasting FCFF and FCFE.
- 8.6 Contrast the recognition of value in the FCFE model with that of dividend discount models.
- 8.7 Explain how dividends, share repurchases, share issues, and changes in leverage may affect future FCFF and FCFE.
- 8.8 Critique the use of net income and EBITDA as proxies for cash flow in valuation.
- 8.9 Discuss the single-stage (stable-growth), two-stage, and three-stage FCFF and FCFE models, and select and justify the appropriate model given a company's characteristics.
- 8.10 Estimate a company's value using the appropriate model(s).

References

 Pinto J.E., E. Henry, T.R. Robinson and D.D. Stowe. (2010). Equity Asset Valuation. (2nd edition) John Wiley & Sons: New Jersey. Chapter 4.



School of Examples & Finance based on Pinto, et al (2010).

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Outcome 8.

Free Cash Flow Valuation

- Discounted cash flow (DCF) valuation views the intrinsic value of a security as the present value of its expected future cash flows
- In Topic 7, we used dividends to represent future cash flows – in this topic we will use Free Cash Flow
- Whereas dividends are the cash flows actually paid to shareholders, free cash flows are the cash flows available for distribution to providers of capital
- Free Cash Flows to the Firm (FCFF) are total cash flows available to repay the providers of both debt and equity capital, whereas Free Cash Flows to Equity (FCFE) are cash flows available for distribution to equity holders

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Outcome 8.2

FCF v Dividend Discount Models

- FCF models are preferred over DDM models when
 - The company does not pay dividends
 - The company pays dividends but the dividends paid differ significantly from the company's capacity to pay dividends
 - Free cash flows align with profitability within a reasonable forecast period with which the analyst is comfortable
 - The investor takes a control perspective
- An investor who controls a company can determine how free cash flows are used; e.g.
 - There could be a substantial change in dividend policy
 - Free cash flows could be diverted to repay debt, such as the debt incurred to acquire the company

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Definitions of free cash flow

- · Free Cash Flow to the Firm can be defined as cash flow available to suppliers of capital after
 - all operating expenses (including taxes) have been paid
 - all necessary investments in working capital have been made
 - all necessary investments in fixed capital have been made
- Free Cash Flow to Equity can be defined as the cash available to ordinary shareholders after
 - all operating expenses, interest and principal have been paid
 - all necessary investments in working capital have been made
 - all necessary investments in fixed capital have been made
- FCFE can also be defined as cash flow from operations. minus capital expenditures minus net payments to

FCFF or FCFE

- · The advantages of the free cash flow valuations over other models is that they can be used to value either the firm or the equity of the firm
- · Depending on the company being valued, an analyst might have reasons to prefer one method over the other:
 - If the company's capital structure is relatively stable, FCFE is more direct and simpler to use than FCFF
 - If the company has financial leverage and FCFE is negative, working with FCFF to value equity might be easier
 - If a company has a history of leverage changes in the past a growth rate in FCFF may be more meaningful than an everchanging growth pattern in FCFE, and FCFF might be preferred

Computing FCFF from net income

- · FCFF is the cash flow available to the company's suppliers of capital after all operating expenses, including taxes, have been paid, but excluding all noncash accrued income and charges to net income, and operating investments made
- · FCFF can be obtained by adjusting net income

$$FCFF = NI + NCC + Int(1 - Tax Rate) - FCInv - WCInv$$
 where

- NI = net income
- NCC = net non-cash charges
- = Interest paid, which is adjusted to an after tax basis
- FCInv = investments in fixed capital
- WCInv = investments in working capital

Computing FCFF from net income



Using the information below and on the next two slides, calculate Cane Distribution Inc's FCFF, starting with net income

Cane Distribution Inc Income Statement	2001 US\$m	2002 US\$m	2003 US\$m
EBITDA	200.00	220.00	242.00
Depreciation	45.00	49.50	54.45
EBIT	155.00	170.50	187.55
Interest expense	15.68	17.25	18.97
Income before tax	139.32	153.25	168.58
Taxes @30%	41.80	45.97	50.58
Net income	97.52	107.28	118.00

Computing FCFF from net income



Cane Distribution Inc Balance Sheet	2000 US\$m	2001 US\$m	2002 US\$m	2003 US\$m
Cash	0.00	108.92	228.74	360.54
Accounts receivable	0.00	100.00	110.00	121.00
Inventory	60.00	66.00	72.60	79.86
Net fixed assets	500.00	455.00	455.50	456.05
Total assets	560.00	729.92	866.84	1,017.45
Accounts payable	0.00	50.00	55.00	60.50
Long-term debt	224.00	246.40	271.04	298.15
Total liabilities	224.00	296.40	326.04	358.65
Common stock	336.00	336.00	336.00	336.00
Retained earnings	0.00	97.52	204.80	322.80
Total shareholders' equity	336.00	433.52	540.80	658.80
Total liabilities & shareholders' equity	560.00	729.92	866.84	1,017.4

Computing FCFF from net income



Cane Distribution Inc Cash Flow Statement	2001 US\$m	2002 US\$m	2003 US\$m
Net income	97.52	107.28	118.00
Depreciation	45.00	49.50	54.45
Change in working capital	-56.00	-11.60	-12.76
Cash from operating activities	86.52	145.18	159.69
Purchases of fixed assets	0.00	-50.00	-55.00
Cash from investing activities	0.00	-50.00	-55.00
Net borrowing	22.40	24.64	27.10
Cash from financing activities	22.40	24.64	27.10
Cash and equivalents increase	108.92	119.82	131.79
Cash and equivalents (beginning of year)	0.00	108.92	228.74
Cash and equivalents (end of year)	108.92	228.74	228.74



Outcome 8.3

Computing FCFF from net income 🔨



- Using the information provided, calculate Cane Distribution Inc's FCFF, starting with net income
- The first step is to calculate the increase in working capital

Accounts receivable	\$0.00	\$100.00	\$110.00	\$121.00
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plus Inventory	60.00	66.00	72.60	79.86
less Accounts payable	0.00	50.00	55.00	60.50
Working capital	\$60.00	\$116.00	\$127.60	\$140.36
Increase in working capital		\$56.00	\$11.60	\$12.76

Outcome 8.

Computing FCFF from net income



- Using the information provided, calculate Cane Distribution Inc's FCFF, starting with net income
- · We can then calculate FCFF using the previous formula

	2001	2002	2003
Net income	\$97.52	\$107.28	\$118.00
plus Depreciation	45.00	49.50	54.45
plus Interest expense x (1 - tax rate)	10.98	12.08	13.28
less Investment in fixed capital	0.00	-50.00	-55.00
less Investment in working capital	-56.00	-11.60	-12.76
Free cash flow to the firm	\$97.50	\$107.26	\$117.97

Outcome 8.3

Computing FCFF from cash flow

FCFF can also be obtained by adjusting cash flow from operations

FCFF = CFO + Int(1 - Tax Rate) - FCInvwhere CFO = cash flow from operations

- This may depend on the accounting principles applied
 - Under US GAAP, interest expenses is an operating cash flow and therefore needs to be added back as above
 - Under IAS, interest expense may be treated as an operating cash outflow or a financing cash outflow
 - If it is not included as a cash outflow from operations, it should not be added back
 - Under IAS, dividends may be treated as an operating cash outflow, in which case they would need to be added back

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Outcome 8.3

Computing FCFF from cash flow



 Using the financial statements previously provided, calculate Cane Distribution Inc's FCFF, starting with cash flow from operations

	2001	2002	2003
Cash flow from operations	\$86.52	\$145.18	\$159.69
plus Interest expense x (1 - tax rate)	10.98	12.08	13.28
less Investment in fixed capital	0.00	-50.00	-55.00
Free cash flow to the firm	\$97.50	\$107.26	\$117.97

Outcome 8.4

Computing FCFE from FCFF

- · FCFE is cash flow attributable to equity holders only
- It is therefore necessary to reduce FCFF by after-tax interest paid to debt-holders and to add any net increase in borrowing

FCFE = FCFF - Int(1 - Tax Rate) + Net Borrowing

Outcome 8.3

Computing FCFE from FCFF



 Using the financial statements previously provided, calculate Cane Distribution Inc's FCFE, starting with FCFF

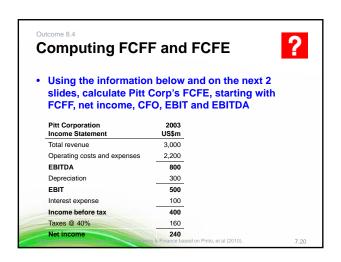
	2001	2002	2003
Free cash flow to the firm	\$97.50	\$107.26	\$117.97
less Interest expense x (1 - tax rate)	-10.98	-12.08	-13.28
plus Net borrowing	22.40	24.64	27.10
Free cash flow to equity	\$108.92	\$119.82	\$131.79

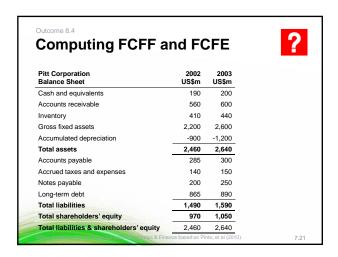


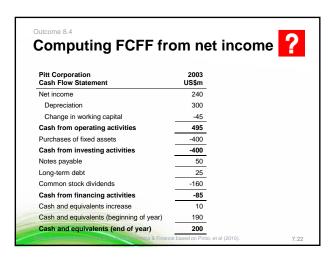
Computing FCFF and FCFE • FCFF and FCFE can both be calculated from earnings before interest and tax (EBIT) by deducting tax, adding back depreciation and deducting investments in fixed and working capital FCFF = EBIT (1-Tax Rate) + Dep - FCInv - WCInv FCFE = FCFF - Int (1-Tax Rate) + Net Borrowing • FCFF and FCFE can both be calculated from earnings before depreciation interest and tax (EBITDA) by deducting tax, investments in fixed and working capital

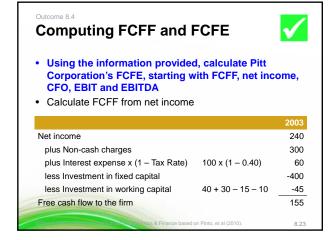
FCFF = EBITDA(1-Tax Rate) + Dep(Tax Rate) - FCInv - WCInv

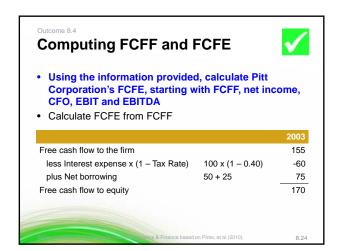
FCFE = FCFF - Int (1 - Tax Rate) + Net Borrowing



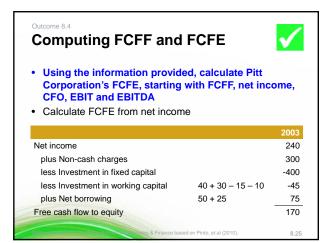


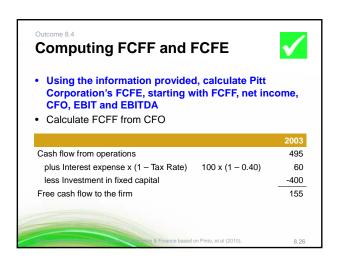


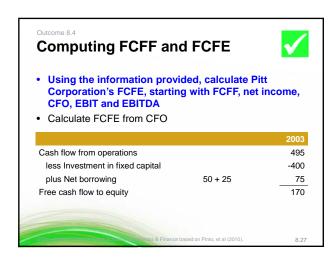


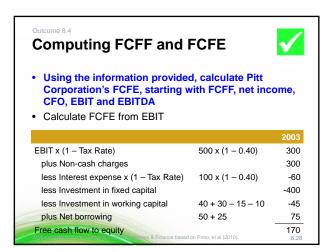


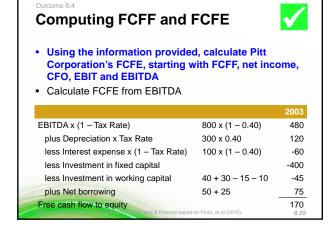


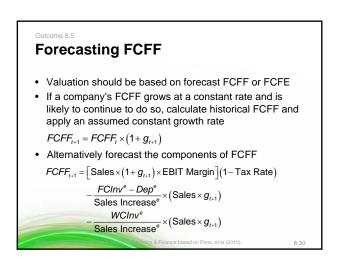


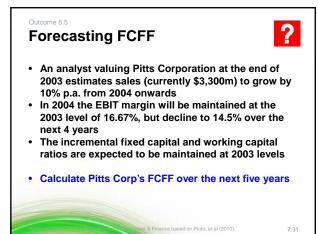


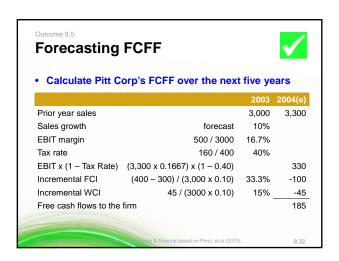


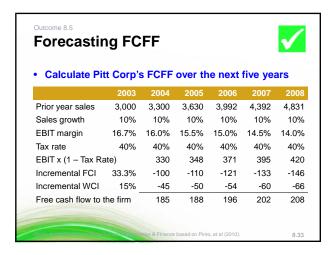






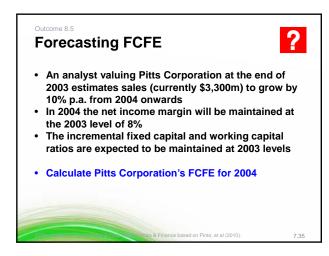


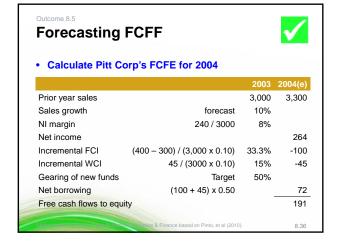




Forecasting FCFE

• If a company's FCFE grows at a constant rate and is likely to continue to do so, calculate historical FCFE and apply an assumed constant growth rate $FCFE_{t+1} = FCFE_t \times (1+g_{t+1})$ • Alternatively forecast the components of FCFE $FCFE_{t+1} = \left[\text{Sales} \times (1+g_{t+1}) \times \text{NI Margin}\right] - FCInv^e - Dep^e - WCInv^e + \text{Net Borrowing}$ where net borrowing is estimated by assuming a specified portion of the net new investment in fixed and working capital is funded by debt Net Borrowing = Debt Ratio(FCInv - Dep) + Debt Ratio(WCInv)







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Comparing DDM and FCFE

- If all inputs were known and mutually consistent a dividend discount model and a free cash flow model should result in identical valuations
- Although high dividends normally reflect high FCFE and low dividends normally reflect low FCFE, it is often the case that the two will differ
- Free cash flow discount models are sometimes preferred
 if.
 - The company pays little or no dividends
 - Dividends are at the discretion of the board and may not reflect profitability
 - The company is being analysed as a takeover target

& Finance based on Pinto, et al (2010).

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Outcome 8.

Comparing DDM and FCFE

- Dividend discount models: value the firm based on the cash flow actually distributed and as such the analyst is valuing the stock excluding a premium for control
 - In this case the perspective is that of a portfolio investor
 - The analyst takes a non-control perspective and assumes the payout ratio is given
- Free cash flow discount models: value the firm based on the cash flow available for distribution
- Hence the analyst can use this model to value the firm including a control premium
- The perspective is that of a potential acquirer
- The analyst takes a control perspective and assumes the payout ratio is adjustable

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Outcome 8.7

FCFE and dividends, issues & leverage

- FCFF and FCFE are cash flows available to investors or to stockholders and dividends and share repurchases are uses of these cash flows
- Transactions between a company and its shareholders do not affect free cash flow
- Leverage changes, such as increasing the debt/equity ratio by using more debt, have some impact on free cash flow as they increase the interest tax shield (reduce tax due to the tax deductibility of interest payments) and reduce FCFE

ics & Finance based on Pinto, et al (2010

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Outcome 8.

Problems with EBITDA

- EBITDA is not a good proxy for FCFF because:
 - The depreciation tax shield (depreciation charge times the tax rate) varies significantly between firms
 - EBITDA does not take into account investments in fixed capital and working capital
 - EBITDA is a before-tax measure
 - This could be adjusted for by adjusting WACC to a before-tax basis; otherwise it ignores the cash flows associated with tax payments
- EBITDA is not a good proxy for FCFE as:
 - In addition to the above problems, EBITDA ignores after-tax interest costs and cash flows from new borrowings or repayments (i.e. net borrowings)

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Comparison of different FCFE models

- One-stage model
 - Appropriate for companies which exhibit constant growth
- Two-stage model
 - Appropriate for companies that exhibit abnormal growth for a period, due to holding a patent, first mover advantage or some other short-term competitive advantage, before the growth rate falls to a sustainable level
- Three-stage model
 - Appropriate where stage one is an extraordinarily long period, or where there is a large difference between the high growth rate and the normal growth rate

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Outcome 8.10

One-stage model

 If FCFF grows at a constant rate, we can calculate the value of equity by calculating the value of the firm in a manner similar to the GGM approach, replacing D₁ with FCFF₁ and r with WACC, and subtracting the market value of the firm's debt

Equity Value =
$$\frac{FCFF_1}{WACC - g}$$
 -MV Debt = $\frac{FCFF_0(1 + g)}{WACC - g}$ -MV Debt

or

Equity Value =
$$\frac{FCFE_1}{r-g} = \frac{FCFE_0(1+g)}{r-g}$$

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utcome 8.10

One-stage model



- Cagiati Enterprises (CE) has FCFF of CHF700m, FCFE of CHF620m and expects to grow FCFF forever at 5% p.a.
- CE's before-tax cost of debt is 5.7% and its required return on equity is 11.8%
- CE expects a target capital structure of 20% debt and 80% equity
- CE has debt outstanding with a market value of CHF2.2b and 200m outstanding common shares
- The tax rate is 33.33%
- Calculate CE's intrinsic value per share

Finance based on Pinto, et al (2010).

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One-stage model • Calculate CE's intrinsic value per share • WACC = $\left(\frac{\text{MV Debt}}{\text{MV Debt + MV Equity}}\right) \times r_d (1-\text{Tax Rate})$ + $\left(\frac{\text{MV Equity}}{\text{MV Debt + MV Equity}}\right) \times r$ = $\left[0.20 \times 0.057 \times (1-0.3333)\right] + \left[0.80 \times 0.118\right] = 10.2\%$ • Equity Value = $\frac{FCFF_0}{WACC-g} - \text{MV Debt}$ = $\frac{700 \times (1+0.05)}{0.102-0.05} - 2,200 = CHF11,934.6m$ • Value per share = $\frac{11,934.6m}{200m} = CHF59.67$

Outcome 8.10

Two-stage model

- If FCFF grows at a constant rate for a period (stage one) prior to shifting to a long-term sustainable growth rate (stage two), we can calculate the value of equity by:
 - Calculating the present value of the stream of FCFF in stage one
 - Adding a terminal value of the firm as at the beginning of stage two, calculated in a manner similar to the GGM approach, replacing D₁ with FCFF₁ and r with WACC, and
 - Subtracting the market value of the firm's debt

Equity Value =
$$\sum_{t=1}^{n} \frac{FCFF_{t}}{\left(1 + WACC\right)^{t}} + \frac{FCFF_{n+1}}{WACC - g} \times \frac{1}{\left(1 + WACC\right)^{n}} - MV \text{ Debt}$$
or

Equity Value = $\sum_{t=1}^{n} \frac{FCFE_{t}}{(1+r)^{t}} + \frac{FCFE_{n+1}}{r-g} \times \frac{1}{(1+r)^{n}}$ 8 Finance based on Pinto et al (2010).

Outcome 8.10

Two-stage model



- On 1/1/03, Vishal Noronha is valuing Sindhuh Enterprises (SE), which had an EPS of \$2.40 in 2002
- For the next five years EPS is estimated to grow by 30%, 18%, 12% and 9%, respectively, and 7% thereafter
- Net investment in fixed capital per share is estimated for each of the next five years at 3.0, 2.5, 2.0, 1.5 and 1.0, respectively, and to grow by 7% thereafter
- Investment in working capital equals 50% of investment in fixed capital
- Investment in capital is funded 30% by new debt
- R_F is 6%, the equity risk premium is 4% and beta is 1.1
- Calculate SE's intrinsic value per share on 1/1/03
 What should be the trailing P/E on 1/1/03 and 1/1/07?

Outcome 8.10

Two-stage model



- Calculate SE's intrinsic value per share on 1/1/03
- Required rate of return = $R_F + \beta_i [E(R_M) R_F]$ = 0.06 + (1.1×0.04) = 10.4%

200	2 2003	2004	2005	2006	2007			
EPS growth rate	30%	18%	12%	9%	7%			
EPS 2.40	0 3.120	3.682	4.123	4.494	4.809			
less Net FC Exp	-3.000	-2.500	-2.000	-1.500	-1.000			
less Net WC Exp	-1.500	-1.250	-1.000	-0.750	-0.500			
plus Net Borrowing	1.350	1.125	0.900	0.675	0.450			
FCFE per share	-0.030	1.057	2.023	2.919	3.759			
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Outcome 8.1

Two-stage model



- Calculate SE's intrinsic value per share on 1/1/03
- Terminal Value₂₀₀₆ = $\frac{FCFE_{2007}}{r-g} = \frac{3.759}{0.104 0.07} = 110.559$

	2002	2003	2004	2005	2006
FCFE per share		-0.030	1.057	2.023	2.919
Terminal Value					110.559
Total FCFE		-0.030	1.057	2.023	113.478
Discount factor		1.104-1	1.104-2	1.104-3	1.104-4
PV of cash flows		-0.027	0.867	1.504	76.390
Total PV	78.74				



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Two-stage model



- What should be the trailing P/E on 1/1/03 and 1/1/07?
- Trailing P/E₂₀₀₃ = $\frac{V_{2003}}{EPS_{2002}}$ = $\frac{78.73}{2.40}$ = 32.8
- Trailing P/E₂₀₀₇ = $\frac{V_{2007}}{EPS_{2006}}$ = $\frac{110.56}{4.494}$ = 24.6

Outcome 8.10

Three-stage model

- If FCFF grows at a distinct but constant rate for each of three periods, we can calculate the value of equity by:
 - Calculating the present value of the stream of FCFF in stages one and two
 - Adding a terminal value of the firm as at the beginning of stage three, and
 - Subtracting the market value of the firm's debt

$$\begin{aligned} & \text{Equity Value} = \sum_{t=1}^{n} \frac{\textit{FCFF}_{0} \left(1 + g_{1} \right)^{t}}{\left(1 + \textit{WACC} \right)^{t}} + \sum_{t=1}^{m} \frac{\textit{FCFF}_{0} \left(1 + g_{1} \right)^{n} \left(1 + g_{2} \right)^{t}}{\left(1 + \textit{WACC} \right)^{n+t}} \\ & + \frac{\textit{FCFF}_{0} \left(1 + g_{1} \right)^{n} \left(1 + g_{2} \right)^{m} \left(1 + g_{3} \right)}{\left(\textit{WACC} - g \right) \left(1 + \textit{WACC} \right)^{n+m}} - \mathsf{MV} \; \mathsf{Debt} \end{aligned}$$

Outcome 8.10

Three-stage model



- Marathon Oil Company (MRO) reported FCFF of \$745m
- Forecast growth rate of FCFF is 8.8% p.a. for the next four years, 7.4%, 6.0% and 4.6% in years 5, 6 and 7, respectively, and 3.2% p.a. thereafter
- Capital structure is 20% debt, 80% equity
- Cost of debt is 7.1%
- · Long-term debt is currently \$1.518b
- Tax rate is 34%
- Beta for MRO is 0.90, the risk-free rate is 5.04% and the equity premium is 5.5%
- There are 309.39 million shares outstanding
- Estimate MRO's WACC, firm value, equity value and value per share

Outcome 8.10

Three-stage model



- Estimate MRO's WACC
- Required rate of return = $R_F + \beta_i [E(R_M) R_F]$ = 0.0504 + (0.9×0.055) = 9.99%
- WACC = $\frac{E}{D+E}(r_e) + \frac{D}{D+V}(r_d)(1-\text{Tax Rate})$ = (0.80)(0.0999) + (0.20)(0.071)(1-0.34) = 8.93%

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Outcome 8.10

Three-stage model



Estimate MRO's firm value

Estimate MRO's firm value								
	2002	2003	2004	2005	2006	2007	2008	2009
FCFF growth ra	ate	8.8%	8.8%	8.8%	8.8%	7.4%	6.0%	4.6%
FCFF	745	811	882	959	1044	1121	1188	1243
Terminal value ₂₀₀₉ = $\frac{FCFF_{2010}}{WACC - g} = \frac{FCFF_{2009}(1 + g)}{WACC - g} = \frac{1243(1.032)}{0.0893 - 0.032} = 260$								22389
Total FCFF	•	811	882	959	1044	1121	1188	23632
PV of FCFF		744	743	742	741	731	711	12986
Total PV	17,398							

Outcome 8.1

Three-stage model



- Estimate MRO's equity value
- Value of equity = Value of firm Value of debt
 = 17.398 1,518 = \$15,880
- Estimate MRO's value per share
- Value per share = $\frac{\text{Value of equity}}{\text{No of shares}} = \frac{15,880}{309.39} = \51.33

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