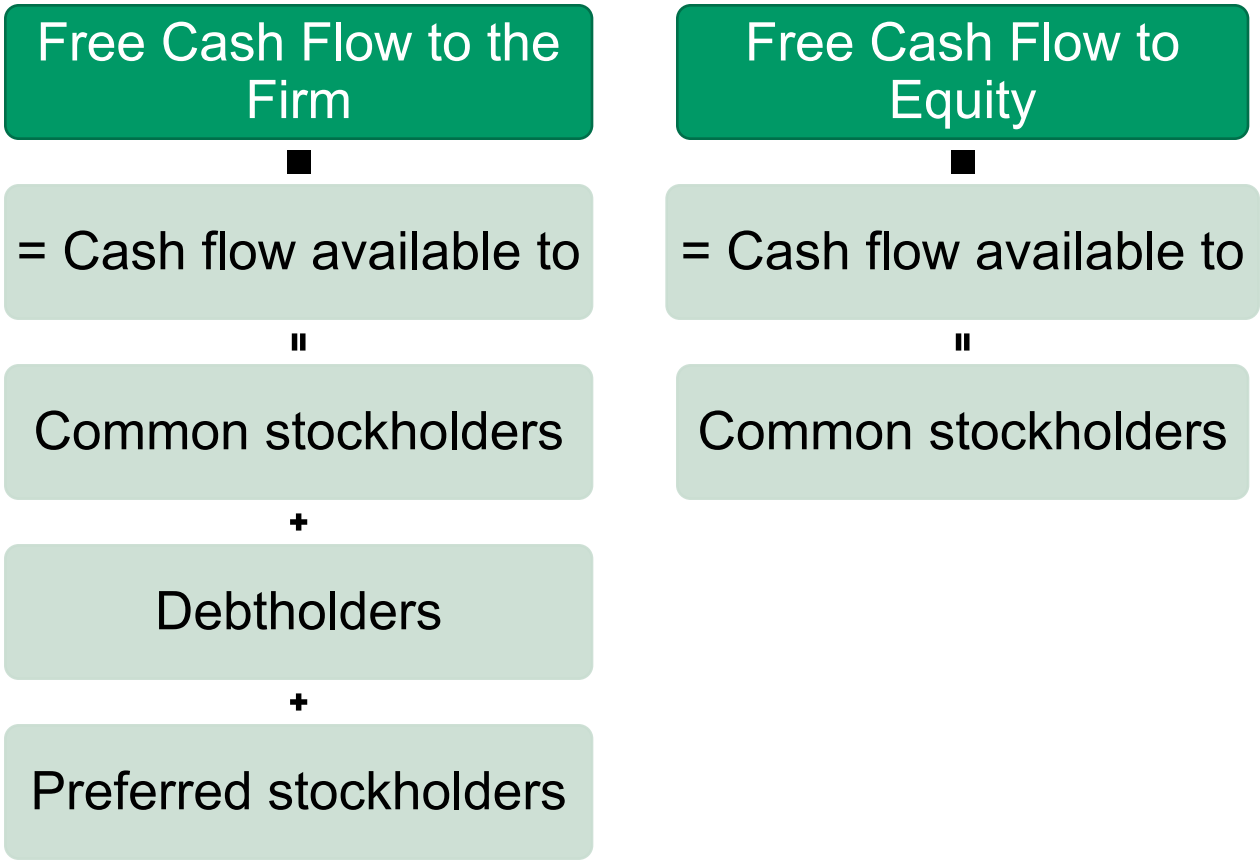
FREE CASH FLOW VALUATION

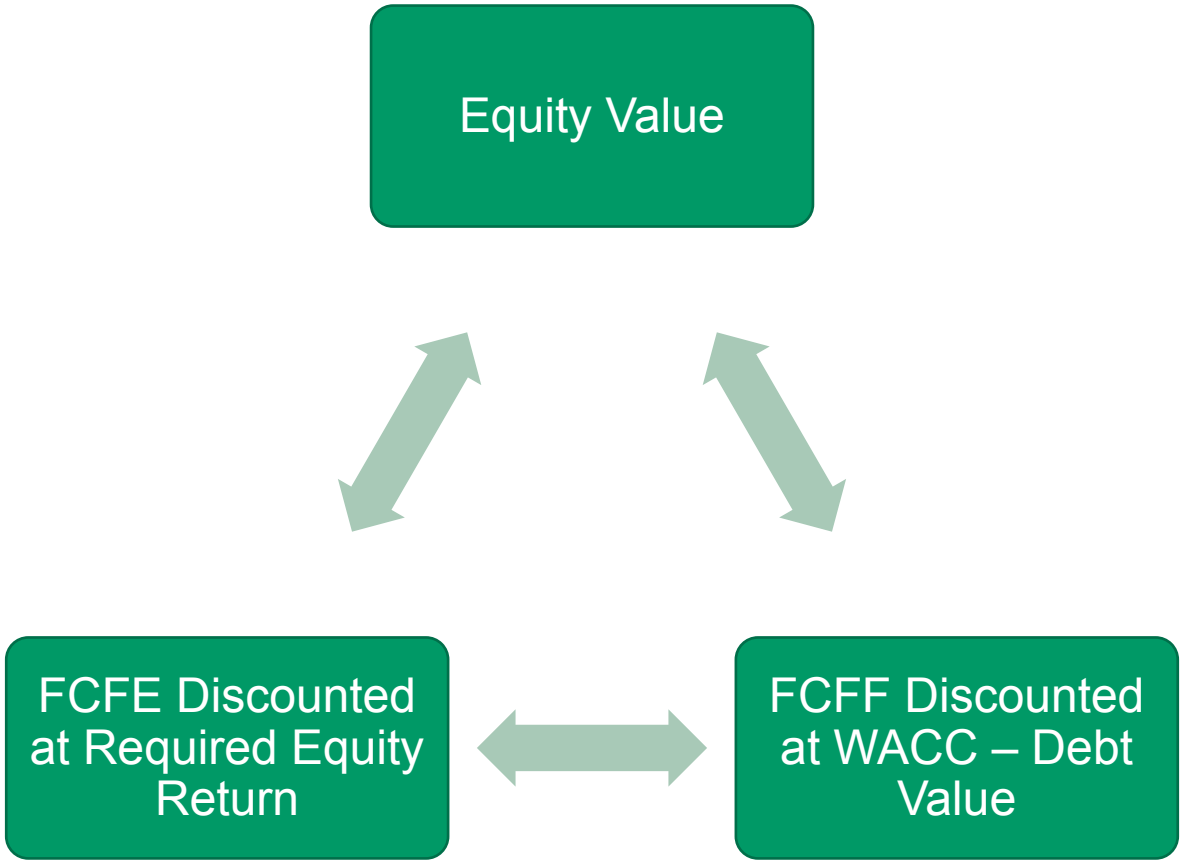
Presenter
Venue
Date

CFA Institute

FREE CASH FLOW



FCFF VS. FCFE APPROACHES TO EQUITY VALUATION



FCFF VS. FCFE APPROACHES TO EQUITY VALUATION

$$\text{Firm value} = \sum_{t=1}^{\infty} \frac{\text{FCFF}_t}{(1+\text{WACC})^t}$$

$$\text{Equity value} = \text{Firm value} - \text{Debt value}$$

$$\text{Equity value} = \sum_{t=1}^{\infty} \frac{\text{FCFE}_t}{(1+r)^t}$$

SINGLE-STAGE FREE CASH FLOW MODELS

$$\text{Firm value} = \frac{\text{FCFF}_1}{\text{WACC} - g}$$

$$\text{Equity value} = \text{Firm value} - \text{Debt value}$$

$$\text{Equity value} = \frac{\text{FCFE}_1}{r - g}$$

EXAMPLE: SINGLE-STAGE FCFF MODEL

Target debt to capital	0.25
Market value to debt	$30,000,000
Shares outstanding	2,900,000
Required return on equity	12%
Cost of debt	7%
Long-term growth in FCFF	5%
Tax rate	30%

EXAMPLE: SINGLE-STAGE FCFF MODEL

$$\text{WACC} = \left[\left(\frac{\text{MV(Debt)}}{\text{MV(Equity)} + \text{MV(Debt)}}\right) \times r_d \times (1 - \text{Tax rate})\right] + \left[\left(\frac{\text{MV(Equity)}}{\text{MV(Equity)} + \text{MV(Debt)}}\right) \times r\right]$$

$$\text{WACC} = [0.25 \times 7\% \times (1 - 0.30)] + [0.75 \times 12\%] = 10.23\%$$

EXAMPLE: SINGLE-STAGE FCFF MODEL

Firm value

Firm value

Equity value = $120.5 million – $30 million = $90.5 million

Equity value per share = $90.5 million/2.9 million = $31.21

USING NET INCOME TO DETERMINE FCFF

$$\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}\left(1 - \text{Tax rate}\right) - \text{FCInv} - \text{WCInv}$$

OTHER NONCASH ADJUSTMENTS

Amortization	• Added back
Restructuring Expense	• Added back
Restructuring Income	• Subtracted out
Capital Gains	• Subtracted out
Capital Losses	• Added back
Employee Option Exercise	• Added back
Deferred Taxes	• Added back?
Tax Asset	• Subtracted out?

USING EBIT AND EBITDA TO DETERMINE FCFF

$$\text{FCFF} = \text{EBIT}\left(1 - \text{Tax rate}\right) + \text{Dep} - \text{FCInv} - \text{WCInv}$$

$$\text{FCFF} = \text{EBITDA}\left(1 - \text{Tax rate}\right) + \text{Dep}\left(\text{Tax rate}\right) - \text{FCInv} - \text{WCInv}$$

USING CASH FLOW FROM OPERATIONS TO DETERMINE FCFF

$$\text{FCFF} = \text{CFO} + \text{Int}\left(1 - \text{Tax rate}\right) - \text{FCInv}$$

CALCULATING FCFE FROM FCFF, NET INCOME, AND CFO

FCFE from net income (NI) and FCFF:

FCFF = NI + NCC + Int(1-Tax rate) – FCInv – WCInv
FCFE = NI = NCC – FCInv – WCInv + Net borrowing

FCFE from CFO and FCFF:

FCFF = CFO + Int(1-Tax rate)- FCInv
FCFE = CFO – FCInv + Net borrowing

FCFE AND FCFF ON A USES-OF-FCF-BASIS

$$\text{FCFE} = \text{Change in cash balance} = \text{Net payments to debtholders} + \text{Net payments to stockholders},$$

$$\text{FCFF} = \text{Change in cash balance} = \text{Net payments to stockholders}$$

Where Net payments to debtholders $= \text{Int}(1 - \text{Tax rate}) + \text{Debt repayments} - \text{Debt issuances}$

Where Net payments to stockholders $= \text{Cash dividends} + \text{Share repurchases} - \text{Stock issuances}$

EXAMPLE: CALCULATING FCFF

EBITDA	$1,000
Depreciation expense	$400
Interest expense	$150
Tax rate	30%
Purchases of fixed assets	$500
Change in working capital	$50
Net borrowing	$80
Common dividends	$200

EXAMPLE: CALCULATING FCFF FROM NET INCOME

$$\text{NI} = (\text{EBITDA} - \text{Dep} - \text{Int})(1 - \text{Tax rate})$$

$$\text{NI} = (\$1000 - \$400 - \$150)(1 - 0.30) = \$315$$

$$\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv}$$

$$\text{FCFF} = \$315 + \$400 + \$150(1 - 0.30) - \$500 - \$50 = \$270$$

EXAMPLE: CALCULATING FCFF FROM EBIT AND EBITDA

$$\text{EBIT} = \text{EBITDA} - \text{Dep} = \$1000 - \$400 = \$600$$

$$\text{FCFF} = \text{EBIT}\left(1 - \text{Tax rate}\right) + \text{Dep} - \text{FCInv} - \text{WCInv}$$
$$\text{FCFF} = \$600\left(1 - 0.30\right) + \$400 - \$500 - \$50 = \$270$$

$$\text{FCFF} = \text{EBITDA}\left(1 - \text{Tax rate}\right) + \text{Dep}\left(\text{Tax rate}\right) - \text{FCInv} - \text{WCInv}$$
$$\text{FCFF} = \$1000\left(1 - 0.30\right) + \$400\left(0.30\right) - \$500 - \$50 = \$270$$

EXAMPLE: CALCULATING FCFF FROM CFO

$$\text{CFO} = \text{NI} + \text{Dep} - \text{WCinv}$$
$$\text{CFO} = \$315 + \$400 - \$50 = \$665$$

$$\text{FCFF} = \text{CFO} + \text{Int}\left(1 - \text{Tax rate}\right) - \text{FCInv}$$
$$\text{FCFF} = \$665 + \$150\left(1 - 0.30\right) - \$500 = \$270$$

EXAMPLE: CALCULATING FCFE FROM FCFF, NET INCOME, AND CFO

$$\text{FCFE} = \text{FCFF} - \text{Int}\left(1 - \text{Tax rate}\right) + \text{Net borrowing}$$
$$\text{FCFE} = \$270 - \$150\left(1 - 0.30\right) + \$80 = \$245$$

$$\text{FCFE} = \text{NI} + \text{NCC} - \text{FCInv} - \text{WCInv} + \text{Net borrowing}$$
$$\text{FCFE} = \$315 + \$400 - \$500 - \$50 + \$80 = \$245$$

$$\text{FCFE} = \text{CFO} - \text{FCInv} + \text{Net borrowing}$$
$$\text{FCFE} = \$665 - \$500 + \$80 = \$245$$

EXAMPLE: CALCULATING FCFE AND FCFF ON A USES BASIS

$$\text{Net payments to debtholders} = \text{Int}(1 - \text{Tax rate}) + \text{Debt repayments} - \text{Debt issuances}$$
$$\text{Net payments to debtholders} = \$150(1 - 0.30) + \$0 - \$80 = \$25$$

$$\text{Net payments to stockholders} = \text{Cash dividends} + \text{Share repurchases} - \text{Stock issuances}$$
$$\text{Net payments to stockholders} = \$200 + \$0 - \$0 = \$200$$

$$\Delta\text{Cash Balance} = \text{CFO} \pm \text{Cash from investing activities} \pm \text{Cash from financing activities}$$
$$\Delta\text{Cash Balance} = \$665 - \$500 + \$80 - \$200 = \$45$$

$$\text{FCFF} = \$45 + \$25 + \$200 = \$270$$

$$\text{FCFE} = \$45 + \$200 = \$245$$

FORECASTING FCFF AND FCFE

$$\text{FCFF} = \text{EBIT}(1 - \text{Tax rate}) - \text{Capital expenditures} - \Delta\text{WCInv}$$

$$\text{FCFE} = \text{NI} - (1 - \text{DR})(\text{FCInv} - \text{Dep}) - (1 - \text{DR})(\text{WCInv})$$

EXAMPLE: FORECASTING FCFF AND FCFE

Sales	$4,000
Sales growth	$200
EBIT	$600
Tax rate	30%
Purchases of fixed assets	$800
Depreciation expense	$700
Change in working capital	$50
Net income margin	10%
Debt ratio	40%

EXAMPLE: FORECASTING FCFF AND FCFE

$$\text{Sales growth} = \$200 / \$4000 = 5\%$$

$$\text{EBIT margin} = \$600 / \$4000 = 15\%$$

$$\text{Incremental FC/Sales growth} = \frac{(\$800 - \$700)}{\$200} = 50\%$$

$$\text{Incremental WC/Sales growth} = \frac{\$50}{\$200} = 25\%$$

EXAMPLE: FORECASTING FCFF

$$\text{Sales} = \$200 + \$4000 = \$4200$$

$$\text{EBIT} = \$4200 \times 15\% = \$630$$

$$\text{EBIT}(1 - \text{Tax rate}) = \$630 \times (1 - 30\%) = \$441$$

$$\text{Incremental FC} = \$200 \times 50\% = \$100$$

$$\text{Incremental WC} = \$200 \times 25\% = \$50$$

$$\text{FCFF} = \text{EBIT}(1 - \text{Tax rate}) - \text{Capital Expenditures} - \Delta\text{WCInv}$$

$$\text{FCFF} = \$441 - \$100 - \$50 = \$291$$

EXAMPLE: FORECASTING FCFE

$$\text{Sales} = \$200 + \$4000 = \$4200$$

$$\text{Net income} = \$4200 \times 10\% = \$420$$

$$\text{Incremental FC} = \$200 \times 50\% = \$100$$

$$\text{Incremental WC} = \$200 \times 25\% = \$50$$

$$\text{FCFE} = \text{NI} - (1 - \text{DR})(\text{FCInv} - \text{Dep}) - (1 - \text{DR})(\text{WCInv})$$

$$\text{FCFE} = \$420 - (1 - 0.40)(\$100) - (1 - 0.40)(\$50) = \$330$$

ISSUES IN FCF ANALYSIS

- Financial Statement Discrepancies
- Dividends vs. FCFE
- Effect of Shareholder Cash Flows and Leverage
- FCFF and FCFE vs. EBITDA and Net Income
- Country Adjustments
- Sensitivity Analysis
- Nonoperating Assets

SIMPLE TWO-STAGE FCF MODELS

$$\text{Firm value} = \sum_{t=1}^{n} \frac{\text{FCFF}_t}{(1+\text{WACC})^t} + \frac{\text{FCFF}_{n+1}}{(\text{WACC}-g)} \frac{1}{(1+\text{WACC})^n}$$

$$\text{Equity value} = \sum_{t=1}^{n} \frac{\text{FCFE}_t}{(1+r)^t} + \frac{\text{FCFE}_{n+1}}{(r-g)} \frac{1}{(1+r)^n}$$

EXAMPLE: SIMPLE TWO-STAGE FCFE MODEL

Current sales per share	$10
Sales growth for first three years	20%
Sales growth for year 4 and thereafter	5%
Net income margin	10%
FCInv/Sales growth	40%
WCInv/Sales growth	25%
Debt financing of FCInv and WCInv growth	30%
Required return on equity	12%

EXAMPLE: SIMPLE TWO-STAGE FCFE MODEL

$$\text{FCFE} = (\text{Sales} \times \text{Net income margin}) - \Delta\text{FCInv} - \Delta\text{WCInv} + \text{t financing}$$

$$\text{FCFE} = (\$12.00 \times 10\%) - (\$2 \times 40\%) - (\$2 \times 25\%) + (\$2 \times 65\% \times 30\%)$$

$$\text{FCFE} = (\$1.20) - (\$0.80) - (\$0.50) + (\$0.39)$$

$$\text{FCFE} = \$0.29$$

EXAMPLE: SIMPLE TWO-STAGE FCFE MODEL

	Year				
	1	2	3	4	5
Percentage sales growth	20%	20%	20%	5%	5%
Sales per share	$12.000	$14.400	$17.280	$18.144	$19.051
EPS	$1.200	$1.440	$1.728	$1.814	$1.905
FCInv per share	$0.800	$0.960	$1.152	$0.346	$0.363
WCInv per share	$0.500	$0.600	$0.720	$0.216	$0.227
Debt financing per share	$0.390	$0.468	$0.562	$0.168	$0.177
FCFE per share	$0.290	$0.348	$0.418	$1.421	$1.492
Growth in FCFE		20.0%	20.0%	240.3%	5.0%

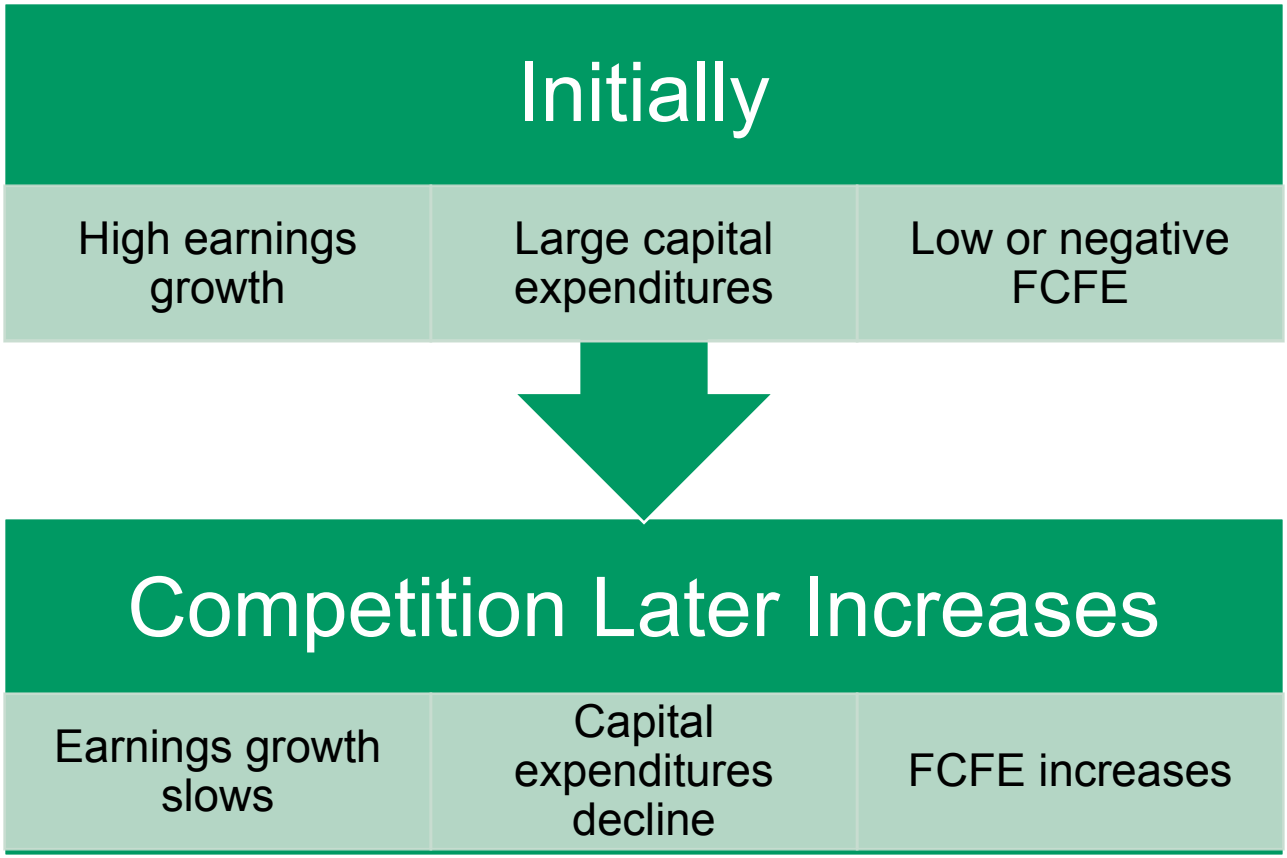
EXAMPLE: SIMPLE TWO-STAGE FCFE MODEL

$$\text{Equity value} = \sum_{t=1}^{n} \frac{\text{FCFE}_t}{(1+r)^t} + \frac{\text{FCFE}_{n+1}}{(r-g)} \frac{1}{(1+r)^n}$$

$$\text{Equity value} = \frac{\$0.29}{(1.12)^1} + \frac{\$0.348}{(1.12)^2} + \frac{\$0.418}{(1.12)^3} + \frac{\$1.421}{(0.12 - 0.05)} \frac{1}{(1.12)^3}$$

$$\text{Equity value} = \$0.2589 + \$0.2774 + \$0.2975 + \$14.4491 = \$15.28$$

DECLINING GROWTH TWO-STAGE FCFE MODEL



EXAMPLE: DECLINING GROWTH TWO-STAGE FCFE MODEL

Current EPS	$1.00
WCInv/FCInv	40%
Debt financing of FCInv and WCInv growth	30%
Required return on equity	12%
EPS and FCInv growth for Year 5 and thereafter	5%

EXAMPLE: DECLINING GROWTH TWO-STAGE FCFE MODEL

	Year				
	1	2	3	4	5
EPS growth	30%	21%	13%	8%	5%
FCInv per share	$1.50	$1.25	$1.00	$0.75	$0.50

EXAMPLE: DECLINING GROWTH TWO-STAGE FCFE MODEL

$$\text{FCFE} = \text{NI} + \text{Net noncash charges} - \Delta\text{FCInv} - \Delta\text{WCInv} + \text{Net debt financing}$$

$$\text{FCFE} = \$1.30 - \$1.50 - (\$1.50 \times 40\%) + \left((\$1.50 + (\$1.50 \times 40\%)) \times 30\%\right)$$

$$\text{FCFE} = \$1.30 - \$1.50 - \$0.60 + \left((\$1.50 + \$0.60) \times 30\%\right)$$

$$\text{FCFE} = -\$0.17$$

EXAMPLE: DECLINING GROWTH TWO-STAGE FCFE MODEL

	Year				
	1	2	3	4	5
EPS	$1.300	$1.573	$1.777	$1.920	$2.016
FCInv per share	$1.500	$1.250	$1.000	$0.750	$0.500
WCInv per share	$0.600	$0.500	$0.400	$0.300	$0.200
Debt financing per share	$0.630	$0.525	$0.420	$0.315	$0.210
FCFE per share	–$0.170	$0.348	$0.797	$1.185	$1.526

EXAMPLE: DECLINING GROWTH TWO-STAGE FCFE MODEL

$$\text{Equity value} = \sum_{t=1}^{n} \frac{\text{FCFE}_t}{(1+r)^t} + \frac{\text{FCFE}_{n+1}}{(r-g)} \frac{1}{(1+r)^n}$$

$$\text{Equity value} = \frac{-\$0.17}{(1.12)^1} + \frac{\$0.348}{(1.12)^2} + \frac{\$0.797}{(1.12)^3} + \frac{\$1.185}{(1.12)^4} + \frac{\$1.526}{(0.12-0.05)} \frac{1}{(1.12)^4}$$

$$\text{Equity value} = -\$0.1518 + \$0.2774 + \$0.5673 + \$0.7531 + \frac{21.80}{(1.12)^4} = \$15.30$$

$$\text{Equity value} = -\$0.1518 + \$0.2774 + \$0.5673 + \$0.7531 + \$13.8543 = \$15.30$$

EXAMPLE: DECLINING GROWTH TWO-STAGE FCFE MODEL

$$\text{Trailing Year 0} \quad P/E = \$15.30 / \$1.00 = 15.3$$

$$\text{Trailing Year 4} \quad P/E = \$21.80 / \$1.92 = 11.4$$

EXAMPLE: THREE-STAGE FCF MODELS

Current FCFF in millions	$100.00
Shares outstanding in millions	300.00
Long-term debt value in millions	$400.00
FCFF growth for Years 1 to 3	30%
FCFF growth for Year 4	24%
FCFF growth for Year 5	12%
FCFF growth for Year 6 and thereafter	5%
WACC	10%

EXAMPLE: THREE-STAGE FCF MODELS

	Year					
	1	2	3	4	5	6
FCFF growth rate	30%	30%	30%	24%	12%	5%
FCFF	$130.0	$169.0	$219.7	$272.4	$305.1	$320.4
PV of FCFF	$118.2	$139.7	$165.1	$186.1	$189.5	

EXAMPLE: THREE-STAGE FCF MODELS

$$\text{Terminal value} = \frac{\text{FCFF}_{n+1}}{(\text{WACC} - g)} \frac{1}{(1+\text{WACC})^n}$$

$$\text{Terminal value} = \frac{\$320.4}{(0.10 - 0.05)} \frac{1}{(1+0.10)^5} = \$3979$$

Note : The above formula shows the present value of perpetual stream at t = 0

EXAMPLE: THREE-STAGE FCF MODELS

$$\text{Firm value} = \sum_{t=1}^{n} \frac{\text{FCFF}_t}{(1+\text{WACC})^t} + \frac{\text{FCFF}_{n+1}}{(\text{WACC}-g)} \frac{1}{(1+\text{WACC})^n}$$

$$\text{Firm value} = \$118.2 + \$139.7 + \$165.1 + \$186.1 + \$189.5 + \$3{,}979 = \$4{,}777$$

$$\text{Equity value} = \text{Firm value} - \text{Debt value}$$

$$\text{Equity value} = \$4777 - \$400 = \$4377$$

$$\text{Equity value per share} = \$4377/300 = \$14.59$$

SUMMARY

FCFF vs. FCFE

- FCFF = Cash flow available to all firm capital providers
- FCFE = Cash flow available to common equity holders
- FCFF is preferred when FCFE is negative or when capital structure is unstable

Equity Valuation with FCFF and FCFE

- Discount FCFF with WACC
- Discount FCFE with required return on equity
- Equity value = PV(FCFF) – Debt value or PV(FCFE)

SUMMARY

Adjustments for Calculating Free Cash Flows

- Depreciation, amortization, restructuring charges, capital gains/losses, employee stock options, deferred taxes/tax assets

Approaches for Calculating FCFF and FCFE

- Sources: Adjust for noncash events and work from
  - Net income
  - EBIT
  - EBITDA
  - CFO
- Uses
  - Change in cash balances and net payments to debtholders and stockholders

SUMMARY

Issues in FCF Analysis

- Financial statement discrepancies
- Dividends versus free cash flows
- Shareholder cash flows and leverage
- FCFF and FCFE versus EBITDA and net income
- Country adjustments
- Sensitivity analysis
- Nonoperating assets

SUMMARY

Forecasting FCFF and FCFE

- Forecast sales growth
- Assume EBIT margin, FCInv, and WCInv are proportional to sales
- For FCFE, assume debt ratio is constant

FCF Valuation Models

- Two-stage with distinct growth in each stage
- Two-stage with declining growth from Stage 1 to Stage 2
- Three-stage model