

# Free Cash Flow Valuation

# Free Cash Flow

Free Cash Flow to the Firm



= Cash flow available to



Common stockholders



Debtholders



Preferred stockholders

Free Cash Flow to Equity



= Cash flow available to



Common stockholders

IBM US

\$ Market

P173.09 / 174.24P

2 x 1



Prev 173.88

Vol 5

IBM US Equity

1) Create Report

2) Output to Excel

Weighted Average Cost of Capital

International Business Machines Corp

Period MR 2016 Q4

Cost of Capital - Current Market Value

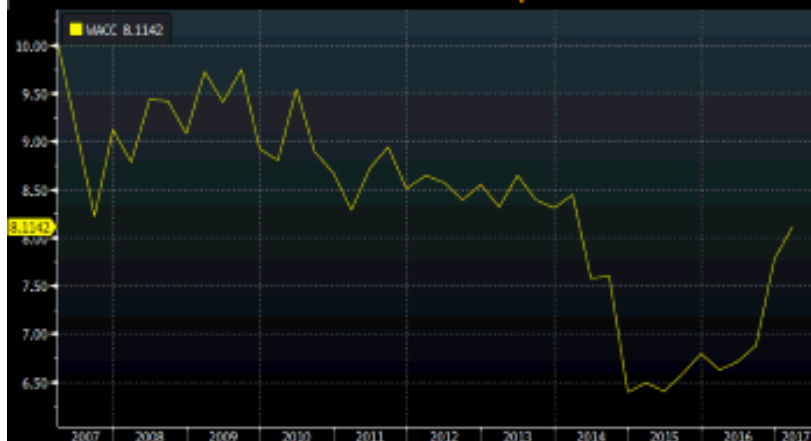
Capital Structure (Millions of USD)

	Weight	Cost	W x C
3) Equity	78.8%	9.6%	7.6%
4) Debt Cost (A-T)	21.2%	2.5%	0.5%
5) Preferred Equity	0.0%	0.0%	0.0%
WACC			8.1%



Market Cap	157,004.5	78.8%
ST Debt	7,513.0	3.8%
LT Debt	34,655.0	17.4%
Pref. Eqty	0.0	0.0%
Total	199,172.5	100.0%

6) History

 WACC
  EVA
  ROIC
  EVA Spread


Economic Value Added (Millions of USD)

1) Net Operating Profit	11775.00
8) Cash Operating Taxes	419.62
NOPAT	11355.38
9) Total Investment Capital	91318.00
Capital Charge	7409.69
Economic Value Added	3945.70
ROIC	12.43%
EVA Spread	4.32%

Australia 61 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000  
 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000

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CEZ CP CZK ↓ 375.80 +.80 K375.60 / 375.90K 380 x 306  
 At 12:21 d Vol 119,571 0 376.00K H 378.50K L 375.30K Val 45.01M

CEZ CP Equity 1) Create Report 2) Output to Excel Weighted Average Cost of Capital  
 CEZ AS Period MR 2015 Q3

Cost of Capital - Current Market Value

	Weight	Cost	W x C
3) Equity	61.5%	7.9%	4.9%
4) Debt Cost (A-T)	38.5%	0.4%	0.1%
5) Preferred Equity	0.0%	0.0%	0.0%
WACC			5.0%

Capital Structure (Millions of CZK)



Market Cap	270,401.4	61.5%
ST Debt	12,882.0	2.9%
LT Debt	156,652.0	35.6%
Pref. Eqty	0.0	0.0%
Total	439,935.4	100.0%

6) History

WACC  EVA  ROIC  EVA Spread

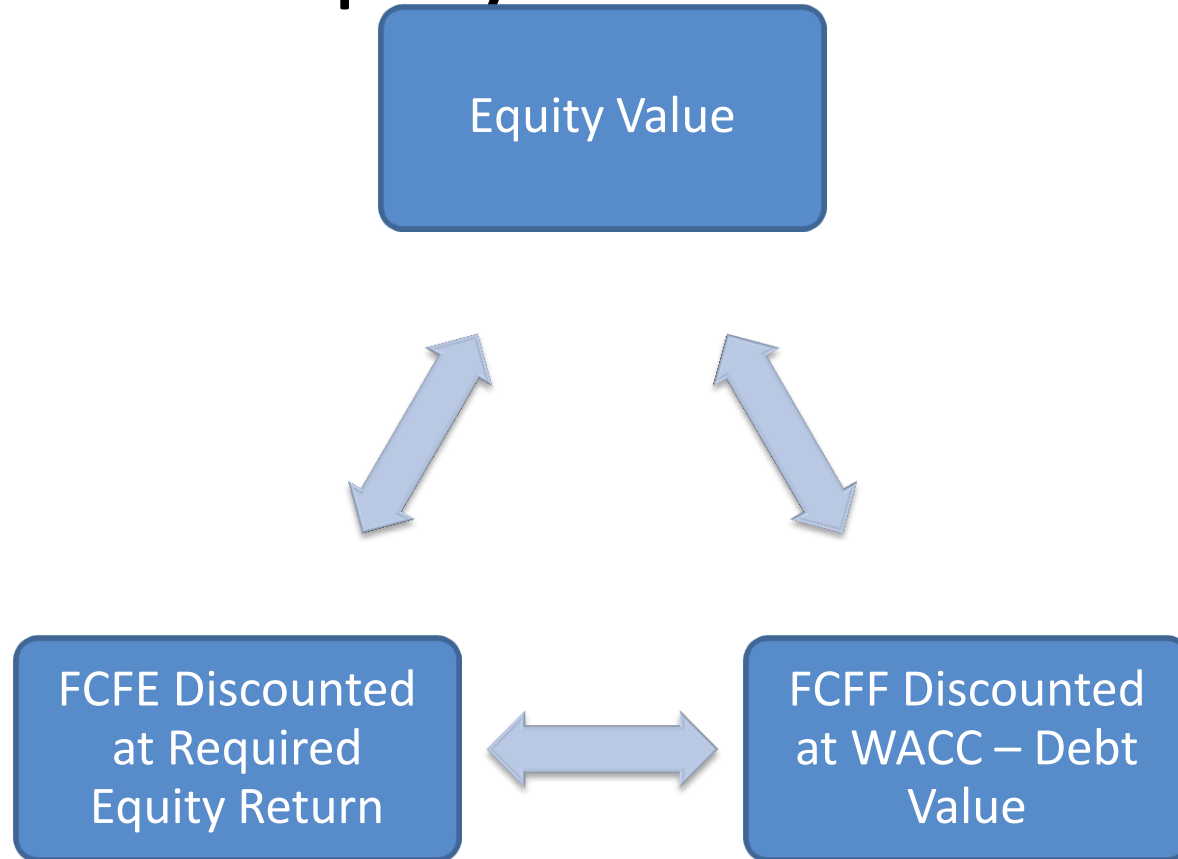


Economic Value Added (Millions of CZK)

7) Net Operating Profit	32746.00
8) Cash Operating Taxes	6937.68
NOPAT	25808.32
9) Total Investment Capital	459756.00
Capital Charge	23048.88
Economic Value Added	2759.44
ROIC	5.61%
EVA Spread	0.60%

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# FCFF vs. FCFE Approaches to Equity Valuation



# FCFF vs. FCFE Approaches to Equity Valuation

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

Equity value = Firm value – 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

Current FCFF	\$6,000,000
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

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

$$\text{Firm value} = \frac{\$6,000,000 (1.05)}{0.1023 - 0.05} = \$120.5 \text{ million}$$

$$\text{Equity value} = \$120.5 \text{ million} - \$30 \text{ million} = \$90.5 \text{ million}$$

$$\text{Equity value per share} = \$90.5 \text{ million} / 2.9 \text{ million} = \$31.21$$

# Using Net Income to Determine FCFF

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

FCFF = Net income available to common shareholders (NI)

Plus: Net noncash charges (NCC)

Plus: Interest expense  $\times$  (1 – Tax rate)

Less: Investment in fixed capital (FCInv)

Less: Investment in working capital (WCInv)

## EXAMPLE 2 Calculating FCFF from Net Income

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Cane Distribution, Inc., incorporated on 31 December 2009 with initial capital infusions of \$224,000 of debt and \$336,000 of common stock, acts as a distributor of industrial goods. The company managers immediately invested the initial capital in fixed capital of \$500,000 and working capital of \$60,000. Working capital initially consisted solely of inventory. The fixed capital consisted of nondepreciable property of \$50,000 and depreciable property of \$450,000. The depreciable property has a 10-year useful life with no salvage value. Exhibits 1, 2, and 3 provide Cane's financial statements for the three years following incorporation. Starting with net income, calculate Cane's FCFF for each year.

EXHIBIT 1 Cane Distribution, Inc. Income Statement (in Thousands)

	Years Ending 31 December		
	2010	2011	2012
Earnings before interest, taxes, depreciation, and amortization (EBITDA)	\$200.00	\$220.00	\$242.00
Depreciation expense	45.00	49.50	54.45
Operating income	155.00	170.50	187.55
Interest expense (at 7 percent)	15.68	17.25	18.97
Income before taxes	139.32	153.25	168.58
Income taxes (at 30 percent)	41.80	45.97	50.58
Net income	\$97.52	\$107.28	\$118.00

EXHIBIT 2 Cane Distribution, Inc. Balance Sheet (in Thousands)

	Years Ending 31 December			
	2009	2010	2011	2012
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
Current assets	<u>60.00</u>	<u>274.92</u>	<u>411.34</u>	<u>561.40</u>
Fixed assets	500.00	500.00	550.00	605.00
Less: Accumulated depreciation	0.00	45.00	94.50	148.95
Total assets	<u>\$560.00</u>	<u>\$729.92</u>	<u>\$866.84</u>	<u>\$1,017.45</u>
Accounts payable	\$0.00	\$50.00	\$55.00	\$60.50
Current portion of long-term debt	0.00	0.00	0.00	0.00
Current liabilities	<u>0.00</u>	<u>50.00</u>	<u>55.00</u>	<u>60.50</u>
Long-term debt	224.00	246.40	271.04	298.14
Common stock	336.00	336.00	336.00	336.00
Retained earnings	0.00	97.52	204.80	322.80
Total liabilities and equity	<u>\$560.00</u>	<u>\$729.92</u>	<u>\$866.84</u>	<u>\$1,017.45</u>

EXHIBIT 3 Cane Distribution, Inc. Working Capital (in Thousands)

	Years Ending 31 December			
	2009	2010	2011	2012
<i>Current assets excluding cash</i>				
Accounts receivable	\$0.00	\$100.00	\$110.00	\$121.00
Inventory	60.00	66.00	72.60	79.86
Total current assets excluding cash	60.00	166.00	182.60	200.86
<i>Current liabilities excluding short-term debt</i>				
Accounts payable	0.00	50.00	55.00	60.50
<i>Working capital</i>	\$60.00	\$116.00	\$127.60	\$140.36
<i>Increase in working capital</i>		\$56.00	\$11.60	\$12.76

	Years Ending 31 December		
	2010	2011	2012
Net income	\$97.52	\$107.28	\$118.00
Noncash charges - Depreciation	45.00	49.50	54.45
Interest expense $\times$ (1 - Tax rate)	10.98	12.08	13.28
Investment in fixed capital	(0.00)	(50.00)	(55.00)
Investment in working capital	<u>(56.00)</u>	<u>(11.60)</u>	<u>(12.76)</u>
Free cash flow to the firm	\$97.50	\$107.26	\$117.97

# Using EBIT and EBITDA to Determine FCFF

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

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

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



# Using Cash Flow from Operations to Determine FCFF

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

# Calculating FCFE from FCFF, Net Income, and CFO

FCFE from net income (NI) and FCFF:

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

$$\text{FCFE} = \text{NI} = \text{NCC} - \text{FCInv} - \text{WCInv} + \text{Net borrowing}$$

FCFE from CFO and FCFF:

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

$$\text{FCFE} = \text{CFO} - \text{FCInv} + \text{Net borrowing}$$

# 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

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

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

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

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

# Example: Simple Two-Stage FCFE Model

	<i>Year</i>				
	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%

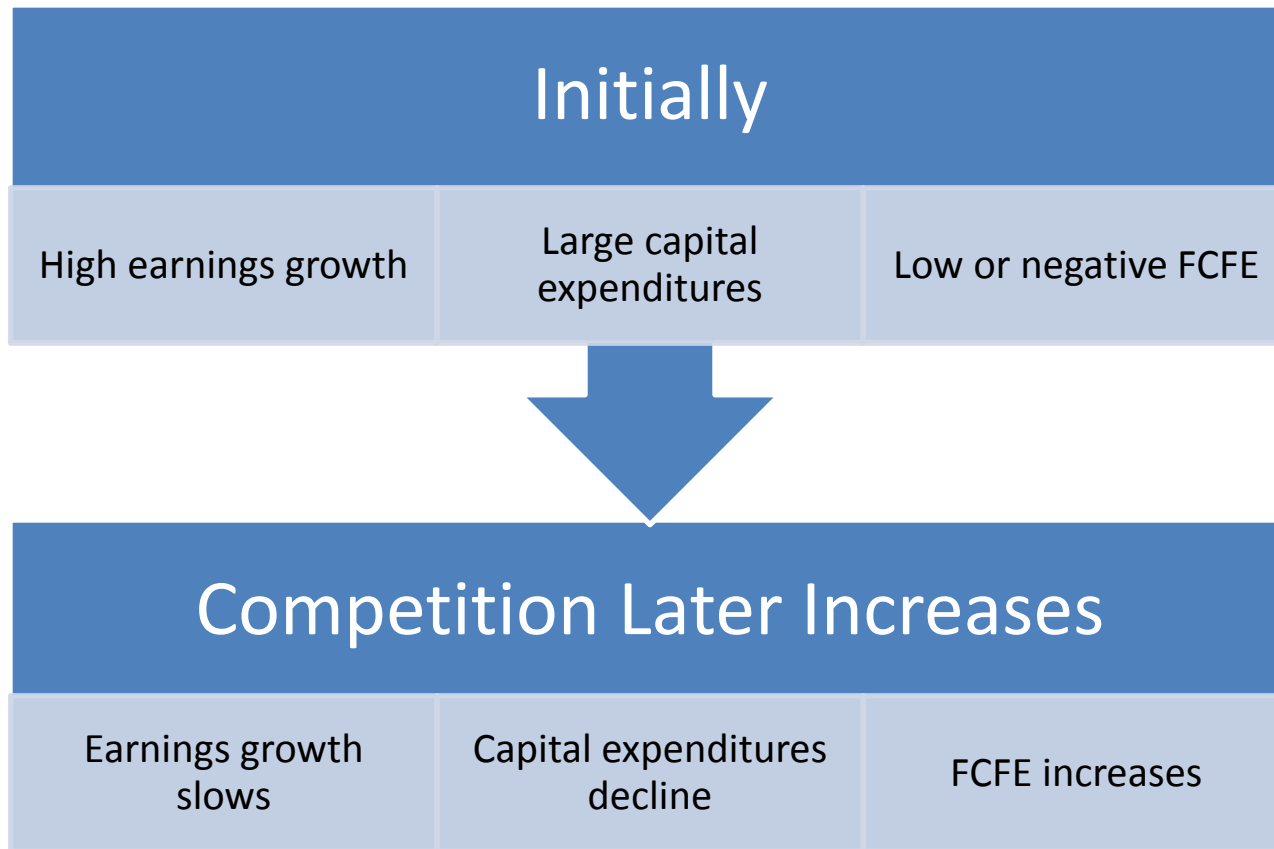
# Example: Simple Two-Stage FCFE Model

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

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

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

# Declining Growth Two-Stage FCFE Model





# Example: 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 =  $PV(\text{FCFF}) - \text{Debt value}$  or  $PV(\text{FCFE})$

# 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