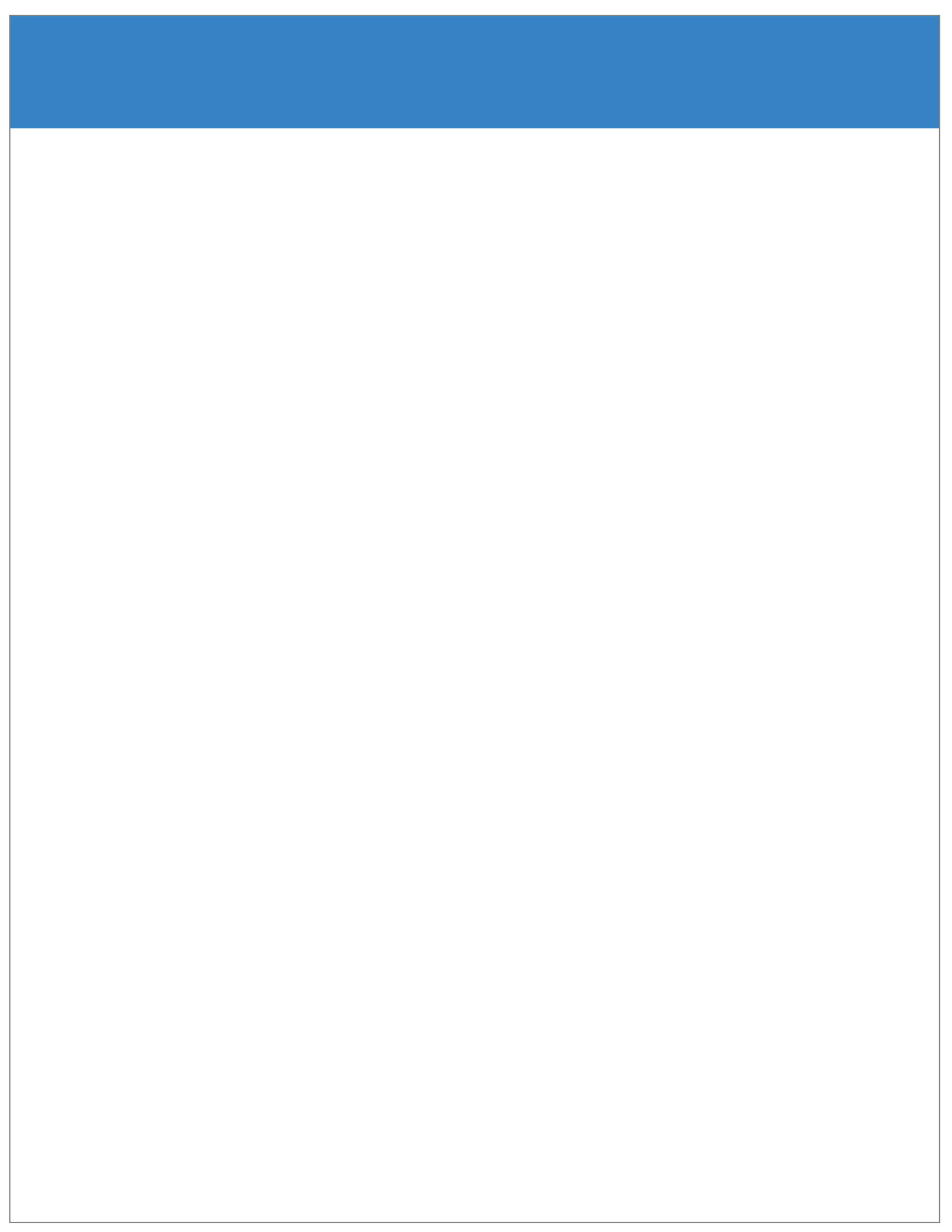




Equity Valuation II



Learning Module 1

Free Cash Flow Valuation



LOS: Compare the free cash flow to the firm (FCFF) and free cash flow to equity (FCFE) approaches to valuation.

LOS: Explain the ownership perspective implicit in the FCFE approach.

LOS: Explain the appropriate adjustments to net income, earnings before interest and taxes (EBIT), earnings before interest, taxes, depreciation, and amortization (EBITDA), and cash flow from operations (CFO) to calculate FCFF and FCFE.

LOS: Calculate FCFF and FCFE.

LOS: Describe approaches for forecasting FCFF and FCFE.

LOS: Explain how dividends, share repurchases, share issues, and changes in leverage may affect future FCFF and FCFE.

LOS: Compare the FCFE model and dividend discount models (DDMs).

LOS: Evaluate the use of net income and EBITDA as proxies for cash flow in valuation.

LOS: Explain the use of sensitivity analysis in FCFF and FCFE valuations.

LOS: Explain the single-stage (stable-growth), two-stage, and three-stage FCFF and FCFE models and justify the selection of the appropriate model given a company's characteristics.

LOS: Estimate a company's value using the appropriate free cash flow model(s).

LOS: Describe approaches for calculating the terminal value in a multistage valuation model, and evaluate whether a stock is overvalued, fairly valued, or undervalued based on a free cash flow valuation model.

LOS: Evaluate whether a stock is overvalued, fairly valued, or undervalued based on a free cash flow valuation mode.

Introduction



LOS: Compare the free cash flow to the firm (FCFF) and free cash flow to equity (FCFE) approaches to valuation.

LOS: Explain the ownership perspective implicit in the FCFE approach.

For equity valuation, analysts generally prefer free cash flow models over dividend discount models (DDMs). One key rationale for this preference is the ownership perspective implicit within FCFE models. FCFE presupposes that an investor with a controlling stake can control how the firm spends its free cash

flows, and therefore can dictate its dividend payout policy. In contrast, DDMs reflect the perspective of a minority shareholder who cannot control dividend policies and only receives dividends based on policies set by controlling shareholders.

Exhibit 1

Rationales for using FCFE instead of dividends for company valuation

- Company does not pay dividends
- Actual dividends do not reflect company's capacity to pay dividends
- Free cash flows better align to long-term profitability
- Free cash flows reflect an acquirer's control perspective

When valuing companies targeted for takeovers, free cash flow valuation should be used since the acquirer will have control over the target's cash flows. The purchase price usually includes a premium to obtain the benefits of control.

FCFF and FCFE Valuation Approaches

Defining Free Cash Flow

The *free cash flow* is the cash flow available for distribution to capital providers after accounting for operating expense and capital investments. There are two main forms of free cash flow.

- Free cash flow to the firm (FCFF) is the cash flow available to all the firm's capital suppliers (ie, bondholders, common shareholders, and preferred shareholders) after accounting for operating expenses, capital expenditures, and investments in net working capital. A firm can use its FCFF to pay interest, retire debt, pay dividends, or repurchase stock.
- Free cash flow to equity (FCFE) is the cash flow available to common shareholders after deducting interest payments to debtholders, principal repayments, new borrowings, and preferred dividends from FCFF. A firm can use its FCFE to pay common dividends or repurchase stock.

The level of debt in a firm's capital structure is the primary driver that accounts for the difference between FCFF and FCFE.

Present Value of Free Cash Flow

Investors discount free cash flow to value firms. Free cash flow is superior to other cash flow measures (eg, CFO) and proxies (eg, EBITDA, net income) for valuing companies since no other metric collectively captures the impact of taxes, noncash items, interest, and capital investments.

Exhibit 2 FCFF and FCFE approaches to calculating equity value

FCFF approach	<p>Equity value = Firm value – Noncommon equity capital</p> $\text{Equity value} = \sum_{t=1}^{\infty} \frac{\text{FCFF}_t}{(1 + \text{WACC})^t} - \left(\begin{array}{l} \text{Market value of debt +} \\ \text{Market value of preferred stock} \end{array} \right)$
FCFE approach	$\text{Equity value} = \sum_{t=1}^{\infty} \frac{\text{FCFF}_t}{(1 + r)^t}$

Theoretically, both the FCFF and FCFE approaches should yield the same intrinsic equity value for a company. With FCFF, analysts can discount FCFFs by the firm's weighted average cost of capital (WACC) to find the firm's value then subtract the market value of debt to determine equity value. Alternatively, analysts can directly discount FCFE by the cost of equity (r) to determine equity value. The intrinsic value for each share of common stock can be calculated using the number of shares outstanding.

At times, using FCFE to calculate equity value is easier when a firm's capital structure is stable. However, when capital structure is volatile or when FCFE is negative, using FCFF may be more appropriate.

Single-Stage (Constant-Growth) FCFF and FCFE Models

Free cash flow valuation models are present value equations structurally similar to their DDM counterparts. The single-stage free cash flow model assumes that cash flows will grow at a constant growth rate (g) into perpetuity.

Exhibit 3 Value calculations from free cash flow with constant growth

$$\text{Firm Value} = \frac{\text{FCFF}_0 (1 + g)}{\text{WACC} - g} = \frac{\text{FCFF}_1}{\text{WACC} - g}$$

$$\text{Equity Value} = \frac{\text{FCFF}_0 (1 + g)}{r - g} = \frac{\text{FCFF}_1}{r - g}$$

Note that the FCFF calculation uses WACC, as the FCFF is discounted by the WACC adjusted for growth, considering all the firm's types of capital. In contrast, the FCFE calculation uses r adjusted for growth, the required return of equity holders, since it is the free cash flow available only to the equity holders.



Example 1 Calculating value based on constant-growth FCFF valuation model

An analyst wants to estimate the value of Star Manufacturers stock and gathers the following information about the company:

- FCFF at the end of 20X9 = \$660 million
- Before-tax cost of debt = 4.5%
- Required rate of return on equity = 11%
- Target debt-to-equity ratio = 0.4
- Number of common shares outstanding = 300 million
- Expected long-term growth rate in FCFF = 5%
- Tax rate = 40%
- Market value of debt = \$1.2 billion

1. Calculate Star Manufacturers WACC.
2. What is the intrinsic value of the company's stock at the end of 20X9?

Solution

$$1. \text{ WACC} = \left(\frac{0.4}{1.4} \times 0.045 \times (1 - 0.4) \right) + (1.4 \times 0.11) \approx 8.63\%$$

2. The value of the firm is calculated by applying the constant-growth FCFF model:

$$\text{Value} = \frac{\text{FCFF}}{\text{WACC} - g} = \frac{660 \times 1.05}{0.0863 - 0.05} \approx \$19,091 \text{ million} \approx \$19.091 \text{ billion}$$

The value of equity equals the value of the firm minus the market value of the firm's debt:

$$\text{MV}_{\text{Equity}} = 19,091 - \text{MV}_{\text{Debt}} = 19,091 - 1.2 = \$17.891 \text{ billion}$$

The intrinsic value of a share of stock equals the value of the equity divided by the number of common shares outstanding:

$$\text{Value per share} = \frac{17,891}{300} \approx \$59.64$$



Example 2 Calculating value based on constant-growth FCFE valuation model

An analyst wants to estimate the value of Veta Inc.'s stock. He gathers the following information regarding the company:

- FCFE at the end of 20X9 = \$3.25 per share
- The company's WACC = 12.25%
- Risk-free rate of return = 4%
- Equity market risk premium = 6.5%
- Beta of the company's stock = 1.2
- Expected long-term growth rate in FCFE = 5.5%

Calculate the value of Veta's stock at the end of 20X9.

Solution

First, use the capital asset pricing model to calculate the required rate of return on equity:

$$\text{Required rate of return on equity} = 0.04 + (1.2 \times 0.065) = 11.8\%$$

Then compute the value of the firm's equity based on the constant-growth FCFE model:

$$\text{Value of equity} = \frac{\text{FCFE}}{r - g} = \frac{3.25 \times 1.055}{0.118 - 0.055} = \$54.42$$

Forecasting Free Cash Flow and Computing FCFF from Net Income



LOS: Explain the appropriate adjustments to net income, earnings before interest and taxes (EBIT), earnings before interest, taxes, depreciation, and amortization (EBITDA), and cash flow from operations (CFO) to calculate FCFF and FCFE.

LOS: Calculate FCFF and FCFE.

LOS: Describe approaches for forecasting FCFF and FCFE.

To calculate FCFF from net income:

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

Where:

NI = Net income

NCC = Noncash charges

Int = Interest

t = Tax rate

FCInv = Investments in fixed capital

WCInv = Investments in working capital

Recall that FCFF is cash flow available to all capital providers (eg, creditors, shareholders) after accounting for operating expenses, capital expenditures, and investments in net working capital. Net income, which is prepared on an accrual basis, is net of operating expenses including interest expense, depreciation, and taxes. As such, net income differs from FCFF in several ways. Primarily, net income includes noncash charges (NCC) (eg, depreciation and amortization, stock-based compensation) and ignores investments in fixed and working capital.

To derive FCFF from net income, analysts should:

- add back NCC;
- add back interest expense net of taxes to reflect funds available for paying interest to creditors;
- subtract FCInv, which typically include capital expenditures (CapEx) net of proceeds from sale of equipment; and
- subtract changes to net working capital. Net working capital is the difference between operating current assets and operating current liabilities.
 - Operating current assets (eg, accounts receivable, inventory) are current assets excluding cash and cash equivalents.
 - Operating current liabilities (eg, accounts payable) are current liabilities excluding any interest-bearing debt (eg, short-term debt, current portion of long-term debt).

Computing FCFF from the Cash Flow Statement



LOS: Explain the appropriate adjustments to net income, earnings before interest and taxes (EBIT), earnings before interest, taxes, depreciation, and amortization (EBITDA), and cash flow from operations (CFO) to calculate FCFF and FCFE.

LOS: Calculate FCFF and FCFE.

LOS: Describe approaches for forecasting FCFF and FCFE.

To compute FCFF from the cash flow statement:

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

Where:

CFO = Cash flow from operations

Int = Interest

t = Tax rate

FCInv = Investments in fixed capital

Unlike net income (which is accrual-based), cash flow from operations (CFO) reflects actual cash flows, so fewer adjustments are required to derive FCFF. CFO is generally net income plus NCC less investments in working capital (WCInv) (ie, NI + NCC – WCInv). Analysts should add back after-tax interest to include funds available for interest payments to creditors and subtract investments in fixed capital (FCInv) to account for net capital expenditures.

Additional Considerations in Computing FCFF



LOS: Calculate FCFF and FCFE.

LOS: Describe approaches for forecasting FCFF and FCFE.

Classification of Certain Items on the Statement of Cash Flow

Exhibit 4 Differences between US GAAP and IFRS for cash flow statement items

	US GAAP	IFRS
Interest received	Operating	Operating or investing
Interest paid	Operating	Operating or financing
Dividend received	Operating	Operating or investing
Dividend paid	Financing	Operating or financing
Taxes paid	Operating	Typically operating, but specific portions can be classified as financing or investing

For companies that report under IFRS, analysts should understand how certain items are categorized on the cash flow statement when using CFO to calculate FCFF. One such item is interest paid; IFRS allows interest paid to be classified under financing or operating activities. If interest paid is captured as a CFF outflow (instead of a CFO outflow), then after-tax interest paid should not be added to CFO when calculating FCFF. Conversely, if interest paid is captured in CFO, then after-tax interest should be added back.

Adjustments to Derive Operating Cash Flow from Net Income

The operating cash flow section of the statement of cash flows typically includes various adjustments to reconcile net income to CFO. These adjustments are noncash (eg, depreciation, amortization) or nonoperating (eg, gain from sale of assets) in nature.

Exhibit 5 Noncash or nonoperating adjustments to net income

Reported net income
 + Depreciation
 + Amortization and impairment of intangibles
 + Restructuring charges
 – Restructuring income from reversal
 + Amortization of bond discounts
 – Amortization of bond premiums
 + Losses on nonoperating activities
 – Gains on nonoperating activities
 + Deferred taxes (requires careful examination)

Adjustments to Derive Operating Cash Flow from Net Income That May Merit Additional Attention from an Analyst

Deferred taxes result from differences between income tax expense reported on financial statements and taxes payable on the tax return. The discrepancies are due to timing differences in recognizing income and expenses for accounting purposes and tax purposes. Over time, these temporary differences should reverse and have no material impact on cash flows.

However, if a company can defer its tax liabilities indefinitely into the future (ie, not reverse), then these deferred tax liabilities should be added back to net income. Similarly, if a company does not expect to ever realize its tax benefits, then these deferred tax assets should be subtracted from net income.

Computing FCFE from FCFF

LOS: Explain the ownership perspective implicit in the FCFE approach.

LOS: Calculate FCFF and FCFE.

LOS: Describe approaches for forecasting FCFF and FCFE.

To compute FCFE from FCFF:

$$\text{FCFE} = \text{FCFF} - \text{Int}(1 - t) + \text{Net borrowing}$$

FCFE is the cash flow available to common shareholders after accounting for transactions with creditors. Therefore, FCFF is adjusted for cash flows to (from) creditors by subtracting after-tax interest and adding net borrowing (ie, new borrowing less debt repayments). FCFE can be used for repurchasing shares or for paying dividends to shareholders.

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

FCFE can also be derived from net income. Note that the first four terms ($NI + NCC - FCInv - WCInv$) are equal to FCFF less after-tax interest [$FCFF - Int(1 - t)$], as shown in the previous equation. Therefore, add net borrowing to the first four terms to derive FCFE:

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

FCFE can also be derived from CFO. Note that:

$$CFO - FCInv = FCFF - Int(1 - t) = NI + NCC - FCInv - WCInv$$

Therefore, add net borrowing to the first two terms of the above equation to derive FCFE.

Finding FCFF and FCFE from EBIT or EBITDA



LOS: Explain the appropriate adjustments to net income, earnings before interest and taxes (EBIT), earnings before interest, taxes, depreciation, and amortization (EBITDA), and cash flow from operations (CFO) to calculate FCFF and FCFE.

LOS: Calculate FCFF and FCFE.

To calculate FCFF from earnings before interest and taxes (EBIT):

$$FCFF = EBIT(1 - t) + Dep - FCInv - WCInv$$

EBIT is also net of depreciation. To derive FCFF, first remove taxes (but not interest) to calculate cash flows available to creditors. Next, add back depreciation (Dep), which is a noncash charge. Finally, subtract the investments in fixed and working capital:

$$FCFF = EBITDA(1 - t) + Dep(t) - FCInv - WCInv$$

EBITDA is earnings before interest, taxes, depreciation, and amortization. First remove taxes (but not interest) then add back the depreciation tax savings. Finally, subtract investments in fixed and working capital.

FCFE can also be calculated from EBIT and EBITDA. Since $FCFE = FCFF - Int(1 - t) + \text{Net borrowings}$:

$$FCFE = EBIT(1 - t) + Dep - FCInv - WCInv - Int(1 - t) + \text{Net borrowings}$$

$$FCFE = EBITDA(1 - t) + Dep(t) - FCInv - WCInv - Int(1 - t) + \text{Net borrowings}$$

The next example incorporates all these formulas.



Example 3 Calculating FCFF

The tables shown provide the balance sheet and income statement for Saturn Inc. for 20X8 and the forecasted balance sheet and income statement for 20X9. Saturn Inc. prepares its financial statements in accordance with US GAAP.

<u>Income Statement (\$ millions)</u>	<u>20X9</u>	<u>20X8</u>
Sales	625	450
Cost of goods sold	(280)	(225)
Gross profit	345	225
SG&A	(25)	(20)
Depreciation	(60)	(50)
EBIT	260	155
Interest expense	(20)	(15)
Pretax earnings	240	140
Taxes (30%)	(72)	(42)
Net income	168	98
<u>Balance Sheet (\$ millions)</u>	<u>20X9</u>	<u>20X8</u>
Cash	24	25
Accounts receivable	8	10
Inventory	53	45
Total current assets	85	80
Gross PPE	1,443	1,125
Less: Accumulated depreciation	(260)	(200)
Net property, plant & equipment	1,183	925
Total noncurrent assets	1,183	925
Total assets	1,268	1,005
Accounts payable	38	35
Short-term debt	62	45
Total current liabilities	100	80
Long-term debt	365	290
Total liabilities	465	370
Common stock	300	300
Retained earnings	503	335
Total equity	803	635
Total equity & liabilities	1,268	1,005

Saturn did not dispose of any of its long-term assets in 20X9. Based only on the information provided, calculate 20X9 FCFE from:

- Net Income
- CFO
- EBIT
- EBITDA

Solutions

Before diving into each equation, first calculate two variables that will appear repeatedly: FCInv and WCInv.

<u>WCInv Calculation</u>	<u>20X9</u>	<u>20X8</u>
Accounts receivable	8	10
+ Inventory	53	45
- Accounts payable	38	35
<u>Net working capital</u>	<u>23</u>	<u>20</u>
WCInv = 23 - 20 = 3		

Saturn Inc.'s net working capital increased by \$3 million year on year, this represents a cash outflow.

<u>FCInv Calculation</u>	<u>20X9</u>
Net PPE (20X9)	1,183
- Net PPE (20X8)	925
+ Depreciation	60
<u>FCInv</u>	<u>318</u>

$$\text{Beginning Net PPE} + \text{FCInv} - \text{Dep} = \text{Ending Net PPE}$$

Therefore:

$$\text{FCInv} = \text{Beginning Net PPE} - \text{Ending Net PPE} + \text{Dep}$$

FCInv equals CapEx less proceeds from the sale of equipment. In this scenario, Saturn Inc. did not dispose of any of its equipment, so FCInv equals CapEx.

1. Calculating FCFF from net income

<u>Net Income to FCFF</u>	<u>20X9</u>	
Net income	168	
+ Depreciation	60	
+ Int(1 - t)	14	20 × (1 - 0.3)
- FCInv	318	
- WCInv	3	
FCFF	(79)	

2. Calculating FCFF from CFO

CFO is not given in the question, so first calculate CFO.

<u>Net Income to CFO</u>	
Net income	168
+ Depreciation	60
- WCInv	<u>3</u>
CFO	225

Next, calculate FCFF from CFO.

<u>CFO to FCFF</u>	
CFO	225
+ Int(1 - t)	14
- FCInv	<u>318</u>
FCFF	(79)

3. Calculating FCFF from EBIT

<u>EBIT to FCFF</u>		
EBIT(1 - t)	182	$260 \times (1 - 0.3)$
+ Depreciation	60	
- FCInv	318	
- WCInv	<u>3</u>	
FCFF	(79)	

4. Calculating FCFF from EBITDA

<u>EBITDA to FCFF</u>		
EBITDA(1 - t)	224	$(260 + 60) \times (1 - 0.3)$
+ Depreciation $\times t$	18	60×0.3
- FCInv	318	
- WCInv	<u>3</u>	
FCFF	(79)	



Example 4 Calculating FCFE

<u>Income Statement (\$ millions)</u>	<u>20X9</u>	<u>20X8</u>
Sales	625	450
Cost of goods sold	280	225
Gross profit	345	225
SG&A	25	20
Depreciation	60	50
EBIT	260	155
Interest expense	20	15
Pretax earnings	240	140
Taxes (30%)	72	42
Net income	168	98
<u>Balance Sheet (\$ millions)</u>	<u>20X9</u>	<u>20X8</u>
Cash	24	25
Accounts receivable	8	10
Inventory	53	45
Total current assets	85	80
Gross property, plant & equipment	1,443	1,125
Less: Accumulated depreciation	260	200
Net property, plant & equipment	1,183	925
Total noncurrent assets	1,183	925
Total assets	1,268	1,005
Accounts payable	38	35
Short-term debt	62	45
Total current liabilities	100	80
Long-term debt	365	290
Total liabilities	465	370
Common stock	300	300
Retained earnings	503	335
Total equity	803	635
Total equity & liabilities	1,268	1,005

Continuing from the example above, calculate 20X9 FCFE from:

- FCFF
- Net Income
- CFO

Solution

First calculate net borrowing, which equals new borrowings less debt repayments, which can simply be calculated from the change in total debt outstanding.

Net Borrowing	20X9	20X8
Short-term debt	62	45
Long-term debt	365	290
Total debt	427	335
Net borrowing = 427 – 335 = 92		

1. Calculating FCFE from FCFF

FCFF to FCFE	
FCFF	(79)
- Int(1 - t)	14
+ Net borrowing	92
FCFE	(1)

2. Calculating FCFE from Net Income

Net Income to FCFE	
Net Income	168
+ Depreciation	60
- FCInv	318
- WCInv	3
+ Net borrowing	92
FCFE	(1)

3. Calculating FCFE from CFO

CFO to FCFE	
CFO	225
- FCInv	318
+ Net borrowing	92
FCFE	(1)

Although memorizing every formula may not be practical, try to memorize a few formulas as a baseline, and understand how to modify the baseline formulas to derive the variants.

Exhibit 6 Free cash flow formulas

FCFF	FCFE
$FCFF = NI + NCC + Int(1 - t) - FCInv - WCInv$	$FCFE = FCEE - Int(1 - t) + \text{Net borrowing}$
$FCFF = EBIT(1 - t) + NCC - FCInv - WCInv$	$FCFE = NI + NCC - FCInv - WCInv + \text{Net borrowing}$
$FCFF = EBITDA(1 - t) + NCC(t) - FCInv - WCInv$	$FCFE = CFO - FCInv + \text{Net borrowing}$
$FCFF = CFO + Int(1 - t) - FCInv$	

NI = Net income

NCC = Noncash charges (eg, depreciation)

t = Tax rate

Int = Interest expense

FCInv = Investments in fixed capital

WCINV = Investments in working capital

FCFF and FCFE on a Uses-of-Free-Cash-Flow Basis



LOS: Calculate FCFF and FCFE.

LOS: Explain how dividends, share repurchases, share issues, and changes in leverage may affect future FCFF and FCFE.

Up until now, free cash flow has been calculated based on its sources (eg, net income, CFO, EBIT). Alternatively, free cash flow can also be calculated based on its uses, mainly as a reconciliation tool. In general, FCFF can be used to:

- increase cash balances,
- distribute cash to debt providers (ie, interest and principal payments in excess of new borrowings),
- distribute cash to shareholders (ie, dividend payments and share repurchases in excess of new share issuance).

Therefore, FCFF based on uses can be calculated as:

$$\begin{aligned}
 & \text{Increases in cash balances} \\
 \text{Plus: Net payments to debt providers} & \\
 & + \text{Interest expense } (1 - \text{tax rate}) \\
 & + \text{Repayment of principal} \\
 & - \text{New borrowings} \\
 \text{Plus: Net payments to shareholders} & \\
 & + \text{Cash dividends} \\
 & + \text{Share repurchases} \\
 & - \text{New equity issues} \\
 & = \text{FCFF based on uses}
 \end{aligned}$$

FCFE reflects cash flows available after accounting for transactions with debt providers. Therefore, FCFE can be calculated as:

$$\begin{aligned}
 & \text{Increases in cash balances} \\
 \text{Plus: Net payments to shareholders} & \\
 & + \text{Cash dividends} \\
 & + \text{Share repurchases} \\
 & - \text{New equity issues} \\
 = & \text{FCFE based on uses}
 \end{aligned}$$



Example 5 FCFF calculated on uses of cash

Saturn Inc.'s FCFF of -\$79 million can also be calculated based on the uses-of-free-cash-flow approach:

Uses of FCFF	
Decrease in cash & cash equivalents (= 24 - 25)	(1)
+ After-tax interest payments to providers of debt capital	14
- Net borrowing	(92)
+ Dividends	0
+ Share repurchases	0
FCFF	(79)

Forecasting FCFF and FCFE



LOS: Describe approaches for forecasting FCFF and FCFE.

Analysts can forecast free cash flows through a simple approach or complex approach. The simple approach involves using average historical free cash flow growth rates to forecast future free cash flows (for example, a firm's FCFF may be forecasted to grow at 3% indefinitely). Although this approach is straightforward, the complex approach is more realistic and more popular. *Note that this section discusses one out of many complex approaches used by analysts.*

The complex approach involves forecasting individual free cash flow components (eg, EBIT, WCInv, FCInv) based on their relationship to revenue growth. The rationale is that operating expenses, working capital investments, and capital expenditures all correlate to sales growth.

When forecasting free cash flow components, analysts forecast:

- sales growth rates;
- profits margins as a percent of sales (eg, gross margin %, EBIT %);
- WCInv as a percent of sales growth (increase in working capital / increase in sales);
- incremental fixed capital expenditures as a percent of sales growth [(FCInv – Dep) / increase in sales];
- debt ratio (for FCFE).

Once the components are forecast, analysts can calculate FCFF and FCFE:

$$\text{FCFF} = \text{EBIT}(1 - t) - (\text{FCInv} - \text{Dep}) - \text{WCInv}$$

With FCFF, when forecasting capital expenditures, analysts separate maintenance from growth. Maintenance supports existing sales capacity and is captured by *depreciation*. Growth supports sales growth and is captured by (FCInv – Dep); this expression is also referred to as *incremental fixed capital expenditures* or *net new FCInv*. This approach eliminates the need to separately forecast depreciation since the forecast of net new FCInv already captures depreciation.

With FCFE, analysts often assume that the firm aims to maintain a constant target debt ratio (DR) (ie, $\text{DR} = \text{Debt} / [\text{Debt} + \text{Equity}]$) when financing investments in fixed and working capital. Thus, the equity-financed portion of FCInv is $(1 - \text{DR}) \times (\text{FCInv} - \text{Dep})$ and in working capital is $(1 - \text{DR}) \times (\text{WCInv})$.

Using the debt ratio in forecasting allows analysts to forecast FCFE without having to separately forecast debt issuance and repayments for net borrowing. This then creates another variation of the FCFE formula:

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

Start with net income, then subtract the equity FCInv and WCInv:

$$\text{Net borrowing} = (\text{DR}) \times (\text{FCInv} - \text{Dep}) + (\text{DR}) \times (\text{WCInv})$$

$$\text{FCFE} = \text{NI} - (\text{FCInv} - \text{Dep}) - (\text{WCInv}) + \text{Net borrowing}$$

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

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



Example 6 Forecasting FCFF and FCFE using a complex approach

An analyst collects the following historical data for Phesco Inc. to forecast free cash flows for 20X2.

Phesco Selected Data (€ millions)

	20X0	20X1
Sales	5,000.00	5,250.00
EBIT	750.00	787.50
Net income	450.00	472.50
FCInv – Dep	71.43	75.00
WCInv	23.81	25.00

In addition, Phesco Inc. is subject to a tax rate of 25% and maintains a target debt ratio of 40%. The analyst will make forecasts based on 20X1's year-on-year (YoY) growth and margins.

1. Based on 20X1's YoY growth and margins, define the inputs the analyst should use for:
 - a. sales growth %
 - b. EBIT margin
 - c. net profit margin
 - d. growth of capital expenditure to sales
 - e. working capital investments to sales
2. Forecast 20X2 FCFF using the complex approach.
3. Forecast 20X2 FCFE using the complex approach.

Solution

1. Inputs are calculated as follows:

	<u>20X0</u>	<u>20X1</u>	<u>Calculation to derive inputs</u>	
Sales	5,000.00	5,250.00	Sales growth %	$5,250 / 5,000 - 1 = 5\%$
EBIT	750.00	787.50	EBIT margin	$787.5 / 5,250 = 15\%$
Net income	450.00	472.50	Net profit margin	$472.5 / 5,250 = 9\%$
FCInv – Dep	71.43	75.00	Growth CapEx %	$75 / (5,250 - 5,000) = 30\%$
WCInv	23.81	25.00	WCInv %	$25 / (5,250 - 5,000) = 10\%$

2. 20X2 FCFF is calculated as follows:

<u>FCFF</u>	<u>20X1</u>	<u>20X2(F)</u>	<u>Formula</u>
Sales	5,250.00	5,512.50	$Sales_{t-1} \times (1 + \text{sales growth}\%) = 5,250 \times (1 + 0.05)$
EBIT	787.50	826.88	$Sales \times \text{EBIT Margin} = 5,512.5 \times 0.15$
EBIT (1 – t)	590.63	620.16	$\text{EBIT} (1 - t) = 826.88 \times (1 - 0.25)$
– FCInv – Dep	75.00	78.75	$\text{Increase in sales} \times \text{Growth CapEx \%} = (5,512.5 - 5,250) \times 0.3$
– WCInv	25.00	26.25	$\text{Increase in sales} \times \text{WCInv \%} = (5,512.5 - 5,250) \times 0.1$
FCFF	490.63	515.16	

3. 20X2 FCFE is calculated as follows:

<u>FCFE</u>	<u>20X1</u>	<u>20X2(F)</u>	<u>Formula</u>
Net income	472.50	496.13	$Sales \times \text{Net profit margin} = 5,512.5 \times 0.09$
– (1 – DR) × (FCInv – Dep)	45.00	47.25	$(1 - \text{DR}) \times (\text{FCInv} - \text{Dep}) = (1 - 0.4) \times (78.75)$
– (1 – DR) × (WCInv)	15.00	15.75	$(1 - \text{DR}) \times (\text{WCInv}) = (1 - 0.4) \times (26.25)$
FCFE	412.50	433.13	

Other Issues in Free Cash Flow Analysis



LOS: Compare the FCFE model and dividend discount models (DDMs).

LOS: Explain how dividends, share repurchases, share issues, and changes in leverage may affect future FCFF and FCFE.

LOS: Evaluate the use of net income and EBITDA as proxies for cash flow in valuation.

Free Cash Flow versus Dividends and Other Earnings Components

FCFE versus DDM

Analysts prefer FCFE models over DDMs for several reasons:

- Some corporations pay irregular, negligible, or no dividends.
- Dividends paid may not reflect the firm's true long-term profitability. For example, a firm with negative profits but positive retained earnings can still pay dividends in the near term.
- DDMs reflect a minority perspective since shareholders only realize value when dividends are paid, whereas FCFE models reflect a controlling perspective since majority shareholders can dictate the dividend policy from the available FCFE. When analyzing a firm targeted for takeover, analysts should use the FCFE approach since the acquirer will have control.

Dividends, Share Repurchases, and Changes in Leverage

Dividends, share repurchases, and share issuance have no effect on free cash flow. Free cash flows represent cash flows available to shareholders before returning any capital to creditors or shareholders. Dividends and repurchases represent uses of cash and are transactions between the company and its investors, but they do not reduce the cash flows that are available for use.

Changes in leverage have some impact on FCFE but not on FCFF. For example, additional leverage will initially increase FCFE through more net borrowing but subsequently decrease FCFE through interest payments.

Net Income and EBITDA Proxies

Due to the complexity of calculating free cash flows, investors often adopt several alternative cash flow proxies such as net income, EBIT, EBITDA, and CFO; however, there are drawbacks with these proxies. For example, net income includes NCC (ie, depreciation) and ignores WCInv and FCInv. EBITDA does not capture taxes and ignores FCInv and WCInv. CFO ignores capital expenditures.

Free Cash Flows and Complicated Capital Structures

The discussion thus far has assumed a capital structure consisting of debt and common equity, but more complex capital structures do exist. If the firm's capital structure includes preferred stock, the income statement may report *net income available to common shareholders* (which is net income after preferred dividends), and preferred dividends would have to be added back to derive FCFF.

$$\text{FCFF} = \text{NI available to common shareholders} + \text{NCC} + \text{Int}(1 - t) + \text{Preferred dividends} - \text{FCInv} - \text{WCInv}$$

Free Cash Flow Model Variations



LOS: Explain the use of sensitivity analysis in FCFF and FCFE valuations.

An International Application of the Single-Stage Model

A variation of the constant growth free cash flow model is frequently used to value international stocks using real discount rates and real growth rates, especially if they are easier to estimate than nominal discount and growth rates (eg, when inflation rates are high and volatile). In this variation, real (inflation-adjusted) discount rates and cash flows are used.

To estimate the real required rate of return (r_{real}) for an international stock, analysts start with the real required rate of return on stocks for a particular country and then adjust it for the company's industry, size, and leverage.

Exhibit 7

Country return	x%
± Industry adjustment	x%
± Size adjustment	x%
± Leverage adjustment	x%
Real required rate of return	x%

Next, analysts estimate the real growth rates (g_{real}) for these international stocks' FCFEs. Once those two variables are determined, analysts can plug them into the single-stage model to calculate intrinsic value:

$$V_0 = \frac{\text{FCFE}_0(1 + g_{\text{real}})}{r_{\text{real}} - g_{\text{real}}}$$

Sensitivity Analysis of FCFF and FCFE Valuations

Sensitivity analysis can show analysts how a firm's FCFE and FCFF valuations can range based on different inputs. This example displays how changes to sales growth, gross margin, and capital expenditures impact a company's valuation:

Exhibit 8

Variable	Base-Case Estimate	Low Estimate	High Estimate	Valuation with Low Estimate (RUB billions)	Valuation with High Estimate (RUB billions)
Sales growth rate	15%	12%	18%	460	530
Gross margin %	30%	29%	31%	490	500
CAPEX % of sales	5%	4%	6%	535	540

Two-Stage Free Cash Flow Models

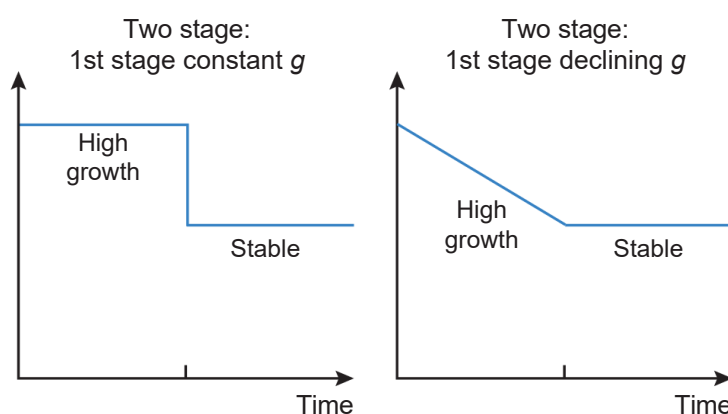


LOS: Explain the single-stage (stable-growth), two-stage, and three-stage FCFF and FCFE models and justify the selection of the appropriate model given a company's characteristics.

LOS: Estimate a company's value using the appropriate free cash flow model(s).

LOS: Describe approaches for calculating the terminal value in a multistage valuation model, and evaluate whether a stock is overvalued, fairly valued, or undervalued based on a free cash flow valuation model.

Exhibit 9 Two-stage Free Cash Flow models



There are two popular versions of two-stage free cash flow models, distinguished by the growth rates in the first stage:

- The growth rate is constant in Stage 1 and abruptly drops to the long-term sustainable growth rate in Stage 2.
- The growth rate gradually declines during Stage 1 toward the long-term sustainable growth rate of Stage 2.

In both versions, the growth rate in the second stage is a long-run sustainable growth rate. For a declining industry, the second-stage growth rate could be slightly lower than the GDP growth rate. For an industry with brighter prospects, the second-stage growth rate could be slightly greater than the GDP growth rate.

Below are the generally expressions for the two-stage FCFF and FCFE models:

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

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

The discounted cash flow(s) of the first stage are added to the discounted cash flows (ie, the terminal value) of the second stage. The terminal value is the present value of the second stage's cash flows at the beginning of the second stage.



Example 7 Calculating value using two-stage FCFF model

The following information relates to Alpha Inc.:

- Net profit margin = 22%
- Sales in Year 0 = \$15m
- Fixed capital investment in Year 0 = \$4m
- Depreciation in Year 0 = \$5m
- Working capital investment as a percentage of sales = 8.5%
- Tax rate = 40%
- Interest expense on par value of debt of \$20m in Year 0 = 11.5%
- WACC during the high growth phase = 19%
- WACC during the mature phase = 16%

Net income, fixed capital investment, depreciation, interest expense, and sales are expected to grow at a rate of 12% for the next 5 years and then stabilize at a long-term constant growth rate of 6%.

Compute the value of the firm.

Solution

FCFF in each of the first 6 years is calculated in the table below:

Year	0	1	2	3	4	5	6
Sales (\$ millions)	15.00	16.80	18.82	21.07	23.60	26.44	28.02
Net income	3.30	3.70	4.14	4.64	5.19	5.82	6.16
Add: Depreciation	5.00	5.60	6.27	7.02	7.87	8.81	9.34
Add: After-tax interest expense	1.38	1.55	1.73	1.94	2.17	2.43	2.58
Less: Fixed capital investment	4.00	4.48	5.02	5.62	6.29	7.05	7.47
Less: Working capital investment	1.28	1.43	1.60	1.79	2.01	2.25	2.38
FCFF	4.41	4.93	5.53	6.19	6.93	7.76	8.23

Calculations for Year 0 and Year 1:

	Year 0 \$	Year 1 \$
Sales	15m	$15m \times (1 + 0.12) = 16.8m$
Net income	22% of 15m = 3.3	$3.3m \times (1 + 0.12) = 3.696m$
Depreciation	5m	$5m \times (1 + 0.12) = 5.6m$
After-tax interest expense	$11.5\% \text{ of } 20m \times (1 - 0.4) = 1.38m$	$1.38m \times (1 + 0.12) = 1.5456m$
Fixed capital investment	4m	$4m \times (1 + 0.12) = 4.48m$
Working capital investment	$8.5\% \text{ of } 15m = 1.275m$	$8.5\% \text{ of } 16.8m = 1.428m$

Next, calculate the terminal value as of the end of Year 5 (end of Stage 1) using Year 6 FCFF (8.23m), the mature stage WACC (16%), and the Stage 2 constant growth rate (6%) in the calculation.

$$\text{Terminal value at the end of Year 5} = \frac{8.23}{(0.16 - 0.06)} = \$82.3m$$

Compute the value of the firm as the sum of the present values of FCFF in Stage 1 and the present value of the terminal value. Note that the high growth phase WACC (19%) is used in this calculation.

$$\text{Value of firm} = \frac{4.93}{(1.19)^1} + \frac{5.53}{(1.19)^2} + \frac{6.19}{(1.19)^3} + \frac{6.93}{(1.19)^4} + \frac{7.76 + 82.3}{(1.19)^5} = \$52.92m$$



Example 8 Two-stage FCFE model with declining growth in Stage 1

The following information relates to Violet Inc.:

Year	0	1	2	3	4	5	6
Revenues (\$ millions)	15						
Sales growth rate (%)		35%	30%	25%	30%	15%	10%
Net profit margin (%)		8.5%	8%	7.5%	7%	6.5%	6%
(FCInv - Dep) as a % of increase in sales		25%	25%	25%	25%	25%	25%
WCInv as a % of increase in sales		8%	8%	8%	8%	8%	8%

- Long-term constant growth rate = 6%
- Investors' required return on equity = 13%
- Debt ratio = 35%

If the company has 2 million shares outstanding, what is the per-share value of Violet Inc.'s stock today?

Solution

FCFE for each of the first 6 years is calculated as:

Year	0	1	2	3	4	5	6
Sales (\$ millions)	15.000	20.250	26.325	32.906	39.488	45.411	49.952
Net income		1.721	2.106	2.468	2.764	2.952	2.997
Less: FCInv – Dev		1.313	1.519	1.645	1.545	1.481	1.135
Less: WCInv		0.420	0.486	0.527	0.527	0.474	0.363
Add: Net Borrowings		0.606	0.702	0.760	0.760	0.684	0.524
FCFF (\$ millions)		0.595	0.803	1.056	1.352	1.681	2.023

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Illustration of calculations for Year 1:

1. FCInv – Dep = 25% × (20.25 – 15) = \$1.3125m
2. WCInv = 8% × (20.25 – 15) = \$0.42m
3. Net borrowings = 35% × (1.3125 + 0.42) = \$0.6063m

FCFE in Year 1 can be calculated two ways:

Method 1

$$\begin{aligned} \text{FCFE} &= \text{NI} - (\text{FCInv} - \text{Dep}) - \text{WCInv} + \text{Net borrowings} \\ &= 1.721 - 1.313 - 0.42 + 0.606 = 0.595\text{m} \end{aligned}$$

Method 2

$$\begin{aligned} \text{FCFE} &= \text{NI} - [(1 - \text{DR}) \times (\text{FCInv} - \text{Dep})] - [(1 - \text{DR}) \times \text{WCInv}] \\ &= 1.721\text{m} - [(1 - 0.35) \times 1.313\text{m}] - [(1 - 0.35) \times 0.420\text{m}] = \$0.595\text{m} \end{aligned}$$

Calculate the terminal value as of the end of Stage 1 based on Year 6 FCFE (2.023m), required return on equity (13%), and the long-term constant growth rate (6%):

$$\text{Terminal value in Year 5} = \frac{2023}{(0.13 - 0.06)} = \$28.901\text{m}$$

Next, calculate the value of equity as the sum of the present values of Stage 1 FCFE and the present value of the terminal value:

$$\text{Value of equity} = \frac{0.595}{(1.13)^1} + \frac{0.803}{(1.13)^2} + \frac{1.056}{(1.13)^3} + \frac{1.352}{(1.13)^4} + \frac{1.681 + 28.901}{(1.13)^5} = \$19.31\text{m}$$

Three-Stage Free Cash Flow Models

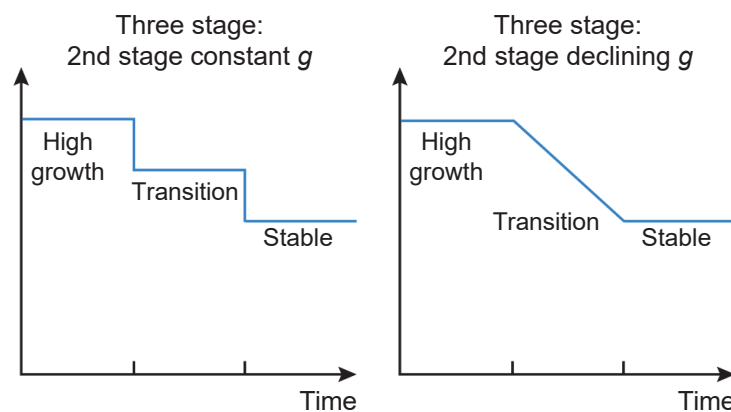


LOS: Explain the single-stage (stable-growth), two-stage, and three-stage FCFF and FCFE models and justify the selection of the appropriate model given a company's characteristics.

LOS: Estimate a company's value using the appropriate free cash flow model(s).

LOS: Describe approaches for calculating the terminal value in a multistage valuation model, and evaluate whether a stock is overvalued, fairly valued, or undervalued based on a free cash flow valuation model.

Exhibit 10 Three-stage Free Cash Flow models



Three-stage models are straightforward extensions of two-stage models. There are two primary versions of three-stage models:

- Each stage has a constant but different growth rate.
- Stages 1 and 3 have constant but different growth rates, and Stage 2 has a declining growth rate.

As is the case with two-stage models, the growth rate could refer to FCFF, FCFE, sales, profits, or any other component of free cash flow.

After calculating the intrinsic value per share from the differently staged free cash models, analysts can determine whether the stock is undervalued or overvalued. If the intrinsic value is greater than the market price, then the stock is undervalued. Conversely, if the intrinsic value is less than the market price, then the stock is overvalued.



Example 9 Calculating value based on the three-stage FCFE model

Jeremy Traders' most recent FCFE/per share amounted to \$1.25. An analyst has the following expectations regarding the company's growth in FCFE:

- FCFE will grow at a rate of 35% for the next 3 years, during which investors' required rate of return will be 25%.
- During the following 3 years, FCFE growth will decline by 10% per year toward its stable long-term growth rate. During this time, investors' required rate of return will be 20%.
- From Year 7 onward, FCFE will grow at a stable long-term growth rate of 5%, during which investors' required rate of return will be 10%.

The company's stock is currently trading at \$35.00 per share. Determine whether the stock is undervalued or overvalued based on the intrinsic value of the company's common stock.

Solution

FCFE per share for the next 7 years and relevant present values are:

Year	High growth period $g = 35\%$			Transitional period g declines by 10% each year			Stable growth $g = 5\%$	
	0	1	2	3	4	5	6	7
FCFE (\$)	1.250	1.688	2.278	3.075	3.844	4.421	4.642	4.874
Terminal value in Year 6							97.483	
Discount factors		0.800	0.640	0.512	0.427	0.356	0.296	
Present values		1.350	1.458	1.575	1.640	1.572	30.259	

Sum of Present Values 37.854

The terminal value as of the end of Stage 2 (Year 6) is computed based on FCFE in Year 7 (4.874), the Stage 3 required return on equity (10%), and the Stage 3 constant growth rate (5%):

$$\text{Terminal Value} = \frac{4.874}{(0.10 - 0.05)} = \$97.48$$

The value of the company's stock is estimated as the sum of the present values of forecasted FCFEs for each year during the first two stages and the present value of the terminal value. In calculating the present values, be careful about the discount rates applied to each year's cash flow.

$$\begin{aligned} \text{Value of stock} &= \frac{1.688}{(1.25)^1} + \frac{2.278}{(1.25)^2} + \frac{3.075}{(1.25)^3} \\ &+ \frac{3.844}{(1.25)^3 (1.2)^1} + \frac{4.421}{(1.25)^3 (1.2)^2} + \frac{4.642 + 97.483}{(1.25)^3 (1.2)^3} = \$37.854 \end{aligned}$$

Since the intrinsic value of \$37.85 is greater than the market price of \$35.00, the stock is undervalued.

Integrating ESG Factors in Free Cash Flow Models

Environmental, social, and governance (ESG) factors, both quantitative and qualitative, can materially impact valuation. Quantitative ESG factors (eg, carbon-emission fines, employee lawsuits) are easier to integrate into valuation models. In contrast, qualitative ESG factors are more difficult to integrate. The typical but highly subjective approach is for analysts to adjust the cost of equity by adding an estimated risk premium. If considerable ESG risks exist, analysts should consider downward adjustments to their valuation results.

Nonoperating Assets and Firm Value



LOS: Estimate a company's value using the appropriate free cash flow model(s).

Exhibit 11 Components of firm value

Equity value	}	Value of operating assets
Market value of debt		
Market value of preferred stock		
Excess cash	}	Value of nonoperating assets
Excess marketable securities		
+ Vacant land		
<hr/>		
Firm value		

So far, the discussion has focused on calculating firm value based on a firm's operating assets (ie, assets that generate cash flows). For firms that contain large amounts of nonoperating assets (ie, excess cash, excess marketable securities, speculative land), analysts should add the value of nonoperating assets to operating assets to estimate the firm's value. In an acquisition, an acquirer would still be required to pay for the nonoperating assets.

$$\text{Value of firm} = \text{Value of operating assets} + \text{Value of nonoperating assets}$$



Example 10 Value of nonoperating assets

Consider the following information regarding PS Manufacturing (PSM):

- Value obtained from FCFF model = \$510 million
- Market value of cash and short-term investments = \$75 million
- Book value of land held as an investment = \$35 million
- Market value of land held as an investment = \$50 million
- Bonds and notes outstanding = \$275 million
- Number of shares outstanding = 150 million

Based on this information, determine the value of PSM stock.

Solution

First, compute the total value of nonoperating assets (cash, short-term investments, and investment in land) held by the company:

$$\text{Value of nonoperating assets} = 75 + 50 = 125 \text{ million}$$

Then determine the total value of the company as the sum of value of operating assets (obtained from the FCFF model) and non operating assets:

$$\text{Total value of firm} = 510 + 125 = 635 \text{ million}$$

The value of equity is the value of the firm net of the value of debt:

$$\text{Equity value} = 635 - 275 = 360 \text{ million}$$

Therefore, the stock price is \$360 million / 150 million shares = \$2.40 per share.

Learning Module 2

Market-Based Valuation: Price and Enterprise Value Multiples



LOS: Contrast the method of comparables and the method based on forecasted fundamentals as approaches to using price multiples in valuation and explain economic rationales for each approach.

LOS: Calculate and interpret a justified price multiple.

LOS: Describe rationales for and possible drawbacks to using alternative price multiples and dividend yield in valuation.

LOS: Calculate and interpret alternative price multiples and dividend yield.

LOS: Calculate and interpret underlying earnings, explain methods of normalized earnings per share (EPS), and calculate normalized EPS.

LOS: Explain and justify the use of earnings yield (E/P).

LOS: Describe fundamental factors that influence alternative price multiples and dividend yield.

LOS: Calculate and interpret a predicted P/E, given a cross-sectional regression on fundamentals, and explain limitations to the cross-sectional regression methodology.

LOS: Calculate and interpret the justified price-to-earnings (P/E), price-to-book (P/B), and price-to-sales (P/S) for a stock, based on forecasted fundamentals.

LOS: Calculate and interpret the P/E-to-growth (PEG) ratio and explain its use in relative valuation.

LOS: Calculate and explain the use of price multiples in determining terminal value in a multistage discounted cash flow (DCF) model.

LOS: Evaluate whether a stock is overvalued, fairly valued, or undervalued based on comparisons of multiples.

LOS: Evaluate a stock by the method of comparables and explain the importance of fundamentals in using the method of comparables.

LOS: Explain alternative definitions of cash flow used in price and enterprise value (EV) multiples and describe limitations of each definition.

LOS: Calculate and interpret EV multiples and evaluate the use of EV/EBITDA.

LOS: Explain sources of differences in cross-border valuation comparisons.

LOS: Describe momentum indicators and their use in valuation.

LOS: Explain the use of the arithmetic mean, the harmonic mean, the weighted harmonic mean, and the median to describe the central tendency of a group of multiples.

Introduction



LOS: Contrast the method of comparables and the method based on forecasted fundamentals as approaches to using price multiples in valuation and explain economic rationales for each approach.

Valuation multiples are used to estimate a stock's value from a performance indicator, often based on some measure of earnings:

- Price multiples are ratios of a company's equity market price to a measure of value, based on performance (eg, company earnings), or asset values.
- EV multiples are ratios of the total market value of a company's capital (from all sources) to a measure of company value, based on performance (eg, EBITDA), or asset values.
- Momentum indicators are time-series indicators that relate either the stock price or a fundamental factor to its value in the past.

Multiples are commonly used to estimate whether a stock price is overvalued, fairly valued, or undervalued by the market.

Price and EV Value Multiples in Valuation

The Method of Comparables

The method of comparables refers to valuation based on multiples of comparable (similar) companies that serve as the benchmark in the valuation. The method of comparables is based on the "law of one price" (ie, similar assets should be priced similarly [or trade at similar multiples]).

For example, the value of a company's stock may be estimated by multiplying its EPS by the P/E multiple of a comparable company or a benchmark P/E multiple. This value can then be compared with the stock's current market price to assess whether the stock is overvalued, undervalued, or fairly valued relative to the benchmark. Equivalently, the stock's actual P/E ratio can be compared with the benchmark P/E multiple to assess relative value.

Note that this valuation is relative to comparable companies or to a benchmark. To be effective, the choice of comparable companies and/or benchmark must be appropriate, and their multiple must be efficiently priced.

The Method Based on Forecast Fundamentals

The method of forecasted fundamentals refers to valuation based on multiples that are derived from forecasts of the company's own fundamentals, rather than comparisons with other companies. Company fundamentals refer to characteristics of the business related to profitability, growth, or financial strength.

A justified price multiple for a stock refers to the estimate of the fair value of a price multiple that can be justified, either on the basis of the method of comparables or on the basis of the method of forecasted fundamentals. The justified price multiple is the value that the multiple would take if the stock were currently trading at its fair value. If the justified price multiple is larger (smaller) than the actual current multiple of the stock, the stock is undervalued (overvalued).



Example 1 Calculating P/E based on the method of comparables

Star Manufacturers' stock is currently trading at \$42. The company reported EPS of \$3 last year. Given that the average trailing P/E of peer companies is 12, comment on whether Star's stock is undervalued, overvalued, or fairly valued.

Solution

$$\text{Trailing P/E} = 42/3 = 14$$

Since Star's actual trailing P/E (14) is a higher-than-average trailing P/E of peer companies (12), it is relatively overvalued.

Alternately, estimate the value of Star's stock by applying the benchmark P/E to its EPS and compare it with its market price.

$$\text{Estimated value} = 3 \times 12 = \$36$$

Star's actual market price (\$42) is higher than its intrinsic value (\$36), so Star is relatively overvalued.



Example 2 Calculating P/E based on forecasted fundamentals

The stock of Jeremy Traders is currently trading at \$27 per share. The following information is also available:

- Next year's expected EPS = \$3
 - Dividend payout ratio = 40%
 - Required rate of return on equity = 12%
 - Long-term growth rate = 6%
1. Calculate the stock's leading P/E multiple based on its market price.
 2. Calculate the stock's leading P/E multiple based on its fundamental value using the Gordon growth model, and comment on whether its shares are undervalued, overvalued, or fairly valued.

Solution

$$\text{Leading P/E ratio} = 27/3 = 9$$

$$\text{Next year's expected dividend} = 3 \times 0.4 = 1.2$$

$$\text{Intrinsic Value} = \frac{D_1}{r - g} = \frac{1.2}{0.12 - 0.06} = 20$$

$$\text{Leading PE ratio} = \frac{20}{3} = 6.67$$

Since the stock's actual P/E ratio (9) is higher than the P/E ratio based on its fundamentals (6.67), it is overvalued.

Price/Earnings: The Basics



LOS: Calculate and interpret a justified price multiple.

LOS: Describe rationales for and possible drawbacks to using alternative price multiples and dividend yield in valuation.

LOS: Calculate and interpret alternative price multiples and dividend yield.

LOS: Calculate and interpret underlying earnings, explain methods of normalizing earnings per share (EPS), and calculate normalized EPS.

LOS: Explain and justify the use of earnings yield (E/P).

Price/Earnings

The price-to-earnings (P/E) ratio has several advantages and disadvantages. The advantages include:

- Earnings are key drivers of stock value.
- The ratio is simple to calculate and interpret and is widely accepted by investors.
- According to empirical research, differences in P/E ratios are significantly related to long-term average stock returns.

Some disadvantages include:

- Companies that have negative earnings have negative EPS and P/E ratios. Negative P/E ratios are not informative and thus not useful in relative valuation.
- It may be difficult to separate the recurring components of earnings that drive intrinsic value from the transient components.
- Management may use different accounting assumptions to prepare financial statements, which distorts reported EPS and reduces the comparability of P/E ratios across companies.

Alternative Definitions of P/E

There are alternative definitions of the P/E ratio based on the time horizon for the measurement of earnings:

- **Trailing P/E** is based on earnings over the last four quarters (or trailing 12 months [TTM]) and is generally used when earnings are expected to be volatile going forward and cannot be forecasted accurately.
- **Normalized P/E** is based on the average year earnings over a longer time. If a company has negative earnings in the most recent 12-month period, it may be more meaningful to use normalized earnings in the ratio.
- **Leading or forward P/E** is based on next year's expected earnings. The "next year" can be defined as (1) the next four quarters, (2) the next 12 months, or (3) the next fiscal year. The leading P/E ratio should be used if a company's business has changed fundamentally (eg, due to an acquisition or divesture) such that use of the trailing P/E (which is based on past EPS) would not be appropriate.

Calculating the Trailing P/E

Analysts should consider the potential dilution of EPS by dilutive securities, such as convertible bonds, convertible preferred shares, and stock options, that the company has issued. Because companies must

report both basic and diluted EPS, this information is readily available. Note that P/E calculated with diluted EPS will be greater than P/E calculated with basic EPS.

ANALYST ADJUSTMENTS FOR NONRECURRING ITEMS

The analyst's focus should be on estimating recurring earnings, which should eliminate nonrecurring items. Some examples of nonrecurring items include gains and losses from the sale of assets, asset write-downs, goodwill impairment, provisions for future losses, and changes in accounting estimates.

ANALYST ADJUSTMENTS FOR BUSINESS-CYCLE INFLUENCES

In addition to company-specific effects, transitory effects on earnings can come from business-cycle or industry-cycle influences. Business-cycle effects can be expected to recur in subsequent cycles, but the most recent four quarters might not reflect the long-term earning power. Trailing EPS for cyclical stocks will be lower at the bottom of a cycle and higher at the top of the cycle, causing the P/E to be higher at the bottom of the cycle and lower at the top of the cycle. This countercyclical property of P/E ratios is known as the **Molodovsky effect**.

One way to adjust for this is by estimating a normal or normalized (mid-cycle) EPS. The two most common ways to calculate mid-cycle EPS are:

- Historical average EPS
- Average return on equity

ANALYST ADJUSTMENTS FOR COMPARABILITY

Analysts should be aware of accounting assumptions, such as inventory valuation or depreciation methods, that affect the comparability of peer companies' earnings.

DEALING WITH EXTREMELY LOW, ZERO, OR NEGATIVE EARNINGS

Zero and negative earnings can pose problems if the analyst is ranking P/E ratios. Generally, a lower P/E ratio is preferable because it indicates that the investor is paying a lower price for earnings. However, if the company has negative earnings, the P/E ratio will also be negative despite having a higher relative price than other companies with positive earnings. For this reason, the P/E ratio is not meaningful if the company has negative earnings.

One approach to accommodating negative earnings is to use normalized earnings; another is to use forward EPS and forward P/E if historical EPS is negative.

Yet another solution is to use the inverse of the P/E ratio, (E/P), the **earnings yield**. This ratio shows earnings (per share) as a percentage of price (per share), and, in that sense, is a measure of return on investment, which can be ranked for comparison.

Forward P/E

Because valuation is forward-looking, the forward P/E ratio is a logical alternative to the trailing P/E ratio. The forward P/E ratio can be based on earnings estimated for the next four quarters, the next 12 months (NTM), or the next fiscal year. If the next calendar year encompasses two different fiscal years, earnings can be based on a weighted average of the fiscal years' projected earnings. For companies with volatile earnings, forward P/E estimates may be less reliable.

Calculating the Trailing and Forward P/E



Example 3 Calculating trailing and forward price-to-earnings ratios

On December 31, 20X8, the stock of Alpha Associates was trading at \$32.80. The following information is provided:

- EPS for 20X8 = \$2.50
- Expected EPS in the first quarter of 20X9 = \$0.47
- Expected EPS in the second quarter of 20X9 = \$0.75
- Expected EPS in the third quarter of 20X9 = \$0.83
- Expected EPS in the fourth quarter of 20X9 = \$0.80

Calculate Alpha's:

1. Trailing P/E ratio.
2. Forward P/E ratio.

Solutions

1.

$$\text{Trailing P/E ratio} = \frac{\text{Current stock price}}{EPS_{2009}} = \frac{32.80}{2.50} = 13.12$$

2.

$$\text{Forward P/E ratio} = \frac{\text{Current stock price}}{\text{Expected EPS}} = \frac{32.80}{(0.47 + 0.75 + 0.83 + 0.80)} = 11.51$$

To make the P/E ratios comparable, analysts should apply the same definition (trailing or forward P/E ratio) to all companies and time periods covered in the analysis.

Price/Earnings: Valuation Based on Forecasted Fundamentals



LOS: Describe fundamental factors that influence alternative price multiples and dividend yield.

LOS: Calculate and interpret a predicted P/E, given a cross-sectional regression on fundamentals, and explain limitations to the cross-sectional regression methodology.

Justified P/E

The simplest of all the discounted cash flow (DCF) models is the constant growth model using dividends:

$$P_0 = \frac{D_1}{(r-g)}$$

This model can easily be adjusted to calculate a justified forward P/E ratio:

$$\frac{P_0}{E_1} = \frac{D_1/E_1}{(r-g)} = \frac{1-b}{(r-g)}$$

This formula can easily be adjusted for a trailing P/E ratio.

$$\frac{P_0}{E_0} = \frac{D_0(1+g)/E_0}{(r+g)} = \frac{(1+b)(1+g)}{(r-g)}$$

Where:

P_0 = Current price

E_0 = Trailing earnings

E_1 = Forward earnings

D_1 = Expected dividend

D_0 = Recent dividend

r = Required rate of return

g = Dividend growth rate

b = Earnings retention rate

The justified (fundamental) P/E ratio can be compared to the observed P/E ratio to determine whether the stock is undervalued, fairly valued, or overvalued.

The logic from other valuation models carries over to the justified P/E ratio: a higher growth rate or a lower required return translates to a greater intrinsic value for the stock and a greater justified P/E ratio.

Predicted P/E Based on Cross-Sectional Regression

The predicted P/E ratio is conceptually similar to the justified P/E ratio, except that, instead of using the Gordon growth model to derive an estimated P/E ratio, the analyst derives a regression formula using any set of explanatory values. As with all regressions, the analyst should try to avoid multicollinearity among the independent variables.

Although the cross-sectional regression can summarize a large amount of data into a single equation, it is not used frequently since:

- The valuation relationship captured by this method applies only to the specific stock in a specific time-period.
- Regression coefficients and their explanatory power diminish over time.
- Multicollinearity between independent variables complicates the interpretation of individual regression coefficients.

Price/Earnings: Using the P/E in Valuation



LOS: Calculate and interpret the justified price-to-earnings ratio (P/E), price-to-book ratio (P/B), and price-to-sales (P/S) for a stock, based on forecasted fundamentals.

LOS: Calculate and interpret the P/E-to-growth (PEG) ratio and explain its use in relative valuation.

LOS: Calculate and explain the use of price multiples in determining terminal value in a multistage discounted cash flow (DCF) model.

LOS: Evaluate whether a stock is overvalued, fairly valued, or undervalued based on comparisons of multiples.

Using any multiple in the method of comparables involves the following steps:

- Select and calculate the price multiple that will be used.
- Select the comparison asset or assets and calculate the value of the multiple for the comparison asset(s). If using a group of assets use the mean or median of the multiple for those assets. In either case, that will become the benchmark value of the multiple.
- Use the benchmark value of the multiple (adjusted if necessary) to estimate a value for the company's stock.
- Assess whether differences between the estimated value and the current price can be explained by fundamental differences and modify conclusions accordingly.

Peer-Company Multiples

Multiplying the benchmark P/E ratio by the company's EPS provides an estimate of the stock's value that can be compared with the stock's market price. If the subject stock has higher-than-average (or higher-than-median) expected earnings growth than a P/E ratio higher than the benchmark, P/E ratio is justified. If the risk is higher than the average (or median) than a P/E ratio lower than the benchmark, P/E ratio is justified.

The P/E-to-growth (PEG) ratio attempts to incorporate earnings growth on the P/E ratio. The PEG ratio is calculated as the ratio of the P/E ratio to the expected earnings growth rate. In effect, it is a calculation of units of P/E ratio per units of growth; some consider a PEG ratio of less than 1 to be an attractive level. This ratio must be used with caution because the PEG ratio:

- incorrectly assumes a linear relationship between the P/E ratio and the expected growth rate
- does not factor in differences in duration of growth
- does not take into account differences in risk

Industry and Sector Multiples

The mechanics of using industry multiples are identical to those used for peer group comparisons; however, some databases report only the mean multiple when an analyst might prefer to use the median industry multiple as the benchmark.

Comparisons with broader segments of the economy can also provide insights, but the more likely the important differences in fundamentals, the more dissimilar the subject company in relation to the benchmark.

Overall Market Multiple

The logic of the comparables approach dictates that similar assets should be priced at similar multiples, and although this is more likely to hold for peer groups, industries, and sectors than for a broader market, some analysts use an equity market index multiple as the comparison asset. The mechanics of using the method of comparables do not change when comparing to an equity index, but the user should take into account the differences between the benchmark and the subject company.

Factors to consider when using an index P/E as a benchmark include the index weighting, the efficient pricing of the index, and the time horizon the market multiple reflects.

Most equity indexes are market-cap weighted, and databases often report the weighted average market P/E ratio with the individual company P/E ratios weighted by the market cap. This gives larger market cap companies more weight in the market P/E ratio calculation. However, there is some evidence that P/Es differ systematically by market cap (eg, the use of the “size” factor used in the Fama-French factor model), which would need to be factored into the comparison to the benchmark.

As with any comparison, it is important to note whether the index constituents are efficiently priced, or whether their P/Es are influenced by interest rates, by the stage of the business cycle, or by some other macro event that causes the entire market to be over- or undervalued, for example.

The time frame is relevant to identifying whether the index constituents are under- or overvalued relative to their own historical averages.

There have also been attempts to estimate whether the market itself is under- or overvalued, using extensions of the method of comparables. The Fed model (created by three analysts at the US Federal Reserve) explores the relationship between the P/E and the rate of the 10-year US Treasury yield, based on the inverse relationship between equity value and interest rates. The Yardeni model explores the relationship between earnings yields and corporate bond yields and expected earnings growth.

Exhibit 1 Fed and Yardeni models

Model	Justified P/E	Components
Fed	$\frac{P}{E} = \frac{1}{Y_{10}}$	Y10 = 10-year US T-Bond yield
Yardeni	$\frac{P}{E} = \frac{1}{(CBY - b \times LTEG)}$	CBY = A-rated corporate bonds yield LTEG = Market index 5-year earnings growth rate b = Weight the market give to LTEG

Own Historical P/E

A common alternative to comparing a subject company to other company’s stocks is to use past values of its own P/E multiple. This approach assumes that the multiple will regress toward its historical average. In addition to a relative comparison, this approach can also be used to calculate a justified price.

The assumption that a stock’s P/E should regress to its historical P/E assumes that company-specific factors (business mix, leverage, etc.) and external factors (inflation, interest rates, etc.) will remain constant over time.

P/Es in Cross-Country Comparisons

When comparing P/E ratios of companies in different countries, analysts should be aware of the effects of accounting standards on EPS and should also take into account that the benchmarks used will also be affected by different macroeconomic contexts (eg, different rates of inflation).

Using P/Es to Obtain Terminal Value in Multistage Dividend Discount Models

When multistage models in a DDM or spreadsheet modeling are used to value a stock, the process requires a terminal value, which reflects long-term growth. Analysts often use a terminal price multiple based on fundamentals or on comparables.

Price/Book Value



LOS: Calculate and interpret a justified price multiple.

LOS: Describe rationales or and possible drawbacks to using alternative price multiples and dividend yield in valuation.

LOS: Calculate and interpret alternative price multiples and dividend yield.

LOS: Describe fundamental factors that influence alternative price multiples and dividend yield.

LOS: Calculate and interpret the justified price-to-earnings ratio (P/E), price-to-book ratio (P/B), and price-to-sales (P/S) for a stock, based on forecasted fundamentals.

LOS: Evaluate a stock by a method of comparables and explain the importance of fundamentals in using a method of comparables.

LOS: Evaluate whether a stock is overvalued, fairly valued, or undervalued based on comparisons of multiples.

The price-to-book (P/B) value multiple has a long history of use in valuation. This approach has several advantages and disadvantages. The advantages include:

- Book value usually remains positive even when the company reports negative earnings.
- Book value is typically more stable over time compared to reported earnings.
- For financial sector companies that have significant holdings of liquid assets, such as banks or insurers, P/B is more meaningful because book values reflect recent market values.
- P/B is useful in valuing companies that are expected to go out of business.
- Studies suggest that differences in P/B ratios over time are related to differences in long-term average returns on stocks.

The disadvantages include:

- Book values ignore some intangible “assets” such as the quality of a company’s human capital and brand image, as they are not reflected on the balance sheet.
- P/B can lead to misleading valuations if significantly different levels of assets are used (due to differing business models) by the companies being studied. For example, a company that outsources production will have fewer fixed assets and a higher P/B ratio than a similar firm that does not outsource.