

1. Introduction

In the previous reading, we used dividends as a measure of cash flow for valuation of companies. In this reading, we will use free cash flow to the firm (FCFF) and free cash flow to equity (FCFE) as measures of cash flows. While dividends are the cash flows actually paid to shareholders, free cash flows are the cash flows *available* for distribution to shareholders.

Analysts like to use free cash flow valuation models whenever one or more of the following conditions hold true:

- The company does not pay dividends.
- The company pays dividends, but the dividends paid differ significantly from the company's capacity to pay dividends.
- Free cash flows align with profitability within a reasonable forecast period with which the analyst is comfortable.
- The investor takes a control perspective.

In this reading, we will learn how to calculate FCFF and FCFE, and look at various valuation models based on discounting of FCFF and FCFE.

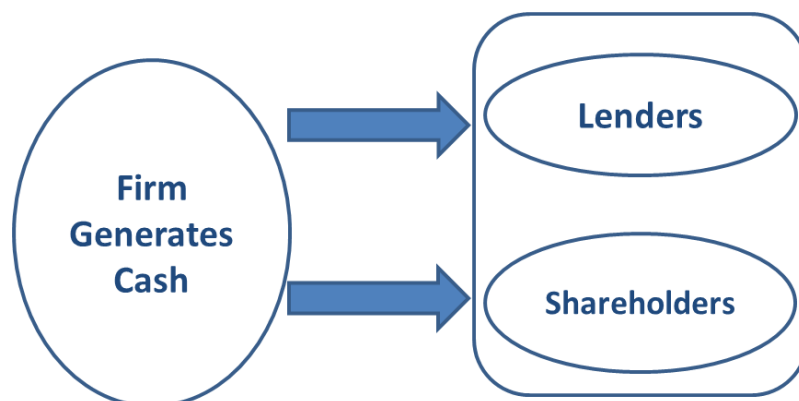
1.1 FCFF and FCFE Valuation Approaches

Defining Free Cash Flow

Free cash flow to the firm (FCFF) is the cash flow available to the company's suppliers of capital after all operating expenses have been paid and necessary investments in working capital and fixed capital have been made.

Free cash flow to equity (FCFE) is the cash flow available to the company's common stockholders after all operating expenses, interest, and principal payments have been paid and necessary investments in working and fixed capital have been made.

Valuation approaches:



FCFE represents free cash flow available to shareholders. It is discounted at the cost of equity to obtain the value of equity.

FCFF, on the other hand, represents free cash flow available to both lenders and shareholders. It is discounted at the weighted average cost of capital (WACC) to obtain the value of the total firm. WACC takes into account both cost of equity and cost of debt. By subtracting the market value of debt from the value of the firm, we can calculate the value of equity.

Value of equity = Value of the firm – Market value of debt

Instructor's Note: Ensure that you use the correct discount rates. FCFF should always be discounted using WACC and FCFE should always be discounted using cost of equity.

The FCFF approach is preferred over the FCFE approach when:

- A company has negative FCFE
- A company has a changing capital structure

Present Value of Free Cash Flow

Let us now look at the formulas for the two approaches. The formulas are similar to the DDM model covered in the previous reading.

FCFE approach:

The value of equity can be found by discounting FCFE at the required return on equity:

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

FCFF approach:

The value of the firm can be found by discounting FCFF at the WACC as shown below:

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

The weighted average cost of capital (WACC) is calculated as:

$$\text{WACC} = \frac{\text{MV (debt)}}{\text{MV (debt)} + \text{MV (equity)}} * r_d(1 - \text{tax rate}) + \frac{\text{MV (equity)}}{\text{MV (debt)} + \text{MV (equity)}} * r$$

where:

MV (debt) = market value of debt

MV (equity) = market value of equity

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

Constant-Growth FCFF Valuation Model:

The constant-growth FCFF model assumes that FCFF grows at a constant rate g such that FCFF in any period is equal to FCFF in the previous period multiplied by $(1 + g)$:

$$\text{FCFF}_t = \text{FCFF}_{t-1}(1 + g).$$

The firm value can be calculated using the Gordon growth model:

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

Subtracting the market value of debt from the firm value gives the value of equity. Dividing the total value of equity by the number of outstanding shares gives the value per share.

Constant-Growth FCFE Valuation Model

The constant-growth FCFE model assumes that FCFE grows at a constant rate, g , such that FCFE in any period is equal to FCFE in the previous period multiplied by $(1 + g)$:

$$\text{FCFE}_t = \text{FCFE}_{t-1}(1 + g).$$

The value of equity can be calculated as:

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

Instructor's Note: The growth rate of FCFF and the growth rate of FCFE are usually not the same.

2. Forecasting Free Cash Flow and Computing FCFF from Net Income

In this section, we will see how to compute FCFF and FCFE from various accounting measures of income. To keep things simple, we will assume that the firm has only two sources of capital: debt and common stock.

2.1 Computing FCFF from Net Income

Net income is the bottom line in an income statement. It represents income after depreciation, amortization, interest expense, and income taxes.

FCFF can be calculated from net income by making the following adjustments:

FCFF = Net income available to common shareholders

Plus: Net noncash charges

Plus: Interest expense * (1 – tax rate)

Less: Investment in fixed capital (FCInv)

Less: Investment in working capital (WCInv)

This equation can also be written as:

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

The rationales for these adjustments are:

- Noncash charges reduce reported net income but they don't actually result in an outflow of cash. Therefore, they are added back to net income. The largest noncash charge is usually the depreciation expense. Other noncash charges are covered in Section 3.3.
- Interest expense, net of tax, is subtracted to arrive at net income. However, interest is a cash flow available to capital (debt) providers. Hence, the after-tax interest expense is added back to net income.
- Net investment in fixed capital is subtracted. This represents outflows of cash to purchase fixed capital necessary to support the firm's current and future operations. While calculating the net fixed capital investment we deduct any amount the company receives in cash by selling any of its long-term assets.

Investment in working capital is subtracted. Working capital is usually defined as current assets minus current liabilities. However, for the purposes of calculating free cash flows, we define working capital to exclude cash, notes payable and current portion of long-term debt. Cash is excluded because a change in cash is what we are trying to explain. Notes payables and current portion of long-term debt are excluded because they are short-term liabilities with explicit interest costs. This makes them financing items rather than operating items.

3. Computing FCFF from the Cash Flow Statement

Analysts often use cash flow from operations (CFO) as a starting point to compute free cash flows because CFO is already adjusted for noncash charges like depreciation, as well as for net investments in working capital.

$$\text{CFO} = \text{NI} + \text{NCC} - \text{WCInv}$$

Therefore, the equation for calculating FCFF from net income can be simplified as shown below:

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

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

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

Note: It is important to understand the treatment of interest expense while calculating FCFF from CFO. If the interest expense was classified as an operating cash flow, then the above formula stays the same. However, if the interest expense was classified as a financing cash flow (applicable only for IFRS) then we do not add back the interest expense; and the formula changes to: $\text{FCFF} = \text{CFO} - \text{FCInv}$

The IFRS and US GAAP treatment of interest and :

- Interest received:
 - IFRS: Operating or investing
 - US GAAP: Operating
- Interest paid:
 - IFRS: Operating or financing
 - US GAAP: Operating
- Dividends received:
 - IFRS: Operating or investing
 - US GAAP: Operating
- Dividends paid:
 - IFRS: Operating or financing
 - US GAAP: Financing

4. Additional Considerations in Computing FCFF

Noncash Charges

The following table reproduced from the curriculum shows how several noncash items are adjusted while calculating FCFF from net income:

Noncash Item:

- Depreciation: Added back
- Amortization and impairment of intangibles: Added back
- Restructuring charges (expense): Added back

Adjustment Item:

- Restructuring charges (income resulting from reversal): Subtracted
- Losses: Added back
- Gains: Subtracted
- Amortization of long-term bond discounts: Added back
- Amortization of long-term bond premiums: Subtracted
- Deferred taxes: Added back, but calls for special attention

The rationales for these adjustments are:

- Amortization, like depreciation, is a noncash expense that must be added back to net income.
- Restructuring charges may be cash expenditures or noncash charges. If the firm records a restructuring expense/income that is a noncash event such as an asset-write down, then that amount should be added/subtracted to net income to determine FCFF. If the restructuring expense is meant to cover future firm expenses, then forecasts of future FCFF should be reduced by those amounts.
- Gains or losses on sale of long-term assets must be removed. For example, if a firm records a gain of \$30,000 for selling an asset, then the gain is a noncash item and must be subtracted.
- Amortization of bond discounts and premiums affect net income but do not result in actual cash flows. If a company has issued bonds, the amortization of bond discounts should be added back while the amortization of bond premium should be subtracted.
- Stock option: Granting of stock options does not result in cash outflow, but the exercise of stock options results in a cash inflow for the firm. This is considered as a financing cash flow under both IFRS and US GAAP. However, an analyst should consider the impact of options on the number of shares outstanding. When forecasting FCFF per share, the expected number of shares must be used rather than the current number of shares outstanding.
- Deferred taxes result from differences in the timing of reporting income and expenses in the company's financial statements and the company's tax return. Over time, these differences between book income and taxable income should offset each other and have no effect on the overall cash flows. However, increases in deferred

tax assets that are not expected to reverse should be subtracted from net income. Similarly, increases in deferred tax liabilities that are not expected to reverse should be added back to net income.

5. Computing FCFE from FCFF

FCFE is free cash flow available to shareholders, whereas FCFF is free cash flow available to all capital providers. The cash flows that arise from transactions with debtholders are deducted from FCFF to arrive at FCFE.

$$\begin{aligned}\text{FCFE} = & \text{Free cash flow to the firm (FCFF)} \\ & \text{Less: Interest expense} * (1 - \text{Tax rate}) \\ & \text{Plus: Net borrowing}\end{aligned}$$

This equation can also be written as:

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

As the above equation shows, FCFE is found by starting from FCFF, subtracting after-tax interest expenses, and adding net new borrowing. Since interest is paid to debtholders and is not available to shareholders, the after-tax interest part is subtracted. Net borrowing is added because this cash flow is available to shareholders. When the debt is paid back, net borrowing can be negative.

Calculating FCFE from net income

We can adjust the “FCFF from net income” formula to get a formula for “FCFE from net income” as shown below:

$$\begin{aligned}\text{FCFF} &= \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv} \\ \text{FCFE} &= [\text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv}] - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \\ \text{FCFE} &= \text{NI} + \text{NCC} - \text{FCInv} - \text{WCInv} + \text{Net borrowing}\end{aligned}$$

Calculating FCFE from CFO

Similarly, we can adjust the “FCFF from CFO” formula to get a formula for “FCFE from CFO” as shown below:

$$\begin{aligned}\text{FCFF} &= \text{CFO} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} \\ \text{FCFE} &= [\text{CFO} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv}] - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \\ \text{FCFE} &= \text{CFO} - \text{FCInv} + \text{Net borrowing}\end{aligned}$$

6. Finding FCFF and FCFE from EBIT or EBITDA

In the previous sections, we started from the last line item on the income statement and made adjustments to it. Now, we go up the income statement and derive FCFF from other

income statement items such as EBIT or EBITDA.

Calculating FCFF from EBIT

We start with the “FCFF from net income” formula and assume that depreciation is the only noncash charge.

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

Net income (NI) can be expressed as

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

Substituting this expression for NI in the equation for FCFF, we have:

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

Some important points to note about this formula are:

- EBIT is before interest and taxes.
- We don't adjust for interest since we are calculating cash flows to all providers of capital.
- However, we do have to adjust for taxes by calculating after tax EBIT.
- Depreciation is added back because it was subtracted to get EBIT.
- Adjustments for FCInv and WCInv are required as before.

Calculating FCFF from EBITDA

We start with the “FCFF from net income” formula and assume that depreciation is the only noncash charge.

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

Net income can be expressed as

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

Substituting this expression for NI in the equation for FCFF, we have:

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

Some important points to note about this formula are:

- EBITDA is before interest, taxes and depreciation.
- We don't adjust for interest.
- We adjust for taxes by calculating after tax EBITDA.
- Only the depreciation tax shield ($\text{Dep} \times \text{Tax rate}$) is added because the company saves on taxes by showing depreciation as an expense, which adds to its cash flows.
- Adjustments for FCInv and WCInv are required as before.

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

So far, we used the sources of cash flow such as net income or cash flow from operations as starting points for calculating FCFF and FCFE. We will now take a slightly different approach by examining the *uses* of free cash flow. For instance, free cash flow to equity may be used to pay out dividends, acquire other companies, and repurchase shares and so on. Analyzing free cash flow on a uses basis serves as a consistency check on the sources calculation. The uses of FCFF must equal the sources of FCFF.

Uses of FCFF = Δ cash balance + net payments to debt providers + net payments to equity holders

where:

Δ cash balance = cash flow from operations \pm cash from financing activities \pm cash from investing activities.

Net payments to debt providers = $\text{Int} (1 - \text{Tax rate}) + \text{debt repayments} - \text{debt issuance}$

Net payments to equity holders = $\text{dividends paid} + \text{share repurchases} - \text{share issuances}$

8. Forecasting FCFF and FCFE

There are two approaches to forecast FCFF and FCFE:

- Assume that the free cash flows will grow at a constant rate forever.
- Forecast the individual components of the free cash flow separately.

Constant growth: This approach assumes that the free cash flows (FCFF and FCFE) will grow at a constant rate forever. The simplest assumption is to use the historical growth rate if the relationships between free cash flow and the fundamental factors are expected to continue.

For example, assume that the historical growth rate is 15 percent a year and last year's FCFF was \$155 million. If FCFF continues to grow at historic levels, then the next year estimate for FCFF will be $155 \times 1.15 = \$178.25$ million.

Forecast individual components: The second approach is to forecast the individual components of free cash flow, such as EBIT, net noncash charges, investment in fixed capital, and investment in working capital separately.

We look at a simple sales-based forecasting method for FCFF and FCFE based on the following major assumption:

“Investment in fixed capital in excess of depreciation (FCInv – Dep) and investment in working capital (WCInv) both bear a constant relationship to increases in sales.”

In addition, for FCFE forecasting, we assume that the capital structure represented by the debt ratio (DR)—debt as a percentage of debt plus equity—is constant. Under this assumption, DR indicates the percentage of (FCInv – Dep) and WCInv that will be financed with debt. We also assume that depreciation is the only non-cash charge. This method does

not work well when there are other noncash charges.

The steps to forecast FCFF and FCFE are:

- Forecast the increase in sales using growth rate estimates
- Forecast the after-tax operating margin EBIT (1- tax rate) for FCFF and net profit margin for FCFE.
- Estimate the incremental FCInv in relation to sales increases using the formula:
(Capital expenditure – Depreciation expense)/(Increase in sales)
- Estimate the incremental WCInv in relation to sales increases using the formula:
(Increase in working capital)/(Increase in sales)
- Estimate DR

FCFF can be estimated as:

$$\text{FCFF} = \text{EBIT} (1 - \text{tax rate}) - \Delta \text{FCInv} - \Delta \text{WCInv}$$

Assuming the DR is maintained, FCFE can be estimated as:

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

9. Other Issues in Free Cash Flow Analysis

Analysts should be aware of the following issues when forecasting FCFF and FCFE:

Adjustments to CFO: Analysts should adjust the reported CFO number by removing the impact of financing and/or investing activities. The resulting analyst-adjusted CFO should be the starting point for free cash flow calculations.

Free cash flow versus dividends and other earnings components: Analysts prefer FCFE over dividend discount models because:

- Some companies pay no or few dividends.
- Dividend payments are at the discretion of the company's board of directors, and may not be indicative of the company's long-term profitability.
- Free cash flow to equity is the amount available for distribution without impairing a company's value.
- FCFE is an appropriate cash flow measure when a company is a target for a takeover.

Effect of dividends, share repurchases and leverage on FCFF and FCFE:

Dividends, share repurchases, and leverage do not affect FCFF and FCFE to a great extent.

In the formulas for FCFF and FCFE, dividends and share repurchases are absent because these are the uses of cash flows, and not what is available to the shareholders. Similarly, with stock issuance, investors are putting in money into the firm. It does not reflect what is available to the equity holders.

An increase in leverage increases the tax savings for FCFF. It affects FCFE in two ways: increases FCFE by the amount of debt issued and reduces the cash flow to equity by the after-tax interest expense, i.e. interest payments to debtholders in the future.

FCFF/FCFE vs. EBITDA as a measure of cash flow

FCFF and FCFE are measures of cash flow designed for the valuation of the firm or its equity. The curriculum states that, “because using free cash flow analysis requires considerable care and understanding, some practitioners erroneously use earnings components such as NI, EBIT, EBITDA, or CFO in a discounted cash flow valuation. Such mistakes may lead the practitioner to systematically overestimate or underestimate value.”

A common shortcut is to use EBITDA as a proxy for FCFF. However, EBITDA is a poor proxy for FCFF because it does not account for depreciation, investments in fixed capital and working capital, and cash outflow due to taxes. This is evident when we look at the following equation:

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

Similarly, net income is a poor proxy for FCFE because it does not account for fixed capital, working capital investment and net borrowings. This is evident when we look at the following equation:

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

Free cash flow and complicated capital structures

In our discussion so far, we assumed that the company has a simple capital structure with two sources of capital: debt and equity. However, some companies may have additional capital sources, such as preferred stocks.

The following example demonstrates how to calculate WACC, FCFE, and FCFF when the company has preferred stock.

10. Free Cash Flow Model Variations

10.1 An International Application of the Single-Stage Model

When valuing stocks in countries with high or variable inflation, analysts often use real cash flows and discount at real discount rates. Given below is one way of coming up with a real required rate of return for stocks from a particular country. We start with country return and make adjustments to for the stock's industry, size, and leverage using a build-up model.

Country return (real)	x.xx %
+ / - Industry adjustment	x.xx %
+ / - Size adjustment	x.xx %
+ / - Leverage adjustment	x.xx %
Required rate of return (real)	x.xx %

Using real growth rate values, the formula for the value of a stock is stated as:

$$V_0 = \frac{FCFE_0(1 + g_{\text{real}})}{r_{\text{real}} - g_{\text{real}}}$$

where:

g_{real} = real growth rate

r_{real} = real discount rate

10.2 Sensitivity Analysis of FCFF and FCFE Valuations

The value of a firm or equity depends on estimates for future growth rates, duration of growth, and base-year values for FCFF and FCFE. Growth rate and duration of growth depend on the growth phase of the company and the profitability of the industry.

Analysts perform a sensitivity analysis to examine how valuation changes with each of these inputs. Some input variables have a much larger impact on stock valuation than others.

11. Two-Stage Free Cash Flow Models

There are two versions of two-stage free cash flow models. In the first version, we assume that the growth rate is constant in stage 1 and it declines to a sustainable rate at the beginning of stage 2. The transition from growth rate in stage 1 to the sustainable growth rate in stage 2 is abrupt.

The general expression for the two-stage FCFF and FCFE valuation models are as follows:

$$\begin{aligned}\text{Firm value} &= \sum_{t=1}^n \frac{\text{FCFF}_t}{(1 + \text{WACC})^t} + \frac{\text{FCFF}_{n+1}}{\text{WACC} - g} * \frac{1}{(1 + \text{WACC})^n} \\ \text{Equity value} &= \sum_{t=1}^n \frac{\text{FCFE}_t}{(1 + r)^t} + \frac{\text{FCFE}_{n+1}}{r - g} * \frac{1}{(1 + r)^n}\end{aligned}$$

The formulas indicate that the firm or equity value comprises two terms:

- The present value of cash flow stream during the initial growth period at a higher growth rate.

- The present value of the cash flows growing in perpetuity at the long-term sustainable growth rate.

Since the terminal value constitutes a large portion of the value of the stock or the firm, it is critical to estimate it accurately.

In the second version, the rapid growth rate in stage 1 declines gradually over time to a steady rate in stage 2. For instance, a highly profitable company may have low or negative free cash flows. When profitability slows because of increased competition, investment slows and FCFE increases. The value of the company depends on these free cash flows, which increase after the initial high growth period.

Instructor's Note: The calculations for these models are similar to the two-stage DDM models covered in the previous reading.

12. Three-Stage Free Cash Flow Models

The three-stage models are an extension of the two-stage models. These models are appropriate when cash flow streams fluctuate from year to year. There are two versions of three-stage FCF models.

In one version, we assume a constant growth rate in each of the three stages. The growth rates could be for sales, profits, and investments in fixed and working capital; external financing could be a function of the level of sales or change in sales. A simpler model would apply the growth rate to FCFF or FCFE.

A second common model is a three-stage model with constant growth rates in stages 1 and 3 and a declining growth rate in stage 2. Again, the growth rates could be applied to sales or to FCFF or FCFE.

Instructor's Note: The calculations for these models are similar to the three-stage DDM models covered in the previous reading.

13. Integrating ESG considerations in Free Cash Flow Models

Incorporating environmental, social, and governance (ESG) considerations in valuation models can have a significant impact on company valuation. ESG factors can be quantitative or qualitative.

Quantitative ESG information is straight-forward to incorporate in a valuation model, for example, it can be easy to estimate the fine resulting from environmental pollution.

In contrast, qualitative ESG information is more difficult to incorporate. One way of doing this is to adjust the cost of equity by adding a risk premium. This method however, requires judgment on part of the analyst to determine the amount of the risk premium.

14. Nonoperating Assets and Firm Value

In free cash valuation, the focus is on the value of assets needed to generate operating cash flows. If a company has significant nonoperating assets, such as excess cash, excess marketable securities, or land held for investment, then the value of the firm is calculated as the value of its operating assets (e.g., as estimated by FCFF valuation) plus the value of its nonoperating assets:

Value of firm = Value of operating assets + Values of nonoperating assets

Summary

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

Free cash flow to the firm (FCFF) is the cash flow available to the company's suppliers of capital after all operating expenses have been paid and necessary investments in working capital and fixed capital have been made. It is discounted at the weighted average cost of capital (WACC), to obtain the value of the total firm. WACC takes into account both cost of equity and cost of debt. By subtracting the market value of debt from the value of the firm, we can calculate the value of equity.

Value of equity = Value of the firm – Market value of debt

Free cash flow to equity (FCFE) is the cash flow available to the company's common stockholders after all operating expenses, interest, and principal payments have been paid and necessary investments in working and fixed capital have been made. It is discounted at the cost of equity to obtain the value of equity.

FCFF is preferred over FCFE for a levered company with negative FCFE, or with changing capital structure.

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

Analysts like to use free cash flow as the return (either FCFF or FCFE) whenever one or more of the following conditions hold true:

- The company does not pay dividends.
- The company pays dividends, but the dividends paid differ significantly from the company's capacity to pay dividends.
- Free cash flows align with profitability within a reasonable forecast period with which the analyst is comfortable.
- The investor takes a control perspective.

LO: 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.

LO: Calculate FCFF and FCFE.

FCFF can be calculated as:

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

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

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

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

FCFE can be calculated as:

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

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

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

LO: Describe approaches for forecasting FCFF and FCFE.

There are two approaches to forecast FCFF and FCFE:

- Assume that the free cash flows will grow at a constant rate forever.
- Forecast the individual components of the free cash flow separately.

Under the second approach,

FCFF can be estimated as:

$$\text{FCFF} = \text{EBIT} (1 - \text{tax rate}) - \Delta \text{FCInv} - \Delta \text{WCInv}$$

Assuming the DR is maintained, FCFE can be estimated as:

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

LO: Compare the FCFE model and the dividend discount models.

Analysts prefer the FCFE model over dividend discount model for the following reasons:

- Some companies pay no or less dividends.
- Dividends are substantially lower or more than their free cash flow.
- Free cash flow to equity is the amount available for distribution without impairing a company's value.
- FCFE is an appropriate cash flow measure when a company is a target for a takeover.

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

Dividends, share repurchases, and share issues do not affect FCFE and FCFE.

Increase in leverage increases the tax savings for FCFF. It affects FCFE in two ways: increases FCFE by the amount of debt issued and reduces the cash flow to equity by the after-tax interest expense in the future i.e. interest payments to debtholders in the future.

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

EBITDA is a poor proxy for cash flow because it does not account for depreciation, investments in fixed capital and working capital, and cash outflow due to taxes. This is evident when we look at the following equation:

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

Similarly, net income is a poor proxy for FCFE because it does not account for fixed capital, working capital investment and net borrowings. This is evident when we look at the following equation:

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

LO: 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.

A simpler version of two-stage model assumes a constant growth rate in each stage with the transition from stage 1 to stage 2 being abrupt. A second version assumes declining growth in stage 1 followed by a long-run sustainable growth rate in stage 2.

Three-stage growth models are appropriate when cash flow stream fluctuates from year to year.

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

Expressions for FCFF and FCFE using the single-stage model:

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

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

Expressions for FCFF and FCFE using the multi-stage models:

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

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

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

Since the models are sensitive to inputs such as growth rates, duration of the growth rates, and base values of FCFF/FCFE, analysts must perform a sensitivity analysis to examine how the value of a firm changes with each of these inputs.

LO: Describe approaches for calculating the terminal value in a multistage valuation model.

The terminal value is calculated using two ways as seen in DDM: calculate the present value of the terminal value, or multiply the forecasted multiple such as EPS with the estimated value of the fundamental such as earnings.

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

If the per share value of a stock based on FCFE is greater than its current price, then the stock is undervalued. Similarly, if the per share value of a stock based on FCFE is lesser than its current price, then the stock is overvalued.