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Wiley's CFA® Program Exam Review
Study Guide for 2020
Level II CFA Exam

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Level II CFA Exam

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ABOUT THE AUTHORS

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Wiley's expert team of contributing authors and instructors is led by Content Director Basit Shajani, CFA. Basit founded online education start-up Élan Guides in 2009 to help address CFA candidates' need for better study materials. As lead writer, lecturer, and curriculum developer, Basit's unique ability to break down complex topics helped the company grow organically to be a leading global provider of CFA Exam prep materials. In January 2014, Élan Guides was acquired by John Wiley & Sons, Inc., where Basit continues his work as Director of CFA Content. Basit graduated magna cum laude from the Wharton School of Business at the University of Pennsylvania with majors in finance and legal studies. He went on to obtain his CFA charter in 2006, passing all three levels on the first attempt. Prior to Élan Guides, Basit ran his own private wealth management business. He is a past president of the Pakistani CFA Society.

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STUDY SESSION 7: CORPORATE FINANCE (1)

READING I9: CAPITAL BUDGETING

LESSON 1: INTRODUCTION AND LEVEL I RECAP

Level I Recap

Capital budgeting is used to determine whether long-term investments, such as acquiring new machinery, replacing current machinery, launching new products, and spending on research and development, are worth pursuing.

Steps in Capital Budgeting

- Generating ideas.
- Analyzing individual proposals.
- Planning the capital budgeting.
- Monitoring and post-auditing.

Categories of Capital Projects

- Replacement projects.
- Expansion projects.
- New products and services.
- Regulatory/safety and environmental projects.
- Other projects.

Important Definitions

Sunk costs are those costs that cannot be recovered once they have been incurred.

An **opportunity cost** is the value of the next best alternative that is foregone in making the decision to pursue a particular project. Opportunity costs should be included in project costs.

An **incremental cash flow** is the additional cash flow realized as a result of a decision. Incremental cash flow equals cash flow with a decision minus cash flow without the decision.

An **externality** is the effect of an investment decision on things other than the investment itself.

A **conventional cash flow stream** is a cash flow stream that consists of an initial outflow followed by a series of inflows. The sign of the cash flows changes only once.

In a **nonconventional cash flow** pattern, the initial outflow is not followed by inflows only, but the direction of the cash flows can change from positive to negative again.

Basic Principles of Capital Budgeting

Decisions are based on actual cash flows: Only incremental cash flows are relevant to the capital budgeting process, while sunk costs are completely ignored.

Timing of cash flows is crucial: Analysts try to predict exactly when cash flows will occur, as cash flows received earlier in the life of the project are worth more than cash flows received late.

Cash flows are based on opportunity costs: Projects are evaluated on the incremental cash flows they bring in over and above the amount that they would generate in their next best alternative use (opportunity cost).

Cash flows are analyzed on an after-tax basis.

Financing costs are ignored from calculations of operating cash flows: Financing costs are reflected in the required rate of return from an investment project, so cash flows are not adjusted for these costs.

Interactions between Projects

- **Independent versus mutually exclusive projects:** Independent projects are those whose cash flows are unrelated. Mutually exclusive projects compete directly with each other for acceptance.
- **Project sequencing:** Sometimes projects may only be undertaken in a certain order, so investing in one project creates the opportunity to invest in other projects in the future.
- **Capital rationing:** If the capital required to invest in all profitable projects exceeds resources available, the company must allocate funds to only the most lucrative projects to ensure that shareholder wealth is maximized.

Investment Decision Criteria

Net Present Value (NPV)

A project's NPV equals the present value of all expected inflows minus the present value of all expected outflows. The rate used to discount each cash flow is the project's cost of capital.

- A project should be undertaken if its NPV is *greater* than zero. Positive NPV projects increase shareholder wealth.

Internal Rate of Return (IRR)

For an investment project that requires only one investment outlay that is made at inception, IRR is the discount rate that equates the sum of the present values of future after-tax cash flows to the initial investment outlay.

- A company should invest in a project if its IRR is *greater* than the required rate of return. When the IRR is greater than the required return, NPV is positive.

Profitability Index

The profitability index (PI) of an investment equals the present value (PV) of a project's future cash flows divided by the initial investment. Therefore, the PI is the *ratio* of future discounted cash flows to the initial investment. The PI indicates the value that a company receives in exchange for one unit of currency invested. It is also known as the "benefit-cost" ratio.

- A company should invest in a project if its PI is *greater* than 1. The PI is greater than 1 when NPV is positive.

NPV Profiles

An NPV profile is a graphical illustration of a project's NPV at different discount rates. NPV profiles are downward-sloping, because as the cost of capital increases, the NPV of an investment falls.

- The discount rate at which the NPVs of two projects are the same (their NPV profiles intersect) is called the *crossover* rate.
- A project's NPV profile intersects the x-axis at its IRR.

NPV versus IRR

For independent projects, the NPV and IRR criteria for acceptance lead to the same result:

- Accept the project if NPV is greater than zero.
- Accept the project if IRR is greater than the cost of capital.

For mutually exclusive projects, NPV and IRR may offer different recommendations. In such a situation, a company should select the project with the *higher* NPV. NPV is a better criterion because of its more realistic reinvestment rate assumption.

- IRR assumes that interim cash flows received during the project are reinvested at the IRR. This assumption is sometimes rather inappropriate, especially for projects with high IRRs.
- NPV makes a more realistic assumption that interim cash flows are reinvested at the required rate of return.

NPV and IRR may give conflicting project rankings because of *differences in project size* and *cash flow timing differences*.

Problems with the IRR

It is possible for a project's cash flow stream to have no IRR or even multiple IRRs. This may occur even though the project has a positive NPV.

NPV, Company Value, and Stock Price

If a company invests in a positive NPV project, the expected addition to shareholders' wealth should lead to an increase in the company's stock price.

LESSON 2: CASH FLOW PROJECTIONS

LOS 19a: Calculate the yearly cash flows of expansion and replacement capital projects and evaluate how the choice of depreciation method affects those cash flows. Vol 3, pp 27–38

Expansion Projects

An expansion project is an independent investment that does not affect the cash flows for the rest of the company. For any particular project, the cash flows can be broken down into:

- Investment outlays.
- After-tax operating cash flows over the project's life.
- Terminal year after-tax nonoperating cash flow.

Let's work with the following example to illustrate the different types of cash flows for a project:

Mega Builders is evaluating a new 5-year project. The project requires an initial fixed capital investment of \$550,000 (Nondepreciable land = \$100,000; PP&E = \$450,000). PP&E is depreciated on a straight-line basis (with zero salvage value) over a 5-year period. At the end of five years, all fixed capital assets (including land) are expected to be sold for \$150,000. The project will also require \$60,000 in current assets and will generate \$20,000 in current liabilities. It is expected to generate annual sales of \$300,000 and requires cash operating expenses of \$100,000 each year. Given a required rate of return of 10% and a marginal tax rate of 40%, calculate the NPV of the project.

We have illustrated three approaches to this problem here. For exam purposes you should focus on Approach III.

Approach I: Table Format with Cash Flows Collected by Year

One approach to this problem requires all cash flows to be collected by year. After annual cash flows have been determined, they are discounted at the cost of capital to determine the project's NPV. Table 2-1 lists all the project's cash flows by year:

Continued

Table 2-1: Cash Flows Collected by Year

Year	0	1	2	3	4	5
Investment Outlays						
Fixed capital		-550,000				
Net working capital		-40,000				
Total Investment Outlays¹	-590,000					
Annual After-Tax Operating Cash Flows						
Sales	300,000	300,000	300,000	300,000	300,000	
Cash operating expenses	100,000	100,000	100,000	100,000	100,000	
Depreciation ²	90,000	90,000	90,000	90,000	90,000	
Operating income before taxes	110,000	110,000	110,000	110,000	110,000	
Taxes on operating income (40%)	44,000	44,000	44,000	44,000	44,000	
Operating income after taxes	66,000	66,000	66,000	66,000	66,000	
Add back: Depreciation ³	90,000	90,000	90,000	90,000	90,000	
After-tax operating cash flow	156,000	156,000	156,000	156,000	156,000	
Terminal Year After-Tax Nonoperating Cash Flows						
After-tax salvage value ⁴						130,000
Return of net working capital ⁵						40,000
Total						170,000
Total after-tax cash flow	-590,000	156,000	156,000	156,000	156,000	326,000
Net present value at 10%⁶	106,919					
IRR	16.12%					

1. Initial investment outlay = FCI_{Inv} + NWC_{Inv} = 550,000 + (60,000 – 20,000) = \$590,000
 2. Annual depreciation (PP&E) = (450,000 – 0)/5 = \$90,000
 3. Depreciation is added back to operating income after taxes to determine after-tax operating cash flow.
 4. At the end of Year 5, fixed capital assets are sold for \$150,000, which represents a gain of \$50,000 on book value (land is carried at \$100,000, while PP&E is carried at 0). This gain is taxed at 40%, resulting in a tax payment of \$20,000. Therefore, cash inflow upon sale of fixed capital assets equals \$150,000 – \$20,000 = \$130,000.
 5. It is typically assumed that net working capital investments are recovered at the end of the project. This results in a cash inflow of \$40,000 at the end of Year 5.
 6. Discounting annual after-tax cash flows at the cost of capital (10%) yields an NPV of **\$106,919**. The IRR of the investment equals **16.12%**.

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 NPV = \$106,919.36
 IRR = 16.12%

Both the NPV and IRR suggest that the company should undertake the project.

Approach II: Table Format with Cash Flows Collected by Type

A second approach collects cash flows by type (e.g., sales, operating expenses, etc.) and calculates the NPV of each type of cash flow. The NPVs of the different types of cash flows are then summed to determine the project's NPV.

Table 2-2 calculates the NPV of the project by summing the present values of each type of cash flow:

Table 2-2: Cash Flows Collected by Type

Year	Type of Cash Flow	Before-Tax Cash Flow	After-Tax Cash Flow	PV at 10%
0	Fixed capital investment ¹	-550,000	-550,000	-550,000
0	Working capital investment	-40,000	-40,000	-40,000
1–5	Sales minus cash expenses ²	300,000 – 100,000 = 200,000	200,000(1 – 0.4) = 120,000	454,894
1–5	Depreciation tax savings ³	None	90,000(0.4) = 36,000	136,468
5	After-tax salvage value ⁴	150,000	150,000 – [(150,000 – 100,000) × 0.4] = 130,000	80,720
5	Return of working capital ⁵	40,000	40,000	24,837
NPV⁶				106,919

1. Outlays in fixed capital and net working capital at t=0 amount to \$590,000.
2. For Years 1–5, the company realizes after-tax cash flows from sales minus cash expenses with a total present value of \$454,894. (PMT = -120,000; N = 5; I/Y = 10; CPT PV)
3. For Years 1–5, depreciation charges result in tax savings with a total present value of \$136,468. (PMT = -36,000; N = 5; I/Y = 10; CPT PV)
4. The present value of the Year 5 after-tax salvage value equals \$80,720. (FV = -130,000; N = 5; I/Y = 10; CPT PV)
5. The present value of the Year 5 return of working capital equals \$24,837. (FV = -40,000; N = 5; I/Y = 10; CPT PV)
6. NPV (Project) = -590,000 + 454,894 + 136,468 + 80,720 + 24,837 = **\$106,919**

Approach III: Equation Format for Organizing Cash Flows

Instead of using a table, cash flows can be determined using various equations.

1. **Initial investment outlay for a new investment** = FCInv + NWCIInv
 - **Fixed capital investment (FCInv)** includes the cost of new equipment as well as expenditures necessary to get the equipment in workable condition (e.g., shipping and installation).

- **Net working capital investment (NWCInv):** Investment in a new project may lead to a proportionate increase in inventories, accounts receivable, accounts payable, accruals, etc. Investment in net working capital is defined as the difference between changes in noncash current assets and changes in nondebt current liabilities.

$$\text{NWCInv} = \Delta\text{Noncash current assets} - \Delta\text{Nondebt current liabilities}$$

- If NWCInv is positive, it means that the company is making additional investment in working capital (cash outflow).
- If NWCInv is negative, it means that working capital is being freed up (cash inflow).
- It is usually assumed that investment in net working capital is recovered at the termination of the project.

$$\begin{aligned}\text{Initial investment outlay for Mega} &= \text{FCInv} + \text{NWCInv} \\ &= 550,000 + (60,000 - 20,000) = \$590,000\end{aligned}$$

2. **Annual after-tax operating cash flows (CF)** are incremental operating cash flows generated by the project and are calculated as:

$$\text{CF} = (S - C - D)(1 - t) + D \text{ or } \text{CF} = (S - C)(1 - t) + tD$$

where:

S = Sales

C = Cash operating expenses

t = Tax rate

D = Depreciation

Although depreciation is a noncash expense, it has an impact on operating cash flow as it reduces the amount of taxes paid by the company. The higher the depreciation charged by the company, the higher the resulting tax savings. Therefore, the depreciation method applied by a company has important implications on the amount and timing of a project's after-tax cash flows.

$$\begin{aligned}\text{CF for Mega} &= (S - C)(1 - t) + tD \\ &= (300,000 - 100,000)(1 - 0.4) + (0.4 \times 90,000) = \$156,000\end{aligned}$$

3. **Terminal year after-tax nonoperating cash flow (TNOCF)** includes:

- The selling price of fixed capital assets (Sal_T) on termination date (T).
- Recovery of working capital investment (NWCInv).
- Taxes on gain on sale ($\text{Sal}_T - \text{BV}_T$) of fixed capital assets (cash outflow).

$$\begin{aligned}\text{TNOCF} &= \text{Sal}_T + \text{NWCInv} - t(\text{Sal}_T - \text{BV}_T) \\ &= 150,000 + 40,000 - [0.4(150,000 - 100,000)] = \$170,000\end{aligned}$$

Working capital is defined in this use as current assets (excluding cash and equivalents) minus current liabilities (excluding short-term debt).

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 [NPV]
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 [CPT]
 NPV = \$106,919.36

The NPV of the project can be calculated as the sum of the present values of:

- An initial investment outlay of \$590,000 at $t = 0$
- An annuity of \$156,000 for five years from $t = 1$ to $t = 5$
- A single payment of \$170,000 received at $t = 5$

$$\text{NPV} = -590,000 + \sum_{t=1}^5 \frac{156,000}{(1.1)^t} + \frac{170,000}{(1.1)^5} = \$106,919$$

The Impact of Depreciation Methods on Cash Flow Projections

Companies can choose between a variety of depreciation methods, including the straight-line, sum-of-years digit, double-declining balance, and units-of-production methods. Further, certain jurisdictions allow companies to use different depreciation methods for financial and tax reporting purposes. Companies in those jurisdictions prefer to use accelerated depreciation methods for tax reporting purposes as they result in lower taxes payable in the early years of an asset's life. The **MACRS (modified accelerated cost recovery system)** is an accelerated depreciation method commonly used in the United States. Table 2-3 presents depreciation rates for different MACRS classes:

Table 2-3: Depreciation Rates under U.S. MACRS

Year	Recovery Period Class		
	3-Year	5-Year	7-Year
1	33.33%	20.00%	14.29%
2	44.45%	32.00%	24.49%
3	14.81%	19.20%	17.49%
4	7.41%	11.52%	12.49%
5		11.52%	8.93%
6		5.76%	8.93%
7			8.93%
8			4.45%

- MACRS uses the double-declining balance method (150% declining balance for the 15- and 30-year classes) for the initial years of the asset's life.
- MACRS switches to straight-line depreciation when optimal (i.e., when straight-line depreciation would be at least as large as depreciation under the declining balance method used in the initial years).
- MACRS uses the half-year convention, which means that the asset is placed in service in the middle of the first year.

Table 2-4 calculates the present value of tax savings for Mega if it were to use MACRS 3-year class depreciation:

Table 2-4: MACRS 3-Year Depreciation for Mega

Year	Depreciation Expense	Tax Savings	PV at 10%
1	$450,000 \times 33.33\% = \$149,985^2$	$149,985 \times 0.4 = \$59,994$	\$54,540
2	$450,000 \times 44.45\% = \$200,025^2$	$200,025 \times 0.4 = \$80,010$	\$66,124
3	$450,000 \times 14.81\% = \$66,645$	$66,645 \times 0.4 = \$26,658$	\$20,029
4	$450,000 \times 7.41\% = \$33,345$	$33,345 \times 0.4 = \$13,338$	\$9,110
5	Zero		
Total	\$450,000¹	\$180,000³	\$149,803⁴

1. However, MACRS allocates a larger proportion of total depreciation expense over the life of the asset to the early years of its useful life.
 - Year 1 MACRS dep = \$149,985 versus Year 1 straight-line dep = \$90,000
 - Year 2 MACRS dep = \$200,025 versus Year 2 straight-line dep = \$90,000
2. Total depreciation expense is the same under straight-line and MACRS depreciation (\$450,000).
3. Total depreciation tax savings are identical under both methods (\$180,000).
4. The PV of tax savings is higher under MACRS depreciation.
 - PV tax savings MACRS = \$149,803 versus PV tax savings straight line = \$136,468.
5. Therefore, NPV and IRR are higher when MACRS depreciation is used.
 - NPV MACRS = \$120,254 versus NPV straight-line method = \$106,919
 - IRR MACRS = 17.35% versus IRR straight-line method = 16.12%

Accelerated depreciation methods result in greater tax savings in the early years of a capital project compared to the straight-line method. Therefore, all other factors remaining the same, accelerated depreciation methods result in a greater net present value (NPV) for a project compared to straight-line depreciation.

REPLACEMENT PROJECTS

Cash flow analysis for a replacement project is more complicated because analysts must deal with the differences between cash flows that occur with the new investment and cash flows that would have occurred from the old investment (the one being replaced).

Cash Flows for a Replacement Project

Let's work with the following example to illustrate capital budgeting decisions for a replacement project:

The management of Mega Builders is considering replacing an old piece of equipment. The following information is provided:

- The equipment it wants to replace (old equipment) was purchased five years ago for \$1.5m. It had a useful life of 15 years and the company applies straight-line depreciation with zero salvage value. The equipment's current market value is \$1.2m. If the company keeps using it, this piece of equipment will generate annual sales of \$200,000 and incur annual cash operating expenses of \$120,000. At the end of its useful life, the company expects to sell the equipment for \$125,000.

- The new equipment will cost \$2.5m and will be depreciated on a straight-line basis over 10 years with zero salvage value. The company expects to be able to sell it for \$600,000 after 10 years. The new equipment will require an additional investment of \$200,000 in working capital (on top of the working capital invested in the old equipment). It is expected to generate annual sales of \$600,000 and require annual cash operating expenses of \$300,000.

The company's marginal tax rate is 40%. Given a required rate of return of 10%, determine whether the company should replace the old equipment with the new.

Investment Outlays

The initial investment (cash outflow) for a replacement project is reduced by the salvage value of the equipment being replaced (cash inflow) and increased by taxes paid on any gain on sale of the equipment being replaced (cash outflow).

The current book value (BV) of old equipment (five years into its useful life) equals \$1.5m

$$-(100,000 \times 5) = \$1,000,000$$

$$\begin{aligned} \text{Initial investment for a replacement project} &= \text{FCInv} + \text{NWCInv} - \text{Sal}_0 + t(\text{Sal}_0 - \text{BV}_0) \\ \text{Initial investment} &= 2,500,000 + 200,000 - 1,200,000 + [0.4 \times (1,200,000 - 1,000,000)] \\ &= \$1,580,000 \end{aligned}$$

Annual After-Tax Operating Cash Flow

When calculating after-tax operating cash flow for replacement projects, we only consider the changes in cash flow that result from the replacement.

Annual depreciation on the new equipment will be \$2.5m/10 = \$250,000.

$$\begin{aligned} \Delta\text{CF} &= (\Delta\text{S} - \Delta\text{C})(1 - t) + t \Delta\text{D} \\ \Delta\text{CF} &= \{[(600,000 - 200,000) - (300,000 - 120,000)] \times (1 - 0.4)\} + [(250,000 - 100,000) \times 0.4] \\ \Delta\text{CF} &= 132,000 + 60,000 = \$192,000 \end{aligned}$$

Terminal Year After-Tax Nonoperating Cash Flow

At the end of the project, fixed capital is sold and taxes are paid on any gain on sale. Since only incremental cash flows are relevant in the analysis of a replacement project, terminal year after-tax nonoperating cash flow consists of:

- Incremental cash flow over the selling price of old equipment:
 - $\$600,000 - \$125,000 = \$475,000$
- Recovery of additional investment in net working capital, \$200,000.
- Incremental cash flow from taxes on gains on disposal:
 - $0.4(600,000 - 0) - 0.4(125,000 - 0) = \$190,000$

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 [NPV] 10 [ENTER]
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NPV = -\$213,254.62
 IRR = 7.18%

$$\begin{aligned} \text{TNOCF} &= \text{Sal}_T + \text{NWCInv} - t(\text{Sal}_T - \text{B}_T) \\ \text{TNOCF} &= 475,000 + 200,000 - 190,000 = \$485,000 \\ \text{The NPV of the project equals: } \text{NPV} &= -1,580,000 + \sum_{t=1}^{10} \frac{192,000}{(1.1)^t} + \frac{485,000}{(1.1)^{10}} \end{aligned}$$

NPV = -\$213,254.62
 IRR = 7.18%

Conclusion: It does not make sense for the company to replace the equipment as NPV of the replacement decision is negative and IRR is less than the cost of capital.

Spreadsheet Modeling

Capital budgeting makes heavy use of spreadsheets such as Microsoft Excel® because:

- They provide an effective way for building very complex models.
- They have a lot of built-in functions that are easy to use.
- Model assumptions can be changed and solved for easily.
- They can be shared with others and can be used for making presentations.

LOS 19b: Explain how inflation affects capital budgeting analysis.

Vol 3, pg 38

Effects of Inflation on Capital Budgeting Analysis

- Analysts must decide whether to perform the analysis in nominal terms or in real terms. Nominal cash flows reflect the effects of inflation, while real cash flows are adjusted to remove the effects of inflation. While the analysis may be undertaken in nominal or real terms, analysts should be careful to use the nominal discount rate to discount nominal cash flows and the real discount rate to discount real cash flows.

$$(1 + \text{Nominal rate}) = (1 + \text{Real rate}) \times (1 + \text{Inflation rate})$$

- Expected inflation is accounted for in discounted cash flow analysis. If inflation is higher than expected, the real value of future cash flows will be lower, reducing the profitability of the project.
- Higher-than-expected inflation increases real taxes as it reduces the value of the depreciation tax shelter (unless the tax system adjusts depreciation for inflation).
- Inflation also affects the value of fixed payments to bondholders. If inflation is higher than expected, the value of real payments to bondholders is lower than expected, shifting wealth from bondholders to issuing companies.
- Inflation does not affect all revenues and costs uniformly. The overall impact on a company's after-tax cash flow depends on how sales quantities and different cost items are affected by inflation.

LESSON 3: PROJECT ANALYSIS AND EVALUATION

LOS 19c: Evaluate capital projects and determine the optimal capital project in situations of 1) mutually exclusive projects with unequal lives, using either the least common multiple of lives approach or the equivalent annual annuity approach, and 2) capital rationing. Vol 3, pp 38–42

Mutually Exclusive Projects with Unequal Lives

When faced with mutually exclusive projects, a company should choose the project with the highest positive NPV as it would lead to the greatest increase in shareholder wealth. However, if the projects have unequal lives the analysis is a bit more complicated. With unequal lives, analysis of a **one-shot (one time only) investment** differs from that of an **investment chain** (in which the project is continuously replicated in the future).

Let's work with an example. Assume that a company can invest in either of the following projects:

	Project A	Project B
Initial investment	\$2,000	\$1,000
Life of project	4 years	3 years
Annual after-tax cash flows	Year 1: \$600 Year 2: \$800 Year 3: \$1,000 Year 4: \$1,200	Year 1: \$500 Year 2: \$800 Year 3: \$800
Cost of capital	10%	10%
NPV	\$777.54	\$716.75
IRR	24.89%	44.07%

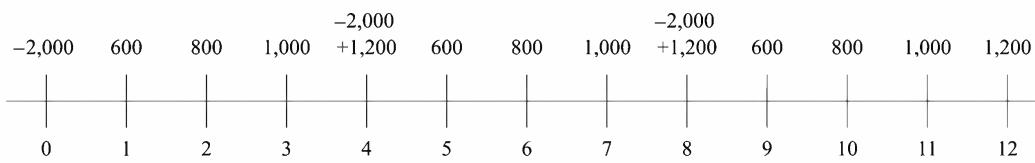
Given that the two projects are mutually exclusive, if these were one-shot investments, the company should choose Project A since it has the higher positive NPV. If, however, the company needs to replace both projects every time they wear out (i.e., if they are replacement projects), there are two methods that can be used to compare the projects.

Project A: Timeline 1	
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NPV = \$1,671.34	
[IRR] [CPT]	
IRR = 24.89%	

1. Least Common Multiple of Lives Approach

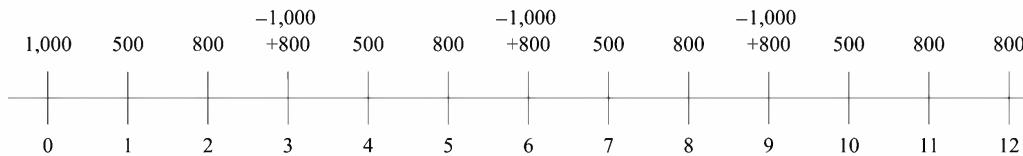
In this approach, both projects are repeated until their “chains” extend over the same time horizon. Given equal time horizons, the NPVs of the two project chains are compared and the project with the higher chain NPV is chosen. In the example above, Project A has a life of 4 years, while Project B has a life of 3 years. The least common multiple of 4 and 3 is 12, which means that in order to compare the two projects (over an identical time horizon), we would need to replicate Project A three times and Project B four times.

Timeline 1: Project A



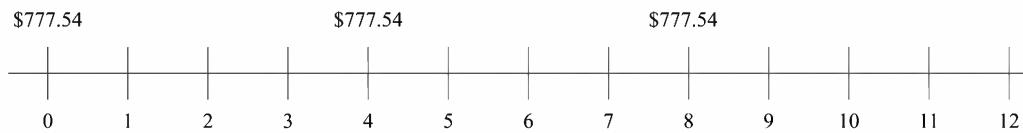
NPV (Project A 12-year chain) = \$1,671.34

Timeline 2: Project B



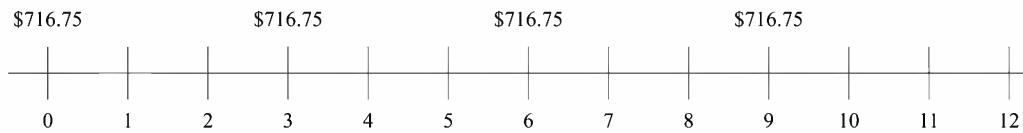
NPV (Project B 12-year chain) = \$1,963.82

Timeline 3: Project A



NPV (Project A 12-year chain) = \$1,671.34

Timeline 4: Project B



NPV (Project B 12-year chain) = \$1,963.82

Over an identical horizon, the replacement chain for Project B has a higher NPV than the replacement chain for Project A. Therefore, the company should choose Project B. Note that this decision is the reverse of the one the company would have made were these projects one-shot investments.

2. Equivalent Annual Annuity Approach (EAA)

This approach calculates the annuity payment (equal annual payment) over the project's life that is equivalent in present value (PV) to the project's NPV. The project with the higher EAA is chosen. For our example, the EAAs of the two projects are calculated as:

Project A: N = 4; I/Y = 10; PV = -777.54; FV = 0; CPT PMT \Rightarrow PMT = \$245.29

Project B: N = 3; I/Y = 10; PV = -716.75; FV = 0; CPT PMT \Rightarrow PMT = \$288.22

Since Project B has a higher EAA, it should be chosen over Project A.

Project A: Timeline 3

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NPV = \$1,671.34

The NPV of a single investment represents the present values of its cash flows. Therefore, you can think of the NPV of a replacement chain as the present value of each link in the chain. This line of thinking is represented in Timelines 3 and 4.

Capital Rationing

In an ideal world, companies would be able to invest in all available positive-NPV projects and maximize shareholder wealth. However, companies typically have limited amounts of capital, so they must choose between projects and invest the capital budget in a manner that maximizes shareholder wealth given the budgetary constraint. This is known as **capital rationing**.

Under capital rationing, a situation may arise where a company chooses a project that has a lower NPV over a project that has a higher NPV in order to maximize shareholder wealth given the budget constraint. Example 3-1 illustrates this.

Example 3-1: Capital Rationing

The management of RVP Builders has a capital budget of \$2,000 that it can use to invest in the following projects.

Project	Investment Outlay (\$)	NPV (\$)	PI	IRR (%)
A	1,200	250	1.21	12
B	200	30	1.15	13
C	600	-45	0.93	7
D	400	80	1.20	11
E	500	150	1.30	10
Total Investment	2,900			

Assuming that the projects are not divisible, which project(s) should the company invest in?

Solution:

If the company had an unlimited capital budget, it would invest in Projects A, B, D, and E (all positive-NPV projects). However, given the fixed capital budget (\$2,000), the company must choose which project(s) to prioritize, given the aim of shareholder wealth maximization.

When a company has a fixed capital budget, the profitability index (PI) is extremely useful as it measures profitability per unit of investment. If we rank the projects based on their PI's, Project E has the highest PI, followed by Projects A, D, and B. Given the fixed budget, the company would definitely invest in Projects E and A (combined investment: \$1,700; combined NPV = \$400) but would only have \$300 left over, which is insufficient to undertake Project D (the next most-lucrative project). However, it can accept Project B and maximize NPV (given the budget constraint) at \$430 with a total capital investment of \$1,900.

It is important for you to understand that the company would prefer Project D over Project B as it has a higher NPV. Unfortunately, however, investing in Projects A, D, and E would require a combined investment of \$2,100, which exceeds the fixed budget. In this respect, capital rationing may result in outcomes that violate market efficiency (which requires the allocation of funds to their highest and best uses).

$$\text{PI} = 1 + \frac{\text{NPV}}{\text{IO}}$$

There are two types of capital rationing:

- Under **hard capital rationing**, the budget is fixed. In such situations, managers should use the NPV and PI capital budgeting methods. Note that choosing the optimal combination of capital projects can be computationally intensive.
- Under **soft capital rationing**, managers may be allowed to exceed their budgets if they can convince senior management that the projects will enhance shareholder wealth.

LOS 19d: Explain how sensitivity analysis, scenario analysis, and Monte Carlo simulation can be used to assess the stand-alone risk of a capital project. Vol 3, pp 42–48

Stand-Alone Risk

The stand-alone risk of a capital project is measured in terms of the dispersion of its outcomes (the project's possible NPVs or IRRs). Stand-alone risk depends on the variation of the project's cash flows. Methods of evaluating stand-alone risk include sensitivity analysis, scenario analysis, and simulation analysis. We will work with the following base-case numbers for Contour Builders to illustrate the different approaches for evaluating stand-alone risk (see Table 3-1):

Table 3-1: Contour Builders—Base-Case Scenario

	Base Value
Unit price	\$10
Annual unit sales	20,000
Variable costs per unit	\$4.00
Investment in fixed capital	\$250,000
Investment in working capital	\$30,000
Project life	5 years
Annual depreciation	\$50,000
Expected salvage value	\$40,000
Tax rate	40%
Required rate of return	10%

Sensitivity Analysis

Sensitivity analysis determines the impact on NPV of changes in one input variable at a time holding all other input variables constant. This enables an analyst to identify the most significant variables in the analysis in terms of their effect on NPV and their influence on the success/failure of the project.

Let's evaluate the impact of a 15% change in unit price, annual unit sales, variable cost per unit, and salvage value on the NPV of the project.

We first calculate the base-case NPV using the base-case scenario provided. We then proceed to evaluate the impact of a change in each of the input variables (one by one) by changing its value by 15% and calculating revised NPVs. For example, in order to evaluate the impact of a change in unit price, we decrease it by 15% (to \$8.50) and increase it by 15% (to \$11.50) and calculate NPVs holding all other input variables constant. Table 3-2 summarizes the results of the sensitivity analysis.

This value has been calculated with unit price = \$8.50 and all other variables taking their base-case values.

This value has been calculated with unit price = \$11.50 and all other variables taking their base-case values.

Table 3-2: Sensitivity of Project NPV to Changes in Input Variables

Variable	NPV if Value Decreases 15%	Base-Case NPV	NPV if Value Increases 15%	Range of NPV Estimates
Annual sales	\$61,341.64	\$102,282.13	\$143,222.63	±40.03%
Unit price	\$34,047.97	\$102,282.13	\$170,516.30	±66.71%
Variable costs per unit	\$129,575.80	\$102,282.13	\$74,988.47	±26.68%
Expected salvage value	\$100,046.82	\$102,282.13	\$104,517.45	±2.19%

- Unit price has the most impact on the NPV of the project as changes in unit price result in the broadest range of NPV estimates (±66.7%).
- Changes in expected salvage value have the least significant impact on NPV (±2.19%).

Scenario Analysis

While sensitivity analysis allows us to evaluate the impact of a change in one input variable on NPV, scenario analysis calculates the NPV of a project in a number of different scenarios where each scenario consists of changes in several input variables. The greater the dispersion in NPV across the given scenarios, the higher the risk of the project.

Let's evaluate the risk of Contour's project by examining NPVs under the three scenarios presented in Table 3-3.

Table 3-3: Contours Project—Possible Scenarios

	Pessimistic Scenario	Most Likely Scenario	Optimistic Scenario
Unit price (\$)	8.50	10.00	11.50
Annual sales (units)	17,000	20,000	23,000
Variable costs per unit (\$)	4.60	4.00	3.40
Investment in fixed capital (\$)	250,000	250,000	250,000
Investment in working capital (\$)	30,000	30,000	30,000
Project life (years)	5	5	5
Annual depreciation (\$)	50,000	50,000	50,000
Expected salvage value (\$)	34,000	40,000	46,000
Tax rate (%)	40	40	40
Required rate of return (%)	10	10	10

The project's NPV in each of the three scenarios is provided in Table 3-4.

Table 3-4: Contour Scenario Analysis

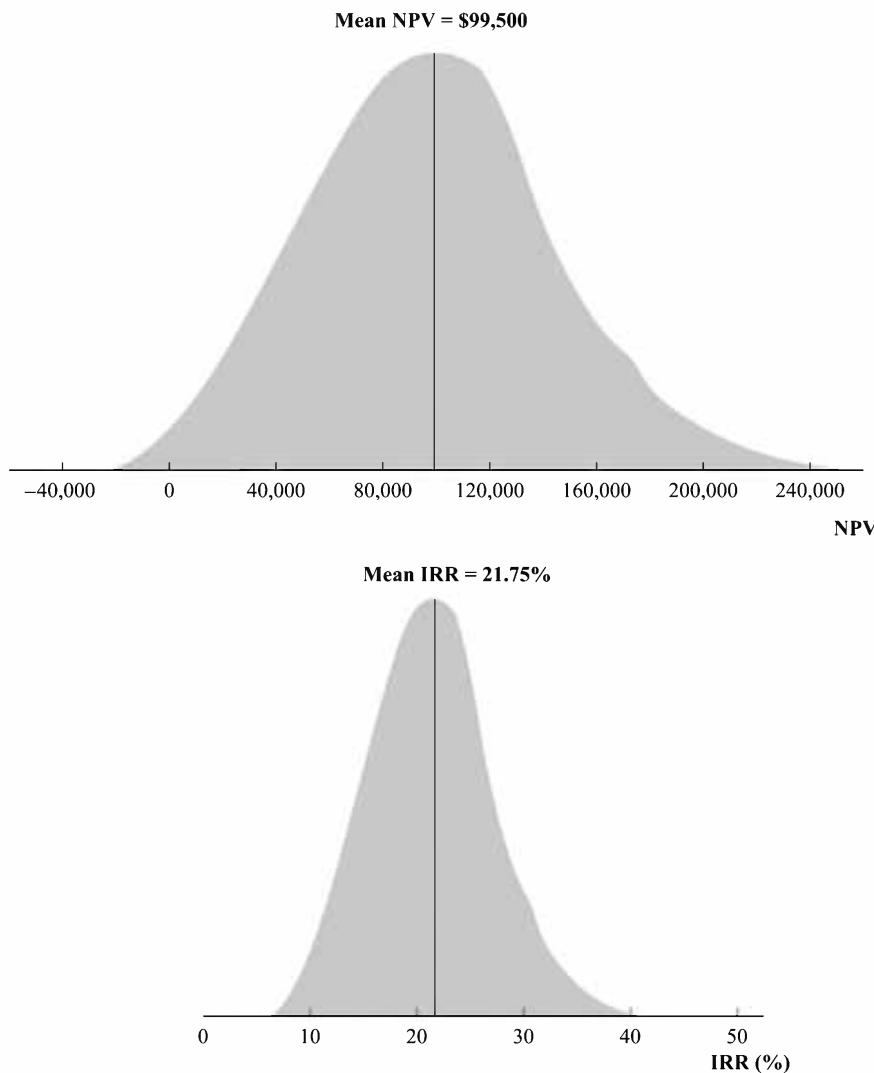
	Pessimistic Scenario	Most Likely Scenario	Optimistic Scenario
Investment Outlays	\$280,000	\$280,000	\$280,000
ATOCF	\$59,780	\$92,000	\$131,780
TNOCF	\$50,400	\$54,000	\$57,600
NPV	-\$22,092.33	\$102,282.13	\$255,314.95
Change in NPV	-121.60%	IRR = 22.54%	+149.62%

- The scenario analysis reflects the possibility of an unprofitable (negative-NPV) investment.
- The range of NPVs is very large relative to the initial outlay, which suggests that the investment is quite risky.
- Note that we have only evaluated three scenarios in this example. Management can expand the analysis to include other scenarios as well.

Simulation (Monte Carlo) Analysis

In simulation analysis, we estimate a probability distribution of outcomes for a project's NPV and IRR. Instead of using point estimates for input variables (as is the case in sensitivity and scenario analysis), we can define probability distributions for each of them. The simulation can be run thousands of times to come up with a distribution for possible values of NPV and IRR. Figure 3-1 illustrates the probability distributions for NPV and IRR for Contour's project.

Figure 3-1: Probability Distributions for NPV and IRR



- Both the curves resemble the normal distribution. As the number of observations (iterations) increases, the distribution of outcomes approaches the normal distribution.
- Both the curves are skewed to the right (positive skewness).
- The mean NPV and IRR values from the simulation are fairly close to the base-case/most likely scenario NPV and IRR (calculated based on point estimates of input variables) of \$102,282.13 and 22.54%, respectively. Note that this need not be the case all the time.
- The distributions show how the project's NPV and IRR vary under different assumptions. They offer management more information than simple mean NPV and IRR figures.
- Statistical output may include correlations between different input variables and NPV (and IRR). These correlations can be interpreted as sensitivity factors. The higher the correlation between an input variable and NPV, the more significant the impact of the variable on NPV.

LOS 19e: Explain and calculate the discount rate, based on market risk methods, to use in valuing a capital project. Vol 3, pp 49–51

Our approach to capital budgeting is to discount expected cash flows at a risk-adjusted cost of capital. An alternative approach, which is also conceptually sound, is the “certainty-equivalent method.” In this method, certainty-equivalent cash flows (expected cash flows that are reduced to certainty equivalents) are valued by discounting them at a risk-free discount rate. However, the use of risk-adjusted discount rates is more intuitive and much more popular.

Market Risk

Market risk depends not only on the variation of a project's cash flows but also on how those cash flows correlate with market returns. When using market risk measures, the applicable discount rate should reflect the rate of return required by a diversified investor, and the risk premium should only reflect factors that are priced in the marketplace (as opposed to those that can be diversified away). Analysts typically use the capital asset pricing model (CAPM) to calculate this discount rate (although others like the APT can also be used). The CAPM breaks down total risk into:

- Systematic risk** that is related to the market and is nondiversifiable. It is typically measured by beta (β). Only systematic risk is priced in the market. Diversified investors demand a risk premium for bearing systematic risk.
- Unsystematic risk** is nonmarket risk that can be diversified away.

The security market line (SML) expresses the asset's required rate of return as a function of β (systematic risk).

Stand-alone risk measures (such as the dispersion of a project's expected NPVs and IRRs) are inappropriate when the company is diversified or when its shareholders are diversified investors.

$$\text{SML: } R_i = R_F + \beta_i [E(R_M) - R_F]$$

where:

R_i = Required return for project or asset i

R_F = Risk-free rate of return

β_i = Beta of project or asset i

$[E(R_M) - R_F]$ = Market risk premium

According to the SML, the required rate of return (or hurdle rate) varies with each project according to its systematic risk (beta). The required rate of return can be used to calculate NPVs and to evaluate IRRs and then to make capital budgeting decisions. See Example 3-2.

Example 3-2: Using the SML to Find the Required Rate of Return for a Project

The management of Beta Construction is provided with the following information regarding a new investment. Determine whether the company should invest in the project.

- Initial outlay = \$500,000
- Annual after-tax operating cash flows = \$120,000
- Project life = 5 years
- Terminal year after-tax nonoperating cash flow = \$230,000
- Risk-free rate = 5.5%
- Expected market return = 10.5%
- Project beta = 1.10

Solution:

First, we use the SML to determine the required rate of return for the project.

$$R_i = R_F + \beta_i [E(R_M) - R_F] = 5.5\% + 1.1[(10.5\% - 5.5\%)] = 11\%$$

Given a hurdle rate of 11%, NPV equals \$80,001.45. The IRR equals 16.18%. Both these capital budgeting techniques indicate that the company should invest in the project.

The required rate of return calculation here assumes that the project is 100% equity financed.

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NPV = \$80,001.45

IRR = 16.18%

Using project betas to determine hurdle rates is particularly important when a project's risk differs from the company's overall level of risk. The cost of capital (WACC) reflects the riskiness of the company's assets and its financial structure. It represents the average risk of all projects undertaken by the company. Using the WACC as the discount rate will result in an overstated NPV for a relatively risky project and an understated NPV for a relatively conservative project.

LOS 19f: Describe types of real options and evaluate a capital project using real options. Vol 3, pp 52–55

Real options are capital budgeting options that give managers the right but not the obligation to make a capital budgeting decision in the future. These decisions have the potential to alter the value of capital budgeting decisions made today. Real options are options on real assets and are contingent upon future events. They offer greater business flexibility to managers and increase the NPV of projects.

Types of Real Options

- **Timing options** give the company an option to delay making an investment (until, hopefully, improved information becomes available that facilitates better decision making).
- **Sizing options** include:
 - **Abandonment options**, which give the company an option to abandon the project. An abandonment option will typically be exercised if the cash flow from abandoning the project exceeds the present value of the cash flows from continuing it.

- **Growth options**, which give the company an option to expand a project. A growth option is typically exercised if future financial performance is expected to be strong.
- **Flexibility options** give managers choices regarding certain operational aspects of the project. They include:
 - **Price-setting options**, which give the company an option to change prices.
 - **Production-flexibility options**, which give the company an option to change output quantities (e.g., by paying workers overtime wages).
- **Fundamental options** are essentially options embedded in the project itself. For example, for a company that owns an oil well, the decision to drill is governed by the price of oil. If oil prices are too low, the company will choose not to drill; if oil prices are high enough, the company will go ahead and drill.

Approaches to Evaluating Projects with Real Options

- **Use DCF analysis without considering real options.** If the NPV of the project is positive without considering real options, then it is safe to assume that the project will be even more profitable after accounting for the value of the real option, so the project should be accepted.
- **Adjust the project's NPV for the net value of real options.** Calculate the NPV of the project without considering real options and then evaluate whether the option value net of its cost is adequate to make the investment feasible. For example, if a project's NPV (based on DCF analysis) equals -\$25 million, the company should accept the project only if the net value of any embedded real options is expected to exceed \$25 million.
- **Use decision trees.** While they are not as useful for calculating the value of a real option, decision trees improve decision making by clearly describing the sequence of events along a project's life.
- **Use option-pricing models.** Although they may be used to value options, option-pricing models typically involve complex calculations that may require the services of special consultants. See Example 3-3.

Example 3-3: Evaluating a Project with Real Options

Consider a project with the following details:

- Initial outlay = \$550,000
- Project life = 5 years
- Salvage value at termination = \$0
- Required rate of return = 10%
- There is a 50% probability that annual after-tax operating cash flows will be \$90,000 and a 50% probability that they will equal \$180,000.
- At the end of Year 1, the company will be able to decide whether to abandon the project or to continue. If it decides to abandon the project, the company will receive a salvage value of \$400,000.

1. Calculate the value of the project without the abandonment option.
2. Calculate the value of the project with the abandonment option and determine the value of the option.

Solution:

1. Expected annual after-tax cash flows = $(90,000 \times 0.5) + (180,000 \times 0.5)$
= \$135,000 The NPV of the project equals:

$$\text{NPV} = -550,000 + \sum_{t=1}^5 \frac{135,000}{(1.1)^t} = -\$38,243.79$$

Without considering the real option, the project has a negative NPV so it should be rejected.

2. At the end of one year, if the project generates \$90,000, it should be abandoned. The present value of the remaining cash flows forgone if the project is abandoned (PV of four annual payments of \$90,000 discounted at 10% = \$285,288) is less than the salvage value at the end of Year 1 (\$400,000).

However, if the project generates \$180,000 in Year 1, it should be continued as the present value of the remaining cash flows (PV of four annual payments of \$180,000 discounted at 10% = \$570,576) is greater than the salvage value at the end of Year 1 (\$400,000).

The NPV of the project if it is abandoned at the end of Year 1 can be calculated as:

$$\text{NPV} = -550,000 + \frac{90,000}{(1.1)^1} + \frac{400,000}{(1.1)^1} = -\$104,545.45$$

The NPV of the project if it is continued can be calculated as:

$$\text{NPV} = -550,000 + \sum_{t=1}^5 \frac{180,000}{(1.1)^t} = \$132,341.62$$

Expected NPV with abandonment option:

$$\text{NPV} = [0.5 \times (-104,545.45)] + (0.5 \times 132,341.62) = \$13,898.08$$

After accounting for the abandonment option, the project has a positive NPV so it should be accepted.

Value of the abandonment option:

$$\begin{aligned} &= \text{NPV (with abandonment option)} - \text{NPV (without abandonment option)} \\ &= 13,898.08 - (-38,243.78) \\ &= \$52,141.871 \end{aligned}$$

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NPV = -$38,243.79
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NPV = -$104,545.45
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NPV = $132,341.62
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If the value of the real option exceeds its cost, the NPV of the project increases.

LOS 19g: Describe common capital budgeting pitfalls. Vol 3, pp 55–57**Common Capital Budgeting Pitfalls**

- **Not incorporating economic responses of other market participants into the analysis.** For example, an investment may initially appear to be very successful, but if low barriers to entry allow rival firms to enter the market, the resulting loss in market share would hurt profitability in the long run.
- **Misusing capital budgeting templates.** Use of a standardized template to make capital budgeting decisions may be inappropriate if the project under consideration is different in certain material aspects from the average project considered by the company. Another possible error is using inaccurate input values in the analysis.
- **Pet projects of senior managers.** These projects may not be scrutinized too thoroughly and may be pushed through by influential managers to satisfy personal interests.
- **Basing investment decisions on EPS, net income, or return on equity instead of incremental cash flows.** A manager's compensation is often linked to a company's earnings, which may encourage her to concentrate on the company's reported net income rather than on overall shareholder wealth. As a result, some projects with positive NPVs may not be undertaken if they have an adverse impact on earnings in the short run.
- **Using IRR instead of NPV to make investment decisions.** For mutually exclusive projects, basing capital budgeting decisions on IRR may result in the company choosing smaller, short-term projects with high IRRs at the expense of larger, long-term, high-NPV projects. The IRR only works for independent projects with conventional cash flow patterns. NPV is the capital budgeting technique that is most economically sound.
- **Bad accounting for cash flows.** Common mistakes include omitting relevant cash flows, double counting cash flows, and mishandling taxes.
- **Overestimation or underestimation of overhead costs.** It is very difficult to accurately estimate the proportion of overhead costs (including costs of IT support, management time, and financial systems) applicable to a particular project, so managers often misestimate these costs.
- **Not using the appropriate risk-adjusted discount rate.** The discount rate used to evaluate a project should reflect the risk associated with that particular project. High-risk projects should not use the WACC as the discount rate as the WACC only reflects the risk of the average-risk project of the firm.
- **Over-/underspending the investment budget.** Some managers tend to spend their entire budgets just so they can ask for more funds in the future. Ideally, a manager should leave the capital budget underutilized if she fails to identify profitable investment opportunities and should make a compelling case for more funds if the budget is too small.
- **Failure to consider investment alternatives.** The first step in the capital budgeting process is to identify good investment opportunities. However, once a manager finds a good enough investment, she may rule out the possibility of an even better one.
- **Handling sunk costs and opportunity costs incorrectly.** Managers may incorrectly include sunk costs in analyzing a particular project or ignore the opportunity costs of a project in their analysis.

For example, even if a project is financed entirely with debt, its cash flows should be discounted at the required rate of return for the project, not the firm's cost of debt.

LESSON 4: OTHER INCOME MEASURES AND VALUATION MODELS

LOS 19h: Calculate and interpret accounting income and economic income in the context of capital budgeting. Vol 3, pp 57–61

Evaluation of capital projects may also be based on:

- Economic income and accounting income
- Economic profit valuation
- Residual income valuation
- Claims valuation

We will use the following information to illustrate each of these methods:

Jupiter Inc. is considering a project that requires an initial investment of \$500,000. Sales will amount to \$300,000 in the first year and are expected to increase by 3% every year. Variable cash operating expenses are expected to equal 50% of sales each year, while fixed cash operating expenses will be \$25,000 a year. The project will be depreciated on a straight-line basis to zero over its five-year useful life. However, the company expects the market value of fixed capital at the end of five years to be \$150,000. The company's marginal tax rate and the required rate of return are 40% and 10%, respectively.

Given this information, we can calculate the NPV of the project as follows in Table 4-1.

Table 4-1: Capital Budgeting Example for Jupiter Inc

Year	0	1	2	3	4	5
Fixed capital investment	-500,000					
Sales		300,000	309,000	318,270	327,818	337,653
Variable cash expenses		150,000	154,500	159,135	163,909	168,826
Fixed cash expenses		25,000	25,000	25,000	25,000	25,000
Depreciation		100,000	100,000	100,000	100,000	100,000
Operating income before taxes		25,000	29,500	34,135	38,909	43,826
Taxes at 40%		10,000	11,800	13,654	15,564	17,531
Operating income after taxes		15,000	17,700	20,481	23,345	26,296
Add back: Depreciation		100,000	100,000	100,000	100,000	100,000
After-tax operating cash flow		115,000	117,700	120,481	123,345	126,296
Salvage value						150,000
Taxes on salvage value						60,000
After-tax salvage value						90,000
Total after-tax cash flow	-500,000	115,000	117,700	120,481	123,345	216,296
NPV at 10%		10,886				
IRR		10.77%				

An NPV of \$10,886 means that the value of the project/ asset equals \$500,000 + \$10,886 = **\$510,886**

Economic Income

Economic income equals the profit realized from an investment. For a given year, economic income equals the sum of after-tax operating cash flow and the change in the investment's market value.

$$\text{Economic income} = \text{After-tax operating cash flow} + \text{Increase in market value}$$

$$\text{Economic income} = \text{After-tax operating cash flow} + (\text{Ending market value} - \text{Beginning market value})$$

$$\text{Economic income} = \text{After-tax operating cash flow} - (\text{Beginning market value} - \text{Ending market value})$$

$$\text{Economic income} = \text{After-tax cash flows} - \text{Economic depreciation}$$

Note that interest expense is ignored in the calculation of after-tax operating cash flows that are used to determine economic income. Financing costs are reflected in the discount rate.

We have already calculated annual after-tax operating cash flows for Jupiter in Table 4-1. The market value of the investment at a given point in time equals the sum of the present values of remaining cash flows discounted at the required rate of return. We calculate economic income for Jupiter in Table 4-2.

For example, the ending market value at the end of Year 2 is calculated as the PV of the three remaining after-tax cash flows.

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NPV = \$373,972.58

Table 4-2: Jupiter's Annual Economic Income

Year	1	2	3	4	5
Beginning market value	510,887	446,975	373,973	290,889	196,633
Ending market value	446,975	373,973	290,889	196,633	0
Change in market value	-63,911	-73,002	-83,084	-94,257	-196,633
After-tax cash flow	115,000	117,700	120,481	123,345	216,296
Economic income	51,089	44,698	37,397	29,089	19,663
Economic rate of return	10%	10%	10%	10%	10%

The **economic rate of return** is calculated as economic income divided by beginning market value. Notice that the economic rate of return equals the required rate of return from the project (10%). This should make sense because the required return is used to determine the market value of the company.

Accounting Income

Accounting income refers to a company's net income. It differs from economic income in the following ways:

- Economic income ignores interest expenses, whereas accounting income subtracts interest expenses to arrive at net income.
- Economic depreciation is based on changes in the market value of the investment, whereas accounting depreciation is based on the original cost of the investment.

Table 4-3 calculates Jupiter's accounting income assuming that half of the company's beginning market value of \$510,887 is financed with debt at a cost of 6%. Table 4-4 lists aggregate values for balance sheet elements, and Table 4-5 presents the calculation of annual cash flows.

Table 4-3: Jupiter's Annual Net Accounting Income

Year	1	2	3	4	5
Sales	300,000	309,000	318,270	327,818	337,653
Variable expenses	150,000	154,500	159,135	163,909	168,826
Fixed expenses	25,000	25,000	25,000	25,000	25,000
Depreciation	100,000	100,000	100,000	100,000	100,000
EBIT	25,000	29,500	34,135	38,909	43,826
Interest expense ¹	15,327	13,409	11,219	8,727	5,899
Earnings before tax	9,673	16,091	22,916	30,182	37,927
Taxes at 40%	3,869	6,436	9,166	12,073	15,171
Net income before salvage value	5,804	9,654	13,749	18,109	22,756
After-tax salvage value					90,000
Net (accounting) income	5,804	9,654	13,749	18,109	112,756

Table 4-4: Balance Sheet

Year	0	1	2	3	4	5
Assets ²	500,000	400,000	300,000	200,000	100,000	0
Liabilities ³	255,443	223,488	186,986	145,445	98,316	0
Net worth	244,557	176,512	113,014	54,555	1,684	0

Table 4-5: Cash Flow Statement

Year	1	2	3	4	5
Net income	5,804	9,654	13,749	18,109	112,756
Depreciation	100,000	100,000	100,000	100,000	100,000
Total ⁴	105,804	109,654	113,749	118,109	212,756

1. Interest expense is deducted before calculating accounting net income. Interest expense for Year 1 is calculated as $0.06 \times 255,443 = 15,327$
2. The book value of assets is based on historical cost less accumulated depreciation.
3. Each year the company retires enough debt to ensure that liabilities equal half of the year-end **market value** of assets. For example:
 - In Year 2, the company retires $223,488 - 186,986 = 36,502$ worth of liabilities.
 - Year 1 liabilities ($223,488$) equal half of Year 1 ending market value of assets ($\$446,975$)
 - Year 2 liabilities ($186,986$) equal half of Year 2 ending market value of assets ($\$373,973$)
4. The company uses its annual cash flow to make principal repayments on liabilities and distributes the remainder to shareholders in the form of share repurchases/dividends. For example:
 - Cash flow for Year 2 equals $109,654$
 - Principal repayment on debt over Year 2 amounts to: $36,502$
 - Therefore, distributions to shareholders for Year 2 amount to:
 $109,654 - 36,502 = 73,152$

Make sure you understand each of these points and the calculations performed here. These calculations provide the inputs used in the models described in the next LOS. Annual distributions to shareholders are listed in Table 4-8.

Note:

- Accounting and economic income are substantially different.
- Over the five years, economic income is higher than accounting income and their patterns also differ.

LOS 19i: Distinguish among the economic profit, residual income, and claims valuation models for capital budgeting and evaluate a capital project using each. Vol 3, pp 61–65

Economic Profit

Economic profit measures the profit earned by the company above and beyond the cost of capital invested in the project. The cost of capital reflects the amount that the company must earn in order to pay debt and equity holders their required rates of return.

$$\text{Economic profit} = [\text{EBIT}(1 - \text{Tax rate})] - \$\text{WACC}$$

$$\text{Economic profit} = \text{NOPAT} - \$\text{WACC}$$

where:

EBIT = Earnings before interest and tax

NOPAT = Net operating profit after tax

\$WACC = Dollar cost of capital = Cost of capital (%) × Invested capital

For illustrative purposes, we calculate economic profit for Jupiter for Year 1 below:

$$\text{NOPAT} = \text{EBIT}(1 - \text{Tax rate}) = 25,000(1 - 0.4) = \$15,000$$

$$\$WACC = 0.10 \times \$500,000 = \$50,000$$

$$\text{EP} = 15,000 - 50,000 = -\$35,000$$

Jupiter's economic profit for each year of the project is calculated in Table 4-6.

Table 4-6: Jupiter's Annual Economic Profit

Year	1	2	3	4	5
Capital	500,000	400,000	300,000	200,000	100,000
NOPAT	15,000	17,700	20,481	23,345	116,296
\$WACC	50,000	40,000	30,000	20,000	10,000
Economic Profit	-35,000	-22,300	-9,519	3,345	106,296

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NPV = \$10,886.43

Under this approach, a project's NPV is calculated as the sum of the present values of economic profit earned over its life discounted at the cost of capital.

$$\text{NPV} = \text{MVA} = \sum_{t=1}^{\infty} \frac{\text{EP}_t}{(1 + \text{WACC})^t}$$

This NPV is also known as market value added (MVA). For Jupiter, the MVA equals \$10,886. The total value of the asset equals MVA plus the original cost of the asset (\$500,000), which gives us a total project valuation of **\$510,886**.

Residual Income

Residual income focuses on returns to equity. It is calculated as:

$$\text{Residual income} = \text{Net income for the period} - \text{Equity charge for the period}$$

$$\text{Equity charge for the period} = \text{Required return on equity} \times \text{Beginning-of-period book value of equity}$$

For illustrative purposes, we calculate residual income for Jupiter for Year 1 below:

$$RI = 5,804 - 0.164(244,557) = -\$34,303.35$$

- Given a cost of capital of 10%, a cost of debt of 6%, a tax rate of 40%, and a debt-asset ratio of 50%, the cost of equity equals 16.4%.
- Given total assets at Year 0 of \$500,000 and beginning liabilities as \$255,443, beginning equity at Year 0 equals $500,000 - 255,443 = \$244,557$ (see Table 4-4).

The residual income for all five years for Jupiter is calculated in Table 4-7.

Table 4-7: Jupiter's Annual Residual Income

Year	1	2	3	4	5
Net income	5,804	9,654	13,749	18,109	112,756
Equity (beginning)	244,557	176,512	113,014	54,555	1,684
Required return on equity	40,107	28,948	18,534	8,947	276
Residual income	-34,303	-19,294	-4,785	9,162	112,480

The RI approach calculates value from the perspective of equity holders only. Therefore, future residual income is discounted at the **required rate of return on equity** to calculate NPV.

$$\text{NPV} = \sum_{t=1}^{\infty} \frac{RI_t}{(1 + r_E)^t}$$

$$\text{NPV} = \$10,886$$

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NPV = $10,886
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The value of the asset/project is calculated as the sum of the equity investment (\$244,557), debt investment (\$255,443), and present value of residual income (\$10,886), which is **\$510,886**.

Claims Valuation

This approach values a firm as the sum of the values of claims of debt and equity holders against the firm's assets. First, we separate the cash flows available to debt and equity holders, and then discount them at their respective required rates of return. Cash flows

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NPV = \$255,443

available to debt holders are discounted at the cost of debt, while cash flows available to equity holders are discounted at the cost of equity. The present values of the two cash flow streams are added to calculate the total value of the company/asset.

Table 4-8 identifies the future cash flows to debt and equity holders.

Table 4-8: Cash Flows to Jupiter's Debt and Equity Holders

Year	1	2	3	4	5
Interest payments	15,327	13,409	11,219	8,727	5,899
Principal payments	31,955	36,502	41,541	47,129	98,316
Total debt payments	47,282	49,911	52,760	55,856	104,215
Equity distributions	73,849	73,153	72,208	70,980	114,440

- Debt payments equal the sum of interest and principal payments.
- All cash flows after making principal repayments are distributed to equity holders. (See Point 4 under Table 4-5 for details.)

NPV (cash flows on debt) = \$255,443

NPV (cash flows on equity) = \$255,443

Value of company = **\$510,886**

READING 20: CAPITAL STRUCTURE

LESSON 1: THE CAPITAL STRUCTURE DECISION PART I: CAPITAL STRUCTURE AND THE MM PROPOSITIONS WITH NO TAXES

LOS 20a: Explain the Modigliani–Miller propositions regarding capital structure, including the effects of leverage, taxes, financial distress, agency costs, and asymmetric information on a company’s cost of equity, cost of capital, and optimal capital structure. Vol 3, pp 94–103

The Capital Structure Decision

A company's capital structure refers to the combination of debt and equity capital it uses to finance its business. The aim of the company is to achieve the capital structure that minimizes its weighted average cost of capital (WACC) and, consequently, maximizes company value.

The WACC is calculated as the weighted average of the marginal cost of each type of financing used by the company. The WACC for a company that uses both equity and debt financing and for which interest expense is tax deductible is calculated as:

$$r_{WACC} = \left(\frac{D}{V}\right)r_D(1 - t) + \left(\frac{E}{V}\right)r_E$$

... (Equation 1)

where:

r_D = Marginal cost of debt

r_E = Marginal cost of equity

t = Marginal tax rate

D = Market value of the company's outstanding debt

E = Market value of shareholders' equity

V = D + E = Value of the company

Note:

- Since the costs of debt and equity and the tax rate in Equation 1 are all “marginal” rates, the overall cost of capital is also a marginal rate (i.e., the cost the company would incur to raise additional capital in the specified ratio of debt to equity).
- These costs reflect current costs, but not costs incurred in the past.

MM Proposition I without Taxes: Capital Structure Irrelevance

Nobel Prize–winning economists Franco Modigliani and Merton Miller (MM) argued that given certain assumptions, a company's capital structure does not affect its overall value. This assertion assumes that:

1. Investors have homogeneous expectations regarding the cash flows from an investment in bonds or stocks.
2. Capital markets are perfect (i.e., there are no taxes, no transaction costs, and no bankruptcy costs). Further, all market participants have the same information so investments with identical cash flow streams and risk must trade at the same price.
3. Investors can borrow and lend at the risk-free rate.

4. There are no agency costs—i.e., managers always act in the best interests of shareholders (aim to maximize shareholder wealth).
5. The financing and investment decisions are independent of each other. Therefore, operating income remains unaffected by changes in capital structure.

To understand this proposition, think of the total capital of the company as a pie.

- Each slice represents the proportion of total capital provided by a particular source of financing (debt or equity).
- The pie may be split in any number of ways, but its overall size will not change.

Saying that the size of the pie remains the same is equivalent to saying that the present value of the company's expected future cash flows remains the same.

- This implies that future cash flows are unaffected by changes in capital structure.
- This also means that the cost of capital (which reflects the risk inherent in these cash flows) remains the same.

BOTTOM LINE: GIVEN THE ASSUMPTIONS LISTED ABOVE AND NO TAXES, CHANGES IN CAPITAL STRUCTURE DO NOT AFFECT COMPANY VALUE.

While this assertion may seem quite unacceptable to you at this stage, we illustrate its implications through a quick example. Suppose a company has a capital structure with 50% debt and 50% equity. However, an investor believes that the optimal capital structure for the company would be 60% debt and 40% equity. Given Assumption 3 above, this investor can borrow at the risk-free rate to finance her purchase of shares, such that her effective ownership of the company reflects her preferred 60/40 debt-equity ratio. With perfect capital markets and investment and financing decisions independent of each other, each shareholder can create the capital structure she desires by borrowing and lending at the risk-free rate. Therefore, the capital structure chosen by the company becomes irrelevant.

Further, under this proposition, the value of a levered company (V_L) is the same as the value of an unlevered company (V_U). The possibility of arbitrage profits (by purchasing the undervalued asset and selling the overvalued one) if this were not the case ensures that the two are the same.

$$V_L = V_U$$

For example, suppose there are two companies with different capital structures that have identical perpetual expected future cash flows, identical uncertainty associated with those cash flows, and, therefore, identical present values of expected future cash flows. If their different capital structures translated into different firm values, the possibility of riskless arbitrage profits would arise by purchasing the firm with the lower value and selling the firm with the higher value. The future cash flows of the two firms would offset and the investor would be left with a riskless arbitrage profit equal to the difference between the firms' values.

The importance of this proposition is that it implies that managers cannot create value by simply altering the company's capital structure.

- If the company were financed only with equity, its entire operating earnings would belong to shareholders, and the company's value would equal the present value of those operating earnings.

- If the company were financed with both debt and equity, its operating earnings would be shared by equity and debt holders. The value of the company would still remain the same as its value is determined solely on the basis of its expected future cash flows (and the risk inherent in them) and not on the proportion of debt and equity in its capital structure.

An important implication here is that the WACC for the company is unaffected by capital structure assuming that there are no taxes.

MM Proposition I (no taxes): The market value of a company is not affected by the capital structure of the company.

MM Proposition II without Taxes: Higher Financial Leverage Raises the Cost of Equity

Assuming that there are no costs of financial distress and given that debt holders have a priority claim to assets and income (above equity holders), the cost of debt is lower than the cost of equity. However, as companies take on more debt, the risk to equity holders increases, so the cost of equity increases. MM Proposition I (without taxes) implies that a company's WACC is unaffected by changes in its capital structure. Therefore (in response to an increase in leverage), the company's cost of equity rises to a level such that the higher cost of equity exactly offsets the benefit of using cheaper debt, with the WACC remaining unchanged.

The risk of equity depends on (1) operations or business risk and (2) the degree of financial leverage or financial risk. Business risk determines the cost of capital, while capital structure determines financial risk.

Ignoring taxes, a company's WACC can be calculated as:

$$r_{WACC} = \left(\frac{D}{V}\right)r_D + \left(\frac{E}{V}\right)r_E \quad \dots \text{Equation 2}$$

Note that r_D equals the before and after-tax cost of debt (as we are assuming zero taxes for now).

Based on MM Proposition I and denoting the cost of capital for an all-equity financed company as r_0 , we can state the following relationship:

$$r_{WACC} = \left(\frac{D}{V}\right)r_D + \left(\frac{E}{V}\right)r_E = r_0 \quad \dots \text{Equation 3}$$

Since $D + E$ equals V , we can solve for the cost of equity and obtain the following equation:

$$r_E = r_0 + (r_0 - r_D) \frac{D}{E} \quad \dots \text{Equation 4}$$

Equation 4 clearly shows that the relationship between a company's cost of equity (r_E) and the proportion of debt in its capital structure (D/E) is positive and linear. As the D/E ratio increases, the cost of equity also increases.

MM Proposition II (without taxes): The cost of equity is a linear function of the company's debt/equity ratio.

Let's quickly work through an example to illustrate the impact on the cost of equity and r_{WACC} when the company alters its capital structure. Suppose ABC Company is initially financed entirely with equity. The company's operating income (EBIT) equals \$10,000 and its WACC (also its cost of equity) equals 10%. Assuming no taxes and that EBIT and other cash flows are perpetuities, the value of the company is calculated as:

$$V = \frac{EBIT}{r_{WACC}} = \$10,000 / 0.10 = \$100,000$$

The company now plans to issue \$25,000 worth of debt at 6% to repurchase stock worth \$25,000. Once debt is issued and stock repurchased, annual interest payments on debt amount to \$25,000 $\times 0.06 = \$1,500$, and the value of equity in the capital structure falls to $100,000 - 25,000 = \$75,000$. Under MM Proposition II with no taxes, ABC's cost of equity would now rise to:

$$r_E = r_0 + (r_0 - r_D) \frac{D}{E}$$

$$r_E = 0.10 + (0.10 - 0.06)(\$25,000/\$75,000) = 11.33\%$$

Debt is also assumed to be perpetual.
Cash flow to equity holders equals initial EBIT minus interest on debt.

The total value of the company would remain the same.

$$V = \frac{\text{Interest}}{r_D} + \frac{\text{EBIT} - \text{Interest}}{r_E}$$

$$V = \frac{\$1,500}{0.06} + \frac{(\$10,000 - \$1,500)}{0.1133} = \$25,000 + \$75,000 = \$100,000$$

And its WACC also remains the same:

$$r_{WACC} = \left(\frac{D}{V}\right)r_D + \left(\frac{E}{V}\right)r_E$$

$$r_{WACC} = 0.25(0.06) + 0.75(0.1133) = 10\%$$

Also note that the systematic risk (β) of the company's assets can be expressed as the weighted average of the systematic risk of the company's debt and equity.

$$\beta_A = \left(\frac{D}{V}\right)\beta_D + \left(\frac{E}{V}\right)\beta_E \quad \dots \text{Equation 5}$$

This formula can also be expressed as:

$$\beta_E = \beta_A + (\beta_A - \beta_D)\left(\frac{D}{E}\right) \quad \dots \text{Equation 6}$$

As mentioned earlier, MM assert that the company's cost of capital does not depend on capital structure, but depends on business risk. An increase in leverage increases the probability of

default, and this risk is borne by equity holders. Therefore, as the proportion of debt in the company's capital structure increases (D/E), the firm's equity beta (β_E) also increases.

LESSON 2: THE CAPITAL STRUCTURE DECISION PART II: MM PROPOSITIONS WITH TAXES, THE COSTS OF FINANCIAL DISTRESS, AGENCY COSTS, ASYMMETRIC INFORMATION AND THE STATIS TRADE-OFF THEORY

LOS 20a: Explain the Modigliani–Miller propositions regarding capital structure, including the effects of leverage, taxes, financial distress, agency costs, and asymmetric information on a company's cost of equity, cost of capital, and optimal capital structure. Vol 3, pp 94–103

MM Proposition with Taxes

If we relax the assumption of no taxes, the use of debt would actually increase the value of a company. This is because interest payments are tax deductible in most countries, so the use of debt results in tax savings for the company. Therefore, assuming no costs of financial distress, the value of a leveraged company (V_L) is greater than that of an unleveraged company (V_U) by an amount equal to the marginal corporate tax rate (t) multiplied by the value of debt (D).

Note that tD is also referred to as the debt tax shield.

$$V_L = V_U + tD \quad \dots \text{Equation 7}$$

The WACC is then calculated as:

$$r_{WACC} = \left(\frac{D}{V}\right)r_D(1 - t) + \left(\frac{E}{V}\right)r_E \quad \dots \text{Equation 8}$$

And the cost of equity is calculated as:

$$r_E = r_0 + (r_0 - r_D)(1 - t) \left(\frac{D}{E}\right) \quad \dots \text{Equation 9}$$

Notice that the difference between Equation 4 (calculating cost of equity assuming no taxes) and Equation 9 (calculating the cost of equity with taxes) lies in the slope term. Specifically, $(1 - t)$ is present in the slope term in Equation 9, but not in Equation 4. This has the following important implications:

- With taxes, the cost of equity still rises as more debt is introduced into the capital structure, but it does not rise as fast as it would were there no taxes.
 - $(r_0 - r_D)(1 - t)$ is positive but less than $(r_0 - r_D)$
 - The slope coefficient on D/E in Equation 9 (with taxes) is $(r_0 - r_D)(1 - t)$
 - The slope coefficient on D/E in Equation 4 (no taxes) = $(r_0 - r_D)$
- Since the cost of equity does not rise as rapidly when the company issues additional debt (with taxes), WACC falls as debt increases (as opposed to remaining constant which was the case with no taxes). Therefore, overall company value increases when more debt is issued.
- With taxes, but without costs of financial distress and bankruptcy, use of debt offers immense benefits to the company.
- In the extreme, the value of a company is maximized if its capital structure is composed entirely of debt.

Let's go back to ABC Company and assume that the company now faces a marginal tax rate of 40%.

Note that the value of the unlevered company has fallen from \$100,000 earlier as the government is now also a claimant on the company's cash flows.

The value of the unlevered (all-equity) company is calculated as:

$$V_U = \frac{EBIT(1 - t)}{r_{WACC}} = \frac{(\$10,000)(1 - 0.4)}{0.1} = \$60,000$$

When the company issues \$25,000 in debt to repurchase an equivalent value of stock, the value of the company rises to:

$$V_L = V_U + tD = \$60,000 + 0.4(\$25,000) = \$70,000 \quad \dots \text{Using Equation 7}$$

The cost of equity rises to:

$$r_E = 0.10 + (0.10 - 0.06)(1 - 0.4)(5/9) = 11.33\% \quad \dots \text{Using Equation 9}$$

The value of equity after the repurchase equals \$45,000.
Therefore:
D/V = 5/14;
E/V = 9/14;
D/E = 5/9.

But the WACC still falls:

$$r_{WACC} = (5/14)(0.06)(1 - 0.4) + (9/14)(0.1133) = 8.5714\% \quad \dots \text{Using Equation 8}$$

For illustrative purposes, note that the value of the leveraged company can also be calculated as the sum of the values of debt and equity:

$$\begin{aligned} V_L &= \frac{\text{Interest}}{r_D} + \frac{(EBIT - \text{Interest})(1 - t)}{r_E} \\ V_L &= \frac{\$1,500}{0.06} + \frac{(\$10,000 - \$1,500)(1 - 0.4)}{0.1133} = \$25,000 + \$45,000 = \$70,000 \end{aligned}$$

Or alternatively, as the present value of after-tax operating cash flows discounted at the WACC:

$$V_L = \frac{EBIT(1 - t)}{r_{WACC}} = \frac{(\$10,000)(1 - 0.4)}{0.085714} = \$70,000$$

Bottom line:

In the earlier example (no taxes), the use of higher debt:

- Did not increase the value of the firm. Company value remained at \$100,000.
- The benefit of lower cost of debt (relative to equity) was offset by a higher cost of equity (due to higher risk for equity holders from increasing leverage). The cost of equity rose from 10% to 11.33%.
- The WACC remained the same (at 10%).

In this new example (with taxes), the use of higher debt:

- Increased the value of the firm from \$60,000 to \$70,000.
- The benefits of lower cost of debt (relative to equity) and the debt tax shield outweighed the effects of a higher cost of equity (due to higher risk for equity holders from increasing leverage).
- The cost of equity still rose from 10% to 11.33%, but importantly, the WACC fell from 10% to 8.57%.

See Table 2-1 and Figure 2-1.

Table 2-1: Modigliani and Miller Propositions

	Without Taxes	With Taxes
Proposition I	$V_L = V_U$	$V_L = V_U + tD$
Proposition II	$r_E = r_0 + (r_0 - r_D) \frac{D}{E}$	$r_E = r_0 + (r_0 - r_D)(1 - t) \frac{D}{E}$

Figure 2-1: MM Proposition II

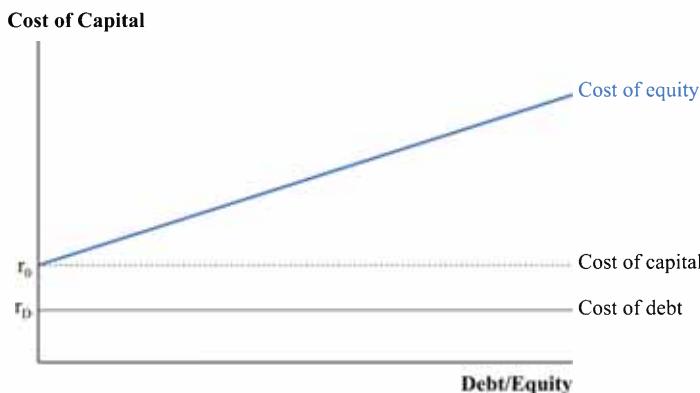


Figure 2-1a:
Cost of Capital with No Taxes

MM Proposition II (without taxes) states that the use of cheaper debt increases the cost of equity. The increase in the cost of equity exactly offsets the benefit of adding cheaper debt to the capital structure, resulting in a constant WACC (cost of capital).

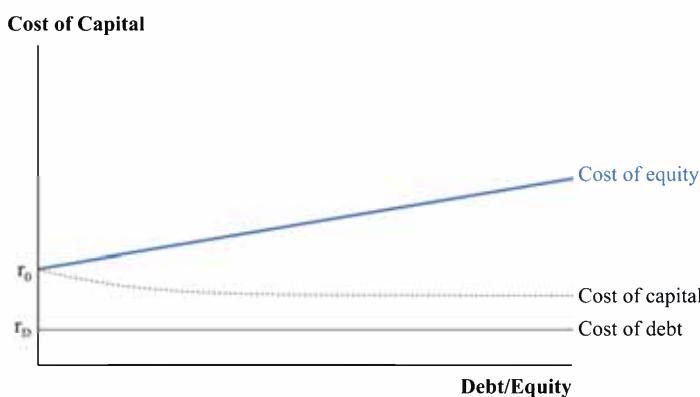


Figure 2-1b:
Cost of Capital with Taxes

Under MM Proposition II (with taxes) the cost of equity still increases, but not fast enough to completely undo the benefit of using cheaper debt (since debt also results in an interest tax shield), resulting in a decrease in the company's weighted average cost of capital.

In 1977, Miller expanded his analysis to include the effects of the differing tax rates on dividend and interest income on the benefits of debt financing. If investors face a higher personal tax rate on interest income relative to dividend income, they would require a higher return on debt, increasing the cost of debt for the company. Therefore, whether or not the use of debt adds value to the company depends on the corporate tax rate, personal

tax rate on interest income, and personal tax rate on dividend income. Depending on these tax rates, the use of debt by a company may add value, lower value, or have no effect on a company's value.

Costs of Financial Distress

The expected cost of financial distress equals the actual cost of financial distress times the probability that the company will face financial distress.

Recall from Level I that leverage (operating and financial) not only enhances returns but also magnifies losses. Losses put companies under financial distress as it becomes difficult to satisfy payment obligations. The expected cost of financial distress has two components:

- The costs of financial distress and bankruptcy: These include:
 - Direct costs of financial distress include actual cash expenses such as legal and administrative fees incurred in bankruptcy proceedings.
 - Indirect costs of financial distress include forgone investment opportunities and an impaired ability to conduct business.
- **The probability of financial distress and bankruptcy occurring:** The probability of bankruptcy depends on the company's operating and financial leverage and the business environment. The company's corporate governance structure and management quality also have an impact on the likelihood of bankruptcy.

All other factors remaining the same, higher expected costs of financial distress serve as disincentives for companies to take on more debt.

Agency Costs

Perquisite consumption refers to items that executives may legally authorize for themselves that have a cost to shareholders. Examples include corporate jets, subsidized dining, etc.

Agency costs refer to the costs that arise due to conflicts of interest when management (an agent) makes decisions for shareholders (principals). The smaller the stake that management has in the company, the lower its share in bearing the costs of excessive **perquisite consumption** or the cost of not running the company to the best of its ability. Since shareholders are aware of this misalignment of interests, they take actions to minimize agency costs.

Agency costs include:

- **Monitoring costs:** These are the costs incurred by shareholders to monitor the actions of management. They include expenses relating to the annual report and the board of directors.
- **Bonding costs:** These are the costs incurred by management to assure shareholders that they are working in shareholder interest. These include explicit costs (e.g., costs of insurance to guarantee performance) and implicit costs (e.g., those associated with noncompete employment contracts).
- **Residual loss:** These losses refer to costs that are incurred despite adequate monitoring and bonding provisions. These costs arise because monitoring and bonding mechanisms are not perfect.

Good corporate governance practices help to lower agency costs by ensuring that management's interests are better-aligned with those of shareholders.

Agency theory predicts that higher use of debt relative to equity in a company's capital structure reduces net agency costs. This forms the basis of **Jensen's free cash flow hypothesis**, which asserts that higher debt levels force managers to use company funds as efficiently as possible so that the company can satisfy debt servicing obligations in a timely manner. Basically, higher debt levels limit opportunities for management to misuse cash.

Costs of Asymmetric Information

The fact that managers generally have more information about a company's performance than outsiders (e.g., shareholders, creditors, etc.) gives rise to information asymmetries. Asymmetric information is relatively higher in companies with:

- Complex products.
- Less transparency in financial accounting information.
- Lower levels of institutional ownership.

Since investors are aware of the existence of information asymmetries, they closely monitor management behavior to gain insights into management's beliefs regarding the company's future prospects. Aware of this scrutiny, managers take into account how their actions will be perceived by investors when they choose financing methods for new investments. The **pecking order theory** asserts that managers prefer modes of financing that offer the least information content to company outsiders. Therefore, managers generally favor internal financing, then debt, and finally equity. The pecking order theory implies that:

- Managers tend to issue equity when they believe that the company's stock is overvalued, and are reluctant to issue equity if they believe that the stock is undervalued. Therefore, issuance of equity is often interpreted as a negative signal by investors.
- Issuance of more debt usually sends a positive signal about the company as the commitment to make timely interest and principal payments shows that management has confidence in the company's cash-generating ability going forward.

Costs of asymmetric information decrease as more debt is issued.

The Optimal Capital Structure: The Static Trade-Off Theory

In our earlier analysis of the MM proposals, we concluded that with taxes (and ignoring the costs of financial distress) the optimal capital structure is 100% debt. Practically speaking, however, the value-enhancing effects of debt in the capital structure (debt tax shield) must be balanced against its value-reducing effects (costs of financial distress). This is the basic idea behind the **static trade-off theory of capital structure**. After accounting for the costs of financial distress, the value of the leveraged firm can be calculated as:

$$V_L = V_U + tD - PV(\text{Costs of financial distress})$$

Figure 2-2a shows that as the proportion of debt in a company's capital structure increases, the market value of a company also increases due to the tax shield benefits of using debt. However, after reaching a certain maximum value (at Point A), additional use of debt lowers the value of the company as the increase in costs of financial distress exceeds the tax shield benefits of issuing additional debt. The point at which the value of the company is maximized defines the company's **optimal capital structure**. Optimal debt usage occurs

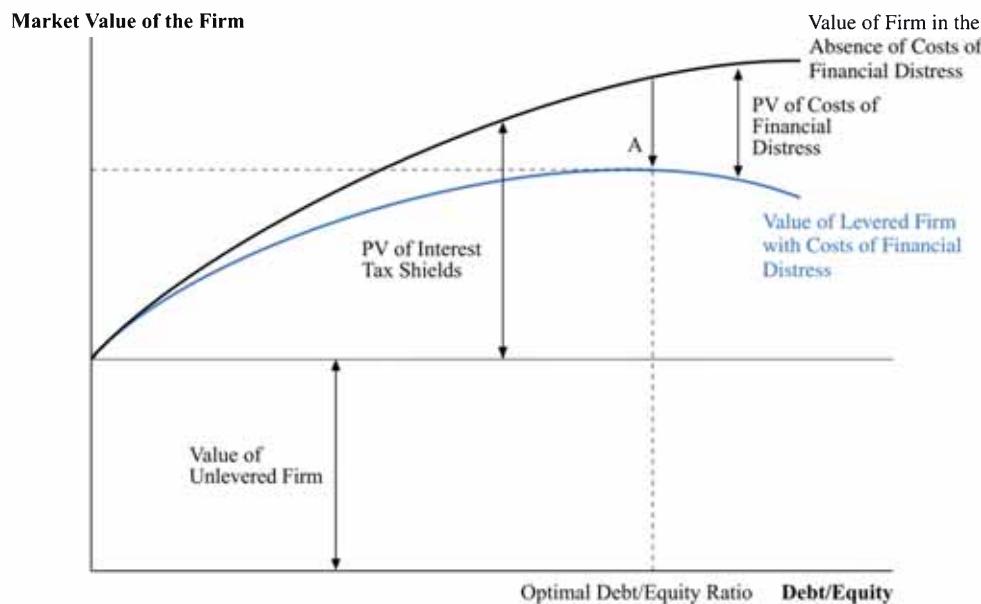
at the point where issuing additional debt would cause the costs of financial distress to increase by a greater amount than the additional tax shield obtained.

Note that the capital structure with which company value is maximized is the same as the capital structure at which the cost of capital (WACC) is minimized (Figure 2-2b). Further note that the WACC curve is U-shaped.

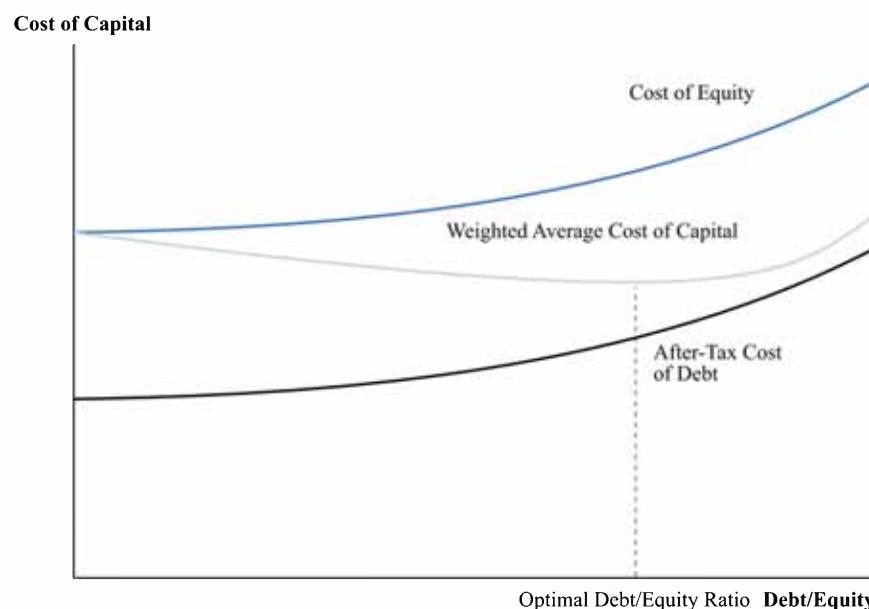
- Initially, as more debt is added to the capital structure, the WACC falls due to the lower cost of debt (compared to equity).
- Eventually, WACC increases as the cost of equity and the cost of debt both rise to compensate for the higher risk associated with high debt levels.

Figure 2-2: Trade-Off Theory with Taxes and Costs of Financial Distress

2a: Value of Company and the D/E Ratio



2b: Cost of Capital and the D/E Ratio



Note that every company has a unique optimal capital structure depending on its appetite for risk, business environment, tax situation, corporate governance, and financial accounting information transparency.

To summarize:

- The MM proposition with taxes (but no costs of financial distress) states that a capital structure comprised entirely of debt is optimal as it maximizes company value (minimizes the cost of capital).
- The static trade-off theory accounts for taxes and costs of financial distress and states that a company's optimal capital structure occurs at a point where the weight of debt is greater than 0% but less than 100%.

LESSON 3: THE TARGET CAPITAL STRUCTURE AND PRACTICAL ISSUES IN CAPITAL STRUCTURE POLICY

LOS 20b: Describe target capital structure and explain why a company's actual capital structure may fluctuate around its target. Vol 3, pp 106–108

Companies usually try to adopt their optimal capital structure as their target capital structure. However, there may be periods during which companies deviate from their target capital structure. This may occur due to the following reasons:

- It may sometimes make sense for the company to exploit short-term opportunities in a particular source of financing. For example, in an environment where interest rates are extremely low, a company may issue additional debt which may cause the weight of debt in its capital structure to temporarily exceed its weight in the target capital structure.
- Capital structure weights are determined using market values of debt and equity. Therefore, changes in market values of debt and equity result in a change in the company's capital structure.
- At certain times, it may be impractical or expensive for the company to issue securities to maintain the target capital structure (e.g., due to high flotation costs).

LOS 20c: Describe the role of debt ratings in capital structure policy. Vol 3, pp 109–110

Debt Ratings

Credit rating agencies, such as Moody's, Standard & Poor's, and Fitch, assess a company's ability to satisfy its commitments relating to the amount and timing of payments on issued debt. In determining how much debt to take on, management must consider the impact of any debt issuance on the company's debt ratings. As leverage increases, the credit risk inherent in the company's debt increases, which can prompt rating agencies to lower (downgrade) the company's credit rating. Lower ratings signify higher risk, and lead to higher required returns for both equity and debt holders, which make it more expensive for the company to raise capital going forward.

LOS 20d: Explain factors an analyst should consider in evaluating the effect of capital structure policy on valuation. Vol 3, pp 110–111

Evaluating Capital Structure Policy

When evaluating a company's capital structure policy, an analyst should consider:

- Changes in the company's capital structure over time.
- The capital structure of competitors that have similar business risks.
- Company-specific factors that may affect agency costs (e.g., corporate governance).

The state of the company's finances, along with potential costs of financial distress, can help the analyst determine how much leverage the company can handle. Practical considerations include:

- The industry in which the company operates.
- The volatility of the company's cash flows.
- The company's need for financial flexibility.
- The value of tangible, marketable assets held by the company.
- The significance of information asymmetries.

Analysts typically use scenario analysis to determine a company's optimal capital structure. Starting with the company's current cost of capital, they look to determine:

- The impact of a change in the company's debt ratio on its cost of capital.
- The debt ratio at which the company's cost of capital is minimized (and the value of the company is maximized).
- The impact of difficult market conditions (during which the company may fail to maintain its optimal capital structure) on the company's stock price and value.

LOS 20e: Describe international differences in the use of financial leverage, factors that explain these differences, and implications of these differences for investment analysis. Vol 3, pp 111–115

So far we have learned that a company's capital structure is largely determined by company-specific factors (e.g., profitability, quality of assets), but is also influenced to some extent by the industry in which it operates. In addition to this, research has shown that certain country-specific factors also have an impact on capital structure. Differences in capital structure as well as differences in debt maturity schedules have been seen across countries.

- Companies in France, Italy, and Japan tend to use more debt relative to companies in the United States and the United Kingdom.
- Companies in North America tend to use more long-term debt compared to Japanese companies.
- Companies in developed markets tend to use more long-term debt and usually have higher long-term debt to total debt ratios compared to companies in emerging markets.

Differences in capital structures across countries may be explained by the following factors:

- Institutional and legal environment.
- Financial markets and banking sector.
- Macroeconomic environment.

Institutional and Legal Environment

Strength of the legal system: The quality of legal protection offered to investors depends on the content and enforcement of contracts and laws.

- Companies in countries with weaker legal systems tend to have higher financial leverage.
- Use of short-term debt is more common relative to long-term debt in countries with weaker legal systems.

Type of law: Research has shown that legal systems based on common law tend to provide better protection to external providers of capital than systems based on civil law.

- It has been observed that companies in common-law countries tend to use longer-term debt and have lower leverage than companies in civil-law countries.

Information asymmetry: A high degree of information asymmetry between managers and investors encourages greater use of debt relative to equity financing and greater reliance on short-term debt than long-term debt. The presence of financial analysts (especially in developed countries) and auditors (especially in emerging countries) tends to reduce information asymmetries and to increase levels of transparency.

Taxes: In jurisdictions where interest expense is tax deductible, taxes lower the cost of debt, encouraging the use of debt financing. However, this relationship may not hold if dividend income is taxed at a more favorable rate than interest income. A lower tax rate on dividend income will reduce the return required by providers of equity capital and reduce the cost of equity for the firm. As a result, companies in countries with low tax rates on dividend income have a relatively lower proportion of debt in their capital structures.

Financial Markets and Banking Sector

Capital markets: Researchers have found that companies in countries with more liquid and active capital markets tend to use more long-term debt (as opposed to short-term debt) relative to companies in countries with less liquid capital markets. This is because there is a higher degree of external monitoring of companies by market participants in active markets.

Reliance on the banking sector: Countries where shareholder rights are relatively strong tend to be more market based. Countries where shareholder rights are not as strong tend to be more bank-oriented, as banks can handle information asymmetries more efficiently than bondholders.

Presence of institutional investors: Some institutional investors have preferred debt maturities (preferred habitats) for their investments, which may influence companies' debt maturity structure. For example, insurance companies and pension plans typically prefer to invest in longer-term debt securities. It has generally been observed that companies in countries with more institutional investors in their markets tend to have a lower proportion of debt in their capital structures and use more long-term debt.

Macroeconomic Environment

Inflation: Inflation lowers the real value of payments to debt holders. Companies in high-inflation countries tend to have lower financial leverage and use more short-term debt.

GDP growth: Companies in developed countries with high GDP growth rates tend to have longer maturities of debt. Companies in developing countries with high GDP growth rates tend to rely less on debt financing.

See Table 3-1.

Table 3-1: Impact of Country-Specific Factors on Companies' Capital Structure

Country-Specific Factor	D/E Ratio	Maturity of Debt
Institutional Framework		
Efficient legal system	Lower	Longer
Common law as opposed to civil law	Lower	Longer
Lower information asymmetry	Lower	Longer
Favorable taxes on equity	Lower	N/A
Financial Markets and Banking System		
Active bond and stock market	N/A	Longer
Bank-based financial system	Higher	N/A
Large institutional investors	Lower	Longer
Macroeconomic Environment		
High inflation	Lower	Shorter
High GDP growth	Lower	Longer

READING 21: ANALYSIS OF DIVIDENDS AND SHARE REPURCHASES

LESSON 1: DIVIDENDS: FORMS AND EFFECTS ON SHAREHOLDER WEALTH AND ISSUING COMPANY'S FINANCIAL RATIOS

LOS 21a: Describe the expected effect of regular cash dividends, extra dividends, liquidating dividends, stock dividends, stock splits, and reverse stock splits on shareholders' wealth and a company's financial ratios. Vol 3, pp 126–134

Companies can make dividend payments in a number of ways—cash dividends, stock dividends, and stock splits.

Cash Dividends

Regular Cash Dividends

Most companies pay out cash dividends to shareholders on a regular schedule. Typically, cash dividends are paid on a quarterly basis in the United States, on a semiannual basis in Europe and Japan, and on an annual basis in other Asian markets.

Companies strive to maintain or increase their cash dividend payouts. A company's cash dividend payout record sends important messages about the company to investors and potential investors.

- A record of consistent dividends over an extended period of time indicates that the company is consistently profitable.
- A trend of increasing regular dividends over time indicates that the company is doing well and is willing to share profits with shareholders. This suggests that the company's shares are of high investment quality.
- An increase in a company's regular dividend, especially if unexpected, can send a very strong message out to investors and usually has a positive effect on share price.

Dividend Reinvestment Plans (DRPs)

A dividend reinvestment plan (DRP) is a system that allows investors to reinvest all or a portion of cash dividends received from a company in shares of the company. There are three types of DRPs:

- Open market DRPs, in which the company purchases shares (on behalf of plan participants) from the open market.
- New-issue DRPs or scrip dividend schemes, in which the company issues the additional shares instead of repurchasing them.
- Plans where companies are permitted to obtain additional shares through open-market purchases or new issuances.

Advantages to the Company

- The shareholder base is diversified as smaller investors gain easier access to additional shares in the company. Companies usually prefer a broad and diversified shareholder base.
- They may encourage long-term investment in the company by building investor loyalty to the company.
- New issue DRPs allow companies to raise equity capital without incurring floatation costs.

Dollar-cost averaging is the technique of buying a fixed dollar amount of a particular investment on a regular schedule, regardless of the share price. More shares are purchased when prices are low and fewer shares are bought when prices are high.

For these reasons, use of such plans may be especially appropriate in a tax-deferred account (in which investment earnings are not taxed), such as certain types of retirement accounts.

Advantages to Shareholders

- Shareholders can accumulate shares in the company using dollar-cost averaging.
- DRPs are a cost-effective means for small investors to purchase additional shares in the company.
- There are no transaction costs associated with obtaining shares through a DRP.
- Shares offered in a DRP are sometimes issued to shareholders at a discount to the market price.

Disadvantages to Shareholders

- In jurisdictions where capital gains are taxed, investors must keep record of the cost basis of shares received to accurately compute gains and losses when shares are sold. If the shares are obtained at a price that is higher (lower) than the purchase price of the shares originally held, the investor's average cost basis will increase (decrease).
- Cash dividends are fully taxed in the year they are received (even if reinvested). As a result, an investor who participates in a DRP may have to pay tax on cash that he actually does not receive.
- If new shares are issued at a discount, shareholders that do not participate in the DRP tend to suffer dilution.

Extra or Special (Irregular) Dividends

A special dividend refers to a dividend payment by a company that does not usually pay dividends or a dividend payment on top of the company's regular dividend. Companies use special dividends to distribute more earnings in strong years and excess cash to shareholders.

Liquidating Dividends

A dividend payment is known as a liquidating dividend when:

- A company goes out of business and its net assets are distributed to shareholders.
- A company sells off a portion of its business and distributes the proceeds to shareholders.
- A company pays out a dividend that is greater than its retained earnings. Such a payment reduces (impairs) the company's stated capital.

Note that a liquidating dividend is a return of capital rather than a distribution from earnings or retained earnings.

Stock Dividends

A stock dividend or a bonus issue occurs when a company issues additional common shares in the company (instead of cash) to shareholders. Example 1-1 illustrates how stock dividends work.

Example 1-1: Illustration of the Effects of Stock Dividends

ABC Company has 10 million shares outstanding. The stock is currently trading for \$25 with an EPS of \$1.25 and a P/E multiple of 20.

1. Illustrate the effects of a 5% stock dividend on ABC's EPS, stock price, P/E ratio, and total number of shares outstanding.
2. Illustrate the effects of the stock dividend on the total cost, cost-per-share, and total number of shares held for an investor who holds 1,000 shares in ABC which were purchased for \$14 each.

Solutions:

- Effects of stock dividend on ABC Company:

	Before Dividend	After Dividend
Shares outstanding	10,000,000	$(10,000,000)(1.05) = 10,500,000$
Earnings per share	\$1.25	$(\$1.25)(10,000,000) / 10,500,000 = \1.19
Total market value	\$25,000,000	\$25,000,000
Stock price	\$25	$(\$25)(10,000,000) / 10,500,000 = \23.81
P/E	$\$25/\$1.25 = 20$	$\$23.81/\$1.19 = 20$

- Effects of stock dividend on the investor:

	Before Dividend	After Dividend
Shares owned	1,000	$(1,000)(1.05) = 1,050$
Total cost	\$14,000	\$14,000
Cost per share	\$14	$(\$14)(1,000) / 1,050 = \13.33
Total value of holding	$(\$25)(\$1,000) = \$25,000$	$(\$23.81)(1,050) = \$25,000$

Observations:

- The investor ends up with more shares, which she did not have to pay for.
- The company issues a dividend without spending any cash.
- The market value of the company does not change in response to a stock dividend.
- The investor's average cost per share falls, but the total cost remains unchanged.

Stock dividends do not affect an investor's proportionate ownership of a company. A stock dividend basically just divides the market value of a firm's equity into smaller pieces, but the percentage of the company owned by each shareholder remains the same, as does the market value of each investor's holding. Stock dividends are generally not taxable.

Advantages of Paying Out Stock Dividends

- Stock dividends favor long-term investors. This may lower the company's cost of equity financing.
- Stock dividends result in an increase in the stock's float, which improves share liquidity and lowers share price volatility.

Differences between Stock Dividends and Cash Dividends for the Company

Cash dividends reduce assets (cash) and shareholders' equity (retained earnings). When a company pays out cash dividends, not only do liquidity ratios deteriorate, but leverage ratios (e.g., debt-assets and debt-equity ratios) also worsen. On the other hand, stock dividends do not have any effect on a company's capital structure. Retained earnings fall by the value of stock dividends paid, but there is an offsetting increase in contributed capital so there is no change in shareholders' equity. Therefore, stock dividends have no impact on a company's liquidity and solvency ratios.

Stock Splits

Stock splits are similar to stock dividends in that they increase the total number of shares outstanding and have no economic effect on the company. If a company announces a 3-for-1 stock split, it means that each investor will get an additional 2 shares (to make a total of 3) for each share originally held. Example 1-2 illustrates how stock splits work.

Example 1-2: Effects of a Stock Split

XYZ Company has 25 million shares outstanding. The stock is currently trading for \$100 with an EPS of \$6 and a P/E multiple of 16.67. XYZ pays an annual dividend of \$2 per share and earns net income of \$150 million for the year.

1. Illustrate the effects of a 2-for-1 stock split on XYZ's EPS, stock price, P/E ratio, dividend payout ratio, dividend yield, and total number of shares outstanding.
2. Illustrate the effects of the stock split on the total cost, cost-per-share, and total number of shares held for an investor who holds 5,000 shares in XYZ which were purchased for \$84 each.

Solutions:

1. Effects of stock split on XYZ Company:

	Before Split	After Split
Shares outstanding	25,000,000	(25,000,000)(2) = 50,000,000
Earnings per share	\$6	$(\$6)(25,000,000) / 50,000,000 = \3
Total market value	\$2,500,000,000	\$2,500,000,000
Stock price	\$100	$(\$100)(25,000,000) / 50,000,000 = \50
P/E	$\$100/6 = 16.67$	$\$50/\$3 = 16.67$
Dividend per share	\$2	$(\$2)(25,000,000) / 50,000,000 = \1
Dividend payout ratio	$(\$2)(25,000,000) / \$150,000,000 = 33\%$	$(\$1)(50,000,000) / \$150,000,000 = 33\%$
Dividend yield	$\$2/\$100 = 2\%$	$\$1/\$50 = 2\%$

The dividend yield equals dividend per share divided by price per share.

2. Effects of stock split on the investor:

	Before Dividend	After Dividend
Shares owned	5,000	$5,000 \times 2 = 10,000$
Total cost	\$420,000	\$420,000
Cost per share	\$84	\$42
Total value of holding	$(\$100)(\$5,000) = \$500,000$	$(\$50)(10,000) = \$500,000$

Observations:

- The investor ends up with more shares, which she did not have to pay for.
- The company issues a dividend without spending any cash.
- The market value of the company does not change in response to a stock split.
- The investor's average cost per share falls, but the total cost remains unchanged.

From Example 1-3, you should also be able to understand that a 2-for-1 stock split has the same effects as a 100% stock dividend. However, there is one important difference between stock splits and stock dividends. A stock dividend results in a transfer of retained earnings to contributed capital, whereas a stock split has no impact on any shareholders' equity accounts.

Companies typically announce stock splits after a period during which the stock price has appreciated significantly to bring it down into a more marketable range. Many investors, however, see a stock split announcement as a signal for future stock price appreciation.

A **reverse stock split** increases the share price and reduces the number of shares outstanding. Similar to stock splits, the aim of a reverse stock split is to bring the stock price into a more marketable range.

Cash dividends result in an outflow of cash (decreasing a company's liquidity ratios and increasing its debt-to-assets ratio) and reduce retained earnings and shareholders' equity (increasing the debt-to-equity ratio). On the other hand, stock dividends, stock splits, and reverse stock splits have no impact on a company's liquidity or leverage ratios. They merely result in a change in the number of shares outstanding.

Example 1-3: Reverse Stock Split

Glitz Corporation's stock is currently trading at \$4.50 per share. The company recently announced a 1-for-10 reverse stock split to support its share price.

All other things remaining the same, calculate the expected stock price after the split. Also comment on the effect of a reverse stock split on shareholder wealth and the investors total cost basis.

Solution:

Expected stock price after the reverse stock split = $\$4.50 \times 10 = \45 per share

Theoretically, a reverse stock split should not have any impact on shareholder wealth. The market capitalization of the company and the investor's total cost basis should remain the same. However, stock splits and reverse stock splits might sometimes have a positive or a negative effect on share price depending on how the decision is interpreted by investors. For example, a reverse stock split that results in an increase in the share price and allows the company to retain the advantages of being listed on a leading global exchange may result in an increase in the market capitalization of the company.

LESSON 2: DIVIDEND POLICY AND COMPANY VALUE: THEORY

LOS 21b: Compare theories of dividend policy and explain implications of each for share value given a description of a corporate dividend action.
Vol 3, pp 134–147

LOS 21c: Describe types of information (signals) that dividend initiations, increases, decreases, and omissions may convey. Vol 3, pp 141–144

LOS 21d: Explain how clientele effects and agency costs may affect a company's payout policy. Vol 3, pp 137–147

A company's **payout policy** (or **distribution policy**) refers to the principles by which a company distributes cash to common shareholders through cash dividends and/or share repurchases. Payout policy is more general than **dividend policy** because it reflects the fact that companies can make distributions to shareholders in the form of cash dividends as well as share repurchases.

The debate regarding the importance of a company's dividend policy for shareholders has gone on for more than 40 years.

- One group of theorists believes that dividends have no impact on shareholder wealth. Only decisions relating to investment in working and fixed capital affect shareholder wealth.
- The other group believes that dividend policy does have an influence on shareholder wealth.

Dividend Policy Does Not Matter—Dividend Irrelevance Theory

Miller and Modigliani (MM) proposed that under perfect capital markets (no taxes, no transaction costs, and symmetric information), a company's dividend policy has no impact on its cost of capital or on company value. Their argument is based on the assumption that a company's dividend policy is independent of its investment and financing decisions.

Note that MM make no distinction between dividends and share repurchases. They are both considered ways of returning cash to shareholders.

Dividend irrelevance can be explained through the concept of **homemade dividends**. In perfect capital markets (with no taxes and transactions costs), if a shareholder desires more current income, she could sell sufficient shares to create her desired cash flow stream without incurring any costs. On the other hand, if she feels that the company's dividend is too high, she could use excess dividends to purchase shares of the company. In either case, the combined value of her investment in the company and cash received would be the same. Each shareholder can effectively design her own desired dividend policy (by buying stock using cash dividends received or selling stock) so the dividend policy adopted by the company becomes irrelevant.

Due to market imperfections, this theory does not hold up in the real world:

- Both companies and individuals incur transaction costs
 - Companies incur flotation costs (e.g., underwriters' fees, legal costs, registration expenses, etc.) when issuing new shares, but no such costs are incurred if internally generated equity is used to finance a capital project.
 - Shareholders incur transaction costs when buying and selling shares.

- Volatile stock prices can make it problematic to create homemade dividends. For example, if there is a decline in share prices, shareholders would have to sell more shares in order to create the desired dividend stream.

Dividend Policy Matters: The Bird in the Hand Argument

Other theorists argue that even under perfect capital markets, shareholders prefer current dividends over an equivalent amount of potential capital gains from reinvesting earnings because there is uncertainty associated with the capital gain, which makes it more risky. All other things remaining the same, a company that pays dividends (as opposed to one that reinvests all its earnings) will have a lower cost of equity as dividends are less risky.

The argument is named in reference to the proverb “a bird in the hand is worth two in the bush.”

The MM counterargument is that paying or increasing current dividends has no impact on the risk of future cash flows; cash dividends only lower the **ex-dividend price** of the share. Overall, shareholder wealth remains the same.

The **ex-dividend price** is the share price when the share first trades without the right to receive an upcoming dividend.

Dividend Policy Matters: The Tax Argument

In countries that impose a higher tax rate on dividends than on capital gains, taxable investors should prefer companies that pay relatively low cash dividends and reinvest their earnings in profitable growth opportunities. If a company does not have profitable growth opportunities, investors would prefer share repurchases over cash dividends as capital gains are taxed at a lower rate. In the extreme, this argument advocates a zero dividend payout ratio.

Before 2002, tax rates on dividends in the U.S. were as high as 39.1%, while long-term capital gains were taxed at 20%. After 2012, dividends on shares held for at least 60 days have been taxed at a maximum rate of 20%, which exceeds the long-term capital gains tax rate of 15%.

In the real world, however, certain countries require companies to distribute excess earnings as dividends or to classify share repurchases as dividends if the repurchases appear to be ongoing in lieu of dividend payments.

Other Important Theoretical Issues in Dividend Policy

The Clientele Effect

The clientele effect refers to the existence of groups of investors that prefer different dividend policies and lean toward investing in companies that match their desired policies. For example:

- Retired investors generally focus on current income so they prefer high dividend paying stocks, while younger investors with longer time horizons focus more on capital appreciation and are more willing to invest in companies that pay low dividends and reinvest their earnings in profitable growth opportunities.
- Investors whose marginal tax rate on capital gains is lower than that on dividends prefer income in the form of capital gains over dividend income.
- Some institutional investors like mutual funds, banks, and insurance companies, for strategic or legal reasons, only invest in companies whose dividend yields exceed a certain threshold.

The examples listed above suggest that equity market participants can be grouped by their preference for dividends or capital gains. However, the clientele effect does not imply that a change in dividend policy has an effect on shareholder wealth (so it does not contradict dividend irrelevance); it only determines the types of investors that hold the company’s stock. A change in dividend policy would leave shareholder wealth unchanged and result in a switch in clientele.

More on Tax Considerations

The expected decrease in share price when it goes ex-dividend can be calculated using the following equation:

This equation represents equilibrium if the marginal investor is indifferent between selling the share just before or just after it goes ex-dividend. A **marginal investor** in a given share is defined as an investor who is very likely to be part of the next trade in the share and is therefore very important in price formation.

$$P_W - P_X = \frac{1 - T_D}{1 - T_{CG}} \times D$$

where:

- P_W = Share price with the right to receive the dividend
- P_X = Share price without the right to receive the dividend
- D = Amount of dividend
- T_D = Tax rate on dividends
- T_{CG} = Tax rate on capital gains

FYI: This equation is derived in the CFA curriculum. For the purposes of the exam, you do not need to know how to derive it. Just make sure you understand the takeaways.

Takeaways

- If the investor's marginal tax rate on dividends is equal to her marginal tax rate on capital gains, the decrease in price when the stock goes ex-dividend should be equal to the amount of the dividend.
- If the investor's marginal tax rate on dividends is higher than her marginal tax rate on capital gains, the decrease in price when the stock goes ex-dividend should be less than the amount of the dividend.
- If the investor's marginal tax rate on dividends is lower than her marginal tax rate on capital gains, the decrease in price when the stock goes ex-dividend should be more than the amount of the dividend.

Example 2-1: Clientele and Preferences for Dividends versus Capital Gains

An investor pays taxes of 30% on dividend income and 18% on capital gains. Based on this information, would she prefer \$1 in dividends or \$0.82 in capital gains?

Solution:

$$D \times \frac{1 - T_D}{1 - T_{CG}} = 1 \times \frac{1 - 0.3}{1 - 0.18} = \$0.8537$$

For this investor, \$1 in dividends is equivalent to \$0.8537 in capital gains. Therefore, she would prefer \$1 in dividends to \$0.82 in capital gains.

Example 2-2: Clientele and Preferences for Dividends versus Capital Gains

All investors are taxed at a rate of 15% on capital gains, but the tax rate on dividends varies across investors. Given that on average the share price drops by 75% of the amount of the dividend when the share goes ex-dividend, calculate the marginal tax rate on dividend income applicable to investors who trade the stock around the ex-dividend day. Assume that any appropriate corrections for equity market price movements on ex-dividend days have been made.

Solution:

The share price drops by 75% of the amount of the dividend when it goes ex-dividend, which means:

$$(P_w - P_x)/D = 0.75$$

$$\text{Therefore: } \frac{1 - T_D}{1 - T_{CG}} = 0.75$$

$$T_D = 1 - [0.75 \times (1 - 0.15)]$$

$$T_D = 1 - 0.6375 = 0.3625 \text{ or } 36.25\%$$

LOS 21c: Describe types of information (signals) that dividend initiations, increases, decreases, and omissions may convey. Vol 3, pp 133–136

The Information Content of Dividend Actions: Signaling

Recall that one of the assumptions of the MM theory was symmetric information—i.e., all investors (insiders and outsiders) have the same information about the company. Practically speaking, however, corporate managers usually have access to more detailed information about the company than outside investors. Given asymmetric information, changes in dividends may convey new information about the company to outsiders and can therefore affect its stock price.

Companies use changes in dividends to convey credible information regarding the company's future prospects to investors. An increase in dividends would send out a positive signal regarding the company's profitability and carries more weight than positive words from management since cash is involved and a sustained increase in dividends would not be possible for a company that does not expect its cash flows to grow to sustainably higher levels in the long run.

Empirical studies have shown that:

- Dividend initiations or increases are usually taken as positive signals and lead to an increase in stock price.
 - A dividend declaration can reduce some of the information asymmetry between insiders and outsiders and close the gap between the market price and intrinsic value of the stock.
 - A dividend initiation or increase tends to be associated with share price increases because it attracts more attention to the company. Managers have an incentive to increase the company's dividend if they believe the company to be undervalued, because the increased scrutiny will lead to a positive price adjustment.
 - In contrast, managers of overvalued companies have little reason to mimic such a signal, because increased scrutiny would presumably result in a downward price adjustment to their shares.

- Companies that consistently increase their dividends seem to share the following characteristics:
 - Dominant or niche positions in their industry.
 - Global operations.
 - Relatively less volatile earnings.
 - Relatively high returns on assets.
 - Relatively low debt ratios.
- Dividend cuts or omissions are usually taken as negative signals and lead to a decrease in a company's share price.
 - However, companies may sometimes attempt to send a positive signal through dividend cuts by stating that retained earnings would be used to take advantage of profitable growth opportunities, which will enhance company value in the long run.

Agency Costs and Dividends as a Mechanism to Control Them

Agency Problems between Shareholders and Managers

The strength of a company's corporate governance has significant implications on its tendency to overinvest.

In many large public companies, managers (who control the company's operations) have little or no ownership in the company. The separation between managers and owners gives rise to the agency problem and results in managers overinvesting (Jensen's free cash flow hypothesis). The basic idea here is that shareholders are usually concerned about management investing in projects that may increase the size of the company (sales and/or assets) but reduce overall shareholder wealth. In such cases, payment of cash dividends constrains management's ability to overinvest. Generally speaking:

- Growing companies in industries undergoing rapid change tend to hold on to more cash and pay low or no dividends.
- Large, mature companies in noncyclical industries tend to pay higher dividends.
- There is empirical evidence to suggest that market reaction to dividend announcements is stronger for companies with stronger incentives to overinvest than for companies with lower incentives to overinvest.

Agency Problems between Shareholders and Bondholders

Generally speaking, bond covenants do not preclude the company from making distributions to shareholders from new earnings or new issues of stock.

Conflicts of interest also exist between shareholders and bondholders. When a company pays out dividends, it reduces the cash cushion available to satisfy its debt payment obligations. All other factors remaining the same, dividends and share repurchases increase the risk inherent in the company's debt. Therefore, bondholders often restrict the ability of the company to pay dividends that may exacerbate the position of bondholders. Covenants included in the bond indenture to mitigate agency problems between shareholders and bondholders include:

- Limitations on the total amount of distributions to shareholders during the term of the bond.
- Restrictions on dividend payments that are financed by selling operating assets or by issuing new debt.
- Requirement for certain minimum levels of EBITDA and/or EBIT for the company to be able to pay dividends.

LESSON 3: FACTORS AFFECTING DIVIDEND POLICY IN PRACTICE

LOS 21e: Explain factors that affect dividend policy in practice.

Vol 3, pp 147–154

LOS 21f: Calculate and interpret the effective tax rate on a given currency unit of corporate earnings under double taxation, dividend imputation, and split-rate tax systems. Vol 3, pp 150–152

A company's dividend policy refers to its decisions about whether and in what amount to pay dividends.

Factors Affecting Dividend Policy

Investment opportunities: Generally speaking:

- Companies that have greater profitable investment opportunities tend to pay lower dividends as they would rather use internally generated funds (that do not entail flotation costs) over issuing new equity to finance new investments.
- Companies that can delay investments without incurring any penalties pay higher dividends than those that must invest immediately when profitable investment opportunities arise.

Opportunities for new investments, and the speed at which the company must respond to them depends on the industry in which the company operates. For example:

- The pace of change in the technology industry is fairly rapid, so tech companies must respond to opportunities very quickly. Therefore, tech companies tend to pay lower dividends.
- On the other hand, there are typically fewer opportunities in the utilities industry and the pace of change is much slower as well. Therefore, utility companies tend to pay higher dividends.

Expected volatility of future earnings: Studies have shown that most managers:

- Have a target payout ratio based on long run sustainable earnings.
- Focus more on dividend changes than on dividend levels.
- Are reluctant to increase the dividend if they might have to reverse it soon.

Generally speaking, the more volatile a company's earnings, the greater the risk that the company will not be able to cover its dividend with earnings in the future. Therefore, companies with high expected volatility of future earnings tend to be more cautious with respect to the size and frequency of dividend increases.

Financial flexibility: A company may omit or cut dividends to keep substantial cash on hand to deal with any unforeseen operating needs and to take advantage of profitable investment opportunities. Strong cash flows are also particularly important during economic contractions when obtaining credit becomes more difficult. Generally speaking, companies that want to increase their financial flexibility prefer share repurchases to cash dividends because repurchases do not entail a formal requirement that they be executed and do not give rise to any expectations that they will be continued (unlike regular dividends).

Advantages of share repurchases relative to regular cash dividends are discussed later in the reading.

Tax considerations: Tax considerations are important because investors are interested in aftertax returns. Generally speaking, the lower an investor's marginal tax rate on dividends relative to her marginal tax rate on capital gains, the stronger her preference for dividends. However, an important factor that works in favor of income from capital gains is that capital gains taxes do not have to be paid until shares are sold, while taxes on dividends must be paid when dividends are received.

Flotation costs: Flotation costs on issuance of new equity can be quite significant (between 4% and 10% of the amount raised). They include:

- The fees paid to investment bankers, attorneys, and securities regulators.
- The possible adverse impact on the company's stock price due to the increase in the supply of shares outstanding.

Companies with profitable investment opportunities tend to pay lower dividends and retain cash because using internally generated equity is cheaper than issuing new equity to meet investment requirements.

Contractual and legal restrictions: In some circumstances, companies may be (contractually or legally) obligated to pay dividends, while in others they may be restricted from making dividend payments. For example:

- Covenants in bond indentures limit the company's ability to pay dividends.
- Dividends on ordinary shares cannot be paid until preference dividends have been paid.

Double Taxation System

Under this system, earnings are first taxed at the corporate level and then again at the shareholder level if they are distributed to taxable investors as dividends. See Example 3-1.

$$\text{ETR} = \text{CTR} + [(1 - \text{CTR}) \times \text{MTR}_D]$$

where:

ETR = Effective tax rate

CTR = Corporate tax rate

MTR_D = Investor's marginal tax rate on dividends

Example 3-1: Double Taxation of Dividends

- Net income before tax = \$100,000
- Corporate tax rate = 30%
- Investor's marginal tax rate on dividends = 15%
- Investor's marginal tax rate on capital gains = 35%

Given a dividend payout ratio of 100%, would the investor most likely prefer cash dividends or capital gains under the double taxation system?

Solution:

Effective tax rate on dividend distributions = $30\% + [(1 - 30\%) \times 15\%] = 40.5\%$

The investor's marginal tax rate on capital gains (35%) is lower than the effective tax rate on dividends (40.5%). Therefore, she would prefer capital gains over cash dividends.

Alternatively, we can calculate the ETR on dividends as follows:

Earnings	\$100,000
Corporate taxes @30%	\$30,000
Earnings after tax	\$70,000
Dividends (100% payout)	\$70,000
Tax on dividends @15%	\$10,500
Investor's after-tax dividend	\$59,500

$$\text{ETR} = (\$100,000 - \$59,500) / \$100,000 = 40.5\%$$

Dividend Imputation Tax System

In a dividend imputation tax system, earnings that are distributed as dividends are effectively taxed only once, at the shareholder's marginal tax rate. Therefore, the effective tax rate on dividends equals the investor's marginal tax rate. See Example 3-2.

Under this system, a company's earnings are first taxed at the corporate level. If and when these earnings are distributed to shareholders as dividends, shareholders may either receive a tax credit or have to pay additional taxes depending on their marginal tax rates:

- If an investor's marginal tax rate is lower than the corporate tax rate, she will receive tax credit (also known as **franking credit**) for the taxes paid by the company on distributed earnings.
- If an investor's marginal tax rate is higher than the corporate tax rate, she must pay additional taxes so that total taxes paid are in line with her marginal tax rate.

Example 3-2: Dividend Imputation Tax System

Net income before tax = \$100,000

Corporate tax rate = 30%

Investor's marginal tax rate = 15%

Assuming a dividend payout ratio of 100%, calculate the effective tax rate on dividends under an imputation system.

Solution:

Pre-tax income	\$100,000
Corporate taxes @ 30%	\$30,000
Net income after tax	\$70,000
Dividend (100% payout)	\$70,000
Shareholder tax on pre-tax income (@15% of pre-tax income)	\$15,000
Less: Tax credit for corporate payment	\$30,000
Tax due from shareholder (tax credit issued to shareholder)	(\$15,000)
Effective tax rate on dividend	15,000 / 100,000 = 15%

Split-Rate Tax System

Under this system, earnings that are distributed as dividends by the company are taxed at a lower rate than earnings that are retained by the company. Dividends are then taxed again at the shareholder level as ordinary income. Note that earnings that are distributed as dividends are still taxed twice, but the lower tax rate on earnings that are distributed mitigates the penalty. See Example 3-3.

$$ETR = CTR_D + [(1 - CTR_D) \times MTR_D]$$

CTR_D = Corporate tax rate on earnings distributed as dividends

Example 3-3: Split-Rate Tax System

Corporate tax rate on distributed earnings = 20%

Corporate tax rate on retained earnings = 35%

Investor's marginal tax rate on dividends = 15%

Calculate the effective tax rate on dividends under the split-rate tax system.

Solution:

Effective tax rate on dividends = $20\% + [(1 - 20\%) \times 15\%] = 32\%$

LESSON 4: PAYOUT POLICIES

LOS 21g: Compare stable dividend, constant dividend payout ratio, and residual dividend payout policies, and calculate the dividend under each policy. Vol 3, pp 155–161

Stable Dividend Policy

Under this policy, companies aim to pay a regular stream of dividends and increase the dividend only when expected future profitability suggests that the increase will be sustainable.

- If the long-term growth rate in sustainable earnings is expected to remain low, then dividends would also be expected to grow slowly over time.
- If long-term sustainable earnings are not expected to grow, the growth rate in dividends would be expected to equal zero.

Under a stable dividend policy, the amount of the dividend remains unaffected by short-term volatility in earnings and/or the company's investment opportunities. Therefore, it offers shareholders more certainty regarding the level of future dividends. See Example 4-1.

A stable dividend policy can be modeled as a process of gradual adjustment toward a **target payout ratio** based on long-term sustainable earnings. The target payout ratio represents the proportion of earnings that the company intends to pay out as dividends over the long term. A model of gradual adjustment known as the **target payout adjustment model** was developed by John Lintner. The model reflects three basic conclusions from his study of dividend policy:

1. Companies have a target payout ratio based on long-term, sustainable earnings.
2. Managers are more concerned with dividend changes than with the level of the dividend.
3. Companies will cut or eliminate a dividend only in extreme circumstances or as a last resort.

Under a simplified version of Lintner's model, the expected increase in dividend in order to adjust the company's dividend toward its target can be estimated as:

$$\begin{aligned}\text{Expected increase in dividends} = \\ (\text{Expected earnings} \times \text{Target payout ratio} - \text{Previous dividend}) \times \text{Adjustment factor}\end{aligned}$$

Example 4-1: Stable Dividend Policy

Aztec Industries' EPS for the current year is expected to be \$6.30. Last year, the company paid a dividend of \$0.90 per share when its EPS was \$4.50. The company establishes a target payout ratio of 30% and plans to use a 4-year period to adjust the dividend toward this target.

Calculate the company's expected dividend for the current year.

Solution:

$$\text{Expected increase in dividends} = [(6.30)(0.3) - 0.90](1/4) = \$0.25$$

$$\text{Expected dividend} = \text{Previous dividend} + \text{Expected increase} = \$0.90 + 0.25 = \$1.15$$

Note that although earnings are expected to increase by 40% $[(6.30/4.50) - 1]$ during the year, dividends are expected to increase by only 28% $[(1.15/0.90) - 1]$.

While this example suggests that the payout ratio actually falls (from $0.90/4.50 = 20\%$ to $1.15/6.30 = 18.25\%$) and moves further away from the target payout ratio (30%), the point is that despite a spike in earnings (an upward spike in this example) the amount of the yearly dividend does not fluctuate wildly. The company would move toward its target payout ratio if earnings growth were slower and the adjustment period were shorter (i.e., the adjustment factor higher). Given the company's long-term forecast of sustainable earnings, eventually the dividend payout ratio will reach its target, and at the same time protect shareholders (and the company) from volatile dividend payments in the interim.

Constant Dividend Payout Ratio Policy

Under this policy, companies aim to keep a constant dividend payout ratio (i.e., distribute a constant percentage of net income as dividends). Companies that want to reflect the cyclical nature of their businesses in their dividend payments adopt this policy.

See Example 4-2.

Example 4-2: Constant Dividend Payout Ratio Policy

An analyst gathered the following information regarding a company:

Year	EPS (\$)	DPS (\$)
1	2.50	0.75
2	3.13	0.75
3	3.75	1.31
4	4.31	1.51
5	4.74	1.66
6	5.46	1.91
7	5.73	2.00
8	6.01	2.11

Identify which year the company started using the constant dividend payout ratio policy.

Solution:

The company started using the constant dividend payout ratio policy from Year 3 onward. For the first two years, the company paid a constant dividend of \$0.75 irrespective of earnings.

However, from Year 3 onward, the dividend payout ratio remains approximately constant at 35%.

Residual Dividend Policy

Fluctuating earnings and different capital budgets both contribute to the volatility of dividends under this policy.

Under a residual dividend policy, a company first utilizes internally generated funds to finance investments in positive NPV projects consistent with its target capital structure. Remaining funds (if any) are distributed in their entire amount as dividends to shareholders.

Use of internally generated funds to finance investments in positive NPV projects and distributing the balance to shareholders (to avoid overinvestment) both appear to be consistent with the goal of shareholder wealth maximization. However, this policy prioritizes investment in positive NPV projects above reducing the dividend (which most managers try to avoid). The increased volatility (uncertainty) regarding future dividends may result in investors demanding a higher rate of return on equity.

If the share of equity in required capital spending exceeds company earnings, the shortfall will most likely be financed with debt, which would result in the company temporarily deviating from its target capital structure, rather than using more expensive external equity financing.

In order to smooth its dividend payments, a company may forecast earnings and capital expenditure requirements over the long run, estimate the total amount of residual dividends over the forecasting horizon, and then pay out the estimated residual dividends evenly over the horizon. Alternatively, the company could set a low stable regular cash dividend, and distribute any additional amounts as special dividends or share repurchases. See Example 4-3.

$\text{Dividend} = \text{Residual earnings} = \text{Earnings} - (\text{Capital budgeting} \times \text{Equity percentage in capital structure})$ or zero, whichever is greater.

Example 4-3: Residual Dividend Policy

Mars Inc. earned \$15 million in 2010. The company has a target D/E ratio of 2:3, and is considering investing in two positive NPV projects that require an initial investment of \$8 million each. Calculate the company's dividend payout ratio under a residual dividend policy.

Solution:

The two projects combined require an initial investment of \$16 million, and will be financed by 40% debt (\$6.4 million) and 60% equity (\$9.6 million). Therefore, the company will retain \$9.6 million of its earnings and distribute \$5.4 million (calculated as \$15m – \$9.6m) as dividends. The company's dividend payout ratio will equal $5.4/15 = 36\%$.

LESSON 5: SHARE REPURCHASES**LOS 21h: Compare share repurchase methods. Vol 3, pg 162**

LOS 21i: Calculate and compare the effect of a share repurchase on earnings per share when 1) the repurchase is financed with the company's surplus cash and 2) the company uses debt to finance the repurchase.

Vol 3, pp 164–166

LOS 21j: Calculate the effect of a share repurchase on book value per share.
Vol 3, pg 167

LOS 21k: Explain the choice between paying cash dividends and repurchasing shares. Vol 3, pp 167–177

A share repurchase occurs when a company buys back its own shares. Shares that are repurchased by the company are known as treasury shares if they may be reissued, or canceled shares if they will be retired. In either case, they are not then considered for dividends, voting, or computing earnings per share.

Unlike stock dividends and stock splits, repurchases entail an outflow of cash from the company. In most developed markets around the world, stock repurchases are becoming more popular as an alternative to cash dividends.

Share Repurchases versus Cash Dividends

- Just because a company authorizes a share repurchase, it does not necessarily mean that the company is obligated to go through with the purchase. For cash dividends, once a company announces a dividend, it is committed to paying them.
- Cash dividends are distributed to shareholders in proportion to their ownership percentage. However, repurchases generally do not distribute cash in such a manner.

Share Repurchase Methods

Buy in the open market: Under this method, the company repurchases shares from the open market. Buying in the open market offers the company flexibility as there is no legal obligation to go through with the entire repurchase once it has been authorized, and the authorization can last for several years. This method is also cost-effective as the company can choose to execute the trades when the price impact is likely to be minimal and when the stock is attractively priced.

Buy back a fixed number of shares at a fixed price: This type of repurchase is known as a fixed price tender offer. The company offers to purchase a fixed number of shares at a fixed price (typically at a premium to the current market price) at a fixed date in the future. If the number of shares offered for sale exceeds the amount of shares that company desires to repurchase, the company will repurchase a pro rata amount from each shareholder who offers her shares for sale. Fixed price tender offers can be accomplished very quickly.

Dutch auction: Instead of specifying a fixed price for all the shares that the company wants to buy back (as is the case in a fixed price tender offer), under a Dutch auction, the company specifies a range of acceptable prices. Shareholders who are interested in selling their shares specify their selling price and the amount of shares that they want to sell. The company accepts the lowest bids first and then accepts higher and higher bids until it has repurchased the desired number of shares. Dutch auctions can also be accomplished relatively quickly.

Repurchase by direct negotiation: This occurs when a company negotiates directly with a major shareholder to buy back its shares. This may occur in the following situations:

- A large shareholder wants to sell off its shares and the company wants to prevent the large block of shares from overhanging the market and depressing the share price.
- The company wants to buy out a large shareholder to prevent it from gaining representation on the company's board of directors.

Share repurchases have an effect on a company's balance sheet and its income statement. If the repurchase is financed with cash, assets (cash) and shareholders' equity decline and result in an increase in reported debt ratios. On the income statement, repurchases can increase or decrease EPS depending on how and at what cost the repurchase is financed. See Example 5-1.

Share Repurchases Using Excess Cash

Example 5-1: Share Repurchases with Idle Cash

XS Dough Inc. has 20 million shares outstanding and each share is currently worth \$20. The company made \$40 million in after-tax profits during 2009 and plans to buy back shares worth \$2.2 million at the end of the year. The company believes that it will be able to repurchase the shares at a 10% premium to the current market price. Calculate the impact on 2009 EPS if XS Dough manages to buy back the shares at \$22 per share.

Solution:

Current EPS = \$40 million / 20 million shares = \$2 per share

After the repurchase:

Net income remains the same (\$40 million)

The total number of shares outstanding falls to $20m - 100,000 = 19.9$ million.

Therefore, EPS = \$40 million / 19.9 million shares = \$2.01 per share.

Notice that the company's 2009 EPS rises by approximately 0.503% as a result of the repurchase. Further, the increase in EPS would have been more significant had the company managed to buy back the shares at the current market price (\$20) rather than at a 10% premium.

Share Repurchases Using Borrowed Funds

See Example 5-2.

Example 5-2: Share Repurchases Using Borrowed Funds

Starsky Inc. plans to repurchase \$16 million worth of stock with borrowed funds. The following information is provided:

Repurchase price	\$80
Net income after tax	\$150 million
EPS before repurchase	\$5

1. What is Starsky's EPS assuming that it finances the repurchase by borrowing at an after-tax interest rate of 6.25%?
2. What is Starsky's EPS assuming that it finances the repurchase by borrowing at an after-tax interest rate of 8%?

Solutions:

1. Number of shares initially outstanding = Net income / EPS = \$150 million / \$5 = 30 million

$$\text{Number of shares repurchased} = \$16,000,000 / \$80 = 200,000$$

$$\begin{aligned}\text{Number of shares outstanding after repurchase} &= 30,000,000 - 200,000 \\ &= 29,800,000\end{aligned}$$

EPS after the repurchase is calculated as:

$$\begin{aligned}(\text{Net income after tax} - \text{After-tax interest expense}) / \text{Shares outstanding after repurchase} &= [150,000,000 - (16,000,000 \times 0.0625)] / 29,800,000 = \$5\end{aligned}$$

Notice that Starsky's EPS remains the same after the repurchase if it borrows the funds at 6.25%. This will typically be the case if the company's after-tax cost of borrowing equals its earnings yield.

$$\text{Earnings yield} = \text{EPS} / \text{Stock price} = \$5/\$80 = 6.25\%$$

2. EPS after repurchase is calculated as:

$$\begin{aligned}(\text{Net income after tax} - \text{After-tax interest expense}) / \text{Shares outstanding after repurchase} &= [150,000,000 - (16,000,000 \times 0.08)] / 29,800,000 = \$4.99\end{aligned}$$

When the after-tax cost of borrowing is greater (lower) than the earnings yield, EPS falls (rises) after the repurchase.

Share repurchases may increase, decrease, or have no effect on EPS:

- If the funds used to finance the repurchase are generated internally, a repurchase will increase EPS only if the funds would not have earned the company's cost of capital if they were retained by the company.

- If borrowed funds are used to finance the repurchase, and the after-tax cost of borrowing is greater than the company's earnings yield, EPS will fall.
- If borrowed funds are used to finance the repurchase, and the after-tax cost of borrowing is lower than the company's earnings yield, EPS will rise.

The total return on a stock is composed of capital gains and dividends.

Bear in mind that it would be incorrect to infer that an increase in EPS indicates an increase in shareholder wealth. The cash used to finance the repurchase could as easily have been distributed as a cash dividend. Any capital gains resulting from an increase in EPS from share repurchases may be offset by a decrease in the stock's dividend yield.

See Example 5-3.

Example 5-3: The Effect of Share Repurchases on Book Value per Share

The following information relates to two companies that each plan to repurchase \$2 million worth of common stock. The only difference between the companies is that Company A has a higher book value of equity and a higher book value per share. Evaluate the impact of the repurchase on the companies' book values per share.

	Company A	Company B
Stock price	\$50	\$50
Number of shares outstanding	10 million	10 million
Buyback amount	\$2 million	\$2 million
Book value of equity	\$600 million	\$200 million

Solution:

$$\text{Book value per share} = \text{Book value of equity} / \text{Number of shares outstanding}$$

$$\text{Company A's BV/share} = \$600m / 10m = \$60$$

$$\text{Company B's BV/share} = \$200m / 10m = \$20$$

Both companies repurchase 40,000 shares (\$2m/\$50) and have 9,960,000 shares outstanding after the repurchase.

After the repurchase:

$$\text{Company A's BV of equity} = \$600m - \$2m = \$598m$$

$$\text{Company A's BV/share} = \$598m / 9.96m = \$60.04$$

$$\text{Company B's BV of equity} = \$200m - \$2m = \$198m$$

$$\text{Company B's BV/share} = \$198m / 9.96m = \$19.88$$

Conclusions:

- When the market price is greater than the book value per share, book value per share will decrease after the repurchase (see change in Company B's BV/share after repurchase).
- When the market price is lower than the book value per share, book value per share will increase after the repurchase (see change in Company A's BV/share after repurchase).

All else being equal, a share repurchase is equivalent to the payment of a cash dividend of an equal amount in terms of its effect on shareholder wealth. Example 5-4 illustrates this.

Example 5-4: Share Repurchase versus Cash Dividend

Kon Fused Inc. is deciding between distributing \$20 million of excess cash to its shareholders through a share repurchase or a special dividend. The company has 10 million shares outstanding and the current market price of its stock is \$40. Determine the effects on shareholder wealth under both the distribution methods being considered by the company.

Solution:

Cash dividend:

Market value of equity = $(\$40 \times 10 \text{ million shares} - \$20 \text{ million}) = \$380 \text{ million}$

Market price per share after dividend = $\$380 \text{ million} / 10 \text{ million shares} = \38

Once the dividend is distributed (\$2 per share), each shareholder gets a \$2 dividend and the ex-dividend price of the stock equals \$38. Total wealth from the ownership of a single stock equals \$40.

Share repurchase:

The company would be able to repurchase 500,000 shares with the \$20 million excess cash (at \$40/share). The post-repurchase price would remain at \$40.

Market value of equity = $(\$40 \times 10 \text{ million shares} - \$20 \text{ million}) = \$380 \text{ million}$

Market price per share after repurchase = $\$380 \text{ million} / (10 \text{ million shares} - 500,000 \text{ shares}) = \40

If an investor's shares are repurchased, she receives \$40 for each share. If she continues to hold the shares, each share is worth \$40 in the market.

The takeaway is that the impact on shareholder wealth of distributing cash to shareholders through a share repurchase or a cash dividend is the same. However, the above analysis assumes that:

- Dividends are received as soon as the shares go ex-dividend.
- Tax implications of dividends and repurchases are the same.
- The information content of the two policies does not differ.
- The company can purchase any number of shares at the current market price. If the company must repurchase stock at a premium to the current market price, shareholders whose shares are repurchased benefit, while remaining shareholders suffer a decrease in their wealth.

Cash Dividends versus Share Repurchases

Many investors believe that, on average, share repurchases have a net positive effect on shareholder wealth. Studies have shown that share repurchase announcements have been accompanied by significant positive excess returns around the announcement date and for the next few years. These findings indicate that management tends to buy back company stock when it is undervalued in the marketplace.

Theoretically speaking, all other factors constant, the impact of share repurchases on shareholder wealth is equivalent to that of cash dividends. The following arguments are usually presented in favor of share repurchases (over cash dividends)

Some analysts take issue with the belief that share repurchases are a positive for the company. In their opinion, stock repurchases imply that the company has run out of profitable investment opportunities and is therefore returning cash to shareholders.

- **Potential tax advantages:** There is a tax advantage in distributing cash through share repurchases in markets where capital gains are taxed at a lower rate than cash dividends. Even if the two tax rates are equal, the option to defer capital gains taxes (by deciding not to participate in the share repurchase) will be valuable to many investors.
- **Share price support / signaling that the company considers its shares a good investment:** Since management usually has more information regarding the company's prospects relative to outsiders, a share repurchase can be interpreted as a signal that management believes that the company's stock is undervalued. Further, in an open market repurchase, the company can time its purchases of its stock with respect to market price. Finally, an unexpected announcement of a share repurchase can have a positive impact on the company's stock price.
- **Added managerial flexibility:** Share repurchases (unlike cash dividends) do not create the expectation that they will be continued going forward. Further, once a company announces a share repurchase, it is not obligated to follow through with it, which is not the case with an announcement of a cash dividend. Share repurchases also offer investors flexibility as participation in a repurchase (unlike in a cash dividend) is optional.
- **Offsetting earnings dilution from exercise of employee stock options:** Share repurchases can be used to limit the number of shares outstanding when a significant number of employee stock options have been exercised.
- **Increasing financial leverage:** Share repurchases increase a company's financial leverage (by reducing the number of ordinary shares outstanding). If a company thinks that its capital structure will be more efficient with greater leverage, a share repurchase can help the company achieve the desired change in its capital structure. Note that a share repurchase financed with borrowed funds increases leverage to a greater extent than a repurchase financed with excess cash.

Another argument often made in favor of repurchases is that they increase EPS. However, this argument has two problems:

- Even though EPS may increase, the company's required return will also increase due to higher leverage.
- Changing EPS by changing the number of shares outstanding has no impact on the value of the company as total free cash flow remains unchanged.

Sometimes companies experience upward spikes in cash flows that are not expected to continue in future years. Special cash dividends and share repurchases offer companies the means to distribute surplus cash to shareholders without creating an expectation of similar distributions in the future. Generally speaking, share repurchases usually tend to rise when the economy is strong (when companies typically have strong cash flows) and fall during recessions.

Example 5-5: Share Repurchase to Increase Financial Leverage

XYZ Holdings has \$60 million of debt outstanding, with a debt ratio of 30%. The company plans a share repurchase program involving \$14 million, which is 10% of the market value of its common shares (equity = \$140 million = $7/3 \times \$60$ million).

1. All other things remaining the same, if the repurchases are financed using cash on hand, what would be the resulting debt ratio?
2. All other things remaining the same, if the repurchases are financed using new debt, what would be the resulting debt ratio?
3. Assuming XYZ's net income and P/E remain the same, discuss the effect on the value of equity from financing the repurchases using cash on hand.
4. Assuming XYZ's after-tax cost of debt is greater than its E/P and that they both remain the same, discuss the effect on the value of equity from financing the repurchases using new debt.
5. Continuing with the assumptions in Question 4, discuss the effect on the value of debt from financing the repurchases using new debt, knowing that XYZ is in imminent danger of a credit rating downgrade.

Solutions:

1. If XYZ uses cash on hand to make the share repurchase, the debt ratio would increase to 32% ($= \$60\text{ million}/\186 million).
2. If XYZ uses new debt to finance the share repurchase, the debt ratio would increase to 37% ($= \$74\text{ million}/\200 million). Note that this is higher than in Question 1.
3. After the repurchase, XYZ's equity is \$126 million. Given that net income remains the same, EPS would now increase with fewer shares outstanding. With the same P/E, XYZ's market value of equity would be expected to rise.
4. After the repurchase, XYZ's equity is \$126 million. Given that after-tax cost of debt is greater than the E/P, EPS would decline. Assuming the same P/E, XYZ's market value of equity would be expected to decrease.
5. After the repurchase, XYZ's debt is \$74 million. Given that there is a real threat of a credit rating downgrade, XYZ's credit spreads would rise, resulting in a decline in the market value of debt.

Note that in a scenario that combines Questions 4 and 5, the post-repurchase market values of both equity and debt would be lower. In such a situation, the impact of the repurchase on XYZ's post-repurchase capital structure would be indeterminate.

Share repurchases grew at almost twice the rate of cash dividends between 2000 and 2007. However, during the financial crisis of 2008–2009, companies were forced to cut back sharply on their discretionary share repurchases. Although cash dividends were also cut, the decline was much less considerable. During the subsequent recovery, dividends started accounting for a higher proportion of total distributions. This may be due to the fact that investors' appetite for dividend yield has increased during the extended period of low (or even negative) interest rates on many fixed-income securities.

LESSON 6: GLOBAL TRENDS IN PAYOUT POLICY AND ANALYSIS OF DIVIDEND SAFETY

LOS 21l: Describe broad trends in corporate payout policies. Vol 3, pp 177–178

LOS 21m: Calculate and interpret dividend coverage ratios based on 1) net income and 2) free cash flow. Vol 3, pp 179–183

LOS 21n: Identify characteristics of companies that may not be able to sustain their cash dividend. Vol 3, pp 179–183

- At the turn of the millennium, studies looking into the concept of “disappearing” dividends found that the decline in dividends was related to the large number of relatively unprofitable companies that were assuming prominence in the stock market.
- Studies that dug deeper found that there were actually two tiers of companies in the United States: (1) large, extremely profitable companies that had a fairly stable payout ratio of around 40% and (2) nondividend payers that included both financially troubled, marginally profitable, or money-losing companies and companies related to technology that tended to use share repurchases as a substitute for dividends.
- A study published in 2004 found that dividend policies have differed across countries and have changed through time as companies adapt to changing investor preferences (**catering theory of Baker and Wurgler**). Generally speaking:
 - A higher percentage of companies in Europe pay dividends than in the United States.
 - The percentage of companies paying cash dividends has decreased in most developed markets.
 - The percentage of companies undertaking share repurchases has increased in most developed markets.
- A study in 2009 concluded that both aggregate dividend amounts as well as payout ratios have generally increased over time, although the fraction of dividend payers has decreased. More recent studies found that the two-tier framework (described previously) held in the international context as well.
- In the international arena, there is a negative relationship between dividend initiations/increases and enhanced corporate governance and transparency. This is consistent with the notion of the decreasing information content of dividends and their reduced signaling role as governance and transparency of markets improves.
- Dividend payout policies are less generous in countries requiring detailed corporate disclosures and having strong investor protection. The long-term decline in dividend payers can be explained by (1) the reduction in both information asymmetry and agency issues resulting from improved corporate governance and (2) the flexibility offered by share repurchases.

Analysis of Dividend Safety

Analysts usually evaluate the safety of dividends through the **dividend payout ratio** (dividends/net income) or its inverse, the **dividend coverage ratio** (net income/dividends). All else being equal, a higher dividend payout ratio/lower dividend coverage ratio increases the risk of a dividend cut or omission. See Example 6-1.

Generally speaking:

- Large, mature companies typically target a payout ratio of 40–60%.
- Small, young companies generally do not pay dividends, preferring to reinvest internally for growth. However, as such companies grow, they typically initiate dividends and their payout ratios tend to increase over time.
- Dividends of companies that have a record of stable or increasing dividends are considered safer than dividends of companies that have cut their dividend in the past.

Example 6-1: Traditional Measures of Dividend Safety

An analyst gathered the following information regarding a company:

	Year 1	Year 2
Net income available for common stock	\$230 million	\$110 million
Dividends paid	\$80.5 million	\$90 million

Calculate the company's dividend payout and coverage ratios for both years.

Solution:

Year 1:

$$\text{Dividend payout ratio} = 80.5m / 230m = 35\%$$

$$\text{Dividend coverage ratio} = 230m / 80.5m = 2.86 \text{ times}$$

Year 2:

$$\text{Dividend payout ratio} = 90m / 110m = 82\%$$

$$\text{Dividend coverage ratio} = 110m / 90m = 1.22 \text{ times}$$

Conclusion: The sharp increase in the dividend payout ratio (decrease in the dividend coverage ratio) indicates that the company's capacity to pay dividends has declined. A further cause of concern is that the worsening ratios are caused by a steep decline in net income, not by a sharp increase in the payout.

Another way to evaluate dividend safety is by examining free cash flow to equity (FCFE). FCFE is the cash available to be distributed to a company's equity holders after accounting for fixed capital expenditures, working capital expenditures, and net borrowings. A comprehensive measure of dividend safety evaluates the adequacy of FCFE to cover all distributions to shareholders (dividends and share repurchases). See Example 6-2.

$$\text{FCFE coverage ratio} = \text{FCFE} / [\text{Dividends} + \text{Share repurchases}]$$

- If this ratio equals 1, the company is distributing all available cash to shareholders.
- If the ratio is greater than 1, the company is retaining some earnings to enhance liquidity.
- If the ratio is less than 1, the company is eating into its liquidity to pay out dividends. This situation may not be sustainable in the long run.

Example 6-2: FCFE Coverage Ratio

An analyst gathered the following information regarding a company:

	Year 1	Year 2	Year 3
Cash flow from operations	\$72m	\$70m	\$80m
Fixed capital investment	\$10m	\$15m	\$25m
Net borrowing	\$15m	\$10m	\$10m
Dividends paid	\$20m	\$25m	\$35m
Share repurchases	\$50m	\$65m	\$75m

Calculate the company's FCFE coverage ratios for each of the three years and comment on your answers.

Solution:

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

	Year 1	Year 2	Year 3
CFO	\$72m	\$70m	\$80m
Less: FCInv	\$10m	\$15m	\$25m
Add: Net borrowing	\$15m	\$10m	\$10m
FCFE	\$77m	\$65m	\$65m

$$\text{FCFE coverage ratio} = \text{FCFE} / [\text{Dividends} + \text{Share repurchases}]$$

$$\text{FCFE coverage ratio in Year 1} = 77m / (20m + 50m) = 1.10$$

$$\text{FCFE coverage ratio in Year 2} = 65m / (25m + 65m) = 0.72$$

$$\text{FCFE coverage ratio in Year 3} = 65m / (35m + 75m) = 0.59$$

Conclusion: The company's FCFE coverage ratio has been consistently deteriorating and is less than 1 in both Years 2 and 3, which means that the company is borrowing cash (note the positive net borrowings each year) to pay dividends. This situation may not be sustainable in the long run as the company is paying out more than it can afford.

Analysts should be particularly alert to companies that support their dividends and stock repurchases by reducing productive capital spending, by adding net debt, or by some combination of the two, because these are not sustainable policies.

Extremely high dividend yields compared with a company's past record and current bond yields are often another warning signal predicting a dividend cut.

Note that past financial data is not always an accurate determinant of future dividend safety. Unforeseen circumstances may force dividend-paying companies to cut their dividends or omit them altogether.

STUDY SESSION 8:

CORPORATE FINANCE (2)

READING 22: CORPORATE GOVERNANCE AND OTHER ESG CONSIDERATIONS IN INVESTMENT ANALYSIS

LESSON 1: GLOBAL VARIATIONS IN OWNERSHIP STRUCTURES

LOS 22a: Describe global variations in ownership structures and the possible effects of these variations on corporate governance policies and practices.

Vol 3, pp 201–208

Environmental, social, and governance (ESG) considerations are increasingly being important in investment analysis as part of risk analysis and as some clients are increasingly concerned on these factors.

Varying global corporate governance ownership structures are the result of differing economic, political, social, and legal structures in each country or region that involve complex relationships among managers (executives), employees, directors, customers, suppliers, governments, and regulators. When analyzing corporate governance during the investment process, you need to understand the variation of ownership structures, their conflicts, influential shareholders, and how they affect corporate governance.

Corporate ownership structures include the following classifications:

- **Dispersed ownership** reflects the existence of many shareholders, none of which can individually exercise control over the corporation.
- **Concentrated ownership** reflects an individual shareholder or a group of controlling shareholders who can exercise control over the corporation.
- Or, a *hybrid of both*.

If you reference Exhibit 1-1, you will find that, on a global basis, concentrated ownership structures are more common than dispersed ones. For example, 38 of the 47 jurisdictions shown have predominantly concentrated ownership structures, whereas four, including the United States and the United Kingdom, have dispersed structures, and five have hybrid structures.

Exhibit 1-1: The Organisation for Economic Co-Operation and Development (OECD) Concentrated Ownership Structures¹

Jurisdictions with Concentrated Ownership

Austria, Belgium, Brazil, Chile, China, Colombia, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, India, Indonesia, Israel, Italy, Latvia, South Korea, Mexico, New Zealand, Norway, Poland, Portugal, Russia, Singapore, Slovenia, South Africa, Spain, Sweden, Turkey	State ownership is characteristic of certain countries, such as China, Norway, and Sweden. In other countries, including Brazil, South Korea, Mexico, and Portugal, families are the predominant shareholders. Company groups are prevalent in a number of additional countries, such as India and Russia.
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¹ OECD (2017). Exhibit 1, Volume 3, CFA Program Curriculum 2020.

Jurisdictions with Dispersed Ownership

Australia, Ireland, United Kingdom, United States

Among the largest companies in Australia, the majority of shares are held (albeit dispersed) by financial institutions. In Ireland, ownership shares tend to be widely dispersed, although there are a few family controlled companies. Among UK companies, few have major shareholders owning 25% or more of shares. In the United States, ownership of public companies is generally characterized by dispersed shareholdings; listed companies are rarely under the control of a major shareholder.

Hybrid Jurisdictions

Canada, Germany, Japan, Netherlands, Switzerland

In Canada, among the largest listed firms, a meaningful minority have controlling shareholders. In Germany, a significant number of companies are under “tight control,” but in many cases shares are broadly distributed (especially for listed companies). In Japan, a small minority of listed companies have a shareholder who owns a majority of shares. The Netherlands has a more dispersed ownership structure than most continental European countries; however, when accounting for “trust offices,” ownership is somewhat more concentrated. In Switzerland, the largest listed companies have more dispersed ownership than medium-sized and smaller companies.

It is important to note that looking at share ownership alone does not determine if a corporation has dispersed or concentrated ownership. Controlling shareholders are either **majority shareholders** who own *more* than 50% of shares or **minority shareholders** who own *less* than 50% of shares. However, some shareholders can benefit from horizontal and/or vertical ownership arrangements that give them more control than their shares alone would give them.

Horizontal ownership is when companies with mutual business interests (e.g., key customers or suppliers) have cross-holding share arrangements that facilitate strategic alliances and long-term relationships.

Vertical ownership (or pyramid ownership) is when a company or group has a controlling interest in two or more companies that have controlling interests in underlying operating companies, allowing them to issue shares with superior voting rights to maintain control.

Dual-class (or multiple-class) shares grant one share class superior or sole voting rights, separating the size of ownership from actual control.

Conflicts within Different Ownership Structures

Corporate ownership structures affect governance policies due to potential conflicts between shareholders and managers, and among shareholders. For example, dispersed ownership and voting power is generally associated with shareholders who cannot control company managers (*weak shareholders*). Conversely, managers in these scenarios are known as *strong managers*.

When these structures exist, they can cause significant conflicts between shareholders and managers. This is because shareholders want to maximize the value of their shares, whereas managers may misuse company resources to their own personal gain. For example, managers may be incentivized to pursue their own agenda. This conflict is known as a **principal–agent problem**. It can be mitigated by controlling shareholders who may exercise control over the board of directors and, therefore, the appointment of managers.

Concentrated share ownership and voting power can lead to *strong shareholders* and *weak managers* with controlling shareholders monitoring and appointing managers.

There are a few other scenarios to consider:

- **Concentrated ownership and voting power** are associated with shareholders having power over both managers and minority shareholders; *strong shareholders* and *weak managers*.
- **Dispersed ownership and concentrated voting power** generally lead to **the principal–principal problem**. This is when controlling owners are able to use company resources to benefit themselves at the expense of minority owners. Those with concentrated voting power can exercise control over other minority shareholders by using dual-class shares and pyramid ownerships structures.
- **Concentrated ownership and dispersed voting power** are the result of **voting caps**, which are legal restrictions on the voting rights of large share positions. Voting caps have been used by many governments to keep foreign investors from having controlling ownership in strategically important domestic companies.

Types of Influential Shareholders

Different shareholders have differing motivations, interests and agendas, thereby requiring investment analysts to identify and assess governance risks.

Shareholder types include the following.

Banks

Banks often, particularly in Asia and Europe, have significant control over companies both when they lend to them and also when they hold an equity stake in them. This can easily lead to a conflict of interest. For example, a bank could influence corporations to borrow money on unfavorable terms to the potential detriment of other shareholders. Obviously, appropriate corporate governance controls are needed to ensure that banks in this situation appropriately balance their interests as lenders and as shareholders.

Families

Family ownership is the main corporate structure in many areas, particularly Latin America, and with concentrated ownership and management responsibility it can mitigate the

risks associated with principle–agent problems. Another related consideration is called **interlocking directorates**, which is when people serve on multiple boards of directors. Interlocking directorates allow a single family/family member to control several corporations. Concentrated family corporate ownership definitely has drawbacks for other shareholders, including poor transparency, lack of management accountability to shareholders, little consideration for minority shareholder rights, and difficulty attracting talented managers.

State-Owned Enterprises

State-owned enterprises (SOEs) can exist in a nation's strategically important sectors, when capital requirements are too large for private sector funding or when a nation needs to provide a certain output of products and services (e.g., utilities). When SOEs trade on public markets, with significant government ownership, this is called a **mixed-ownership model**. State-Owned Enterprises sometimes prioritize social or public policy considerations rather than shareholder value.

Institutional Investors

Mutual funds, insurance companies, and pension funds are typical examples of institutional investors. Together, these investors hold a significant portion of equities. However, because ownership is dispersed and usually uncoordinated between institutions, these investors rarely have a controlling interest in a company. The most institutional investors can do is subject the board of directors and top managers to scrutiny and promote good corporate governance.

Group Companies

Horizontal and vertical ownership allows for group ownership structures that give shareholders a disproportionately higher degree of control than their level of ownership (shares) would imply. Cross-holding arrangements between group companies also allow certain shareholders to restrict transfers of share ownership and create obstacles for others to purchase a controlling interest. Strong corporate governance and regulations are needed in these situations, due to the risk that groups will benefit themselves at the expense of minority shareholders.

Private Equity Firms

Private equity firms strategically invest in companies with the goal of selling them to another private equity firm or taking the company public. Venture capital and leveraged buyout firms usually have a high degree of control over management and governance.

Foreign Investors

Sometimes, foreign investors own more shares than domestic investors, which allows them to implement their own standards for management transparency and accountability. A local company may choose to cross-list its shares on an exchange in another country with higher transparency requirements and investor protections, benefitting local minority shareholders.

Managers and Board Members

Managers and board members who own shares of the company they serve are called **insiders**. Insiders are highly motivated to appropriately deploy company assets to increase the long-term value of their shares, aligning their motives with external shareholders. However, insiders may have large ownership positions and protect their interest without concern for minority shareholders.

Effects of Ownership Structure on Corporate Governance

Independent board directors are those who do not work in the companies they serve, and do not own shares or receive any compensation or remuneration. Independent boards usually occur in dispersed ownership structures and directors can strengthen control over managers.

Independent directors serve a narrower role in concentrated versus dispersed ownership structures. For example, in the United States certain board committees, such as audit, nomination, and compensation, can only use independent directors, which helps mitigate the principal–agent problem. Some countries require a minimum number, or minimum proportion, of independent directors.

A corporation's board of directors is either one-tier or two-tier.

- A **one-tier board structure** is most common and has a single board of directors composed of internal, executive, and external, non-executive directors.
- A **two-tier board structure** is required in some countries such as Argentina, Germany, and Russia and has a supervisory board that oversees the management board to serve as a control on management through various review and audit activities. In Germany the supervisory board has stakeholder representatives from banks and labor groups.

Special voting arrangements improve the power of minority shareholders. For example, Brazil, India, Portugal, Turkey, Italy, Israel, and the United Kingdom use these arrangements to include minority shareholders in board nomination and election processes.

Corporate governance codes, laws, and listing requirements require companies to disclose their adoption of corporate governance practices, or explain why they have not. Many countries have adopted these standards for publicly listed companies.

Stewardship codes are voluntary codes to encourage shareholders to exercise their rights and engage in corporate governance.

LESSON 2: EVALUATING CORPORATE GOVERNANCE POLICIES AND PROCEDURES

LOS 22b: Evaluate the effectiveness of a company's corporate governance policies and practices. Vol 3, pp 208–211

Corporations need effective governance for many reasons. Strong governance policies can increase reputation; improve profitability and return on equity, delivering higher dividend payments; provide cheap access to credit markets; decrease the cost of capital; and increase the long-term return for investors. Conversely, companies with poor governance often experience reputational damage, reduced competitiveness, share price weakness, and volatility, reduced profitability, and a higher cost of capital.

Effective governance practices can be difficult to identify and quantify, but investors must keep these factors in mind during the analytical process. For example, they must evaluate a company's board of directors and its governance and ethics policies. Analysts usually reflect corporate governance practices by adjusting the risk premium or credit spread associated with the company. This is because markets will eventually reflect corporate behavior toward its shareholders via share price. Sometimes, shareholders attempt to force management to follow certain governance policies, which is called **shareholder activism**.

Board Policies and Practices

Investors must evaluate a board's effectiveness in implementing governance policies and practices, and whether the board is effective or dysfunctional. Various capital markets each have their own governance issues that depend on ownership structure, company history, the legal environment, company culture, and industry diversity.

When evaluating board effectiveness, investors should consider whether:

- The board of directors is structured to provide sufficient oversight, representation, and accountability to shareholders.
 - **CEO duality** is when the chief executive officer (CEO) also serves as the board's chairperson, which raises concerns that the board's monitoring and oversight role may be compromised; this may be addressed by a lead independent director to protect investor interests.
- One- or two-tier structures are in place.
- There is an absence or presence of a minority of independent directors.

An absence of independent directors is a big negative for corporate governance due to the potential risks from self-serving management.

- Board committees focus on key governance concerns (e.g., audit and compensation) and ensure the selection of independent directors.
 - Non-independent members lead to conflicts of interest or biases.
- Board skills and expertise are appropriate for the company, and are not overly focused in certain areas. Industries that rely on natural resources will have directors with expertise in environmental, climate, or social issues.
- Board members with long tenure will have a comprehensive understanding of business operations and management effectiveness, but may be too closely aligned with management.
- Board composition is properly sized and diversified regarding members' professional, cultural, geographical background, gender, age, and tenure.
 - Long-tenured board members can become controlling, self-serving, and resistant to change regardless of the benefit to shareholders.
- Proper board evaluation is in place.
 - Duties, leadership, structure, and the relationship between members and management established.
 - Who evaluates the board, who/what gets evaluated, and how the evaluation will occur determined; self-evaluation or external review.
 - Periodic external reviews or reviews on an "as needed" basis set up.

Executive Remuneration

There needs to be transparency for compensation, criteria for incentive plans and their link to company strategy, and a pay differential between CEOs and average workers. The goal is to ensure management compensation is structured to be in line with corporate and shareholder interests.

- **Say-on-pay** provisions allow shareholders to vote and/or provide feedback on remuneration.
- **Clawback** policies allow companies to recover past remuneration if certain events occur.

Shareholder Voting Rights

Straight voting gives shareholders one vote for each share owned. Under dual-class share structures, founder/management shares typically have greater voting power than publicly available shares. This opens the possibility for conflicts between one group of shareholders and another.

LESSON 3: IDENTIFYING ESG-RELATED RISKS AND OPPORTUNITIES

LOS 22c: Describe how ESG-related risk exposures and investment opportunities may be identified and evaluated. Vol 3, pp 211–215

Materiality refers to any ESG issues that could affect a company's operations, finances, or the value of its equities and bond if disclosed.

Investment time horizon plays a factor in how investors analyze ESG issues before investing. For example, if an investor has a short time horizon, then longer term ESG issues are not really a concern because they have little to no impact on short-term price movements. Of course, bad ESG related news could easily affect short-term prices. However, investors with a long time horizon must incorporate the potential costs and benefits of companies adopting ESG standards. Companies that operate in a highly regulated or environmentally sensitive industry are likely to incur significant additional costs over time that need to be incorporated into valuations. For example, environmental issues affect energy companies and banks are typically affected by social factors, such as personal data security and privacy.

Relevant ESG-Related Factors

ESG issues are different for each industry and several approaches are used to identify them.

Proprietary methods involve using proprietary tools and the judgment of analysts to gather and analyze ESG information for a company by analyzing news reports, industry associations, environmental groups, financial markets, labor organizations, industry experts, and government organizations.

ESG data is often publicly available through various sources: annual reports, corporate citizenship or sustainability reports, proxy reports, and regulatory filings (for example, Exhibit 3-1). There are also ESG data vendors that specialize in these issues such as MSCI or Sustainalytics. These data vendors can also include individual company ESG analyses, scores, and/or rankings.

Exhibit 3-1: Greenhouse Gas Emissions Disclosure for Valero Energy²

Valero closely follows regulatory developments and participates in professional and public-policy forums that address greenhouse gases. Valero intends to continue to reduce its greenhouse-gas and other emissions through adoption of new technologies, and improved and more efficient operations. The average pre-barrel greenhouse-gas emissions for 2012–2016 decreased by 14% from the previous five-year average, according to the most recent available data. Through initiatives such as flare-gas recovery, on-site power and steam cogeneration, and alternative energy, Valero continues to produce clean and renewable fuels for the world's energy needs.

² Valero, “2017 Social Responsibility Report.” Exhibit 2, Volume 3, CFA Program Curriculum 2020.

Not-for-profit industry organizations and initiatives have their own initiatives to provide ESG data and insights such as:

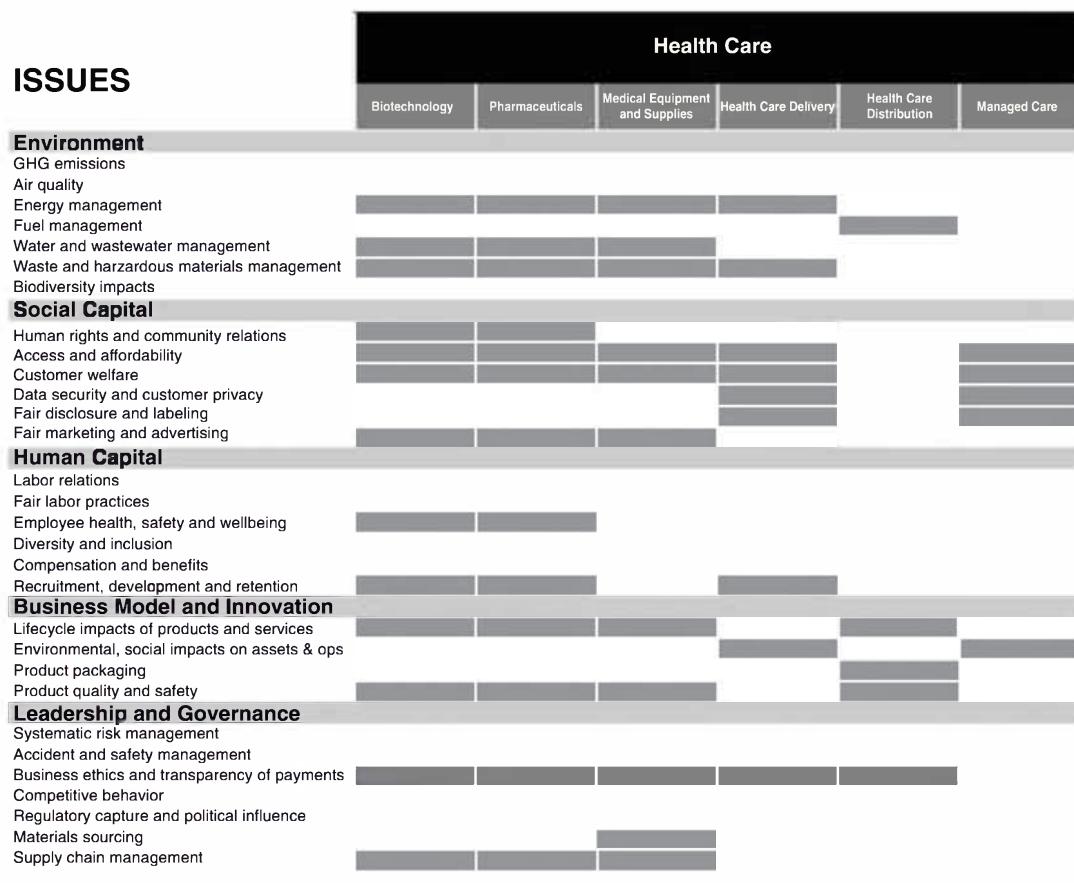
- **International Integrated Reporting Council (IIRC)** is a coalition of industry participants that promotes standardized ESG corporate reporting.
- **Global Reporting Initiative (GRI)** which has worked with various stakeholder groups to develop ESG reporting standards (see Table 3-1).
- **Sustainable Accounting Standards Board (SASB)** also seeks to promote sustainability reporting through standardized reporting and has developed the SASB Materiality Map for material ESG-related, sector-specific factors. (See Exhibit 3-2.)

Table 3-1: GRI Sustainability Topics—Consumer Durables and Household and Personal Products Sector³

Category	Proposed Topic	Topic Specifications (Where Applicable)
Environmental	Materials sourcing	Rare metals; sourcing standards for raw materials; sourcing standards on animal testing; wood-based products from responsibly managed forests
	Product packaging	Not applicable
	Plastic use	Product and packaging
	Chemicals use	International and national chemical safe use regulations; personal care products; phthalates and parabens
	Energy efficiency of end products	Consumer electronics
	Life cycle assessment of end products	Not applicable
	Product transport efficiency	Not applicable
Social	Migrant workers	Recruitment and employment
	Product safety	Personal care products—human health and the environment
	Transparent product information and labeling	Not applicable
	Access to products, technologies, and services	Consumers with disabilities
	Electronic waste (e-waste management)	Consumer awareness
	Product design	Eco-friendly personal care products
	Product innovation	Energy consumption, GHG emissions and packaging
	Corporate governance	Executive board compensation; gender participation on governance bodies
	Supplier screening	Environmental and social standards in the supply chain

³ GRI, “Sustainability Topics for Sectors: What do Stakeholders Want to Know?” (2013). Exhibit 3, Volume 3, CFA Program Curriculum 2020.

Exhibit 3-2: SASB Materiality Map—Health Care Sector⁴



ESG integration is the use of qualitative and quantitative ESG factors. However, the use of ESG issues in investment analysis differs between equity and fixed income securities. ESG integration can identify both opportunities and downsides for equities through financial forecasts and valuation models, but is mostly focused on downside risks for fixed income, perhaps through the impact of lawsuits on cash flows. The application of ESG factors in analysis is done similarly to traditional security analysis. For equities, ESG factors can be used to forecast financial metrics, adjust valuation models, or implement scenario analysis. With fixed income (credit) analysis, ESG factors can be used in internal credit assessments, forecasting financial ratios, and developing credit rankings among various borrowers.

LESSON 4: EVALUATING ESG-RELATED RISKS AND OPPORTUNITIES

LOS 22d: Evaluate ESG risk exposures and investment opportunities related to a company. Vol 3, pp 215–224

ESG factors can affect a company's financial statements and valuations, so the integration of ESG factors gives a broader perspective for analyzing companies and industries. This process usually begins with the identification of material qualitative and quantitative ESG factors germane to a company and its industry. These factors are evaluated in a similar manner to fundamental stock analysis in that they use historic and forecasted data and peer rankings, and are used to adjust financial and valuations models; that is, income, cash flow,

⁴ Sustainability Accounting Standards Board. Exhibit 4, Volume 3, CFA Program Curriculum 2020.

projected revenues, operating/non-operating costs, operating margins, earnings, capital expenditures, impairments to balance sheet assets, or other items.

The use of qualitative and quantitative research, as well as securities valuation of equities and fixed income, are key elements of the “ESG Integration Framework” published by CFA Institute and the Principles for Responsible Investment (PRI): *ESG Integration In The Americas: Markets, Practices, And Data* (2018).

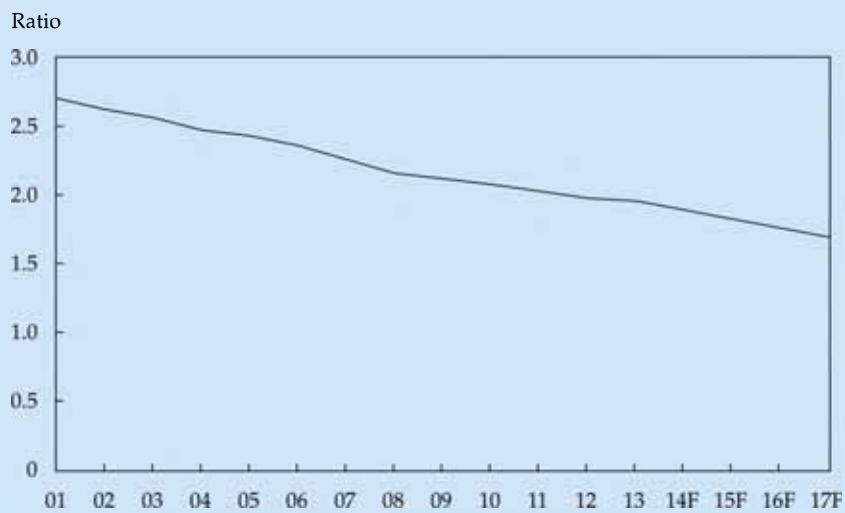
Green bonds are used to raise funds for specific environmental projects.

Example 4-1: ESG Integration—Environmental Factors (Beverage Company)

Frizzle Drinks (Frizzle) is a fictitious non-alcoholic beverage company. It operates in developed and emerging markets where the availability of clean water is a key issue. Obviously, without adequate water supply, Frizzle cannot make their products. Frizzle uses a lot of water and must comply with regulations for pollution. Therefore, Frizzle’s use and supply of water can have significant effects on a company’s financials and reputation with respect to the environment.

Sam Smith, CFA, is analyzing Frizzle with respect to environmental factors. He finds that “water intensity” is a key ESG metric for the beverage industry, which is the ratio of liters of water used per liter of a beverage. Exhibit 4-1 shows the trend of Frizzle’s water intensity ratio from 2X01 to 2X13 and the consensus four year forecast ratio. Sam sees that Frizzle’s water intensity ratio declined by 27% from 2X01 to 2X13 and is forecasted to fall another 13% by 2X17(F).

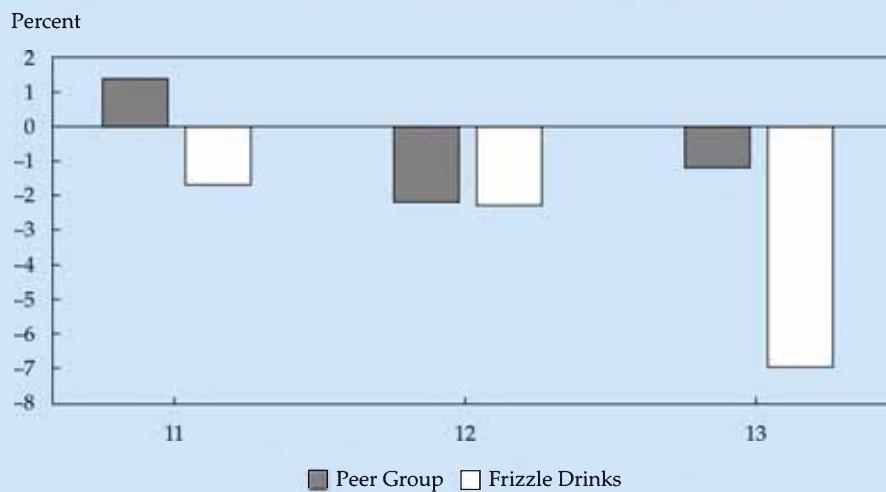
Exhibit 4-1: Water Intensity Ratio (in liters)⁵



Note: (F) indicates forecast year.

Exhibit 4-2 compares the change in Frizzle’s water intensity ratio to its peer group over the last three years. Sam finds that Frizzle’s water intensity decreased considerably over the past few years relative to peers.

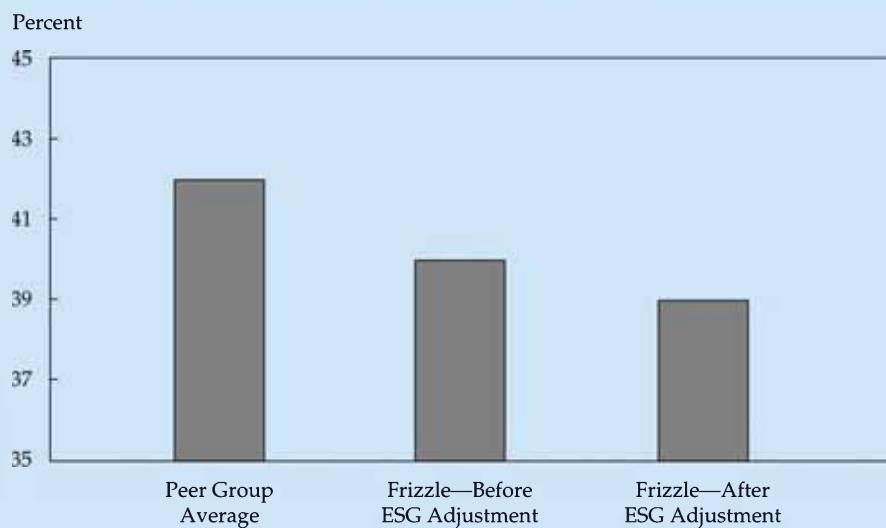
⁵ Exhibit 5, Volume 3, CFA Program Curriculum 2020.

Exhibit 4-2: Water Intensity Ratio Change per \$1 Million of Revenue⁶

To facilitate comparison among companies of varying sizes, Smith adjusts the reported water intensity ratios to reflect \$1 million of revenue.

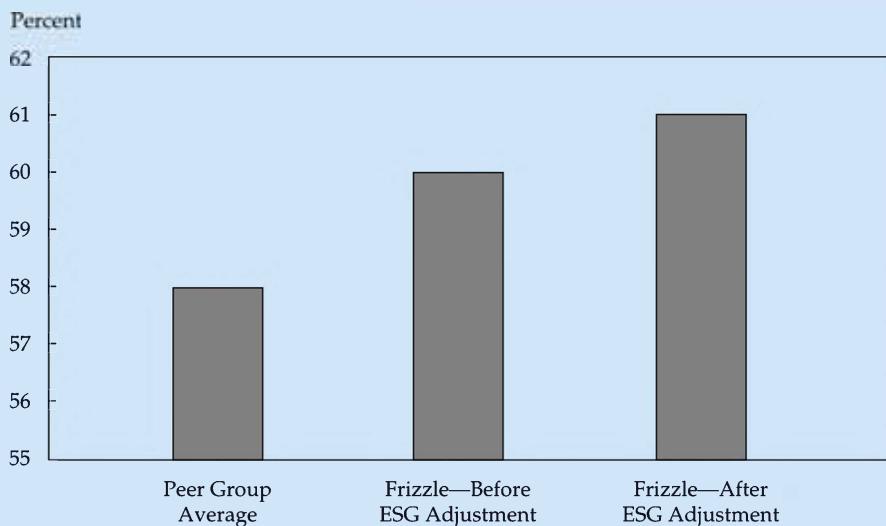
Sam analyzes the effects of Frizzle's water intensity on overall financial performance relative to peers. For example, he adjusts operating costs to account for the improved water intensity ratios (less usage). He expects that Frizzle's cost of goods sold will be 40% of revenue and the peer average will be 42%, and that Frizzle's decrease in water intensity will cause a 1% reduction in cost of goods sold and that industry peers cost of goods sold will remain unchanged.

Exhibit 4-3 shows the cost of goods sold as a percent of revenues on both an absolute and a relative basis. Exhibit 4-4 shows Frizzle's gross margin percentage.

Exhibit 4-3: Cost of Goods Sold as a Percentage of Revenue⁷

⁶ Exhibit 6, Volume 3, CFA Program Curriculum 2020.

⁷ Exhibit 7, Volume 3, CFA Program Curriculum 2020.

Exhibit 4-4: Gross Margin⁸

To conclude his ESG integration analysis, Sam incorporates adjustments to Frizzle's financials to value its stock and bonds. He finds that Frizzle's lower cost of goods results in higher forecasted earnings and fair value for Frizzle's stock.

Example 4-2: ESG Integration—Social Factors (Pharmaceutical Company)

Well Pharma (Well) is a European pharmaceutical company that manufactures drugs for autoimmune diseases and immune disorders. It has the worst five-year industry track record for recalls and regulatory warnings for manufacturing- and marketing-related violations. Well had major quality and safety scandals due to drug side effects, resulting in business disruptions, lost revenue, increased costs, lawsuits, and fines. As part of his analysis, Sam assumes pharmaceutical product quality and social factors as shown in Table 4-1.

Table 4-1: Social Factors—Pharmaceuticals⁹

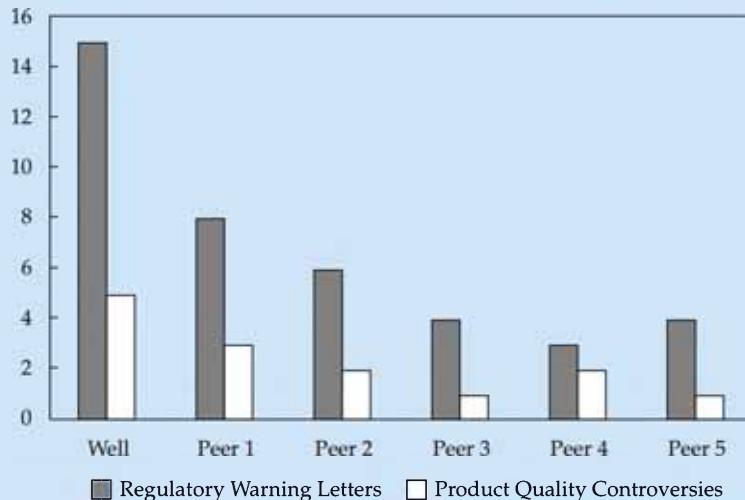
Factor	Description
Product Quality Controversies	Have there been any controversies linked to the company's products or service quality and responsibility?
Regulatory Warning Letters	Number of regulatory warning letters received by the company
Product Recalls	Number and severity of product recalls (voluntary and involuntary)
Regulatory Fines	Level of fines imposed by regulator, linked to poor product quality and/or irresponsible behavior

⁸ Exhibit 8, Volume 3, CFA Program Curriculum 2020.

⁹ Exhibit 9, Volume 3, CFA Program Curriculum 2020.

Exhibit 4-5 shows the number of regulatory warning letters received and marketing controversies faced by Well and several peers.

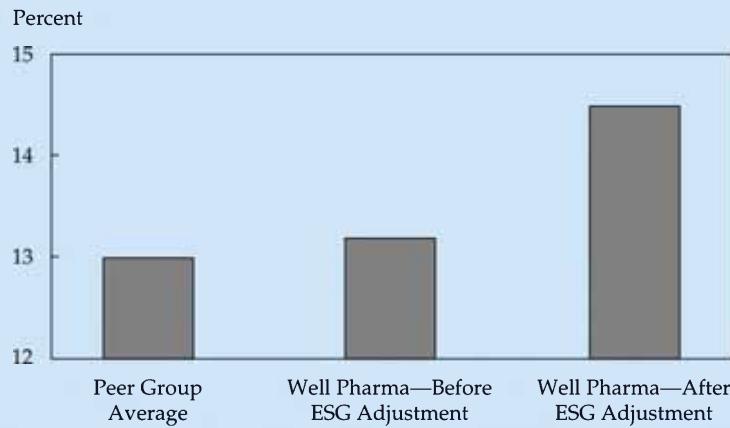
Exhibit 4-5: Regulatory Warning Letters ad Product Quality Controversies¹⁰



Sam adjusts his projected revenues, operating expenses, and non-operating expenses for Well. He assumes a 2% drop in sales due to existing controversies and a 1.3% increase in cost of goods sold to solve them, and a 4.5% increase for non-operating expenses.

Exhibit 4-6 shows Well's cost of goods sold/revenues is in line with its peers, but the higher costs of goods sold will put this ratio at the top of the peer group.

Exhibit 4-6: Cost of Goods Sold as Percentage of Revenue¹¹

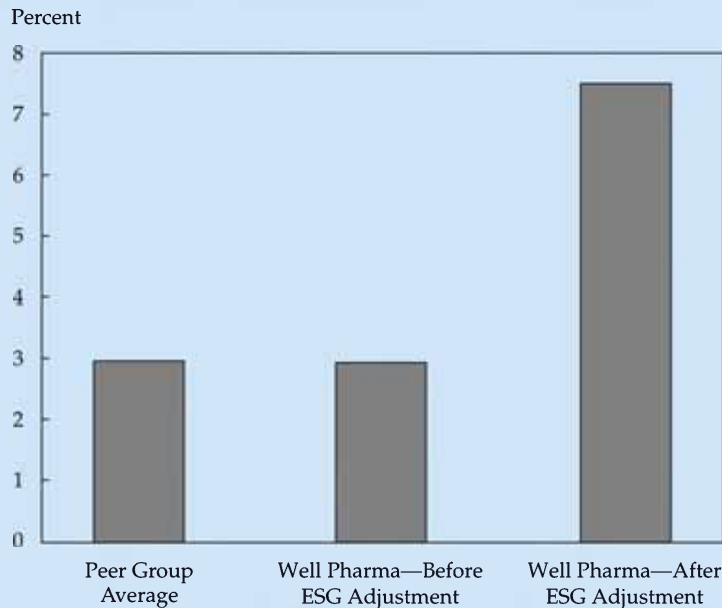


¹⁰ Exhibit 10, Volume 3, CFA Program Curriculum 2020.

¹¹ Exhibit 12, Volume 3, CFA Program Curriculum 2020.

Exhibit 4-7 shows Well's non-operating expense ratio (and forecast) versus its peer group.

Exhibit 4-7: Non-Operating Expenses as a Percentage of Operating Income¹²



Smith believes the valuation implications for Well's stock and bonds could be significant due to the financial and reputational implications of ESG-related scandals.

Expectations of future poor performance could have a direct impact on earnings and cash flow to the detriment of both shareholders and bondholders.

In addition, Smith believes there could be adverse valuation implications if investors view Well's brand value and reputation as impaired.

Example 4-3: ESG Integration—Governance Factors (Bank Holding Company)

Sumiyoshi Banking Group (Sumiyoshi) is a major Japanese bank holding company, with operations in Japan (80% of revenues), the United States, and Southeast Asia. Its core businesses are commercial banking, leasing, securities, and consumer finance.

Due to increased corporate governance reforms following the 2008–2009 global financial crisis, Sam has prepared Table 4-2 to compare governance factors for Sumiyoshi's board of directors and its domestic peer group.

¹² Exhibit 13, Volume 3, CFA Program Curriculum 2020.

Table 4-2: Corporate Governance Factors—Banks¹³

	Domestic Peer Group	Sumiyoshi Bank
Board type	Two tier	Two tier
Board size, number of directors	13	14
Total assets/director	JPY14.9 million	JPY13.3 million
CEO duality	Yes	Yes
Independent chairperson	Yes	No
Board independence %	47%	36%
Board gender diversity	17% female; 83% male	7% female; 93% male
Directors with long tenure (>10 years)	0%	14%
Number of board committees	5	4
Audit, nomination, remuneration, and risk committees in place?	Yes	Yes
Additional board committees?	Yes, governance committee	No
Non-executive directors with industry executive experience/total independent directors	67%	20%
Short-term and long-term incentive plan metrics disclosed?	No	No
Concentrated ownership	No single large shareholder	No single large shareholder
Say-on-pay provision	Yes	No
Straight voting	Yes	Yes
Dual-class shares	No	No

Sam notes Sumiyoshia lags its peers by having no independent chairperson, less board independence and diversity, few board members with significant industry experience, and many members with long tenures. With this information in mind, Sam sees governance issues as having a direct effect on credit risk.

One key banking credit measure for Sam is the percent of all loans that are non-performing loans (NPLs). Sam estimates the Sumiyoshi NPL ratio is 50 bps higher than its peer group, which reflects Sumiyoshi's relative credit weakness. When valuing Sumiyoshi's stock and bonds, Sam will increase the risk premium for its stocks and the credit spread for its bonds.

¹³ Exhibit 14, Volume 3, CFA Program Curriculum 2020.

READING 23: MERGERS AND ACQUISITIONS

LESSON 1: MERGERS AND ACQUISITIONS: DEFINITIONS, CLASSIFICATIONS, MOTIVES, TRANSACTION CHARACTERISTICS, AND REGULATION

Mergers and acquisitions (M&A) refers to businesses combining in some manner to achieve certain corporate objectives.

- An **acquisition** refers to a company's purchase of another company's assets, identifiable business segments, or subsidiaries.
- A **merger** is an acquisition in which a company purchases another company in its entirety.
 - In a merger, the company being bought is absorbed into the other so it ceases to exist as a separate entity once the merger is complete.

In a merger or an acquisition:

- The company making the purchase is known as the **acquiring company** or **acquirer**.
- The company that is bought is known as the **target company** or **target**.

Generally speaking, the smaller of the two companies is absorbed by the other, but this is not always the case.

LOS 23a: Classify merger and acquisition (M&A) activities based on forms of integration and relatedness of business activities. Vol 3, pp 236–238

M&A activities can be categorized on the basis of:

- **Form of integration:** The manner in which the business combination takes place.
- **Business activities of companies:** The manner in which business activities of the merging companies are related to each other.

Forms of Integration

- In a **statutory merger** the legal identity of the target ceases to exist following the amalgamation of all its assets and liabilities into the acquirer.
- In a **subsidiary merger** the target becomes a subsidiary of the acquirer. This is usually the case when the target has a valuable brand that the acquirer wishes to retain.
- In a **consolidation**, both the target and acquirer merge (consolidate) into a newly formed company so both their previous legal entities cease to exist. Consolidations are common in mergers where the combining entities are of similar size.

Business Activities of the Companies

- In a **horizontal merger**, the combining companies are in the same line of business (usually as competitors). The creation of ExxonMobil, ChevronTexaco, and ConocoPhillips are examples of horizontal mergers in the oil industry. Reasons for horizontal mergers include achieving economies of scale and increasing market share (market power).
- In a **vertical merger** the combining companies hail from the same production chain.

Another reason for vertical mergers is cost savings.

- If the acquirer purchases a target that lies ahead of it in the value chain (a supplier) it is known as **backward integration** (e.g., the acquisition by a soft-drink company of a sugar manufacturer).
 - A company might integrate backwards to obtain greater control over procurement of a key resource.
- If the acquirer purchases a target that lies further down the value chain (a retailer) it is known as **forward integration** (e.g., the acquisition by a cloth manufacturer of a retailer).
 - A company might integrate forward to obtain greater control over distribution of its products.
- In a **conglomerate merger**, the target operates in a business that is completely unrelated to that of the acquirer. 3M is a multinational conglomerate with more than 55,000 products including adhesives, dental products, electronic materials, medical products, and optical films. A key motivation for this type of merger is diversification at the company level to reduce earnings volatility.

Later in this reading we will learn that company-led diversification may not actually be in shareholders' interests since investors can diversify on their own at a lower cost.

LOS 23b: Explain common motivations behind M&A activity. Vol 3, pp 239–244

Motives for Merger

Creation of synergy: Synergies are realized when the value of the combined entity that is formed as a result of the merger exceeds the value of the simple sum of its parts.

- **Cost synergies** are achieved through economies of scale in R&D, manufacturing, sales and marketing, distribution, and administration.
- **Revenue synergies** are created through cross-selling of products, greater market share, and higher prices as a result of reduced competition.

Note that regulators will block mergers when they determine that competition will be significantly reduced as a result of a merger. We will study antitrust regulation later in this reading.

Growth: Sometimes it can be cheaper, quicker, and/or less risky for an acquirer to merge with a competitor (external growth) in order to grow than to achieve growth internally (organic growth). Generally speaking, external growth makes more sense if the target possesses the competencies and resources necessary to capitalize on emerging opportunities. This approach also entails lower risk, given that establishing a foothold in foreign markets is more difficult than acquiring a company with an established presence.

Increasing market power: By acquiring a competitor (horizontal integration), a company can increase its pricing power in an industry that has a small number of firms. Vertical integration may give the acquirer greater market power if it allows the acquirer to gain control over a critical production input by merging with a dominant supplier.

Acquiring unique capabilities and resources: Mergers or acquisitions may also be undertaken as an alternative to developing capabilities internally. Empirically, firms have acquired other companies in pursuit of intellectual capital, R&D capabilities, effective marketing, and creative talent.

Diversification: Companies may engage in M&A in order to diversify their businesses. This was the rationale behind the popularity of conglomerates during the 1960s and 1970s. The basic idea was that by investing in different lines of business, the acquirer represented a portfolio of investments, which would experience lower earnings volatility (to the extent that the businesses were uncorrelated). While the idea sounds appealing, investors in efficient markets can diversify their portfolios more easily and cost-effectively than company-level diversification can offer. Further, history shows that conglomerates were unable to manage these different businesses efficiently, especially in cases where acquirers attempted to diversify into areas beyond their core competency.

LOS 23c: Explain bootstrapping of earnings per share (EPS) and calculate a company's post-merger EPS. Vol 3, pp 240–241

Bootstrapping earnings: The “bootstrap effect” (or “bootstrapping earnings”) occurs when a company’s EPS increases as a result of the merger transaction, not due to economic benefits of the business combination. The bootstrap effect occurs when:

- The shares of the acquirer trade at a higher P/E ratio than shares of the target; and
- The acquirer’s P/E does not fall after the merger.

Example 1-1 illustrates the bootstrapping effect.

Example 1-1: Bootstrapping Earnings

Company A (acquirer) is considering a merger with Company T (target). The table below provides information regarding the two companies before the merger and the combined entity post-merger:

	Company A	Company T	Company A Post-Merger
Stock price	\$110	\$55	
EPS	\$5.00	\$3.05	\$5.37
P/E	22	18	
Shares outstanding	100,000	100,000	150,000
Earnings	\$500,000	\$305,000	\$805,000
Market value of equity	\$11,000,000	\$5,500,000	

1. Given Company A’s stock price, how many shares does it need to issue to purchase Company T? Assume that Company T is purchased for its market value. Also calculate Company A’s EPS post-merger.
2. Now assume that Company A’s P/E ratio pre-merger was the same as Company T’s (P/E = 18). Compute the number of shares that Company A would have to issue to acquire Company T at its market value. Also compute EPS for Company A post-merger.

Solution:

1. If it were to acquire Company T at its market value (\$5.5m), Company A would need to issue $5.5m/110 = 50,000$ shares. Post-merger EPS for the combined entity is calculated as the sum of the two companies’ net incomes ($\$500,000 + \$305,000$) divided by the total number of shares outstanding for Company A post-merger ($100,000 + 50,000$). EPS therefore equals \$5.37.
2. If Company A were trading at a P/E of 18, its stock price would equal \$90. In this case, it would need to issue $5.5m/90 = 61,111.11$ additional shares to finance the merger. The EPS of the combined entity would equal $\$805,000/161,111.11 = \5 . This shows that for bootstrapping to work (for EPS to rise post-merger) the acquirer’s P/E must be greater than the target’s P/E.

Important takeaways:

If the market is efficient, Company A's stock price post-merger would remain at \$110. The P/E ratio would adjust to reflect the two companies' contributions to the earnings of the combined entity (Adjusted P/E ratio = $110/5.37 = 20.5$).

If however, the acquirer's management can convince investors to value the combined entity at the acquirer's pre-merger P/E, the acquirer's post-merger stock price would rise to $22 \times 5.37 = \$118.07$.

When there are no expected (economically meaningful) gains from a merger, such share price increases are not seen as investors recognize that the increase in the acquirer's EPS is purely due to the bootstrapping effect, and therefore adjust the acquirer's P/E downwards. However, there have been instances in the past (e.g., during the dotcom bubble of the 1990s) where many high P/E companies bootstrapped their earnings to exhibit continuous EPS growth by successively merging with low P/E companies.

In many countries, tax authorities do not permit the use of target company losses to offset the acquirer's tax liability if the primary motive for the merger is tax avoidance.

Managers' personal incentives: Manager compensation may be tied to factors such as company size, which may encourage them to undertake mergers to increase the size of the firm (as opposed to focusing on maximizing shareholder value). Managers may also seek to increase company size to feed their egos or build prestige.

Tax considerations: A company may acquire a target that is carrying significant accumulated tax losses so that it can use those tax losses to reduce its own tax liabilities.

Unlocking hidden value: In instances where a company is performing suboptimally (e.g., due to poor management or lack of adequate resources) an acquirer may purchase it to unlock value through better management, through reorganization, or by creating synergies. Valuations below breakup value (i.e., the value obtained if the company's assets are divided and sold separately) and/or below replacement cost attract potential acquirers.

Cross-border motivations: International M&A transactions have become increasingly popular since the 1990s as companies aim to merge with foreign companies in order to:

- *Exploit market imperfections:* Companies may shift some part of their operations to a lower cost country by acquiring an existing business in that country. For example, a manufacturer from a developed country may acquire a target in a country where the cost of production inputs is considerably lower.
- *Overcome adverse government policy:* Companies may acquire targets in a foreign country to circumvent any government-imposed barriers to trade in their domestic economies.
- *Transfer technology:* Companies that possess superior technology may acquire companies in foreign markets to introduce those markets to their products. Also, foreign companies that create new technologies may be acquired in order to exploit the advantages that they may offer an acquirer at home and abroad.
- *Product differentiation:* Cross-border acquisitions may be undertaken to add new, differentiated products to the acquirer's portfolio.
- *Following clients:* Firms (especially those in the services sector) may undertake a cross-border merger to be able to serve their clients in different markets.

LOS 23d: Explain, based on industry life cycles, the relation between merger motivations and types of mergers. Vol 3, pp 239–244

The types of mergers and the motivations behind mergers in an industry vary as the industry moves through its life cycle. Table 1-1 lists brief descriptions of each stage of the industry life cycle, motives for mergers in each stage, and the types of mergers that usually occur in each stage.

Table 1-1: Mergers and the Industry Life Cycle

Industry Life Cycle Stage	Industry Description	Motives for Merger	Types of Merger
<i>Pioneering development</i>	<ul style="list-style-type: none"> Low but slowly increasing sales growth. Substantial development costs. 	<ul style="list-style-type: none"> Younger, smaller companies may sell themselves to larger firms in mature or declining industries to enter into a new growth industry. Young companies may merge with firms that allow them to pool management and capital resources. 	<ul style="list-style-type: none"> Conglomerate Horizontal
<i>Rapid accelerating growth</i>	<ul style="list-style-type: none"> High profit margins. Low competition. 	<ul style="list-style-type: none"> To meet substantial capital requirements for expansion. 	<ul style="list-style-type: none"> Conglomerate Horizontal
<i>Mature growth</i>	<ul style="list-style-type: none"> Decrease in the entry of new competitors. Growth potential remains. 	<ul style="list-style-type: none"> To achieve economies of scale, savings, and operational efficiencies. 	<ul style="list-style-type: none"> Horizontal Vertical
<i>Stabilization and market maturity</i>	<ul style="list-style-type: none"> Increasing capacity constraints. Increasing competition. 	<ul style="list-style-type: none"> To achieve economies of scale in research, production, and marketing to match low costs and prices of competitors. Large companies may buy smaller companies to improve management and provide a broader financial base. 	<ul style="list-style-type: none"> Horizontal
<i>Deceleration of growth and decline</i>	<ul style="list-style-type: none"> Overcapacity. Eroding profit margins. 	<ul style="list-style-type: none"> Horizontal mergers to ensure survival. Vertical mergers to increase efficiency and profit margins. Conglomerate mergers to exploit synergy. Companies in the industry may acquire companies in young industries. 	<ul style="list-style-type: none"> Horizontal Vertical Conglomerate

Source: Adapted from J. Fred Weston, Kwang S. Chung, and Susan E. Hoag, *Mergers, Restructuring, and Corporate Control* (New York: Prentice Hall, 1990, p. 102), and Bruno Solnik and Dennis McLeavy, *International Investments*, 5th edition (Boston: Addison-Wesley, 2004, p. 264–265).

LOS 23e: Contrast merger transaction characteristics by form of acquisition, method of payment, and attitude of target management. Vol 3, pp 244–249

The form of acquisition, method of payment, and the mind-set of the target's management play an important role in determining how the merger transaction will occur, which regulations will apply, how the companies will be valued, and how the transaction will be taxed.

Form of Acquisition

An acquirer can either purchase a target's (1) shares or (2) assets.

Stock purchases are the most common type of M&A transactions. In a stock purchase:

- The target's shareholders receive cash, or shares in the acquirer, or a combination of cash and acquirer stock for their shares in the target.
- At least 50% (or more in certain jurisdictions) of shareholders must approve the terms of the merger for the transaction to proceed.
- In instances where the target's management is not in favor of the merger, gaining shareholder approval (which can be difficult and time-consuming) allows the acquirer to bypass management and proceed with the merger.
- Target company shareholders must pay taxes on any capital gains arising out of the compensation received for their shares. The target company itself is not liable for any taxes.
- The acquirer can use the target's tax loss carry forwards to offset its tax liability in the U.S.
- The acquirer assumes the target's liabilities so it must watch out for undisclosed or unexpected liabilities.

Asset purchases are less common, but easier to effect. In an asset purchase:

- The acquirer purchases the target's assets and makes a payment to the target company.
- Barring the purchase of a substantial percentage of assets (usually > 50%), target shareholder approval is not required.
- The acquirer can focus on purchasing only those parts of the target that it is interested in obtaining (e.g., a particular division) instead of having to purchase the entire company.
- Target company shareholders are not liable for any related taxes. However, the target company may be subject to corporate taxes on sale of assets.
- The acquirer cannot use the target's tax loss carry forwards to offset its tax liability in the U.S.
- Generally speaking, acquirers do not assume the target's liabilities. However, in cases where, instead of undertaking a stock purchase, acquirers have purchased substantially all of the target's assets just to avoid assuming the target's liabilities, courts have held acquirers legally liable for the target's liabilities.

Table 1-2 shows the differences between stock and asset purchases.

Table 1-2: Major Differences of Stock versus Asset Purchases¹

	Stock Purchase	Asset Purchase
<i>Payment</i>	Target shareholders receive compensation in exchange for their shares.	Payment is made to the selling company rather than directly to shareholders.
<i>Approval</i>	Shareholder approval required.	Shareholder approval might not be required.
<i>Tax: Corporate</i>	No corporate-level taxes.	Target company pays taxes on any capital gains.
<i>Tax: Shareholder</i>	Target company's shareholders are taxed on their capital gain.	No direct tax consequence for target company's shareholders.
<i>Liabilities</i>	Acquirer assumes the target's liabilities.	Acquirer generally avoids the assumption of liabilities.

Method of Payment

In order to pay for the target, an acquirer may offer:

- Cash (cash offering) using either internally generated funds or funds raised by issuing debt.
- Securities (securities offering). Typically target shareholders receive common stock of the acquiring company according to an exchange ratio. However, there have been instances where target company shareholders have been offered preferred shares and even debt securities.
- A combination of cash and securities (mixed offering) where target shareholders receive a combination of cash and shares in the acquirer.

Factors Affecting Choice of Payment

- Relative beliefs regarding the merger's ability to create value:
 - In a stock offering, target shareholders share a portion of the risk and rewards related to the success of the merger (as they hold shares in the post-merger organization).
 - In a cash offering, target shareholders do not participate in the risk and rewards of the merger.
 - The more strongly the acquirer believes that the merger will create value, the more it is likely to push a cash offering.
 - The more strongly target shareholders believe that the merger will create value, the more they will push for a stock offering.
- Relative values of companies involved in the merger:
 - When the acquirer's stock price is perceived as being overvalued relative to the target's stock price, the acquirer will push a stock offering.
 - Sometimes investors will interpret a stock offering as a signal that the acquirer's management considers its shares overvalued.

¹ Exhibit 1, CFA Program Curriculum 2020

- Impact on the acquirer's capital structure:
 - If debt is issued in order to raise cash to pay for the merger, the acquirer's financial leverage (and risk) will increase.
 - If common shares are issued for a stock offering, existing shareholders will suffer dilution of their ownership interests.

Mind-Set of Target Management

Whether the target's senior management and board of directors are open to the merger or hostile to it has an impact on, among other things, how quickly the merger is completed, the rules and regulations that apply, and how much value is ultimately created.

Friendly Mergers

Generally speaking, the acquirer will approach the target's management directly unless it has reason to believe that the target will not welcome the merger. If both companies are open to the idea, the companies will enter into merger discussions. Key discussion points at this stage include the amount of consideration that target shareholders will receive, terms of the transaction, and post-merger management structure.

Prior to reaching a formal agreement, both parties conduct due diligence examinations where accounts and records are examined to ensure the accuracy of representations made by either party during negotiations (e.g., the acquirer might want to confirm that the target's assets are actually worth the amount claimed by the target). Any issues that arise at this stage may have a direct bearing on the price and/or terms of the deal. The target may also conduct due diligence on the acquirer to ensure financial soundness and ability to meet merger payment terms.

Upon completion of due diligence and negotiations, the parties sign a definitive merger agreement, which is a contract that contains terms and conditions, warranties or representations, covenants, termination procedures and remedies, and other miscellaneous clauses.

Typically, merger discussions and negotiations are kept confidential until the definitive merger agreement has been signed. Once it has been signed, the transaction is announced to the public through a joint press release by both companies. In a friendly merger, the target's management endorses the merger and encourages its shareholders to approve the transaction. In the event that shareholder approval is required (for target shareholders to approve a stock transaction, or acquirer shareholders to approve the issuance of a substantial amount of shares to finance a stock offering) shareholders are provided with a proxy statement that contains all material facts. Once all required approvals have been obtained (from shareholders, regulatory bodies, etc.), legal advisors file documentation as specified by the securities regulator (SEC in the U.S.) and then the transaction is deemed complete. Agreed-upon consideration is paid to target shareholders, and the companies are officially and legally combined.

Hostile Mergers

When the target's management is not receptive to the idea of a merger, the acquirer may employ a tactic known as a bear hug, whereby it submits the merger proposal directly to the target's board of directors, in effect bypassing the target's management.

Should the target's board determine that the offer is worth considering, it may appoint a special committee to negotiate a sale. Although it is rare, it is possible that management may, following a bear hug, withdraw its opposition to the deal and enter into negotiations. If the bear hug does not work, the acquirer may take the deal directly to the target's shareholders through a tender offer or a proxy fight.

In a tender offer:

- The acquirer invites target shareholders individually to submit their shares for a payment.
- The payment can be in the form of cash, shares of the acquirer, other securities, or a combination of cash and securities.

Tender offers are often associated with hostile mergers, but they also occur in a friendly context. Tender offers are considered hostile only when the offer is opposed by the target company's management and board of directors.

In a proxy fight:

- The acquirer approaches target shareholders to vote for an acquirer-nominated board of directors which, if elected, is then able to replace the target's management, and turn the transaction into a friendly merger.
- Proxy solicitation is approved by regulators and then proxies are mailed directly to target shareholders.

LOS 23f: Distinguish among pre-offer and post-offer takeover defense mechanisms. Vol 3, pp 249–255

Takeovers

- When faced with a hostile tender (takeover) offer, the target's management and board of directors can (1) sell the company, either to the bidder or a third party or (2) try to remain independent.
- The determination of the target to resist overtures from the acquirer depends on (1) the strength of the company's takeover defenses, (2) management's resolve to remain independent, and (3) the premium above the target's market price offered by the acquirer.
- The target may use defensive measures to (1) delay, (2) negotiate a better deal for its shareholders, or (3) try to keep the company independent.
- Takeover defenses can be classified as pre-offer defenses and post-offer defenses.
 - The U.S. legal system embraces pre-offer defenses but scrutinizes post-offer defenses. Therefore, lawyers encourage companies to put defenses in place prior to any takeover action.

Pre-Offer Takeover Defense Mechanisms

Poison pills grant a company the right to issue stock options to existing shareholders enabling them to purchase additional shares of stock at significantly discounted prices. They effectively make it very expensive for the acquirer to take over the target without approval of the target's board of directors.

- A flip-in pill gives target shareholders the right to buy the target's shares at a discount.
 - It is triggered when a specific level of ownership is exceeded.
 - Acquiring companies are generally not allowed to participate in the purchase so they are subject to significant dilution.

- A flip-over pill gives target shareholders the right to buy shares of the acquirer at a discount.
 - This can cause significant dilution of the acquiring company's shareholders.
- Under a dead-hand provision (usually incorporated into a poison pill) the poison pill can only be redeemed or cancelled by a vote of the continuing directors.
 - This makes it much more difficult to take over a target without prior board approval.

Poison puts give target company bondholders the right to sell their bonds back to the target at a pre-specified redemption price (typically par value or above) in the event of a takeover. This means that if the acquirer takes over the target, it would need to raise a substantial amount of cash to refinance the target's debt.

Incorporation in a state with restrictive takeover laws: Certain states in the U.S. (e.g., Pennsylvania and Ohio) are relatively "target-friendly" as they give companies the most power in defending against takeover attempts.

Staggered board of directors: Under a staggered board, a portion of the board is up for election each year, not the entire board. A staggered board increases the amount of time an acquirer would need to take control of the board. For example, consider a 12-person board with a three-year term, with only four seats coming up for election each year. With the staggered board, it would take an acquirer at least two years to take control of the board.

Restricted voting rights: Target companies may adopt a mechanism that precludes shareholders who have recently purchased a large block of shares from exercising their voting rights. The possibility of owning target company shares but not being able to vote deters acquirers from making a hostile move for the target.

In a two-tiered tender offer, the acquirer initially offers a high price with the threat of a lower price in the second offer for those who do not tender their shares in the initial offer.

Supermajority voting provisions: Target companies can change their charter and bylaws to require a higher percentage approval by shareholders for mergers (e.g., 80% of outstanding shares as opposed to a simple 51% majority for other items requiring shareholder approval). This supermajority voting requirement is triggered by a hostile takeover attempt and may be combined with a provision that prevents the acquirer from voting its shares. Therefore, even if the acquirer owns a substantial proportion of the target's shares, it may still face difficulty in gathering enough votes in favor of the merger.

Fair price amendments: These are changes to the corporate charter that only allow mergers if the offer price is above a certain threshold (e.g., the highest price attained by the stock over the year). Not only do these amendments protect target shareholders from temporary declines in the target's stock price, but they also provide protection against two-tiered tender offers.

Golden parachutes: These are agreements between the target company and its managers under which executives receive lucrative payouts if they leave the company following a change in corporate control. While they do not serve as deterrents to acquirers (since the value of compensation given to management is insignificant

compared to the amount paid to acquire the target), they do pacify management concerns regarding job loss.

Post-Offer Takeover Defense Mechanisms

“Just say no” defense: The target simply declines the offer and hopes that the acquirer will raise its offer or further reveal its strategy to take the process forward.

Litigation: The target company may take the acquirer to court over alleged violations of antitrust or securities laws. These lawsuits usually fail to stop a takeover bid, but do give the target time to consider how to defend against the unwanted offer.

Greenmail: This is an arrangement where the target is allowed to repurchase its shares from the acquirer at a premium to market price. Essentially, it represents a payoff given to the acquirer to terminate a hostile takeover bid. This strategy is not used much now since there is a 50% tax on acquirers on profits realized through greenmail.

Share repurchase: The target may repurchase its shares from shareholders. This can increase the cost of a takeover for the acquirer by increasing the stock’s price, or by causing the acquirer to increase its bid in order to remain competitive with the target’s offer for its own shares. If financed by issuing debt, share repurchases can increase the target’s leverage, which makes it less attractive as a takeover target.

Leveraged recapitalization: A large amount of debt is issued to finance a substantial share repurchase. This serves to dramatically change the target’s capital structure while attempting to deliver value to target shareholders in excess of the hostile bid.

“Crown jewel” defense: The target sells off a valuable asset to make the firm less attractive to the would-be acquirer. However, if the sale is initiated after a hostile bid, there is a chance that courts would deem the sale illegal.

“Pac Man” defense: The target attempts a hostile takeover of the acquiring company. Since the target is usually smaller than the acquirer, this strategy is rarely observed in practice. Further, such a move may preclude the target from taking the acquirer to court over antitrust violations.

White knight defense: The target encourages a third firm (that is more acceptable to target company management) to acquire the target company. The entrance of a white knight may ignite a bidding war for the target, which may result in improved terms being offered to target shareholders. It may also result in the eventual acquirer suffering a winner’s curse (overpaying for the company).

White squire defense: A third party purchases a substantial minority stake (large enough to block a hostile takeover) in the target. This defense carries significant risk of litigation especially if the shares are purchased directly from the target, without target shareholders receiving any compensation.

LOS 23g: Calculate and interpret the Herfindahl–Hirschman Index, and evaluate the likelihood of an antitrust challenge for a given business combination. Vol 3, pp 255–257

Regulation

Antitrust

Prior to 1982, the Federal Trade Commission (FTC) and Department of Justice used market share as a measure of market power to determine whether there were antitrust violations among competitors in an industry.

- Using a simple measure of industry concentration along with market share information, companies contemplating a merger could determine in advance whether they would be in violation if they were to merge.
- The approach offered transparency and predictability, but was deemed too simplistic and rigid.

After 1982, agencies moved toward using the Herfindahl–Hirschman Index (HHI). This measure sums the squares of each company's market share (based on sales) in the industry. Not only is it easy to calculate and interpret, but the HHI is also more effective at modeling market concentration. See Table 1-3 and Example 1-2.

$$\text{HHI} = \sum_i^n \left(\frac{\text{Sales or output of firm } i}{\text{Total sales or output of market}} \times 100 \right)^2$$

HHIs are calculated based on **post-merger** market shares.

- An HHI of less than 1,000 suggests that the market is not concentrated and a challenge is not likely unless other anticompetitive issues arise.
- An HHI between 1,000 and 1,800 suggests that the market is moderately concentrated.
 - If a merger results in the HHI rising by 100 points or more, the merger may be challenged.
- An HHI above 1,800 suggests that the market is highly concentrated.
 - If a merger results in the HHI rising by 50 points or more, the merger will be challenged.

Table 1-3: HHI Concentration Levels and Possible Government Response²

Post-Merger HHI	Concentration	Change in HHI	Government Action
Less than 1,000	Not concentrated	Any amount	No action
Between 1,000 and 1,800	Moderately concentrated	100 or more	Possible challenge
More than 1,800	Highly concentrated	50 or more	Challenge

² Exhibit 2, CFA Program Curriculum 2020

Example 1-2: Herfindahl–Hirschman Index

An analyst gathered the following information regarding an industry with 10 competitors:

Company	1	2	3	4	5	6	7	8	9	10
Market Share (%)	25	20	15	10	10	5	5	4	4	2

1. Would a merger between Companies 3 and 4 be expected to evoke an antitrust challenge?
2. Would a merger between Companies 6 and 7 be expected to evoke an antitrust challenge?

Solution:

The HHI is the sum of the squared market shares of all the firms in the industry. Pre-merger, the HHI for the industry stands at 1,536. This value suggests that the industry is moderately competitive.

1. If Companies 3 and 4 were to merge, the HHI would equal 1,836. The 300-point increase in HHI indicates that this merger will likely evoke antitrust objections.
2. If Companies 6 and 7 were to merge, the HHI would equal 1,586. Given that this industry is moderately competitive and that the merger only causes the HHI to increase by 50 points (less than 100) the merger is unlikely to raise antitrust concerns.

Pre-Merger			Post-Merger Companies 3 and 4			Post-Merger Companies 6 and 7		
Company	Market Share (%)	Squared Market Share	Company	Market Share (%)	Squared Market Share	Company	Market Share (%)	Squared Market Share
1	25	625	1	25	625	1	25	625
2	20	400	2	20	400	2	20	400
3	15	225	3 + 4	25	625	3	15	225
4	10	100	5	10	100	4	10	100
5	10	100	6	5	25	5	10	100
6	5	25	7	5	25	6 + 7	10	100
7	5	25	8	4	16	8	4	16
8	4	16	9	4	16	9	4	16
9	4	16	10	2	4	10	2	4
10	2	4						
HHI	1,536	HHI				1,836	HHI	1,586

After 1984 agencies started considering additional information in evaluating market power (as it found the HHI useful, but too mechanical and inflexible). The additional considerations used in evaluating market power now include:

- Responsiveness of consumers to price changes.
- Efficiency of companies in the industry.
- Financial viability of merger candidates.
- Ability of U.S. companies to compete in foreign markets.

Securities Laws

The Williams Act has introduced statutory disclosure requirements and initiated a formal process for tender offers to allow shareholders time to evaluate a merger offer and to provide target management time to respond to the offer.

LESSON 2: TARGET COMPANY VALUATION

LOS 23h: Compare the discounted cash flow, comparable company, and comparable transaction analyses for valuing a target company, including the advantages and disadvantages of each. Vol 3, pp 259–270

LOS 23i: Calculate free cash flows for a target company and estimate the company's intrinsic value based on discounted cash flow analysis. Vol 3, pp 259–270

LOS 23j: Estimate the value of a target company using comparable company and comparable transaction analyses. Vol 3, pp 259–270

Target Company Valuation

Discounted Cash Flow (DCF) Analysis

This approach determines the value of the target as the present value of its expected future **FCFF (free cash flow to the firm)**. FCFF represents cash available to all the company's investors (shareholders and bondholders) after paying for all expenses and investments required to maintain the firm's operations. Stated differently, FCFF represents internally generated funds available to the company's investors without diminishing the company's value.

In this reading, we will illustrate a two-stage DCF model (see Example 2-1), which requires the following steps:

These estimates are easier to make for friendly mergers where the analyst has access to detailed financial data.

1. Development of pro forma (prospective) financial statements.
 - The first stage should encompass years for which the analyst is confident of coming up with reasonably accurate estimates for the company's cash flows.
 - The second stage includes subsequent years (into perpetuity) over which the analyst assumes that the cash flows grow at a constant rate.
2. Conversion of pro forma net income into pro forma FCFF.
 - The steps required to accomplish this are illustrated in Example 2-1.
3. Calculation of present values of:
 - The company's yearly FCFF in the first stage.
 - The company's terminal value, which represents the present value of second-stage FCFF.
4. Adding the present values of the two FCFF streams to determine company value.

There is no standard approach for creating pro forma financial statements. The analyst must use her judgment to estimate each item and incorporate potential synergies and announced plans for the merger (e.g., sale of certain divisions) into her analysis.

Example 2-1: Two-Stage DCF Valuation

The following exhibit contains selected pro forma balance sheet, income statement, and cash flow statement information for Oxlard Inc.

Income Statement (\$ in millions)	Historical	Pro Forma				
	2010	2011	2012	2013	2014	2015
Revenues	6,881	7,501	8,251	9,076	9,984	10,982
Cost of goods sold	3,785	4,126	4,538	4,992	5,491	6,040
Gross profit	3,097	3,375	3,713	4,084	4,493	4,942
SG&A expenses	1,032	1,125	1,238	1,361	1,498	1,647
Depreciation	241	262	289	318	350	384
Earnings before interest and taxes	1,823	1,988	2,187	2,405	2,646	2,910
Net interest expense	321	306	293	278	259	236
Earnings before taxes	1,502	1,682	1,893	2,128	2,387	2,675
Income tax	526	589	663	745	836	936
Net income	977	1,093	1,231	1,383	1,552	1,739
Balance Sheet (\$ in millions)						
Current assets	4,129	4,500	4,950	5,446	5,990	6,590
Net property, plant, and equipment	4,817	5,250	5,776	6,353	6,989	7,688
Total assets	8,946	9,751	10,726	11,799	12,979	14,277
Current liabilities	1,720	1,875	2,063	2,269	2,496	2,746
Deferred income taxes	44	53	63	74	86	100
Long-term debt	3,773	3,594	3,449	3,268	3,045	2,776
Total liabilities	5,538	5,522	5,575	5,610	5,627	5,621
Common stock and paid-in capital	571	571	571	571	571	571
Retained earnings	2,837	3,657	4,580	5,617	6,780	8,084
Shareholders' equity	3,409	4,229	5,151	6,189	7,352	8,656
Total liabilities and SE equity	8,946	9,751	10,726	11,799	12,979	14,277
Selected Pro Forma Cash Flow Data (\$ in millions)						
Change in net working capital	0	217	262	289	318	350
Capital expenditures	0	696	814	895	985	1,083

Use the information in the pro forma financials to determine the value of the company assuming that the WACC equals 9.5% and the terminal growth rate from 2015 onward is 5%.

Solution:

Free Cash Flow Calculations (\$ in millions)	2011	2012	2013	2014	2015
Net income	1,093	1,231	1,383	1,552	1,739
Plus: Net interest after tax	199	191	180	168	153
Unlevered net income	1,292	1,421	1,563	1,720	1,892
Plus: Change in deferred taxes	9	10	11	12	14
Net op. profit less adj. taxes (NOPLAT)	1,301	1,431	1,574	1,732	1,906
Plus: Depreciation	262	289	318	350	384
Less: Change in net working capital	217	262	289	318	350
Less: Capital expenditures	696	814	895	985	1,083
Free Cash Flow	650	644	708	779	857

Since the tax rate is not explicitly stated in the question, we can use the firm's effective tax rate based on historical data (2010) as income taxes/EBT = 526/1,502 = 35%.

The **first step** in calculating FCFF is converting net income to net operating profit less adjusted taxes (NOPLAT). The reason for this adjustment is that we want to determine after-tax cash flows available to all providers of capital to the firm. Converting net income into NOPLAT requires two steps:

1. Add net interest after tax to net income to calculate unlevered net income. The interest tax shield is already reflected in net income so this step adds interest after tax to net income so that cash flows represent income available to all investors.

$$\text{Unlevered net income} = \text{Net income} + \text{Net interest after tax}$$

$$\text{For 2011 (Oxford): Unlevered net income} = 1,093 + 306(1 - 0.35) = \$1,292\text{m}$$

2. Add the increase in deferred tax liabilities over the year to unlevered net income. This step is performed to adjust unlevered net income for the differences in depreciation accounting on the financial statements and the tax return. Higher depreciation is typically charged for tax reporting purposes, and this has the effects of (1) reducing the company's taxes payable (increasing cash flows) and (2) increasing deferred tax liabilities. Since we are trying to determine cash flows based on financial statements, we must adjust net income on the income statement for the cash flow effect of changes in deferred taxes. An increase (decrease) in net deferred tax liabilities results in an increase (decrease) in cash flow.

$$\text{NOPLAT} = \text{Unlevered net income} + \text{Change in deferred taxes}$$

$$\text{For 2011 (Oxford)} = 1,292 + (53 - 44) = \$1,301\text{m}$$

The **second step** is to convert NOPLAT into FCFF by:

- Adding all noncash charges (NCC).
- Deducting net investment in working capital.
- Deducting net investment in fixed capital (capital expenditure).

$$\text{FCFF} = \text{NOPLAT} + \text{NCC} - \Delta \text{Net WC} - \text{Capex}$$

$$\text{For 2011 (Oxford): FCFF} = 1,301 + 262 - 11 - 696 = \$650\text{m}$$

To summarize, FCFF is estimated by:

	Net income
+	Net interest after tax
=	Unlevered income
+	Changes in deferred taxes
=	NOPLAT (net operating profit less adjusted taxes)
+	Net noncash charges
-	Change in net working capital
-	Capital expenditures (capex)
	Free cash flow to the firm (FCFF)

Net interest after tax = (Interest expense – Interest income) (1 – tax rate)

Working capital = Current assets (excl. cash and equivalents) – Current liabilities (excl. short-term debt)

Once first-stage FCFF have been determined, we calculate the present value of free cash flows using the WACC.

- When evaluating a target from a noncontrol perspective, we would use the target's WACC (as it reflects the company's existing risk and business environment).
- When evaluating a target as a potential merger candidate, we would adjust the WACC to reflect anticipated changes in the target's risk.

PV (FCFF) for 2011 (Oxford) = $650/(1 + 0.095) = \$593.61m$
Sum of PV (First-stage 2011–2015 FCFF) = \$2,756m

Next we calculate the terminal value and discount it to the present. The terminal value can be calculated based on the **constant-growth model** or the **relative valuation model**.

Under the **constant-growth model**, the terminal value is calculated as:

Terminal value _T = $FCFF_T \cdot (1 + g) / (WACC - g)$
Terminal value (2015) = $857 \cdot (1 + 0.05) / (0.095 - 0.05) = \$19,997$

Under the **relative valuation model**, the analyst determines the terminal value by applying a relevant valuation multiple at which she expects the target to sell for at the end of the first stage. For example, in an industry where a company typically sells for 25 times its FCFF, the terminal value for Oxford would be calculated as:

Terminal value (2015) = $857 \times 25 = \$21,425m$

The value of the target firm is calculated by adding the present value of the FCFF during the first stage and the present value of the terminal value. We assume that the terminal value based on the constant-growth model is more accurate.

$$\begin{aligned}\text{Target value (2010)} &= 2,756\text{m} + 19,997/(1 + 0.095)^5 \\ &= 2,756\text{m} + 12,703 = \$15,459\text{m}\end{aligned}$$

Note that a large proportion of the target's value ($12,703/15,459 = 82.17\%$) is determined by the terminal value. This implies that the assumed values of the WACC and the constant growth rate have a large impact on the target's estimated value.

Advantages of DCF Analysis

- Allows the incorporation of expected changes to cash flows from merger-related synergies and cost structure changes into the model.
- Forecasted fundamentals are used to arrive at an estimate of the firm's intrinsic value.
- The model can be customized to reflect changes in assumptions and/or estimates.

Disadvantages of Discounted Cash Flow Analysis

- Difficulties arise should free cash flow be negative, especially during the first stage (which generally tends to exhibit high growth so capital expenditures are likely to drag FCFF into the red). When this is the case, most of the target's value will be determined by cash flows that are further out into the future and more difficult to predict accurately.
- The margin of error for predicting cash flows increases in each successive future period.
- There can be significant changes in the discount rate either as a result of capital market developments or company-specific factors. These changes will have a significant impact on company value.
- Small changes to assumed values of the WACC or the growth rate dramatically affect the target's value.

Comparable Company Analysis

Under this approach, **relative valuation measures** are used to estimate the **market value of the target company**, and then a **takeover premium** is added to determine a **fair acquisition price**.

The following steps are followed in comparable company analysis:

1. **Identify a set of comparable companies.** Analysts first identify a set of companies with a similar size and capital structure as the target. Comparable companies may belong to the same primary industry as the target or to similar industries.
2. **Calculate different relative value measures based on current market prices of comparable companies.** These measures are usually based on enterprise value (EV) multiples, where EV equals the market value of debt and equity minus the value of cash and investments. Examples of EV multiples include EV-FCFF, EV-EBITDA, EV-EBIT, and EV-Sales. Equity multiples (e.g., P-E, P-B, P-S) may also be used to value the target along with industry-specific multiples.
3. **Calculate specific relative value metrics and apply these to the target firm.** Analysts apply the mean or median value for selected multiples to corresponding estimates of the target to estimate company value. Convergence of values using

different relative value measures leads to increased confidence in the estimated value, while divergence forces the use of judgment to select measures that offer the most realistic estimates of market value.

4. **Estimate the takeover premium.** The takeover premium represents the amount (per share) above the current market price that shareholders would accept in order to approve the merger transaction (give up ownership of the target to the acquirer). The takeover premium is usually expressed as a percentage of the stock price and is calculated as:

$$TP = \frac{(DP - SP)}{SP}$$

where:

TP = Takeover premium

DP = Deal price per share

SP = Target's stock price per share

Takeover premiums paid in recent acquisitions of similar companies (as the target) are used to estimate the takeover premium. Note that takeover premiums tend to fluctuate over time and economic cycles. See Example 2-2.

Example 2-2: Comparable Company Analysis

Alexis has been assigned the task of estimating a fair takeover price for Mars Inc. She decides to use comparable company analysis to determine a fair acquisition price and gathers the following information regarding three comparable companies:

Valuation Variables	Company 1	Company 2	Company 3
Current stock price (\$)	24.00	15.00	30.00
Earnings per share (\$)	1.45	0.95	1.70
Cash flow per share (\$)	2.32	2.35	3.45
Book value per share (\$)	5.95	5.45	12.40
Sales per share (\$)	15.73	7.82	18.60

She then gathers the following information relating to recent takeovers of companies that are similar to Mars.

Target Company	Stock Price Prior to Takeover (\$)	Takeover Price (\$)
Target 1	92.45	105.00
Target 2	35.75	42.50
Target 3	22.50	29.00
Target 4	19.55	24.75
Target 5	40.20	48.45

Relevant valuation variables for Mars are listed below:

Mars Inc. Valuation Variables

Earnings per share (\$)	2.05
Cash flow per share (\$)	3.82
Book value per share (\$)	13.68
Sales per share (\$)	17.9

Based on the given information, estimate a fair acquisition price for Mars.

Solution:

First, we calculate relative valuation ratios using comparable company data. These are shown in the following table:

Relative Valuation Ratio	Company 1	Company 2	Company 3	Mean
P/E	$24/1.45 = 16.55$	15.79	17.65	16.66
P/CF	$24/2.32 = 10.34$	6.38	8.70	8.47
P/BV	$24/5.95 = 4.03$	2.75	2.42	3.07
P/S	$24/15.73 = 1.53$	1.92	1.61	1.69

Next, we estimate Mars' market value based on mean multiples of comparable companies:

Valuation Variable	Mars	Valuation Multiple	Mean Multiples for Comparable Companies	Estimated Stock Value Based on Comparables ¹
Earnings per share (\$)	2.05	P/E	16.66	34.16
Cash flow per share (\$)	3.82	P/CF	8.47	32.37
Book value per share (\$)	13.68	P/BV	3.07	41.98
Sales per share (\$)	17.9	P/S	1.69	30.17
Estimated market price of Mars Inc. stock (\$)				34.67

Now that we have an estimate of Mars' stock price, we need to estimate a fair takeover premium to compute its acquisition value. Based on the recent takeover prices, we calculate the mean takeover premium in the table below:

¹ Estimated market price = Target company's valuation variable × Average value of multiple for comparable companies

Target Company	Stock Price Prior to Takeover (\$)	Takeover Price (\$)	Takeover Premium (%)
Target 1	92.45	105.00	$(105/92.45) - 1 = 13.6\%$
Target 2	35.75	42.50	18.9%
Target 3	22.50	29.00	28.9%
Target 4	19.55	24.75	26.6%
Target 5	40.20	48.45	20.5%
Mean Premium			21.7%

Mars' estimated takeover price can then be calculated by adding the estimated takeover premium to its estimated market price:

Estimated stock price	\$34.67
Estimated takeover premium	21.7%
Estimated takeover price (34.67×1.217)	\$42.19

Advantages of Comparable Company Analysis

- Provides a reasonable approximate value for the target company that is based on the market values of companies that are similar to it.
- Required data is easily available.
- Directly observed market values form the basis for valuation, unlike DCF analysis where estimated value is primarily based on numerous assumptions and estimates.

Disadvantages of Comparable Company Analysis

- Susceptible to market mispricing. During periods of market exuberance, comparable companies tend to be overvalued, resulting in inflated estimates of the target's value.
- This method uses two distinct estimates to arrive at an acquisition value for the target company. First, comparable company metrics are used to estimate a fair market price, and then an estimated takeover premium is added to determine a fair acquisition price.
- It is difficult to incorporate any anticipated target capital structure changes and merger synergies into the analysis.
- For some target companies, relevant data relating to takeover premiums in the industry may not be available.

Comparable Transaction Analysis

This approach utilizes recent merger transactions involving comparable companies to determine a fair acquisition price (directly) for the target company. Given that recent merger transactions include the takeover premium in the acquisition price, there is no need to estimate takeover premiums separately under this approach (see Example 2-3). Comparable transaction analysis entails the following steps:

In comparable company analysis multiples are derived from stock prices, while in comparable transaction analysis multiples are derived from merger transactions.

1. **Identification of relevant merger transactions.** The sample of transactions used should include mergers involving companies from the same (or closely related) industry as the target.
2. **Based on completed deals and transaction prices, relative valuation metrics are calculated for the companies in the sample.** Relative valuation multiples (e.g., P/E, P/B, P/CF, industry-specific ratios, etc.) are calculated based on acquisition prices in comparable transactions (not based on market prices of comparable companies that were used to estimate target market price under comparable company analysis).
3. **Apply multiples to the target company.** The target's estimated acquisition price is determined by multiplying its valuation metrics by corresponding relative valuation multiples.

Example 2-3: Comparable Transaction Analysis

Jeremy has been assigned the task of estimating the takeover price for Jupiter Inc. He decides to use comparable transaction analysis to estimate a fair acquisition value for Jupiter. He gathers the following information regarding three comparable companies that have recently been acquired:

Valuation Variable	Acquired Company 1	Acquired Company 2	Acquired Company 3
Acquisition share price (\$)	42.00	65.50	15.45
Earnings per share (\$)	3.14	5.55	0.75
Cash flow per share (\$)	4.05	8.45	2.50
Book value per share (\$)	8.65	22.62	5.65
Sales per share (\$)	14.29	30.75	8.90

Relevant valuation variables for Jupiter are provided below:

Jupiter's Valuation Variables

Earnings per share (\$)	2.45
Cash flow per share (\$)	5.20
Book value per share (\$)	10.75
Sales per share (\$)	24.80

Based on the information provided, estimate a fair takeover price for Jupiter Inc.

Solution:

First, we calculate relative valuation ratios using comparable transactions.

Relative Valuation Ratio	Comparable Company 1	Comparable Company 2	Comparable Company 3	Mean
P/E	$42/3.14 = 13.38$	11.80	20.60	15.26
P/CF	$42/4.05 = 10.37$	7.75	6.18	8.10
P/BV	$42/8.65 = 4.86$	2.90	2.73	3.50
P/S	$42/14.29 = 2.94$	2.13	1.74	2.27

We then estimate Jupiter's takeover price based on mean multiples of comparable transactions:

Valuation Variable	Jupiter	Valuation Multiple	Mean Multiple for Comparable Transactions	Estimated Takeover Value Based on Comparables ¹
Earnings per share (\$)	2.45	P/E	15.26	37.39
Cash flow per share (\$)	5.20	P/CF	8.10	42.12
Book value per share (\$)	10.75	P/BV	3.50	37.57
Sales per share (\$)	24.80	P/S	2.27	56.26
Estimated takeover price (\$)				43.33

¹Estimated takeover price = Target company's valuation variable × Mean multiple for comparable transactions

An analyst may feel that one particular valuation variable (e.g., cash flow per share) has a more significant impact on takeover prices than others. In such a case, a weighted average can be calculated to determine the estimated takeover price with the relevant variable weighted more heavily in the computation.

Advantages of Comparable Transaction Analysis

- There is no need to estimate the takeover premium separately as it is built into the transaction prices used to calculate valuation multiples.
- Actual (and recent) transaction values are used in deriving the target's value, as opposed to the subjective estimates and assumptions used in DCF analysis.
- Challenges to valuation (litigation risk for board members or management) are less likely given that recent comparable transaction prices are used.

Disadvantages of Comparable Transaction Analysis

- Recent transaction prices can be influenced by market conditions. In such instances, these inaccuracies flow through to the estimates of target company value.
- A lack of recent and relevant transaction data for companies in the same industry may force the use of data from related sectors. As a result, the value derived for the target may not be accurate.
- It is difficult to incorporate any anticipated target capital structure changes and merger synergies into the analysis.

LESSON 3: BID EVALUATION AND CORPORATE RESTRUCTURING

LOS 23k: Evaluate a takeover bid and calculate the estimated post-acquisition value of an acquirer and the gains accrued to the target shareholders versus the acquirer shareholders. Vol 3, pp 270–274

LOS 23l: Explain how price and payment method affect the distribution of risks and benefits in M&A transactions. Vol 3, pp 270–274

Bid Evaluation

The distribution of risks and benefits from a merger between the counterparties depends on (1) the transaction price and (2) the form of payment.

An acquirer must pay target shareholders a premium over its market price to induce them to give up control of the company. The premium is the compensation paid to the target in excess of its market value. The greater the takeover premium, the better it is for target shareholders.

$$\text{Target shareholders' gain} = \text{Takeover premium} = P_T - V_T$$

P_T = Price paid for target

V_T = Pre-merger value of target

The only reason that any acquirer would be willing to pay a takeover price in excess of the target's market value is because it believes that the benefits (e.g., cost reductions) it would derive from the merger exceed the premium paid for the target. All other factors remaining the same, synergies increase the acquirer's gain from the merger, while the takeover premium paid to target shareholders offsets any gains to the acquirer.

$$\begin{aligned}\text{Acquirer's gain} &= \text{Synergies} - \text{Premium} \\ &= S - (P_T - V_T)\end{aligned}$$

S = Synergies created by the merger transaction

The post-merger value of the combined company (V_{A^*}) is composed of the pre-merger value of the acquirer (V_A), the pre-merger value of the target (V_T), and the synergies created by the merger (S). These sources of value are adjusted for the cash paid to target shareholders (C) to determine the value of the combined post-merger company.

$$V_{A^*} = V_A + V_T + S - C$$

When evaluating a merger offer, the minimum bid that target shareholders would accept is the pre-merger market value of the target company, while the maximum amount that any acquirer would be willing to pay is the pre-merger value of the target plus the value of

potential synergies. Bidding prices therefore generally lie between these two amounts. This also implies that analysis of a merger not only depends on the assessment of pre-merger target value, but also assessments of estimated synergies.

Confidence in synergy estimates also has implications on the method of payment. This is because the different forms of payment (cash offer, stock offer, or mixed offer) distribute the risk of misestimating merger synergies in varying proportions between target shareholders and the acquirer. Example 3-1 illustrates this.

Example 3-1: Bid Evaluation

Alpha Ltd. is considering a friendly acquisition of Beta Ltd. Alpha's management estimates that the merger will create synergies worth \$110 million. The following information is provided:

	Alpha Ltd.	Beta Ltd.
Pre-merger stock price (\$)	24	15
Number of shares outstanding (millions)	80	35
Pre-merger market value (\$ millions)	1,920	525

Beta's management is evaluating the following three offers from Alpha.

1. Cash offer of \$16.80 per share.
2. Stock offer of 0.7 shares of Alpha per share of Beta.
3. Mixed offer of \$7 per share and 0.4 shares of Alpha per share of Beta.

Estimate the post-merger value and stock price of the combined company based on each form of payment and evaluate which offer Beta should accept.

Solution:

1. A cash offer of \$16.80 per share means that Alpha will pay \$588 million ($\$16.80 \times 35m$) for the acquisition.

The takeover premium is calculated as:

$$\text{Takeover premium} = P_T - V_T$$

$$\text{Takeover premium} = 588m - 525m = \$63 \text{ million}$$

The acquirer's (Alpha's) gain can be calculated as:

$$\text{Acquirer's gain} = \text{Synergies} - \text{Premium}$$

$$\text{Acquirer's gain} = 110m - 63m = \$47 \text{ million}$$

The acquirer's (Alpha's) gain can be also be calculated as the difference between its pre-merger and post-merger values:

$$\text{Post-merger value of the combined company} = V_{A*} = V_A + V_T + S - C$$

$$V_{A*} = 1,920m + 525m + 110m - 588m = \$1,967 \text{ million}$$

$$\text{Acquirer's gain} = V_{A*} - V_A = 1,967m - 1,920m = \$47 \text{ million}$$

2. A stock offer of 0.7 shares of Alpha per share of Beta means that Alpha will need to issue 24.5m shares ($0.7 \times 35m$) to Beta's shareholders. On the face of

it, this offer seems equivalent to the cash offer of \$16.80 per share in Option 1 because Alpha's stock price is \$24 and 0.7 times \$24 equals \$16.80. However, we must also account for the dilution that occurs when Alpha issues these new shares in determining the value of Alpha shares offered to Beta's shareholders.

$$\text{Post-merger value of the combined company} = V_{A*} = V_A + V_T + S - C$$

$$V_{A*} = 1,920m + 525m + 110m = \$2,555 \text{ million}$$

$$\text{Post-merger stock price} = 2,555m / (80m + 24.5m) = \$24.45 \text{ per share}$$

$$\text{Total value paid to Beta} = \$24.45 \text{ per share} \times 24.5m \text{ shares} = \$599 \text{ million}$$

$$\text{Takeover premium} = P_T - V_T$$

$$\text{Takeover premium} = 599m - 525m = \$74 \text{ million}$$

$$\text{Acquirer's gain} = \text{Synergies} - \text{Premium}$$

$$\text{Acquirer's gain} = 110m - 74m = \$36 \text{ million}$$

3. In the mixed offer, Alpha pays cash amounting to \$245 million ($\$7 \times 35m$) and issues 14 million shares ($0.4 \times 35m$).

$$\text{Post-merger value of the combined company} = V_{A*} = V_A + V_T + S - C$$

$$V_{A*} = 1,920m + 525m + 110m - 245m = \$2,310 \text{ million}$$

$$\text{Post-merger stock price} = 2,310m / (80m + 14m) = \$24.57 \text{ per share}$$

$$\text{Total value paid to Beta} = \$245m + (\$24.57 \text{ per share} \times 14m \text{ shares}) = \$589 \text{ million}$$

$$\text{Takeover premium} = P_T - V_T$$

$$\text{Takeover premium} = 589m - 525m = \$64 \text{ million}$$

$$\text{Acquirer's gain} = \text{Synergies} - \text{Premium}$$

$$\text{Acquirer's gain} = 110m - 64m = \$46 \text{ million}$$

Conclusion: The stock offer results in the highest value (takeover premium) to Beta's shareholders.

The acquirer and target's expected gains under the three payment options in Example 3-1 are listed below:

Option	Alpha's Gain	Beta's Gain	Total Gain
Cash offer	\$47 million	\$63 million	\$110 million
Mixed offer	\$46 million	\$64 million	\$110 million
Stock offer	\$36 million	\$74 million	\$110 million

Even though the inclusion of stock in the offer only reduces the acquirer's gain from the merger, an acquirer would be willing to include stock in the consideration paid to target shareholders because it effects the distribution of the risk and rewards of a merger between the acquirer and the target. The choice of payment method depends on **estimated synergies** and **relative value of the acquirer's shares**.

Estimated synergies

The more confident the counterparties are that estimated synergies will be realized from the merger, the more the acquiring company would want to pay in cash, and the more the target shareholders would prefer receiving stock. Further, the greater the proportion of the acquisition price represented by stock, the more the risk and rewards of the merger will be passed on to target shareholders. For example, assume that actual synergies worth only \$63m were realized from the merger in Example 3-1. In the cash offer, the acquirer's gain would be entirely eliminated, but the target shareholders' premium would remain unaffected. On the other hand, if greater-than-expected synergies were realized, the acquirer's gain would increase, while the target shareholders' premium would remain the same.

When target shareholders accept stock as a payment, they essentially become part owners of the combined company and share the upside and downside from the merger. For example, in the allstock offer in Example 3-1, Beta's shareholders own $24.5/104.5 = 23.44\%$ of the post-merger entity so they participate in that proportion in any differences in realized and expected synergies. If realized synergies were only worth \$63m, Alpha's shareholders would lose all their gains (\$36m) while Beta's shareholders would lose $23.44\% \times (\$110m - \$63m) = \$11m$ worth of gains.

Counterparties' confidence in companies' relative values

The more confident the acquiring company is in its estimates of the target's value, the more it would prefer to pay in cash and the more the target would prefer to receive stock.

Short-Term Performance Studies

Empirical evidence shows that:

- Merger transactions generally benefit target company shareholders in the short term.
- On average, the target companies gain a 30% premium on pre-announcement market price, while acquirers lose between 1 and 3% in market value.¹
- Both the acquirer and the target tend to see higher stock returns under a cash acquisition as opposed to a stock acquisition.²

LOS 23m: Describe characteristics of M&A transactions that create value.

Vol 3, pp 274–275

Explanations for high takeover premiums include the winner's curse and acquirer's assuming that their valuations are correct.³

Long-Term Performance Studies

Empirical evidence shows that:

- Acquirers tend to underperform comparable companies.
- Characteristics of mergers and acquisitions that create value are:

¹J. Fred Weston and Samuel C. Weaver, *Mergers & Acquisitions* (New York: McGraw-Hill, 2001), pp. 93–116.

²Robert F. Bruner, *Deals from Hell: M&A Lessons That Rise above the Ashes* (New York: John Wiley & Sons, 2005), p. 33.

³Richard Roll, "The Hubris Hypothesis on Corporate Takeovers," *Journal of Business*, vol. 59 (April 1986), pp. 176–216.

- The buyer has exhibited strong financial performance (better-than-average earnings growth and share price performance) in the years leading up to the merger.
- The transaction premium is relatively low.
- The number of bidders is low. Acquirer stock returns are negatively related to the number of bidders.
- Initial market reaction is favorable. A decrease in the acquirer's stock price upon announcement of the deal is a signal from investors that (1) the benefits of the merger are doubtful and/or (2) the acquirer is paying too much.

LOS 23n: Distinguish among equity carve-outs, spin-offs, split-offs, and liquidation. Vol 3, pp 275–276

LOS 23o: Explain common reasons for restructuring. Vol 3, pp 275–276

A corporate restructuring is usually used in reference to when a company gets smaller (as opposed to mergers and acquisitions where a company grows larger). When a company sells, liquidates or spins off a division or a subsidiary, it is referred to as a **divestiture**. Common reasons for restructuring include:

- **Change in strategic focus:** Management may sell divisions or subsidiaries that are outside the company's core strategic focus in order to improve the company's overall performance.
- **Poor fit:** A company may choose to sell a division, if it does not have the resources or competencies to fully exploit related opportunities, to a company that does have the required resources.
- **Reverse synergy:** Management may feel that a certain division is undervalued by the market. It may be possible that the division and the company will be worth more separately than combined.
- **Financial or cash flow needs:** Management may sell a division to raise cash or cut expenses.

Some of the basic forms of restructuring are:

- **Equity carve-out:** A company separates one of its divisions to create a new legal entity and offers shares in the entity to outsiders.
- **Spin-off:** A company separates one of its divisions to create a new legal entity but shares are only issued (proportionately) to current shareholders.
 - A spin-off does not result in a cash inflow to the parent (unlike an outright sale of a division to another company).
 - Shareholders end up owning stocks of two different companies.
- **Split-off:** A company separates one of its divisions to create a new legal entity and offers current shareholders shares in the newly formed entity in exchange for shares of the parent.
- **Liquidation:** The company, division, or subsidiary is broken up and sold piecemeal. Most liquidations are associated with bankruptcies.

STUDY SESSION 9: EQUITY VALUATION (1)

READING 24: EQUITY VALUATION: APPLICATIONS AND PROCESSES

LESSON 1: VALUE DEFINITIONS AND VALUATION APPLICATIONS

LOS 24a: Define valuation and intrinsic value and explain sources of perceived mispricing. Vol 4, pp 6–8

Valuation is the process of estimating what an asset is worth. Valuation may be based on:

- Factors that determine the asset's future returns;
- Comparisons with similar assets; or
- Estimates of immediate liquidation proceeds (when relevant).

Intrinsic Value

The **intrinsic value** of an asset refers to its “true” value based on a hypothetically complete understanding of its investment characteristics. Each investor’s intrinsic value estimate for a given asset may be different as it would reflect his or her opinion regarding the asset’s “real” value.

Efficient market theory asserts that an asset’s market price is the best available estimate of its intrinsic value. On the other hand, Grossman and Stiglitz argue that market price does not reflect a security’s intrinsic value. They support their stance (known as the **rational efficient markets formulation**) by arguing that investors will not incur the costs of gathering and analyzing market information unless they expect to be rewarded for their efforts (in the form of higher returns) relative to the free alternative of accepting the market price as a true measure of the actual value of a security.

Any deviation of a security’s market price from an investor’s estimate of its intrinsic value is known as a **perceived mispricing**. An active portfolio manager aims to earn a **positive excess risk-adjusted return** (also known as **abnormal return** or **alpha**) by trading on a perceived mispricing. First, she would estimate a security’s intrinsic value, and if it is mispriced in her opinion (if market price does not equal her estimate of intrinsic value), she would take an appropriate position in the security in order to augment gross returns as the market price converges to the estimated intrinsic value.

An **abnormal return** or **alpha** is a positive excess risk-adjusted return that exceeds the returns of similar assets given the same level of risk.

For example, assume that ABC Stock is currently trading at \$15. Based on her analysis, Kathy, an active portfolio manager, believes that ABC’s “real” value (intrinsic value) is \$20 so she would go long on the stock hoping for an extra \$5 return (on top of the required return on equity for ABC) on her investment as ABC’s price converges towards \$20. The key point here is to recognize that this disparity between ABC’s market price and intrinsic value is a “perceived mispricing” because the intrinsic value estimate is based on Kathy’s valuation of the stock. In reality, in the given scenario, there may be (1) a true mispricing, or (2) an error in Kathy’s intrinsic value estimate.

- A **true mispricing** exists when there is a difference between the true, actual, unobservable intrinsic value (V), and the observed market price (P). In our example, there would be a true mispricing if, given its current market price of \$15, the actual intrinsic value of ABC were \$18. In this case, Kathy would earn a positive alpha of \$3 as ABC’s market price converges to its true intrinsic value.

- An **error in the estimate of intrinsic value** refers to the difference between estimated intrinsic value (V_E) and actual intrinsic value (V). Continuing with our example, there is a \$2 error in Kathy's estimate of ABC's intrinsic value (calculated as $\$20 - \18).

To summarize, there are two sources of a perceived mispricing:

$$\text{Perceived mispricing} = \text{True mispricing} + \text{Error in the estimate of intrinsic value}$$

$$V_E - P = (V - P) + (V_E - V)$$

V_E = Estimate of intrinsic value

P = Market price

V = True (unobservable) intrinsic value

Note that besides the possibility of an error in the estimate of intrinsic value, another risk that must be considered is that the market price may not converge to intrinsic value within the investor's investment horizon.

LOS 24b: Explain the going-concern assumption and contrast a going-concern value to a liquidation value. Vol 4, pg 8

LOS 24c: Describe definitions of value and justify which definition of value is most relevant to public company valuation. Vol 4, pp 8–9

Going-Concern Value versus Liquidation Value

Most of the time, the going-concern value is the definition of value that is most relevant to public company valuation.

In determining the **going-concern value** of a company, we assume that the company will continue its business operations for the foreseeable future (in line with the going-concern assumption). The going-concern value is the appropriate measure of value for a company that will continue to produce and sell goods and services, use its assets in a value-maximizing manner for a relevant economic time frame, and access optimal sources of financing. On the other hand, **liquidation value** refers to the value of the company were it to be dissolved and all its assets sold off individually. Liquidation value is usually the appropriate measure of value for companies in financial distress.

The difference between the going-concern and liquidation values for a company depends on:

- The amount of value created by the application of human capital to the assets' productive capacity.
 - The more value created by operating the business, the greater the positive difference between the going-concern and liquidation values.
- The time frame available for liquidating assets.
 - The sooner the firm must liquidate assets like non-perishable inventory, the lower the liquidation value relative to the **orderly liquidation value**.

Fair Market Value versus Investment Value

The **fair market value** of an asset refers to the price at which the asset can be exchanged between knowledgeable, willing parties in an arm's length transaction. Fair market value is usually the appropriate measure of value in buy-sell agreements among owners of a private business and in assessing taxes. Fair value (a similar concept) plays an important role in financial reporting (e.g., in impairment testing).

In the long run, assuming that the market has confidence that management will act in shareholders' best interests, market prices should tend to reflect fair value. However, in certain situations, an asset may be worth more than its fair market value (e.g., due to potential synergies) to a particular buyer. This unique value to the particular buyer based on its requirements and expectations is known as **investment value**.

LOS 24d: Describe applications of equity valuation. Vol 4, pp 9–11

Applications of Equity Valuation

- **Selecting stocks:** Valuation techniques are used to determine whether a share of common stock is overpriced, underpriced, or fairly priced relative to its estimated intrinsic value, and relative to prices of comparable securities.
- **Inferring market expectations:** A security's market price reflects investors' expectations regarding the company's future performance. Analysts use market prices to extract current expectations of company fundamentals (e.g., earnings, growth, etc.). These expectations can then be:
 - Compared with the analyst's own expectations to evaluate their reasonableness.
 - Used as a benchmark for evaluating the performance of another company.
- **Evaluating corporate events:** Corporate events (e.g., mergers, acquisitions, divestitures, spin-offs, etc.) have an impact on a company's future cash flows. Analysts use valuation tools to evaluate the impact of such events on the value of equity. Further, valuation techniques are used to evaluate the appropriateness of a stock bid for a merger/acquisition.
- **Rendering fairness opinions:** Third parties (such as investment banks) consider valuation an important element when issuing their opinion regarding the fairness of the terms of a merger.
- **Evaluating business strategies and models:** Companies use valuation tools to analyze and choose between various strategies based on their overall impact on shareholder wealth.
- **Communicating with analysts and shareholders:** Valuation concepts provide a basis for dialogue between a company's shareholders, management, and analysts on a range of issues that affect company value.
- **Appraising private business:** Valuation techniques are applied to value businesses that are not publicly traded. The need to value a private business may arise from transactional purposes (e.g., to evaluate an IPO) or tax purposes (e.g., taxation of estates).
- **Share-based payments:** Valuation techniques are required to estimate the value of share-based executive compensation (e.g., restricted stock grants).

LESSON 2: THE VALUATION PROCESS AND COMMUNICATING VALUATION RESULTS

LOS 24e: Describe questions that should be addressed in conducting an industry and competitive analysis. Vol 4, pp 11–23

The Valuation Process

The valuation process generally involves the following five steps:

1. Understanding the business.
2. Forecasting company performance.
3. Selecting the appropriate valuation model.
4. Converting forecasts to a valuation.
5. Applying valuation conclusions.

Understanding the Business

In order to forecast a company's financial performance, analysts must undertake (1) industry and competitive analysis and (2) financial statement analysis.

Industry and Competitive Analysis

Industry and competitive analysis aims to highlight which aspects of the business present the greatest opportunities and challenges and, therefore, warrant further examination and analysis. A comprehensive framework for the analysis should focus on the following questions:

How attractive are the industries in which the company operates, in terms of offering prospects for sustained profitability?

Porter's five forces form the basis for analyzing industry structure (its underlying economic and technical characteristics) and trends that affect that structure. Porter's five forces were covered in depth at Level I. They include:

1. Intra-industry rivalry.
2. Threat of new entrants.
3. Threat of substitutes.
4. Supplier power.
5. Buyer power.

What is the company's relative competitive position within its industry, and what is its competitive strategy?

The level and trend in market share is a good indicator of a company's competitive position within its industry. Generally speaking, a company's value is positively related to its ability to obtain and sustain an advantage over its rivals. Porter identified three generic **corporate strategies** for achieving above-average performance:

Cost leadership: Become the lowest cost producer of a particular product while offering quality that is similar to the quality provided by competitors.

Differentiation: Offer a unique product or service that adds so much value for customers that they are willing to pay a premium for it.

Focus: Establish a competitive advantage in a particular target segment of the industry based on cost leadership (cost focus) or differentiation (differentiation focus).

How well has the company executed its strategy and what are its prospects for future execution?

Financial Statement Analysis

An analysis of a company's financial reports is important because:

- It provides a basis for evaluating a company's success in implementing its business strategy.
- It provides a basis for evaluating a company's past performance and forecasting future performance.

However, analysts should bear in mind that (1) financial statements do not reflect non-numeric, qualitative factors (e.g., brand value) and (2) past performance should not simply be extrapolated when forecasting future performance.

Sources of Information

Important perspectives on industry and competition are sometimes provided by companies themselves in regulator-mandated disclosures, regulatory filings, company press releases, investor relations materials, and discussions with analysts. Analysts can compare the information provided directly by companies to their own independent research.

Apart from company-provided sources of information, analysts also obtain information from third-party sources such as industry organizations, regulatory agencies, and commercial providers of market intelligence.

Sources of ESG Information

The evaluation of environmental, social, and governance (ESG) factors can help analysts identify potential business risks and practices that may produce long-term competitive advantages relative to peers.

For example, consider the U.S. auto industry. The industry is heavily regulated because the manufacturing process as well as vehicles themselves can significantly affect the environment. Further, manufacturers need to keep an eye on worker safety issues and deal with a highly unionized workforce. As a result, avoiding costly lawsuits, lost

production from work stoppages, and negative publicity are huge concerns for automakers. Consequently, analysts must also examine ESG considerations for automakers that they cover. Some sources of relevant information are:

- Corporate filings, press releases, investor calls and webcasts, and trade publications.
- Sustainability reports (often called corporate sustainability reports [CSRs]) that address the economic, environmental, and social effects of an organization's everyday activities and its values and governance.
- Labor union boycott lists and disclosures from the Occupational Safety and Health Administration (OSHA) and the U.S. Equal Employment Opportunity Commission (EEOC).
 - OSHA can help analysts identify auto manufacturers that have demonstrated a history of safety violations or an improvement in workplace safety.
 - The EEOC's litigation database helps in the investigation of any notable workplace discrimination issues that have affected individual automakers.
- Not-for-profit organizations. These include:
 - The Sustainable Accounting Standards Board (SASB), which sets industry-specific ESG standards and can help analysts identify ESG considerations that have a quantitative impact on companies' financial performance.
 - The Carbon Disclosure Project, which collects and synthesizes self-reported environmental data that can provide important information regarding automakers' exposure to climate change and water scarcity.
 - Ceres, an organization committed to driving sustainability research and advocacy, which can provide analysts with access to sustainability research reports for the auto industry.

Considerations in Using Accounting Information

When analyzing accounting information, analysts must consider **earnings quality** in terms of (1) how accurately the reported performance reflects economic reality and (2) how persistent or sustainable the company's earnings are.

Table 2-1 summarizes earnings quality issues. Note that we have dealt with each of these issues in the financial reporting and analysis section.

Table 2-1: Selected Indicators¹

Category	Observation	Potential Interpretation
Revenues and gains	Recognizing revenue early, for example: <ul style="list-style-type: none"> • bill-and-hold sales • recording sales of equipment or software prior to installation and acceptance by customer. 	Acceleration in the recognition of revenue boosts reported income, masking a decline in operating performance.
	Classification of non-operating income or gains as part of operations.	Income or gains may be non-recurring and may not relate to true operating performance, possibly masking declines in operating performance.
Expenses and losses	Recognizing too much or too little reserves in the current year, such as: <ul style="list-style-type: none"> • restructuring reserves • loan-loss or bad-debt reserves • valuation allowances against deferred tax assets. 	May boost current income at the expense of future income, or alternatively may decrease current year's earnings to boost future years' performance.
	Deferral of expenses by capitalizing expenditures as an asset, for example: <ul style="list-style-type: none"> • customer acquisition costs • product development costs. 	May boost current income at the expense of future income. May mask problems with underlying business performance.
Balance sheet issues (may also affect earnings)	Use of aggressive estimates and assumptions, such as <ul style="list-style-type: none"> • asset impairments • long depreciable lives • long periods of amortization • high assumed discount rate for pension liabilities • low assumed rate of compensation growth for pension liabilities. • high expected return on assets for pension. 	Aggressive estimates may indicate actions taken to boost current reported income. Changes in assumptions may indicate an attempt to mask problems with underlying performance in the current period.
	Use of off-balance-sheet financing (financing that does not appear on the balance sheet), such as leasing assets or securitizing receivables.	Assets and/or liabilities may not be properly reflected on the balance sheet.
Operating cash flow	Characterization of an increase in a bank overdraft as operating cash flow.	Operating cash flow may be artificially inflated.

¹ Exhibit 1, Vol 4, CFA Program Curriculum 2020

FORECASTING COMPANY PERFORMANCE

The following approaches may be used in forecasting company performance:

- The **top-down forecasting approach** starts with international and national macroeconomic forecasts followed by industry forecasts and finally, individual company and asset forecasts.
- The **bottom-up forecasting approach** aggregates individual company forecasts into industry forecasts, which in turn are aggregated to macroeconomic forecasts.

LOS 24f: Contrast absolute and relative valuation models and describe examples of each type of model. Vol 4, pp 23–26

SELECTING THE APPROPRIATE VALUATION MODEL

A variety of valuation models are available to analysts to estimate the value of common stock. These valuation models can be broadly categorized as **absolute valuation models** and **relative valuation models**. Note that both these types of models are based on the going-concern assumption.

Absolute Valuation Models

Absolute valuation models look to estimate an asset's intrinsic value based on its own underlying characteristics. They do not give any consideration to the value of comparable assets. Absolute valuation models include **present value models** and **asset-based valuation models**.

- **Present value models** (also known as **discounted cash flow models**) are the most important type of absolute valuation models. Present value models include:
 - **Dividend discount models** where expected future dividends are discounted at the required return on equity.
 - **Free cash flow models** where free cash flows (e.g., FCFF or FCFE) are discounted at the appropriate discount rate (WACC or cost of equity).
 - **Residual income models** where the excess of accounting earnings over the dollar cost of capital is discounted at the cost of equity.
- In **asset-based valuation models**, the value of a company is determined as the sum of the market values of all the assets or resources that it controls.

All the valuation models introduced here are described in much more detail in later readings.

Relative Valuation Models

Relative valuation models are based on the premise that similar assets should trade at similar prices. These models look to estimate the value of an asset based on the current value of comparable assets. Relative valuation is typically implemented using **price multiples** or **enterprise multiples**.

- **Price multiples** (e.g., the price-earnings ratio) express the ratio of the company's stock price to a valuation fundamental (e.g., EPS).
- **Enterprise multiples** (e.g., EV-EBITDA ratio) express the ratio of a company's **enterprise value** (the company's total value net of cash and short-term investments) to a valuation fundamental (e.g., operating earnings).

Note that when using relative valuation models, analysts must bear in mind that they are assuming that the comparable asset is fairly valued.

LOS 24g: Describe sum-of-the-parts valuation and conglomerate discounts. Vol 4, pp 26–30

Valuation of the Total Entity and Its Components

In another approach to valuing a single entity, analysts estimate the value of each of its different businesses individually as going-concerns and then aggregate those values to arrive at a value for the entire company. This method is known as **sum-of-the-parts valuation**, and the value computed using this method is referred to as **breakup value** or **private market value**. The sum-of-the-parts valuation approach is typically used to value companies with operating segments that have significantly different economic profiles (factors that drive performance and profitability).

Conglomerate is the term that is usually used to describe a corporation that is made up of a number of different, seemingly unrelated businesses.

It may sometimes be appropriate to apply a **conglomerate discount** to the sum-of-the-parts value of a company to adjust the value for:

- **The company's lack of focus.** Conglomerates operate in several, unrelated business so a discount is applied to the value of these businesses relative to the stock of companies with a narrower focus.
- **Inefficiencies in capital allocations across business divisions.** The company may not allocate investment capital among its divisions in an optimal (shareholder wealth-maximizing) manner.
- **Endogenous factors.** Generally speaking, it is companies that are performing rather poorly themselves that tend to acquire unrelated businesses.

Conglomerate discounts can also be explained by **research measurement errors**. This argument asserts that conglomerate discounts actually do not exist, and any evidence suggesting otherwise is based on flawed measurement.

An example of a situation where conglomerate discounts arise is when a company divests an operating segment that has limited synergies with its core business. A break-up value in excess of the company's unadjusted going-concern value may prompt a divestiture or a spin-off.

LOS 24h: Explain broad criteria for choosing an appropriate approach for valuing a given company. Vol 4, pp 29–30

Issues in Model Selection and Interpretation

An appropriate valuation model should be:

- **Consistent with the characteristics of the company being valued.** Understanding the characteristics of the company requires understanding its business (as described earlier), the nature of its assets, and how it uses those assets to create value. For example, a relative valuation based on reported assets would be appropriate when applied to a bank (as banks have a relatively large holding of marketable assets), but not as appropriate when applied to a services company (with very few marketable assets).

- **Appropriate given the availability and quality of data.** For example, the dividend discount model cannot be applied to companies that have never paid dividends, nor are expected to pay dividends in the foreseeable future. Similarly, relative valuation based on P/E analysis cannot be applied to a company with negative earnings.
- **Consistent with the purpose of valuation.** For example, an investor who is interested in acquiring a controlling interest in a company should use a free cash flow-based valuation model (as opposed to a dividend discount model) as obtaining a controlling interest would enable the investor to set the company's dividend policy.

Note that analysts typically use multiple valuation models to evaluate the impact of different assumptions on estimates of value.

Converting Forecasts to a Valuation

Aside from inserting forecasts of fundamentals into a valuation model, analysts should perform (1) sensitivity analysis and (2) situational adjustments to gain a complete understanding of value.

- **Sensitivity analysis** involves changing the value of inputs used in the model (one at a time) to gauge their impact on the final estimate of value. For example, sensitivity analysis may be used to determine the impact of changes in the price of a key raw material on the company's future profitability.
- **Situational adjustments** may be required to incorporate control premiums, lack of marketability discounts, and illiquidity discounts into the valuation.
 - A controlling stake in a company gives the investor the right to make important decisions regarding the company's strategic direction, dividend policy, resource allocation, capital structure, etc. Therefore, a **control premium** (to reflect these additional rights) must be **added** to the value obtained from a model that did not explicitly account for these rights in arriving at a valuation.
 - Non-publicly-traded stocks cannot be easily sold. Therefore, the value of these assets must be **discounted** to reflect the relative **lack of marketability**.
 - Publicly-traded stocks that do not trade very frequently or blocks of shares that are large relative to average trading volumes must be **discounted** to reflect the relative **lack of liquidity**.

Situational
adjustments are
described in detail in
a later reading.

Analysts' Role and Responsibilities

In performing valuations, analysts should hold themselves accountable to (1) standards of competence and (2) standards of conduct.

- Analysts help clients achieve their investment objectives by helping them make better buy and sell decisions.
- Analysts contribute to the efficient functioning of capital markets by providing thorough analysis which assists informed investment decision making, and eventually leads to asset prices reflecting their intrinsic values.
- Analysts benefit the suppliers of capital by effectively monitoring management performance.

Characteristics of an Effective Research Report

Research results are communicated through a research report. An effective research report:

- Contains timely information.
- Is written in clear, incisive language.
- Is objective and well researched, with key assumptions clearly identified.
- Distinguishes clearly between facts and opinions.
- Contains analysis, forecasts, valuation, and a recommendation that are internally consistent.
- Presents sufficient information to allow a reader to critique the valuation.
- States the key risk factors involved in the investment.
- Discloses any potential conflicts of interests.

READING 25: RETURN CONCEPTS

LESSON 1: RETURN CONCEPTS AND THE EQUITY RISK PREMIUM

LOS 25a: Distinguish among realized holding period return, expected holding period return, required return, return from convergence of price to intrinsic value, discount rate, and internal rate of return. Vol 4, pp 52–58

Holding Period Return

The **holding period return (HPR)** is the return earned on an investment over the entire investment horizon (whatever it may be). The return on an equity investment comes from investment income (dividends) and price appreciation (capital gains). Therefore, the holding period return can be broken down into the **dividend yield** (D_H/P_0) and the **price appreciation** return $[(P_H - P_0)/P_0]$.

$$\text{Holding period return} = \frac{P_H - P_0 + D_H}{P_0}$$

where:

P_H = Price at the end of the holding period

P_0 = Price at the beginning of the period

D_H = Dividend

- In the equation above, we have assumed that the dividend is received at the end of the holding period ($t = H$). If this is not the case, the HPR is calculated based on reinvestment of interim cash flows in additional shares at the current market price.
- Annualizing the HPR (especially the return over a short time horizon) may be unrealistic as the HPR may not accurately reflect the reinvestment rate available over an entire year.
- An HPR that is computed based on past information (historical market prices and dividend payments) is referred to as a **realized holding period return**.
- An estimate of HPR in a forward-looking context (where future market prices and dividend payments are not known) is referred to as an **expected holding period return**.

Required Return

The **required return** represents the minimum rate of return required by an investor to invest in an asset over a specified period of time, given its level of risk. Stated differently, it represents the opportunity cost of investing in the asset (i.e., the highest level of expected return available from another asset of similar risk).

- The difference between an asset's expected return and its required return is known as **expected alpha, ex ante alpha, or expected abnormal return**.
 - Expected alpha = Expected return – Required return
- The difference between the actual (realized) return on an asset and its required return is known as **realized alpha or ex post alpha**.
 - Realized alpha = Actual HPR – Required return for the period

If an asset's current price equals its perceived intrinsic value, the expected return should be the same as the required return, in which case expected alpha equals zero. However, if an asset's current price is lower (greater) than its perceived value, the expected return should be greater (lower) than the required return, and expected alpha should be positive (negative), as long as the market price converges to intrinsic value over the investor's time horizon.

Therefore, when the investor's estimate of intrinsic value (V_0) is different from the current market price (P_0), the investor's expected return has two components:

1. The **required return** (r_T) earned on the asset's current market price; and
2. The **return from convergence of price to value** $[(V_0 - P_0)/P_0]$. As Example 1-1 illustrates, the return from price convergence represents expected alpha.

Example 1-1: The Components of Expected Return

At the end of 2009, Alpha's stock was trading at \$46 per share, while analysts estimated its intrinsic value to be \$52. The required return on equity for Alpha was estimated to be 8.5% per annum.

1. Estimate the expected 6-month holding period return on the stock if the market price is expected to converge to intrinsic value in 6 months.
2. Estimate the expected one-year return on the stock if the market price is expected to converge to intrinsic value in 2 years.

Solution:

According to the analyst, Alpha is currently undervalued by $V_0 - P_0 = \$6$ or 13.04%.

1. The investor's total return over the 6 months would be composed of:
 - The required return for 6 months $= (1.085)^{1/2} - 1 = 4.16\%$
 - The return from convergence of price to value $= 13.04\%$. (Note that this represents expected alpha, or the excess of expected return over required return.)

$$\text{Expected return} = \text{Required return} + \text{Return from convergence}$$

$$E(R_T) \approx r_T + \frac{V_0 - P_0}{P_0}$$

$$\text{Expected return in 6 months} = 4.16\% + 13.04\% = 17.21\%$$

2. Required return per annum $= 8.5\%$
 Required return over a 2-year horizon $= (1.085)^2 - 1 = 17.72\%$
 - Expected return = Required return + Return from convergence
 - Expected return in 2 years $= 17.72\% + 13.04\% = 30.77\%$
 - Annualized expected return $= (1.3077)^{1/2} - 1 = 14.35\%$

Note that there are risks involved in “second-guessing” the market price.

- The investor’s estimate of intrinsic value may not necessarily reflect the asset’s true intrinsic value.
- Even if the investor is able to estimate the asset’s intrinsic value more accurately than the market, convergence of price to value may not occur within the investor’s time horizon.

Discount Rate

The **discount rate** represents the rate used by investors to calculate the present value of a future cash flow. It is usually calculated as the risk-free rate plus a spread that reflects the risk associated with the cash flow. The discount rate is, therefore, based on the characteristics of the investment. However, considering the limitations of finance models, it may be (subjectively) adjusted by investors to reflect their expectations.

Internal Rate of Return

The **internal rate of return (IRR)** of an investment is the discount rate that equates the present value of expected cash flows from the asset to its price. Based on stable dividend growth, the intrinsic value of a stock can be estimated as:

$$\text{Intrinsic Value} = \frac{\text{Next year's expected dividend}}{\text{Required return} - \text{Expected dividend growth rate}}$$

$$V_0 = \frac{D_1}{k_e - g}$$

If the asset is assumed to be efficiently-priced (i.e., the market price equals its intrinsic value), the IRR would equal the required return on equity. Therefore, the IRR can be estimated as:

$$\text{Required return (IRR)} = \frac{\text{Next year's dividend}}{\text{Market price}} + \text{Expected dividend growth rate}$$

$$k_e(\text{IRR}) \frac{D_1}{P_0} + g$$

Note that when we use the IRR as an estimate of required return, we assume that the market is efficient and that the present value model is correct. For example, in applying the constant-growth dividend discount model above we are assuming that our expected dividend growth rate is correct.

LOS 25b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches. Vol 4, pp 58–71

EQUITY RISK PREMIUM

The **equity risk premium (ERP)** refers to the additional return (premium) required by investors to invest in equities rather than a risk-free asset. Stated differently, it equals the difference between the return on a broad equity market index and the risk-free rate of return.

$$\text{Required return on equity} = \text{Current expected risk-free return} + \text{Equity risk premium}$$

The required rate of return on a particular stock can be computed using either of the following two approaches. Both these approaches require the equity risk premium to be estimated first.

1. Required return on share i = Current expected risk-free return + β_i Equity risk premium
 - A beta greater (lower) than 1 indicates that the security has greater-than-average (lower-than-average) systematic risk.
2. Required return on share i = Current expected risk – free return + Equity risk premium \pm Other risk premia/discounts appropriate for i
 - This method of estimating the required return is known as the **build-up method**. It is discussed later in the reading and is primarily used for valuations of private businesses.

The equity risk premium may be estimated based on **historical data** or **forward-looking estimates**.

Historical Estimates

A historical equity risk premium is calculated as the mean value of the difference between returns on a broad-based equity market index and the return on government debt over a specific time period.

Advantages:

- This method is relatively simple and resulting estimates are objective.
- If it is assumed that investors do not make systematic errors in forming expectations, historical estimates of average returns are unbiased.

However, this method is based on the assumption that the mean and variance of returns are stationary (i.e., constant overtime), which is not always the case. In fact, studies have shown that the expected equity risk premium is countercyclical in the U.S. (it is relatively high during bad times and relatively low during good times).¹

Therefore, analysts must be very careful in choosing the sample period over which they calculate the equity risk premium. While using a longer sample period theoretically increases precision in estimating the mean, there may be sub-periods during which the assumption of stationarity does not hold for the series.

¹ Fama and French (1989) and Ferson and Harvey (1991).

Aside from the sample period, major decisions involved in developing a historical equity risk premium estimate include:

- Selection of the equity market index to represent equity market returns.
 - Typically, broad-based, market-value-weighted indices are selected.
- Selection of the type of mean equity risk premium calculated. The mean value of the difference between equity market index returns and government debt returns can either be calculated using the arithmetic mean or geometric mean.
 - Analysts are increasingly leaning toward the geometric mean in estimating the historical equity risk premium.
- Selection of the proxy for the risk-free rate of return (short-term versus long-term government bond yield).
 - There is a general preference for using the long-term government bond yield as the risk-free rate.

Adjusted Historical Estimates

An estimate of the historical equity risk premium may need to be adjusted (1) for the effect of biases in the data series, or (2) to tweak the estimate to make it more representative in a forward-looking context.

- Poorly performing companies are usually removed from equity market indices over time, while those that consistently perform strongly remain. Therefore, **survivorship bias** tends to inflate historical estimates of the equity risk premium. Analysts should make a downward adjustment to the estimate derived from a series with such a bias.
- Other adjustments may be related to a string of positive or negative events and surprises that do not balance out over the sample period. A string of positive (negative) surprises may result in a series of relatively high (low) returns. In order to make the historical equity risk premium estimate reflective of more “normal” market conditions, it will be revised downward (upward).

Forward-Looking Estimates

Forward-looking estimates of the equity risk premium are based on current information and future expectations of relevant variables. In contrast to historical estimates, forward-looking estimates are free from data biases and issues such as nonstationarity. However, they are exposed to (1) modeling errors and (2) potential behavioral biases in forecasting.

Gordon Growth Model (GGM) Estimates

The **Gordon growth model** is fairly easy to apply in developed economies where broad-based equity indices are closely associated with a dividend yield, and year-ahead dividend payments are usually fairly predictable. The model calculates the required return on equity assuming a constant long-term growth rate in earnings and dividends. Based on this model, the equity risk premium is calculated as the difference between the required return on equity (calculated as the expected dividend yield plus the growth rate in dividends) minus the long-term government bond yield (r_{LTGD}):

$$\text{GCM equity risk premium estimate} = \frac{D_1}{P_0} + g - r_{LTGD}$$

A problem with this model is that (just like historical estimates) Gordon growth model estimates also change over time. Generally speaking, during a boom (recession) dividend yields are low (high), growth expectations are high (low), and government bond yields are high (low).

The GGM assumption of a constant growth rate in earnings and dividends may not be appropriate for economies that grow very rapidly. For such economies, an assumption of multiple earnings growth stages is applied, where stages of growth are classified as rapid growth, transition growth, and mature (sustainable) growth. The cash flows during each of the growth phases are estimated, and then the uniform discount rate or IRR (r) is computed that equates the present value of those cash flows to the current market price of the equity index.

$$\begin{aligned}\text{Equity index price} = & \text{PV Fast growth stage CF discounted at } r \\ & + \text{PV Transition stage CF discounted at } r \\ & + \text{PV Mature stage CF discounted at } r\end{aligned}$$

The long-term government bond yield is then subtracted from the estimate of IRR (r) obtained from the exercise described above to obtain a forward-looking estimate of the equity risk premium for rapidly growing economies.

Macroeconomic Model Estimates

Macroeconomic models (also known as **supply-side models**) use relationships between macroeconomic variables and financial variables used in equity valuation models to estimate the equity risk premium. The use of macroeconomic models is more appropriate in developed countries where public equities represent a relatively large share of the economy. These models usually focus on supply-side variables that fuel growth in gross domestic product. Based on Ibbotson and Chen's (2003) model for the return on equity, the equity risk premium can be estimated as:²

$$\text{Equity risk premium} = \{[(1 + \text{EINFL})(1 + \text{EGREPS})(1 + \text{EGPE}) - 1] + \text{EINC}\} - \text{Expected RF}$$

- **Expected inflation (EINFL)** can be calculated as the difference between the yields for long-term Treasury bonds and Treasury Inflation Protected Securities (TIPS) of a similar maturity.

$$\text{Expected inflation} = \frac{1 + \text{YTM of 20 - year maturity T - bonds}}{1 + \text{YTM of 20 - year maturity TIPS}} - 1$$

- The **expected growth rate in real earnings per share (EGREPS)** can be estimated as the sum of labor productivity growth and labor supply growth.
- The **expected growth rate in the P/E ratio (EGPE)** has a baseline value of zero. However, it may be positive (negative) if the analyst views the market as currently undervalued (overvalued).
- The **expected income component (EINC)** can be based on the historical rate (e.g., 4.5% in the U.S.) and tweaked according to forward-looking estimates.

² See Ibbotson and Chen's (2003) method 3, the earnings method.

Survey Estimates

These involve asking a sample of people (usually experts) about their expectations regarding the equity risk premium, or about their capital markets expectations (from which the expected equity risk premium can be inferred) going forward.

LESSON 2: THE REQUIRED RETURN ON EQUITY, THE WEIGHTED AVERAGE COST OF CAPITAL, AND DISCOUNT RATE SELECTION

LOS 25c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama–French model, the Pastor–Stambaugh model, macroeconomic multifactor models, and the build-up method (e.g., bond yield plus risk premium). Vol 4, pp 71–90

THE CAPITAL ASSET PRICING MODEL (CAPM)

The major insight of the capital asset pricing model (CAPM) is that only systematic (non-diversifiable) risk is priced. The expected return on an asset is calculated as:

$$\text{Required return on } i = \text{Expected risk-free rate} + \text{Beta}_i (\text{Equity risk premium})$$

- **Beta** measures the sensitivity of an asset's returns to the returns of the market portfolio (typically a broad value-weighted equity market index).
- It is calculated as the covariance of the asset's returns with the returns on the market portfolio divided by the variance of returns of the market portfolio.

Example 2-1: Calculating the Required Return on Equity

Given a beta of 1.15, an equity risk premium of 7%, and a risk-free rate of 4.5%, calculate the required rate of return on the stock.

Solution:

$$\text{Required return} = 4.5\% + 1.15 (7\%) = 12.55\%$$

MULTIFACTOR MODELS

Multifactor models consider multiple (more than one) factors when estimating the required return (as opposed to the CAPM which is a single-factor model). For example, arbitrage price theory (APT) models estimate required return based on a set of risk premia:

$$\text{Required return} = \text{Risk-free rate} + (\text{Risk premium})_1 + (\text{Risk premium})_2 + \dots + (\text{Risk premium})_K$$

$$\text{Risk premium}_i = \text{Factor sensitivity}_i \times \text{Factor risk premium}_i$$

- **Factor sensitivity** (or **factor beta**) refers to the asset's sensitivity to a particular factor, holding all other factors constant.
- The **factor risk premium** for factor i is the expected excess return (above the risk-free rate) that accrues on an asset that has a sensitivity equal to 1 to factor i and zero sensitivity to all other factors.

Other multifactor models are discussed below:

The Fama–French Model

The Fama–French model (FF model) attempts to account for the higher (than predicted by the CAPM) return on small-cap stocks. This model estimates the required return as:

$$r_i = R_F + \beta_i^{\text{mkt}} \text{RMRF} + \beta_i^{\text{size}} \text{SMB} + \beta_i^{\text{value}} \text{HML}$$

β_{mkt} = Market beta

β_{size} = Size beta

β_{value} = Value beta

The FF model considers the following factors:

1. **Equity risk premium (RMRF).** The FFM shares this factor with the CAPM. The equity risk premium is calculated as the difference between the return on a value-weighted market index and the risk-free rate.
 - The baseline value for the market beta is 1.
 - $\text{RMRF} = R_M - R_F$
2. **Small-cap return premium (SMB).** This factor accounts for differences in company market capitalizations. It is estimated as the difference between the average return on three small-cap portfolios and the average return on three large-cap portfolios.
 - The baseline value for the size beta is zero.
 - It is usually positive (negative) for small-cap (large-cap) stocks.
 - $\text{SMB} (\text{small minus big}) = R_{\text{small}} - R_{\text{big}}$
 - The smaller the company, the greater the required return.
3. **Value return premium (HML).** This factor accounts for differences in returns on value stocks and growth stocks. It is estimated as the difference between the average return on two high book-to-market (HBM) portfolios (that represent a value bias) and the average return on two low book-to-market (LBM) portfolios (that represent a growth bias).
 - The baseline value for the value beta is zero.
 - It is usually positive (negative) for stocks with high (low) book-to-market ratios.
 - $\text{HML} (\text{high minus low}) = R_{\text{HBM}} - R_{\text{LBM}}$
 - The higher the ratio of book-to-market, the greater the required return.

Example 2-2: Calculating the Required Return on Equity Based on the CAPM and FFM

An analyst gathered the following estimates regarding Violet Inc's stock:

	CAPM	FFM
Current risk-free interest rate	4.0%	4.0%
Equity market return	9.6%	9.6%
Market beta	1.02	1.11
Size beta		-0.25
Historical size premium		2.8%
Value beta		-0.35
Historical value premium		4.4%

Calculate the required return on Violet's stock based on the CAPM and FFM. Also comment on whether the company's cost of equity benefits from its above-average market capitalization.

Solution:

CAPM

$$\text{Required return} = 0.04 + [1.02 (0.096 - 0.04)] = 9.71\%$$

FFM

$$\begin{aligned}\text{Required return} &= 0.04 + [1.11 (0.096 - 0.04)] + [(-0.25) \times 0.028] \\ &\quad + [(-0.35) \times 0.044] = 7.98\%\end{aligned}$$

Since the size premium is positive and the company has negative exposure to it, the company's above-average market capitalization serves to reduce its required return on equity.

Note that the FFM market beta is usually different from the CAPM market beta because the FFM accounts for factors other than just the market factor.

Pastor-Stambaugh Model

We just learned that the FFM considers two types of factors:

- A factor related to equity market risk; and
- Factors related to company characteristics (i.e., size and value).

The Pastor-Stambaugh model (PSM) extends the FFM by adding a liquidity factor (LIQ) to account for the premium demanded by investors for investing in assets that are relatively illiquid.

- The baseline value for liquidity beta is zero, representing average liquidity.
- The liquidity beta for stocks with below-average liquidity (above-average liquidity) is positive (negative).
- The lower the liquidity, the greater the required return.

The PSM is given as:

$$r_i = R_F + \beta_i^{mkt} RMRF + \beta_i^{size} SMB + \beta_i^{value} HML + \beta_i^{liq} LIQ$$

β_i^{liq} = Liquidity beta

Example 2-3: Evaluating the Characteristics of a Common Stock Investment

An analyst gathered the following information about a common stock issue:

- Market beta = 1.2
- Size beta = -0.20
- Value beta = 0.45
- Liquidity beta = -0.10

Based on the information provided, comment on the style characteristics of the issue.

Solution:

- A market beta greater than 1 indicates that the stock entails above-average systematic risk.
- A negative size beta indicates that it is a large-cap stock.
- A positive value beta indicates that the stock has a high book-to-market (low price-to-book) ratio, which represents a value orientation.
- A negative liquidity beta indicates that the stock has above-average liquidity (which is generally expected of large-cap stocks).

Macroeconomic and Statistical Multifactor Models

The FFM and PSM that we have just learned about represent one type of multifactor models (they are based on multiple fundamental factors). Models for estimating required returns on stocks may also be based on **macroeconomic and statistical factors**.

- **Macroeconomic factors** include economic variables that affect a company's future cash flows and/or the discount rate used to determine the present value of those cash flows.
- **Statistical factors** include portfolios of securities that explain historical returns on stocks.

Note that stocks usually have negative sensitivities to time horizon risk and inflation risk.

An example of a macroeconomic factor model is the five-factor **BIRR model** presented by Burmeister, Roll, and Ross:

$$\begin{aligned} r_i = & \text{T-bill rate} + (\text{Sensitivity to confidence risk} \times \text{Confidence risk}) \\ & + (\text{Sensitivity to time horizon risk} \times \text{Time horizon risk}) \\ & + (\text{Sensitivity to inflation risk} \times \text{Inflation risk}) \\ & + (\text{Sensitivity to business cycle risk} \times \text{Business cycle risk}) \\ & + (\text{Sensitivity to market timing risk} \times \text{Market timing risk}) \end{aligned}$$

- **Confidence risk:** The unexpected change in the difference between the return on risky corporate bonds and government bonds of the same maturity. When investor confidence is high, investors are willing to accept a lower spread for bearing the additional risk of corporate bonds.
- **Time horizon risk:** The unexpected change in the difference between the return on 20-year government bonds and 30-day T-bills. The factor reflects investors' willingness to invest for the long term.
- **Inflation risk:** The unexpected change in the inflation rate. Positive surprises in inflation result in lower returns on stocks.
- **Business cycle risk:** The unexpected change in the level of real business activity. A positive surprise means that overall economic activity has increased, which is good for stocks.
- **Market timing risk:** The portion of the total return on the equity market that is not explained by the first four factors. Almost all stocks have a positive sensitivity to this factor.

Example 2-4: Estimating Required Return Based on the BIRR Model

An analyst gathered the following information regarding a company's stock:

- Confidence risk = 2.63%
- Sensitivity to confidence risk = 0.25
- Time horizon risk = 0.75%
- Sensitivity to time horizon risk = -0.35
- Inflation risk = 4.22%
- Sensitivity to inflation risk = -0.15
- Business cycle risk = 1.58%
- Sensitivity to business cycle risk = 0.20
- Market timing risk = 3.44%
- Sensitivity to market timing risk = 0.10

Given a risk-free rate of 2.5%, estimate the required return for a security.

Solution:

$$\begin{aligned} \text{Required return} &= 0.025 + (0.0263 \times 0.25) + [0.0075 \times (-0.35)] + [0.0422 \times (-0.15)] \\ &\quad + (0.0158 \times 0.2) + (0.0344 \times 0.1) \\ &= 2.922\% \end{aligned}$$

THE BUILD-UP METHOD

The **build-up method** is usually applied to closely held companies where betas are not readily available. It starts with the risk-free rate and adds one or more premiums for different risks. However, it does not apply beta adjustments to factor risk premiums. A traditional build-up model is given as:

$$r_i = \text{Risk-free rate} + \text{Equity risk premium} + \text{Size premium} + \text{Company-specific premium}$$

- The **equity risk premium** is usually estimated with reference to equity indices of publicly-traded companies.

- The **size premium** is usually inversely related to the size of the company being valued,
- The **company-specific risk premium** may also include a premium for unsystematic risk based on the premise that the risk associated with privately-held companies cannot easily be diversified away.

Further, when estimating the required return for private companies, analysts should also consider:

- The relative values of a controlling versus minority interest in the company; and
- The impact of lack of marketability on share value.

Practically speaking, analysts account for both these issues (relative control and lack of marketability) by adjusting the value of the company directly; not the required return.

For companies with publicly-traded **debt**, the **bond-yield plus risk premium** approach can be used to calculate the cost of equity:

$$\text{BYPRP cost of equity} = \text{YTM on the company's long-term debt} + \text{Risk premium}$$

- The **YTM on the company's long-term debt** includes:
 - The **real interest rate** and a **premium for expected inflation**, which are reflected in the government bond yield; and
 - A **default risk premium**, which takes into account the creditworthiness of the company.
- The **risk premium** (added to the YTM on LT debt) reflects the extra compensation required by investors for bearing the additional risk associated with investing in an equity instrument as opposed to a debt instrument issued by the company.

Example 2-5: Estimating Cost of Equity Based on the Build-Up Method

Continuing from Example 2-2, suppose that Violet has issued a 15-year bond with a YTM of 5.2%. In order to account for the risk associated with the company's equity, we apply a risk premium of 3.7% in the bond yield plus risk premium approach.

1. Calculate the company's cost of equity using the bond yield plus risk premium approach.
2. Given that the company's stock is undervalued based on the required return calculated using CAPM (in Example 2-2), comment on whether the required return calculated in Part 1 also supports that conclusion.

Solution:

1. Required return = $5.2\% + 3.7\% = 8.9\%$
2. Recall (from Example 2-2) that the required return of Violet's equity based on the CAPM is 9.71%. If the company's stock is considered undervalued using the CAPM cost of equity, based on the inverse relationship between discount rates and value, the company's stock would appear to be more undervalued if the (lower) build-up method cost of equity were used (as the intrinsic value estimate would be even higher).

LOS 25e: Describe strengths and weaknesses of methods used to estimate the required return on an equity investment. Vol 4, pp 71–90

- The CAPM is a simple, widely-accepted model. Further, beta can be estimated quite easily if not available from a vendor. However, in some cases, beta may have very low explanatory power so the CAPM can be a poor predictor of future returns.
- Multifactor models attempt to overcome the weaknesses of the CAPM by adding more explanatory variables.
 - The FFM considers the equity risk premium, small-cap return premium, and value return premium.
 - The PSM is similar to the FFM, but adds a liquidity factor.

However, adding a greater number of explanatory variables to the model makes it more complex (and costly) and does not necessarily lead to better results.

- Similarly, macroeconomic and statistical multifactor models may have higher explanatory power but are more complex and costly.
- Build-up models tend to be very simple and can be applied to closely-held companies. However, they use historical estimates which may or may not continue to be relevant.

LOS 25d: Explain beta estimation for public companies, thinly traded public companies, and nonpublic companies. Vol 4, pp 77–79

Beta Estimation for Public Companies

For public companies, beta is estimated through an ordinary least squares (OLS) regression of the returns on a stock on the returns on the market. Beta estimates from such a regression are influenced by the following choices:

- The choice of index used to represent the market portfolio. For example, for U.S. equities, the S&P 500 index is used as the market portfolio.
- The length of the data period and the frequency of observations. Typically, 5 years of monthly data are used (yielding 60 observations).

The value of beta obtained through OLS regression is known as **raw** or **unadjusted beta**. Betas have exhibited a tendency to revert toward 1.0 over time, and since valuation is forward looking, raw betas are adjusted (via the **Blume adjustment**) so that they more accurately reflect future betas (closer to 1.0).

$$\text{Adjusted beta} = (2/3) (\text{Unadjusted beta}) + (1/3) (1.0)$$

Example 2-6: Adjusting Beta for Beta Drift

An analyst gathers the following information regarding a company:

- Risk-free rate of return = 5.5%
- Equity market risk premium = 4.0%
- Beta = 1.20

Use the CAPM to calculate the company's required return on equity using (1) raw beta and (2) adjusted beta.

Solution:

Required return (based on raw beta) = $0.055 + (1.20 \times 0.04) = 10.30\%$

Adjusted beta = $(2/3 \times 1.20) + (1/3 \times 1.0) = 1.13$

Required return (based on adjusted beta) = $0.055 + (1.13 \times 0.04) = 10.02\%$

Beta Estimation for Thinly Traded Stocks and Nonpublic Companies

Analysts use the **pure-play** method to estimate the beta of a particular project or of a company that is not publicly traded. This method requires adjusting a comparable publicly-listed company's beta for differences in financial leverage.

- First, we find a comparable company that faces similar business risks as the company or project under study and estimate the equity beta of that company. Betas vary with the level of financial risk in a company. Highly leveraged companies have higher financial risk, which is reflected in their high equity betas.
- To remove all elements of financial risk from the comparable's beta we "unlever" the beta. This unlevered beta reflects only the business risk of the comparable and is known as *asset beta*.
- Finally, we adjust the unlevered beta of the comparable for the level of financial risk (leverage) in the project or company under study.

We use the following formula to estimate the asset beta for the comparable publicly traded firm:

β_{ASSET} reflects only business risk of the comparable company. Therefore, it is used as a proxy for business risk of the project being studied.

$$\beta_{\text{ASSET}} = \beta_{\text{EQUITY}} \left[\frac{1}{1 + \left(\frac{D}{E} \right)} \right]$$

β_{EQUITY} reflects business and financial risk of comparable company.

where:

D/E = debt-to-equity ratio of the comparable company.

To adjust the asset beta of the comparable for the capital structure (financial risk) of the project or company being evaluated, we use the following formula:

β_{PROJECT} reflects business and financial risk of the project.

$$\beta_{\text{PROJECT}} = \beta_{\text{ASSET}} \left[1 + \frac{D}{E} \right]$$

β_{ASSET} reflects business risk of project.

where:

D/E = debt-to-equity ratio of the subject company.

Example 2-7: Calculation of a Project's Beta and WACC

Rukaiya Inc. is considering an investment in the confectionaries business. Rukaiya has a D/E ratio of 1.5, a before-tax cost of debt of 6% and a marginal tax rate of 35%. Tastelicious Foods is a publicly-traded company that operates only in the confectionaries

industry, has a D/E ratio of 2, and an equity beta of 0.7. The risk-free rate is 4.5% and the expected return on the market is 11%. Calculate the appropriate WACC that Rukaiya should use to evaluate the risk of entering the confectionaries business.

Solution:

First we calculate Tastelicious Foods' (the reference company's) unlevered (asset) beta, which eliminates the impact of financial risk, and only reflects the business risk of the confectionaries industry.

$$\beta_{\text{ASSET}} = \beta_{\text{EQUITY}} \left[\frac{1}{1 + \left(\frac{D}{E} \right)} \right]$$

$$\beta_{\text{ASSET}} = 0.7 \left[\frac{1}{1 + 2} \right] = 0.233$$

Then we "relever" the reference company's beta to reflect Rukaiya's financial risk:

$$\beta_{\text{PROJECT}} = \beta_{\text{ASSET}} \left[1 + \frac{D}{E} \right]$$

$$\beta_{\text{PROJECT}} = 0.233 [1 + 1.5] = 0.5833$$

Finally, we use the project's cost of equity and the component weights to calculate the WACC of Rukaiya's confectionaries project:

$$\text{Cost of equity} = r_e = 4.5\% + 0.5833 (11\% - 4.5\%) = 8.292\%$$

Rukaiya's D/E ratio is given as 1.5. It has 1.5 units of debt for every unit of equity (the denominator of the D/E ratio is 1). The ratio of debt to equity is 1.5 to 1, or 3:2. The weight for debt in the capital structure is therefore 3/(3+2) or 0.6 [(D/D+E)] and that of equity is 2/(3+2) or 0.4 [E/(D+E)].

$$\text{WACC} = (w_d)(r_d)(1 - t) + (w_e)(r_e)$$

$$\text{WACC} = 0.6 (6\%)(1 - 0.35) + 0.4 (8.292\%) = 5.66\%$$

Instead of using an individual company as the benchmark, analysts may use the median or average industry beta.

**LOS 25f: Explain international considerations in required return estimation.
Vol 4, pp 89–90**

When estimating the required return on equities in a global context, analysts are concerned about various issues including:

- Exchange rates; and
- Data and model issues in emerging markets.

At the end of the day, investors are concerned with returns and volatility of returns in terms of their domestic currency. Estimates of the equity risk premium expressed in terms of domestic currency can be very different from those expressed in terms of foreign currency. This is because exchange rate gains and losses on the equity market return component of the equity risk premium are usually not exactly offset by exchange rate gains and losses on

the government debt return component. To account for this, analysts usually focus on the local currency performance of the equity market and the risk-free asset, and adjust the local currency estimate of the equity risk premium for expected changes in exchange rates.

Another issue (especially in emerging markets) is the lack of availability of data, which makes it difficult to estimate the equity risk premium and the required return.

Two approaches for overcoming these weaknesses are discussed below:

1. Under the **country spread model** for the equity risk premium, a country premium is added to the equity risk premium for a developed market.

$$\text{ERP estimate} = \text{ERP for a developed market} + \text{Country premium}$$

- The **country premium** reflects the extra return required by investors for bearing the relatively greater risk associated with the developing or emerging market compared to the benchmark developed market.
- It is usually estimated as the **sovereign bond yield spread**, which is the difference between the yield on developing/emerging market sovereign bonds (denominated in the currency of the developed market) and the yield on government bonds in the developed market.

2. Under the **country risk rating model**, regression techniques are used to estimate the equity risk premium based on the empirical relationship between developed equity market returns and their risk ratings. This regression equation is then used with risk ratings for less developed markets to predict their required returns.

LOS 25g: Explain and calculate the weighted average cost of capital for a company. Vol 4, pp 90–92

A company's **cost of capital** refers to the overall rate of return required by all its suppliers of capital, and is usually estimated as the weighted average of the returns required by providers of the different sources of capital. If a company obtains capital from creditors and common shareholders, its **weighted average cost of capital (WACC)** is calculated as follows:

$$\text{WACC} = \frac{\text{MVD}}{\text{MVD} + \text{MVCE}} r_d(1 - \text{Tax rate}) + \frac{\text{MVCE}}{\text{MVD} + \text{MVCE}} r$$

where:

MVD = Market value of the company's debt

r_d = Required rate of return on debt

MVCE = Market value of the company's common equity

r = Required rate of return on equity

- Many jurisdictions allow corporations to deduct net interest expense from income when calculating the amount of taxes owed. To reflect the tax deductibility of corporate interest payments, the cost of debt is adjusted downward by a factor of $(1 - t)$. Note that use of the marginal tax rate is preferred over use of the effective tax rate in adjusting the cost of debt. This is because the marginal tax rate reflects the company's cost of raising additional funds (so it is more applicable in a

- forward-looking context), and also because the effective tax rate is influenced by non-recurring items.
- A company's WACC may change over time due to changes in its capital structure. Therefore, analysts often use target weights instead of current market value-based weights of equity and debt to calculate the WACC.

As mentioned earlier, the WACC represents the overall cost of capital (from all sources) for a company. Analysts use the WACC as the discount rate to calculate the present value of the company's expected future cash flows when valuing of the company. They then deduct the market value of the company's debt from the value of the company to estimate the value of equity.

Example 2-8: Calculating the Weighted Average Cost of Capital

An analyst gathered the following information regarding a company:

- Book value of the company's common stock = \$10 million
- Market value of the company's common stock = \$35 million
- Book value of the company's debt = \$40 million
- Market value of the company's debt = \$45 million
- Required rate of return on equity = 8.5%
- Required rate of return on debt = 4%

Given a marginal tax rate of 30%, calculate the company's weighed average cost of capital.

Solution:

- Weight of debt in the capital structure = $45/(45 + 35) = 56.25\%$
- Weight of equity in the capital structure = $35/(45 + 35) = 43.75\%$

$$\text{WACC} = [0.5625 \times 0.04 \times (1 - 0.3)] + (0.4375 \times 0.085) = 5.29\%$$

LOS 25h: Evaluate the appropriateness of using a particular rate of return as a discount rate, given a description of the cash flow to be discounted and other relevant facts. Vol 4, pp 92–93

When discounting a company's cash flows, analysts should use the discount rate that corresponds to (or is consistent with) the type of cash flows being discounted.

- When a cash flow to equity (the cash flow net of payments to senior claimants like taxes and interest payments) is being discounted, the required return on equity should be used as the discount rate.
- When a cash flow to the entire firm (cash flow available to meet claims of all providers of capital including bondholders) is being discounted, the WACC should be used as the discount rate.

Further, cash flows may be stated in either nominal or real terms. Analysts must use nominal discount rates when discounting nominal cash flows and real discount rates when discounting real cash flows. Typically, the analysis is conducted in terms of nominal cash flows as they reflect taxes more accurately.

STUDY SESSION 10: EQUITY VALUATION (2)

READING 26: INDUSTRY AND COMPANY ANALYSIS

LESSON 1: FINANCIAL MODELING: APPROACHES TO PROJECTING REVENUE

Introduction

This reading describes how analysts use industry information and corporate disclosures to project a company's future financial performance. These forecasts are then employed as inputs in fundamental equity valuation models (e.g., discounted cash flow and market multiple) that are illustrated in later readings.

Financial Modeling: An Overview

Typically, modeling the income statement is the first step in financial modeling because future cash flow generating ability is the fundamental driver of value for most companies, and cash flows are primarily determined by the amount of net income generated by the company.

Income Statement Modeling: Revenue

Segment disclosures in companies' financial reports are usually the primary sources of information when it comes to analyzing revenue. Both IFRS and U.S. GAAP require companies to disclose certain information about business segments (e.g., segment definitions, segment revenues, expenses, assets and liabilities, and analysis of revenue by geographical area). Important information can often be found in **other disclosures**, such as regulatory filings, management presentations, and conference calls, and in **external data sources**.

Revenue can be analyzed by (1) geographical source, (2) business segment, or (3) product line.

- In a **geographical analysis**, company revenue is divided into various geographic groups (individual countries or broader regions of the world). A geographical analysis is particularly useful for multinationals operating in several regions that exhibit different underlying growth rates and/or competitive dynamics.
- In a **segment analysis**, company revenue is broken down into its various business segments. This type of analysis is useful for companies that operate in several industries with widely differing economics.
- A **product line analysis** is most relevant for a company that earns a majority of its revenue from a small number of products, and the market for each of its products behaves differently.

LOS 26a: Compare top-down, bottom-up, and hybrid approaches for developing inputs to equity valuation models. Vol 4, pp 111–113

LOS 26b: Compare “growth relative to GDP growth” and “market growth and market share” approaches to forecasting revenue. Vol 4, pp 111–112

Approaches to Projecting Future Revenue

Once the analyst has understood the primary sources of a company's revenue, she must decide on an approach to forecasting future revenue.

- Under a **top-down approach**, the analyst begins with the overall economy and then moves to more narrowly defined levels (sector, industry, or specific product) before eventually arriving at a revenue forecast for a particular company. There are two common top-down approaches to modeling revenue:
 - In the **growth relative to GDP growth approach**, the analyst considers how a company's growth rate will compare with growth in nominal GDP. For example, if GDP is forecast to grow at 3% and company revenue is expected to grow at a 10% faster rate, the forecast revenue growth rate for the company will be $3\% \times (1 + 0.1) = 3.3\%$, or 30bp higher in absolute terms. The growth in a company's revenue relative to the GDP growth rate typically depends on (1) the current stage of the industry life cycle (e.g., embryonic vs. growth vs. shakeout vs. mature) and (2) business cycle sensitivity (cyclical vs. non-cyclical) of company revenues.
 - In the **market growth and market share approach**, the analyst first forecasts growth for a particular market, and then considers how the company's current market share is likely to grow over time. For example, if a company's market share is expected to rise from 5% to 6%, and the overall market is forecast to grow from \$12.50 billion to \$15 billion, company revenue will be expected to grow from $5\% \times \$12.50 \text{ billion} = \625 million to $6\% \times \$15 \text{ billion} = \900 million .
- Under a **bottom-up approach**, an analyst begins at the individual company level or the individual unit level (product line, segment, or location) within the company, and then aggregates those forecasts to project total revenue for the company. Subsequently, revenue projections for individual companies are aggregated to develop forecasts for the sector, industry, or overall economy. Bottom-up approaches to forecasting revenue include:
 - **Time series**, where forecasts are based on historical growth rates or time-series analysis (e.g., trend models).
 - **Return on capital**, where forecasts are based on balance sheet accounts (e.g., interest income for a bank can be calculated as loans/advances multiplied by the average interest rate charged).
 - **Capacity-based measures**, e.g., same-store sales growth or sales related to new stores in the retail industry.

If the product's overall market size has a predictable relationship with GDP, regression analysis may be used to estimate the relationship.

Note that time-series analysis can also be used in the growth relative to GDP growth top-down approach to forecast GDP growth.

Under a **hybrid approach**, elements of both the top-down and bottom-up approaches are combined. For example, an analyst may use a market growth and market share approach to forecast revenues for individual product lines, and then add up the individual projections to forecast revenues for the company. Hybrid approaches are the most commonly-used approaches as they are useful (1) in uncovering implicit assumptions made, and (2) in identifying any errors made when using a single approach.

LESSON 2: FINANCIAL MODELING: INCOME STATEMENT MODELING AND BALANCE SHEET MODELING

LOS 26c: Evaluate whether economies of scale are present in an industry by analyzing operating margins and sales levels. Vol 4, pp 114–117

LOS 26d: Forecast the following costs: cost of goods sold, selling general and administrative costs, financing costs, and income taxes. Vol 4, pp 117–132

Income Statement Modeling

Generally speaking, there is less disclosure relating to operating costs than disclosure about revenue in the financial statements released by companies. Therefore, analysts tend to consider costs at a more aggregated level than revenues in their analysis and forecasts.

As with revenue, analysts can take a top-down, bottom-up, or hybrid approach to make cost projections.

- In a **top-down approach**, analysts consider the overall level of inflation or industry-specific costs in order to make assumptions regarding company costs.
- In a **bottom-up approach**, analysts start at the company level with segment margins, historical cost growth rates, historical margins, or costs of delivering specific products.
- In a **hybrid approach**, analysts incorporate elements from both the top-down and bottom-up approaches.

When forecasting costs, analysts must carefully consider fixed and variable costs.

- **Variable costs** are usually directly linked to revenue growth and are often modeled as (1) a percentage of revenue or (2) projected unit volumes multiplied by variable costs per unit.
- **Fixed costs** are not related to revenue; instead, they are typically linked to (1) future investment in (PP&E) and (2) total capacity growth.

When analyzing costs, it is important for analysts to determine whether the company stands to benefit from economies of scale. **Economies of scale** occur when average cost per unit declines as total output increases. Factors that can lead to economies of scale include:

- Greater bargaining power with suppliers.
- Lower cost of capital.
- Lower per-unit marketing costs.

If a company/industry is benefitting from economies of scale, its gross and/or operating margins would be positively correlated with sales levels. An analysis of common-size income statements would show that larger companies in the industry would have lower COGS and/or SG&A as a percentage of sales compared to smaller companies. See Example 2-1.

Example 2-1: Approaches to Modeling Operating Costs

ABC and XYZ both operate in the retail clothing industry. The financial results for two companies are given below:

Financial Results for ABC and XYZ (\$ millions, unless noted)

	2010	2011	2012
ABC			
Revenue	72,249	78,963	83,451
Cost of goods sold	51,258	56,123	57,000
Selling, general, and administrative	18,321	19,784	20,005
Operating income	2,670	3,056	6,446
Average selling area square footage (millions sq. ft.)	91	93	95.8
Same-store sales growth (%)	3.5	2.8	5.4
XYZ			
Revenue	32,981	32,002	34,000
Cost of goods sold	23,497	22,998	24,049
Selling, general, and administrative	7,829	7,164	8,500
Operating income	1,655	1,840	1,451
Average selling area square footage (millions sq. ft.)	32	35	34.2
Same-store sales growth (%)	-1.2	-0.8	1.5

1. Based on ABC's and XYZ's operating margins for 2012, can it be stated that economies of scale exist in the retail clothing industry? If yes, are those economies of scale realized in cost of goods sold or SG&A expenses?
2. a. Calculate and interpret ABC's and XYZ's SG&A per average square foot over the past three years.
b. Assuming that customer satisfaction is an important driver of sales growth, which company appears to have a more satisfied customer base over the period examined?
c. Assuming that XYZ's average selling area square footage will decline by 2.5% annually over the next four years and that SG&A per average square foot will increase by 1.5% annually during this time, compute expected total SG&A expense for 2016?

Solution:

1. ABC's operating margin (operating income divided by revenue) for 2012 was 7.7% ($= 6,446 / 83,451$), while XYZ's operating margin for the same year was 4.3% ($= 1,451 / 34,000$). ABC's greater size (\$83,451 million in sales versus \$34,000 million for XYZ) combined with its higher operating profit margin indicates that economies of scale do exist in the retail drugstore industry.

In order to answer the second part of the question, we need to compute gross profit margins as well. ABC's gross margin (gross profit divided by revenue) for 2012 was 31.7% [$= (83,451 - 57,000) / 83,451$], while XYZ's gross margin for the same year was 29.27% [$= (34,000 - 24,049) / 34,000$].

Since ABC, the bigger company (due to its higher sales) has a higher gross profit and a higher operating profit margin, we can conclude that economies of scale are present in both COGS and SG&A in the retail clothing industry. Stated differently, COGS and SG&A consume a lower percentage of sales for ABC compared to XYZ.

2. a. ABC's average SG&A per square foot in 2012 and 2010 were \$209 ($= 20,005/95.8$) and \$201 ($= 18,321/91$), respectively, which implies an increase of approximately 4% over the period. For XYZ, average SG&A per square foot stood at \$249 for 2012 and \$245 for 2010, implying an increase of approximately 2%. SG&A per square foot is often used by retail analysts as a quantitative measure to assess customer service. Since, XYZ spends a higher amount on SG&A per square foot than ABC, we may conclude that XYZ offers higher service levels than ABC. Further, the customer service gap between the two companies is decreasing as ABC's average SG&A per square foot has grown faster than that of XYZ over the recent past.
 - b. Same-store sales growth is another metric used by retail analysts to assess customer satisfaction. Based on the same-store sales growth information provided, it appears that ABC has a more satisfied customer base.
 - c. Based on the given assumptions, XYZ's expected average selling area in 2016 will be around 30.9 million square feet [$= 34.2 \times (0.975)^4$], and expected SG&A per average square foot for 2016 will be \$264 [$= 249 \times (1.015)^4$]. Therefore, total SG&A in 2016 should be around \$8,157.6 million ($= 30.9 \times 264$).

Cost of Goods Sold (COGS)

Generally speaking, COGS tends to be the largest component of total cost for manufacturing and merchandising companies. Since it is directly related to sales, it is typically forecasted as a percentage of revenue. COGS plus gross profit equals revenue so COGS can be forecasted based on (1) historical COGS as a percentage of revenue or (2) historical gross profit margins:

$$\text{Future COGS} = (\text{Historical COGS} / \text{Revenue}) \times \text{Projected sales}$$

$$\text{Future COGS} = (1 - \text{Historical GP margin}) \times \text{Projected sales}$$

Note that historical gross profit margins may require some adjustments:

- If a company is losing market share (e.g., due to the introduction of substitute products in the market), gross margins are likely to decline going forward.
- If the company is gaining market share (e.g., from the introduction of cost-effective, innovative products), gross margins are likely to improve going forward.

Given that COGS comprises the bulk of operating costs, analysts may find it useful to break down these costs (e.g., by segment, by product category, or by volume and price components) to improve forecasting accuracy. Some companies face fluctuating input costs, which can only be passed on to customers (if at all) with a time lag. For those companies with narrow margins, abrupt changes in input costs can have a significant impact on profits. For example, consider the airline industry, where unhedged changes in the price of jet fuel have a significant impact on profits. In such a case, a breakdown of

both sales and costs into volume and price components can improve the accuracy of short-term forecasts, even if longer term forecasts are based on the relationship between sales and fuel costs.

Analysts should also consider the company's general strategy regarding hedging various input costs. This information is usually found in the footnotes of the annual report. Items of interest include (1) the proportion of input costs that are hedged away and (2) to what extent any rise in input costs can be passed on to customers.

Finally, analysts should also check their gross margin assumptions against those of the company's competitors. However, they should bear in mind that differences in profit margins across companies can result from (1) different competitive positions or (2) different business models. For example, within the competitive grocery sector:

- A large supermarket chain can gain a superior competitive position by using its size to attain savings on purchases, and to introduce and sell high margin private labels.
- A supermarket wholesaler with franchised retail operations (where the bulk of operating costs are borne by the franchisee and the wholesaler offers goods at a small markup to these franchisees) would have lower margins than a company that owns and operates its own stores (which would have higher operating costs).

Selling, General, and Administrative Expenses (SG&A)

Generally speaking, SG&A have less of a correlation with revenue than COGS. While some components may be forecasted as a percentage of sales (e.g., wages and salaries), others tend to be less variable in nature (e.g., R&D expense and employee overheads).

In addition to analyzing the historical relationship between a company's operating expenses and sales, analysts should evaluate the company's cost structure relative to its competitors as this can help evaluate the efficiency potential and margin potential of the company. Further, both sales and expense projections can be improved if the company provides a breakdown of the product and/or geographical segments in its financial statement footnotes.

Financing Expenses

Interest income depends on (1) the amount of cash and cash equivalents held by the company and (2) the rate of return earned on investments. While interest income is an important source of income for banks and insurance companies, it is not as significant for most non-financial companies.

Interest expense depends on (1) the amount of debt in the company capital structure and (2) the interest rate associated with the debt. The notes to the financial statements typically include information (maturity structure as well as corresponding interest rates) that can be used to forecast financing expenses. See Example 2-2.

Example 2-2: Interest Expense Calculations

Selected financial information regarding XNO Company is provided below:

	2012 \$ millions	2013 \$ millions	Average \$ millions
Loans	2,458	2,008	2,233
Finance lease liabilities	1,623	1,945	1,784
Cumulative preferred financing shares	512	512	512
Non-current portion of long-term debt	4,593	4,465	4,529
Short borrowings and current portion of long-term debt	189	657	423
Gross debt	4,782	5,122	4,952
Less: Cash, cash equivalents, and short-term deposits	3,478	3,026	3,252
Net debt	1,304	2,096	1,700
Interest income for 2012			35
Interest expense for 2012			260
Net interest expense			225
Other financial expenses			123
Total finance costs			348

1. Calculate interest expense on the average gross debt and the interest rate on the average cash position.
2. Calculate the interest rate on average net debt, assuming the other financial income and expenses are not related to debt or cash balances.

Solution:

1. Interest expense on average gross debt is calculated as interest expense divided by average gross debt.

$$\text{Interest expense on average gross debt} = \$260 \text{ million} / \$4,952 \text{ million} = 5.25\%$$

The interest rate on average cash position is calculated as interest income divided by the average cash position.

$$\text{Interest rate/yield on average cash position} = \$35 \text{ million} / \$3,252 \text{ million} = 1.1\%$$

2. The interest rate on the average net debt is calculated as net interest expense divided by average net debt.

$$\text{Interest rate on average net debt} = \$225 \text{ million} / \$1,700 \text{ million} = 13.2\%$$

Corporate Income Tax

Taxes are primarily determined by the laws of the jurisdiction that the company falls under, and are also impacted by the nature of the business. For example, some companies can benefit from special tax treatment (e.g., R&D tax credits and accelerated depreciation on fixed assets). Generally speaking, there are three types of tax rates:

- The **statutory tax rate**, which is the legally applicable rate charged in the country where the company is located.
- The **effective tax rate**, which is calculated as the reported tax amount (income tax expense) on the income statement divided by pre-tax income.
- The **cash tax rate**, which is calculated as tax actually paid divided by pre-tax income.

Differences between cash taxes and reported taxes result from (temporary) timing differences in the recognition of certain items between the tax return and the financial statements of a company. These differences are reflected in deferred tax assets and liabilities. On the other hand, differences between the statutory tax rate and the effective tax rate arise from permanent differences. Examples include tax credits, withholding taxes on dividends, adjustments to prior years, and expenses not deductible for tax purposes. A reconciliation of these two is typically contained in the notes to the financial statements.

- Effective tax rates can differ if a company operates in multiple jurisdictions with different statutory tax rates. If a company earns higher profits in countries with higher statutory tax rates, its effective tax rate will be higher. Further, if a higher proportion of profits is expected to be earned in high-tax jurisdictions going forward, the company's effective tax rate will be expected to increase going forward.
- In order to minimize taxes, some companies create special purpose entities to minimize profits reported in high-tax rate countries. Generally speaking, if a company reports an effective tax rate that is consistently lower than (1) the statutory tax rate, or (2) the effective tax rates of competitors, analysts should dig deeper into the notes to the financial statements to look for items that may be contributing to temporarily low effective tax rate and consider the risk of a change in tax laws (which may limit the use of SPEs to avoid taxes) when forecasting future tax expense.
- Analysts should adjust the effective tax rate for one-time events. Further, if income from investments in subsidiaries accounted for using the equity method forms a substantial and volatile part of pre-tax income, analysts should exclude this item in estimating the future tax expense.
- Generally speaking, analysts project future tax expense using a tax rate based on normalized operating income (i.e., income before special items and income from associates).
- While the effective tax rate is used for forecasting earnings, it is the cash tax rate that is used for forecasting cash flows. Any differences between the tax amount on the P&L (income tax expense) and the amount on the cash flow statement (cash taxes) should be reconciled through a change in deferred tax assets/liabilities.

Other Items

- A company's stated **dividend policy** can be used to project future dividends. Typically, analysts assume that dividends grow each year (1) by a particular dollar amount or (2) as a proportion of net income.
- If a company owns more than 50% of an affiliate, it will generally consolidate the affiliate's results with its own and report the portion of income that does not belong to it as **minority interest**.
- If a company owns less than 50% of an affiliate, it will report its share of income from the affiliate using the **equity method**.
- **Share count** (shares issued and outstanding) is a key input in the calculation of an intrinsic value estimate and earnings per share. Changes in a company's share count may come from (1) dilution related to exercise of stock options, convertible bonds, and similar securities, (2) issuance of new shares, and (3) share repurchases.
- Analysts usually exclude **unusual charges** from their forecasts as they are very difficult to predict. However, if a company has a history of classifying certain recurring costs as "unusual," analysts may want to include a "normalized" level of unusual charges in their forecasts.

LOS 26e: Describe approaches to balance sheet modeling. Vol 4, pp 132–136

Balance Sheet and Cash Flow Statement Modeling

After modeling the income statement, analyst can move on to modeling the balance sheet or the cash flow statement. Here, we work toward modeling the balance sheet.

Some balance sheet items (e.g., retained earnings) flow directly from the income statement, while others (e.g., accounts receivable, accounts payable, and inventory) are closely linked to income statement projections.

Working capital accounts are typically forecast using **efficiency ratios**. For example:

- Accounts receivable may be forecast by applying a days of sales outstanding (DSO) assumption to sales forecasts.
 - So if credit sales are projected at \$30 billion and if cash is normally collected from customers in 50 days, accounts receivable would be estimated as \$4.1 billion ($= \$30 \text{ billion} \times 50/365$).
- Inventory may be projected by applying a days of inventory on hand (DOH) assumption to COGS forecasts.

Generally speaking, if efficiency ratios remain constant, working capital accounts will grow at the same rate as their related income statement accounts. Working capital projections can be modified by applying a bottom-up or top-down approach. Under a bottom-up approach, analysts could look at historical efficiency ratios and apply them to sales/COGS forecasts, while under a top-down approach, analysts could apply economy-wide trends in retail sales to adjust their inventory turnover/DOH assumptions.

Long-term assets such as net PP&E are not strongly linked to the income statement. Net PP&E changes are linked to capital expenditures and depreciation (which are both important components of the cash flow statement).

- Depreciation forecasts are based on historical depreciation and disclosures relating to depreciation schedules.
- Capital expenditure forecasts depend on estimated future need for new PP&E. Capital expenditure includes:
 - Maintenance capital expenditures, which are required to sustain current business.
 - Note that maintenance capital expenditure forecasts should typically be higher than current depreciation due to inflation.
 - Growth capital expenditures, which are required to expand the business.

In order to project future **debt and equity levels**, analysts must make assumptions regarding leverage ratios (e.g., debt-capital, debt-equity, and debt-EBITDA). Analysts must also consider the company's historical practices, current financial strategy, and capital requirements when projecting future capital structure.

Once projected income statements and balance sheets have been projected, analysts move on to projecting the cash flow statement. This requires assumptions relating to how the company will use its future cash flows (e.g., for share repurchases, paying out dividends, acquisitions, capital expenditures, etc.).

Scenario Analysis and Sensitivity Analysis

The extensive use of assumptions in forecasting financial statements brings significant uncertainty to the valuation process. Analysts, therefore, use scenario analysis and sensitivity analysis to evaluate the impact of changes in assumptions on net income.

Uncertainty regarding company value also comes from the type of industry the company operates in. Large, mature, slow-growth, non-cyclical businesses with well-capitalized balance sheets are typically easier to value than new ventures, companies from industries exposed to technological change, or companies with significant operating and financial leverage as the range of potential intrinsic value estimates for those companies is much narrower. Probability-weighted average values are used for high-risk, boom-or-bust businesses where there is no meaningful base case scenario.

LESSON 3: COMPETITIVE FACTORS, INFLATION, AND TECHNOLOGICAL DEVELOPMENTS

LOS 26f: Describe the relationship between return on invested capital and competitive advantage. Vol 4, pg 133

Projected income statements and balance sheets can be used to determine the **return on invested capital (ROIC)** implied by the assumptions used in the forecasting exercise. ROIC measures the profitability of capital invested by the company.

$$\text{ROIC} = \text{NOPLAT} / \text{Invested capital}$$

- NOPLAT = Net operating profit less adjusted taxes.
 - It is a measure of earnings available to both equity and debt holders (as it is before interest expense).

- Invested capital = Operating assets – Operating liabilities.
 - Note that invested capital can be measured at beginning or average values for the accounting period.

ROIC is a better measure of profitability than **return on equity (ROE)** as it is not affected by the company's financial leverage/capital structure. Generally speaking, a sustainably high ROIC indicates a competitive advantage.

Another measure that is similar to ROIC, but focuses on pretax operating profit is **return on capital employed (ROCE)**.

$$\text{ROCE} = \text{Operating profit} / \text{Capital employed}$$

- Operating profit is a pretax measure of profitability.
- Capital employed = Debt capital + Equity capital.

Since it is a pretax measure, ROCE is useful in performing comparisons across companies in different countries with different tax structures.

LOS 26g: Explain how competitive factors affect prices and costs.

Vol 4, pp 136–145

LOS 26h: Judge the competitive position of a company based on Porter's five forces analysis. **Vol 4, pp 136–145**

The Impact of Competitive Factors on Prices and Costs

Most of the items that must be forecast when performing a valuation (e.g., revenues, profits, etc.) are linked to the level of competition in the industry. While there are no rules for incorporating competitive analysis into forecasts, there are various conceptual tools that can be used by analysts to evaluate how competition will affect forecasts of revenue growth, margins, capital expenditures, and working capital investment. One of the tools that analysts use when evaluating how competition will affect company performance is **Michael Porter's “five forces” framework**.

- **Threat of substitute products.** The greater (lower) the number of substitutes that exist and lower (higher) the switching costs, the weaker (stronger) the pricing power enjoyed by companies in the industry.
- **Intensity of rivalry among incumbent companies.** Pricing power tends to be limited in industries that are fragmented, have low growth potential, high exit barriers, high fixed costs, and have similar products.
- **The bargaining power of suppliers.** Companies in industries where suppliers have greater ability to increase prices and/or limit the quality and quantity of inputs have lower prospects for earnings growth.
- **The bargaining power of customers.** Companies in industries where customers have greater ability to demand lower prices and/or control the quality and quantity of end products have lower prospects for earnings growth.
- **The threat of new entrants.** Companies in industries where the threat of new entrants is high due to low entry barriers face downward pressure on profitability.

Bear in mind that there is no direct, mechanical link between an analyst's evaluation of the five forces for a specific company in a particular industry, but that the link is more subjective. Also note that in addition to these forces, there are other factors that can affect profitability, such as government regulation and taxes. The recommended way of understanding the influence of government on competition is to examine how its policies will affect each of the five forces.

LOS 26i: Explain how to forecast industry and company sales and costs when they are subject to price inflation and deflation. Vol 4, pp 145–153

Inflation and Deflation

The impact of inflation and deflation on revenues and expenses varies from company to company. Even within a particular company, the impact of inflation or deflation on various revenue and expense categories can be markedly different. The greater a company's ability to pass on higher costs to customers in the form of price increases, the better its relative performance.

Industry Sales and Inflation or Deflation

The relationship between increases in input costs and increases in the price of final products depends on the following factors:

- **Industry structure:** Generally speaking, if an industry is dominated by a few large firms (as opposed to a large number of smaller firms), sellers will be in a better position to increase prices to compensate for rising costs.
- **Price elasticity of demand:** For most products, price and unit sales volumes are inversely related. The greater the price elasticity of demand, the greater the negative impact of a price increase on unit sales. When a company increases its price, unit sales typically fall in the short term. However, if the company is able to maintain sales volumes despite passing on inflation (with higher prices), its gross profit margin would fall, but the dollar amount of gross profit would remain unchanged.
- **Reaction of competitors and availability of substitutes:** If there is a decrease in input costs, the firm that is quickest to reduce prices will witness an increase in unit sales (at least in the short run) at the cost of lower margins. If there is an increase in input costs, a firm that is too quick to increase prices will see unit sales decrease, while one that is too slow to increase prices will suffer a squeeze on margins.

Company Sales and Inflation or Deflation

In order to forecast revenue for a company that faces rising input costs, analysts must consider the following:

- **Price elasticity of demand for its products:** If demand is relatively price elastic, revenues will decline (increase) if prices are raised (reduced). On the other hand, if demand is relatively price inelastic, revenues will increase (decline) if prices are raised (reduced).
- **The different rates of cost inflation in countries where the company operates:** High inflation in a particular export market may result in pricing gains for the company, but these gains could be wiped out if the country's currency depreciates (in line with Relative Purchasing Power Parity).

- **Likely inflations in costs for individual product categories:** For example, an increase in the price of wheat will have a more significant impact on costs for a specialized retail bakery chain than for a (diversified) standard supermarket chain. The bakery would, therefore, be likely to increase prices by a higher percentage than the supermarket in response to the higher wheat prices.
- **Pricing strategy and market position:** If input prices are increasing, a company may choose to increase its prices (if the objective is to maintain margins) or keep prices constant (if the aim is to increase market share). See Example 3-1.

Example 3-1: Passing on Input Cost Increases or Not

BOP Corp, a global supermarket chain, faces a 6% increase in its cost of goods sold (with stable volume). The table below provides relevant income statement information for BOP for the year 2013.

BOP Data (in \$ millions)

	2013
Sales	96,850
Cost of goods sold	73,100
Gross profit	23,750
Gross margin	24.5%

Four analysts have their own opinions on how the cost increase will actually play out. The table below shows their estimates of input prices, volume growth, and pricing.

Analysts' Estimates of BOP's Reaction to Inflation

	W	X	Y	Z
Price increase for revenues	0%	2%	4.3%	5.5%
Volume growth	9.2%	5%	2.1%	-8%
Total revenue growth	9.2%	7.1%	6.5%	-2.9%
Input costs increase	6%	6%	6%	6%

1. What are each analyst's predictions for gross profit and gross margin for 2013?
2. Who has the highest gross margin in her model? Who has the highest gross profit?

Solution:

1. The results for each analyst's predictions are shown below:

	2013	W	YoY %	X	YoY %	Y	YoY %	Z	YoY %
Sales	96,850	105,760	9.2	103,726	7.1	103,136	6.5	94,003	-2.9
COGS	73,100	84,615	15.8	81,360	11.3	79,113	8.2	71,287	-2.5
Gross profit	23,750	21,145	-11.0	22,366	-5.8	24,023	1.1	22,715	-4.4
Gross margin	24.5%	20.0%		21.6%		23.3%		24.2%	

Illustration of calculations for year on year (YoY) growth in revenues and COGS:

For Analyst X:

Revenues increase by 7.1% [= $(1.02 \times 1.05) - 1$]

- Revenue growth depends on price increase and volume growth.

Cost of goods sold increase by 11.3% [= $(1.05 \times 1.06) - 1$].

- COGS growth depends on volume growth and input cost increase.

The difference between the calculated revenue and cost of goods sold is the projected gross profit.

2. The highest gross margin is anticipated by Analyst Z, who assumed that the company would be able to pass on almost the entire increase in input prices (6%) to customers in the form of price increases (5.5%) such that the gross profit margin did not decline substantially. However, the highest gross profit is anticipated by Analyst Y who expects the margin decline to be more than offset by growth in volumes.

Industry Costs and Inflation or Deflation

In order to forecast industry costs, analysts must consider the following:

- **Specific purchasing characteristics:** For example, for industries in which participants use derivative contracts to hedge against input cost fluctuations, analysts would incorporate any input price fluctuations more slowly than for an industry where hedging such costs is not standard practice.
- **Underlying drivers of input prices:** For example, weather conditions can have a significant impact on agricultural output and prices, so analysts should incorporate the impact of observed/expected weather patterns into cost forecasts of industries that rely on those agricultural products.
- **The competitive environment:** If industry firms have access to substitute inputs or are vertically integrated, the impact of fluctuations in input costs can be minimized.

For a company that neither hedges its input price exposure nor is vertically integrated, analysts must evaluate the extent to which increases in input costs can be passed on to customers, and gauge the impact of any price increase on unit sales and sales revenue. If increases in input costs are thought to be temporary, a company may resort to cutting some other costs such as advertising to maintain profit margins, but such a strategy will not be effective in countering a long-term increase in input costs.

Company Costs and Inflation or Deflation

In order to forecast company costs, analysts should break down costs by category and geography, and evaluate the impact of inflation or deflation on each individual item. They should also consider whether the company can find cheaper substitutes or increase efficiency to offset the impact of higher input prices.

LOS 26j: Evaluate the effects of technological developments on demand, selling prices, costs, and margins. Vol 4, pp 153–163

Technological Developments

Technological changes can have a profound impact not only on individual companies, but also on entire industries. Since the impact of technological innovation can be so unpredictable and significant, analysts typically employ a variety of assumptions and use scenario and/or sensitivity analysis to project future earnings.

- If a new innovation threatens to cannibalize sales of an existing product, a unit sales forecast for the new product must be combined with an expected **cannibalization factor** to project demand for the existing product. (see Example 3-2)
- Technological developments can affect demand, supply, or both. For example,
 - If innovation leads to lower manufacturing costs, the supply curve will move to the right.
 - If innovation leads to the development of better, more attractive products, demand for existing products will shift to the left.

Example 3-2: Estimating the Impact of Cannibalization

An analyst is trying to quantify the tablet market's potential to cannibalize demand for personal computers (PCs). Relevant projections without accounting for any cannibalization of the PC market by tablets are provided in the table below:

Pre-Cannibalization Projections:

	2014 Expected
Global tablet shipments	180,000
% of which is consumer	85%
% of which is non-consumer	15%
Global PC shipments	380,000
% of which is consumer	45%
% of which is non-consumer	55%

Estimate post-cannibalization global PC shipments for 2014 assuming a cannibalization factor of 50% for consumers and 15% for non-consumers.

Solution:

The number of PCs that will be cannibalized by tablets is calculated as the product of (1) expected global tablet shipments, (2) the percentage representation of each category, and (3) the cannibalization factor for each category.

Number of consumer PCs cannibalized by tablets = 180,000 tablets × 85% consumer representation × 50% consumer cannibalization factor = 76,500

Number of non-consumer PCs cannibalized by tablets = 180,000 tablets × 15% non-consumer representation × 15% non-consumer cannibalization factor = 4,050

Total number of PCs that will be cannibalized by tablets = $76,500 + 4,050 = 80,550$

Expected post-cannibalization shipments for 2014 = $380,000 - 80,550 = 299,450$

LOS 26k: Explain considerations in the choice of an explicit forecast horizon.
Vol 4, pp 163–169

Sometimes the investment objective may also lay down an average annual portfolio turnover. The time horizon should correspond with the average annual turnover. For example, a stated investment horizon of 4 to 5 years implies an average annual portfolio turnover of 20 to 25% (average holding period = 1/portfolio turnover).

Longer-Term Forecasting

In determining the appropriate forecasting horizon, analysts must consider the following:

- **Investment strategy for which the stock is being considered:** The objectives section of a portfolio's investment strategy sheds light on (among other things) the investment horizon, or the expected average holding period for a stock.
- **Industry cyclicalities:** The forecasting horizon should be long enough to allow the business to reflect average mid-cycle levels of revenues and profits.
- **Company specific factors:** For example, if the company has recently undertaken acquisitions or restructuring activities, the benefits from those activities should be reflected in financial statements projections.
- **Valuation methods mandated by supervisor:** For example, if the analyst's supervisor requires application of the dividend discount model and if the company is not currently profitable but is expected to become profitable in the future, then the forecasting horizon should be long enough to incorporate the profitable period (during which the company will be able to pay out dividends).

Longer-term projections typically provide a better reflection of normalized earnings than short-term forecasts. **Normalized earnings** reflect mid-cycle earnings for a company after excluding any unusual or temporary factors that (favorably or unfavorably) affect profitability.

LOS 26l: Explain an analyst's choices in developing projections beyond the short-term forecast horizon. Vol 4, pp 170–172

As discussed in the previous section, extending the forecasting horizon beyond the short-term allows the analyst to derive a “normalized” earnings estimate for the company. Long-term forecasting is required for two aspects of the valuation process: making revenue forecasts and determining terminal value. Revenue projection methods have been covered extensively earlier in the reading, so our focus here is on determining terminal value.

Once the analyst has completed the forecasting exercise (over the explicit forecast period), she goes about deriving a terminal value estimate based on those long-term projections. It is important to consider the following when deriving a terminal value estimate:

- If **historical multiples** are used to estimate terminal value, the implicit assumption is that the past is a good reflection of future expectations regarding growth and required returns. Typically, analysts use a historical average multiple as the basis for a target multiple to be applied in the terminal value calculation. If the future growth and/or profitability of the company is likely to be significantly different from the historical average, a premium/discount should be applied to the historical multiple to reflect those differences.

- If the **discounted cash flow (DCF)** approach is used to estimate terminal value, the analyst should first determine whether the terminal year free cash flow forecast actually reflects normalized (mid-cycle) cash flows. If it does not, then an adjustment to reflect the normalized amount must be performed. Most DCF models rely on some kind of perpetuity calculation, where cash flows from the last year are projected to grow at a constant rate going forward. Since the terminal value typically represents a relatively large proportion of overall value, it is extremely important that final year cash flows are normalized. If, for example, the final year cash flow forecast for a cyclical company is based on a “boom” year, the result would be an inflated valuation.

Second, the analyst should also consider how the future long-term growth rate may be different from the historical growth rate. Some mature companies (e.g., Apple) may be able to sustain relatively high growth rates in the long term through product innovation and market expansion, while others (e.g., Kodak) may experience an unexpected decline in their business as a result from technological innovation.

- A final challenge for analysts in long-term forecasting is anticipating **inflection points**, where the future will significantly differ from the recent past. Such abrupt changes can come from:
 - Economic disruption (e.g., the 2008 financial crisis).
 - Changes in business cycle stage.
 - Government regulation.
 - Technological advances.

LOS 26m: Demonstrate the development of a sales-based pro forma company model. Vol 4, pp 172–183

Building a Model

1. Collect industry information. Conduct a Porter’s five forces analysis on the industry to determine the threat of substitutes, rivalry, bargaining power of suppliers, bargaining power of buyers, and threat of new entrants. If the company operates in multiple industries, then obtain information for all significant business segments.
2. Collect company information including segment-wise financial information.
3. Construct the pro forma financial income statement.
 - a. Forecast revenues for each individual segment using a top-down, bottom-up, or hybrid approach.
 - Under the top-down approach, any of the market growth plus market share, trend growth rate, or growth relative to GDP growth approaches can be used.
 - In the bottom-up approach, sales revenues are forecast based on assumptions of future prices, volumes, and exchange rates.
 - b. Estimate COGS. COGS can be estimated based on a percentage of sales, or on a more detailed method which examines the company’s business strategy and competitive environment.
 - c. Estimate SG&A. SG&A can be assumed to be fixed, or be related to sales.
 - d. Estimate financing costs. Financing costs require making assumptions regarding future interest rates, debt levels, capital structure, and capital expenditure requirements.
 - e. Estimate income tax expense. This is based on the historical effective tax rate (with adjustments if necessary).
 - f. Estimate cash taxes. This requires consideration of changes in deferred tax items.
4. Construct the pro forma balance sheet.

- a. Most balance sheet accounts (retained earnings, accounts receivable, accounts payable, and inventory) are related to the income statement.
 - b. Net PP&E is estimated based on depreciation estimates and capital expenditures (for maintenance and growth), which are typically estimated based on sales.
 - c. Liability and capital accounts are influenced by the target capital structure, dividend payments, share repurchases, and debt redemptions/issues.
5. Construct the pro forma cash flow statement. Most of the inputs for the pro forma cash flow statement (e.g., operating profit, capital expenditures, working capital estimates, and capital structure changes) are estimated while constructing the pro forma income statement and balance sheet.

Analysts must use sensitivity analysis or scenario analysis to come up with a range of potential outcomes and assign probabilities to each outcome when appropriate.

READING 27: DISCOUNTED DIVIDEND VALUATION

LESSON 1: PRESENT VALUE MODELS

LOS 27a: Compare dividends, free cash flow, and residual income as inputs to discounted cash flow models, and identify investment situations for which each measure is suitable. Vol 4, pp 199–207

Application of DCF analysis requires the following steps:

- Selecting the specific definition of cash flow;
- Forecasting the cash flows;
- Choosing a discount rate methodology;
- Estimating the discount rate;
- Calculating the present value of the forecasted cash flows.

The three most widely-used definitions of future cash flows are dividends, free cash flow (including FCFF and FCFE), and residual income. Each class of DCF models has its strengths and weaknesses. In the following section we introduce you to each of the three models. The rest of this reading is spent on the dividend discount model (DDM). Free cash flow and residual income models are covered in detail in subsequent readings.

The Dividend Discount Model

In the dividend discount model, cash flows are defined as dividends and the discount rate applied is the cost of equity.

Advantages

- The definition of dividends as cash flow received by investors on their equity investments is theoretically justified. The model also accounts for undistributed (reinvested) earnings as they provide the basis for future dividend increases, which will eventually flow through to investors. Even when the investor sells her shares, she will receive (from the buyer) the present value of all expected future dividends.
- Dividends are less volatile than earnings, which makes DDM values less sensitive to short-term fluctuations and more reflective of long-term company value.

Disadvantages/Important Considerations

- It is difficult to apply the DDM to companies that do not pay dividends. Companies may not pay dividends if (1) they are making losses or (2) if they have a plenty of lucrative investment opportunities that they want to capitalize on. Eventually, however, these companies will be expected to pay dividends (either when they liquidate or when they mature and have fewer profitable investment opportunities) but dividend forecasts for such companies can be very inaccurate because of the uncertainty regarding future earnings, growth rates, and payout ratios.

- The DDM takes the approach of a minority shareholder who does not have any control over the timing and amount of dividend payments.
 - If the dividend policy adopted by the controlling interest bears an understandable relationship with underlying profitability and value creation, the use of the DDM is appropriate for estimating the value of a stock.
 - If dividend policy is not related to the firm's ability to create value, dividends are not an appropriate measure of expected future cash flow to shareholders.

To summarize, use of the DDM is appropriate when:

- The company has a history of paying out dividends.
- The company has an established dividend policy where dividends are related to earnings.
- The perspective is that of a non-controlling (minority) interest.

The Free Cash Flow Model

There are two primary definitions of free cash flow:

Free cash flow to the firm (FCFF) is the cash flow available to all the firm's investors (bondholders and shareholders) after operational and reinvestment needs have been satisfied.

- It is calculated as cash flow generated from operations less capital expenditures (including investments in working capital) required to maintain the company as a going concern.
- FCFF is a pre-debt cash flow concept.
- The value of the firm is calculated as forecasted FCFF discounted at the firm's cost of capital (WACC).
- The value of equity is then calculated as the value of the firm minus the market value of debt.
- The FCFF model is relatively easier to apply (than the FCFE model) when the company's capital structure is expected to undergo significant change in the future.

Free cash flow to equity (FCFE) is the cash flow available to the firm's common shareholders after operational and reinvestment needs have been met, and all payments to bondholders (interest and net repayments) have been made.

- FCFE is a post-debt cash flow concept.
- The value of equity is calculated as forecasted FCFE discounted at the cost of equity.

Advantages

- The free cash flow approach can be used for most companies, even those that do not currently pay dividends.
- Even if a company pays dividends, the free cash flow approach may be preferred to the DDM approach if dividends substantially fall short of or exceed FCFE.
- It is more appropriate if the perspective is that of a controlling interest as FCFE reflects cash flow that can be redeployed without affecting the company's capital investments.
- A minority interest may also use the free cash flow approach when there is a chance that the company will be acquired, in which case the stock price should reflect the price that the acquirer (prospective controlling interest) will pay.

Disadvantage

- Free cash flows may be negative (e.g., when the company must continue to invest heavily in fixed capital). In such a case, the forecasting horizon would have to be long enough so that it incorporates the point where free cash flows turn positive. Forecasting so far out into the future obviously entails greater uncertainty, which makes the model less reliable.

To summarize, use of free cash flow models is appropriate when:

- The firm does not have a history of paying dividends.
- The firm does pay dividends, but they significantly exceed or fall short of FCFE.
- The firm's free cash flow is related to its profitability.
- The investor takes a control perspective.

Free cash flow models are discussed in more detail in a later reading.

The Residual Income Model

Residual income is calculated as the excess of a firm's earnings for a given period over its investors' required return on beginning-of-period investment. The residual income model estimates the value of a company as the sum of its book value and the present value of expected future residual earnings, where residual earnings refer to earnings in excess of the opportunity cost to suppliers of capital.

Advantages

- Residual income can always be calculated, so the residual income model can be used to value both dividend-paying and non-dividend-paying companies.
- It can also be used for companies that are expected to exhibit negative free cash flows over the foreseeable future.

Disadvantages

- Application of the residual income model requires a detailed knowledge of accrual accounting.
- If the quality of accounting disclosures is not good enough, the residual income model can yield erroneous results.

To summarize, use of the residual income model is appropriate when:

- The firm does not have a history of paying dividends.
- The firm's free cash flows are expected to be negative for the foreseeable future.
- The firm's financial reporting and accounting disclosures are of high quality.

Residual income models are discussed in more detail in a later reading.

LESSON 2: THE DIVIDEND DISCOUNT MODEL

LOS 27b: Calculate and interpret the value of a common stock using the dividend discount model (DDM) for single and multiple holding periods.
Vol 4, pp 207–210

THE DIVIDEND DISCOUNT MODEL

Within the dividend discount model, there are a variety of implementations that correspond to different investment horizons, and to the different ways that the future stream of dividends can be modeled.

One-Period DDM

If the investor's holding period is just one year, the value of the stock today equals the present value of the dividends that will be received over the year, plus the present value of the price that the stock is expected to sell for at the end of the year.

$$V_0 = \frac{D_1}{(1+r)^1} + \frac{P_1}{(1+r)^1} = \frac{D_1 + P_1}{(1+r)^1}$$

Where:

V_0 = The value of the stock today ($t = 0$)

P_1 = Expected price of the stock after one year ($t = 1$)

D_1 = Expected dividend for Year 1, assuming it will be paid at the end of Year 1 ($t = 1$)

r = Required return on the stock

Example 2-1: Calculating an Investment's Value Based on the One-Period DDM

Madeline purchases Zemco International's stock for \$32.50. She expects the company to pay a dividend of \$1.75 per share at the end of the year and to be able to sell the stock for \$35.25 at the end of the year. Given a required rate of return of 9%, calculate the value of the stock today and comment on whether it is undervalued, fairly valued, or overvalued.

Solution:

$$V_0 = \frac{D_1 + P_1}{(1+r)^1}$$

$$V_0 = \frac{1.75 + 35.25}{(1+0.09)^1} = \$33.94$$

Based on the one-period DDM, the stock's intrinsic value is \$33.94. Since the current market price of the stock (\$32.50) is less than its intrinsic value (\$33.94), the stock is undervalued based on Madeline's expectations.

Multiple-Period DDM

We apply the same discounting principles for valuing common stock over multiple holding periods. In order to estimate the intrinsic value of the stock, we first estimate the dividends that will be received every year that the stock is held, and the price that the stock will sell for at the end of the holding period. Then, we simply discount these expected cash flows at the cost of equity (required return) and add up their present values.

$$V_0 = \frac{D_1}{(1+r)^1} + \dots + \frac{D_n}{(1+r)^n} + \frac{P_n}{(1+r)^n}$$

$$V_0 = \sum_{t=1}^n \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$$

Example 2-2: Two-Period DDM

Vijay wants to invest in the stock of Glen Co. at its current price of \$51.50. The company is expected to pay dividends of \$1.80 and \$2.10 at the end of each of the next 2 years, respectively. Vijay expects the company's share price at the end of the second year to be \$54.20. Given a required rate of return of 8%, calculate the value of the stock today and comment on whether it is undervalued, fairly valued, or overvalued.

Solution:

$$\begin{aligned} V_0 &= \frac{D_1}{(1+r)^1} + \frac{D_2 + P_2}{(1+r)^2} \\ V_0 &= \frac{1.80}{(1+0.08)^1} + \frac{2.10 + 54.20}{(1+0.08)^2} = \$49.93 \end{aligned}$$

Based on the two-period DDM, the stock's value should be \$49.93. Since the current market price of the stock (\$51.50) is greater than its intrinsic value (\$49.93), the stock is currently overvalued based on Vijay's expectations.

Example 2-3: Four-Period DDM

Pancom Ltd. is expected to pay dividends of \$1.24, \$1.85, \$2.18, and \$2.22 at the end of each of the next 4 years respectively. Analysts expect the stock to trade at \$45.50 after 4 years. Given a required rate of return of 8%, calculate the value of the Pancom's stock today.

Solution:

$$V_0 = \frac{1.24}{(1.08)^1} + \frac{1.85}{(1.08)^2} + \frac{2.18}{(1.08)^3} + \frac{2.22 + 45.50}{(1.08)^4} = \$39.54$$

TI BA II Plus calculator key strokes:

[CF] [2ND] [CE/C]
 [ENTER] [↓]
 1.24 [ENTER] [↓] [↓]
 1.85 [ENTER] [↓] [↓]
 2.18 [ENTER] [↓] [↓]
 47.72 [ENTER]
 [NPV] 8 [ENTER] [↓] [CPT]
 NPV = **\$39.54**

Before moving on, we must highlight that in the finite (that you have just seen) and infinite (that you will see in the next section) dividend discount models, we are still calculating the value of a stock as the present value of **all** its expected future dividends (into the indefinite future). With a finite investment horizon (as in the Examples 2-1, 2-2, and 2-3) the stock value depends directly on dividends to be received during the holding period, and indirectly on dividends paid out after the stock is sold (as the expected selling price at the end of the holding period represents the present value of those future dividends).

Therefore, the expression for calculating the value of a share of stock can be stated as:

$$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$$

Forecasting dividends into infinity with any acceptable degree of accuracy is obviously very difficult. Therefore, analysts use two broad approaches, each of which has several variations:

1. Forecasting future dividends by classifying the dividend stream into one of several stylized growth patterns. The most commonly-used patterns are:
 - a. Constant growth forever (the Gordon growth model)
 - b. Two distinct stages of growth (the two-stage growth model and the H-model)
 - c. Three distinct stages of growth (three-stage models)
 The DDM value of the stock is calculated as the sum of the discounted values of future dividends.
2. Forecasting a finite number of dividends (based on pro forma financial statements) up to a terminal point. The number of dividends forecasted depends on the predictability (also known as visibility) of the company's earnings. After this period (from the terminal point onwards), the analyst may:
 - a. Forecast future dividends by assigning the remaining dividends to a stylized growth pattern; or
 - b. Estimate the share price at the terminal point (e.g., based on multiples).
 The DDM value of the stock is calculated as the sum of the discounted dividends and the present value of the forecasted price (if any).

LESSON 3: THE GORDON GROWTH MODEL, PRESENT VALUE OF GROWTH OPPORTUNITIES (PVGO), AND P/E RATIOS

LOS 27c: Calculate the value of a common stock using the Gordon growth model and explain the model's underlying assumptions. Vol 4, pp 210–219

The Gordon Growth Model

The Gordon growth model assumes that the company will continue to pay dividends for an infinite number of periods, and those dividends will grow indefinitely at a constant rate (g). Under the Gordon growth model, the intrinsic value of a stock is calculated as:

$$V_0 = \frac{D_0(1+g)^1}{(1+r)^1} + \frac{D_0(1+g)^2}{(1+r)^2} + \dots + \frac{D_0(1+g)^n}{(1+r)^n}$$

$$V_0 = \frac{D_0(1+g)}{(r-g)}, \text{ or } V_0 = \frac{D_1}{(r-g)}$$

The values obtained from the Gordon growth model are very sensitive to the estimates of required rate of return (r) and expected dividend growth rate (g). The relation between r and g is critical:

- As the difference between r and g increases, the intrinsic value of the stock falls.
- As the difference narrows, the intrinsic value of the stock rises.
- Small changes in either r or g can cause large changes in the value of the stock.

Note that in order for the Gordon growth model to be valid, the constant growth rate (g) cannot equal or exceed the required return on equity (r). Only if the required return is greater than the growth rate will the Gordon growth model yield a finite, positive value for the intrinsic value of a stock. Therefore, analysts must always check whether the Gordon growth model can actually be applied to a company given its expected growth rate. If a company's earnings growth rate is higher than the growth rate of nominal GDP in the economy, it is highly unlikely that such a high rate of growth is sustainable into perpetuity. Given such a scenario, use of a multistage DDM (described in the next section) would be more appropriate (rather than using just the Gordon growth model) in which the final stage exhibits a growth rate that is comparable to the growth rate of the overall economy.

Example 3-1: The Gordon Growth Model

Susan is trying to estimate Oasis International's stock price. The company recently paid a dividend of \$1.95, which is expected to grow at a constant rate of 5.5% forever. Given a required rate of return of 11%, calculate the intrinsic value of the stock.

Solution:

$$\begin{aligned} V_0 &= \frac{D_1}{(r-g)} \\ V_0 &= \frac{(1.95)(1.055)}{0.11 - 0.055} \\ V_0 &= \$37.40 \end{aligned}$$

Note that just because a company belongs to an industry that is expected to grow indefinitely at a stable rate comparable to the long run economic growth rate, it does not mean that the Gordon growth model can be applied to value the company. The company's individual characteristics should be examined and its individual growth rate forecasted based on its business strategy. For example, a company that plans to acquire aggressively may (albeit temporarily) be able to grow at a relatively high rate in a stable, unregulated industry.

Further, aside from valuing individual stocks, the Gordon growth model is often used to value equity indices in developed markets as the overall market index generally moves in line with average economic growth rates in these countries.

The Gordon growth model can also be used to calculate the value of **fixed-rate perpetual preferred stock** (described under LOS 27g), and stocks with a declining dividend. Also note that the DDM approach can be used to value a company even if it engages in share repurchases as long as the effect of expected repurchases on the per-share growth rate in dividends is taken into account.

Example 3-2: Gordon Growth Model with Negative Growth

Jessica is considering the purchase of Alton Mining Corp's stock, which is currently trading at \$12.50 per share. The stock is expected to pay a dividend of \$1.80 next year. However, a poor industry outlook has meant that dividends are expected to decline at a rate of 8% forever. Given that the required rate of return on Alton's stock is 11%, determine whether the stock is undervalued, fairly valued, or overvalued.

Solution:

$$V_0 = 1.80/[0.11 - (-0.08)] = \$9.47$$

The stock's market price (\$12.5) is greater than its intrinsic value (\$9.47), which implies that it is overvalued.

Finally, note that the Gordon growth model implies a constant payout ratio. Therefore, the constant growth rate (g) reflects the growth in dividends and earnings. Further, the growth rate also reflects the expected growth in the company's stock price (known as **the capital gains yield** or **the rate of price appreciation**). Since dividends and the stock price are growing at the same rate, the dividend yield will also remain unchanged over time.

LOS 27d: Calculate and interpret the implied growth rate of dividends using the Gordon growth model and current stock price. Vol 4, pp 219–220

Differences between the intrinsic value of a stock (based on the Gordon growth model) and the market price of the stock can be the result of different assumptions regarding (1) growth rates and/or (2) required return on equity. An analyst can use the implied dividend growth rate and the implied required return on equity to evaluate their reasonableness in light of her expectations of the stock. She can then examine the differences between implied values and her expectations to determine whether the stock is fairly priced. In Example 3-3, we illustrate how the implied growth rate is calculated.

Example 3-3: Calculating the Implied Growth Rate Using the Gordon Growth Model

Beta Inc's stock is currently trading at \$28.50 per share. The company recently paid a dividend of \$2.15. Given a required rate of return of 10.5%, calculate the implied growth rate.

Solution:

$$V_0 = \frac{D_0(1 + g)}{(r - g)}$$

$$28.50 = 2.15 (1 + g)/(0.105 - g)$$

$$2.9925 - 28.5g = 2.15 + 2.15g$$

$$g = 2.75\%$$

If analysts expect the company's actual growth rate to be greater (less) than 2.75%, the stock is undervalued (overvalued).

LOS 27e: Calculate and interpret the present value of growth opportunities (PVGO) and the component of the leading price-to-earnings ratio (P/E) related to PVGO. Vol 4, pp 220–222

Present Value of Growth Opportunities

The impact of a company's growth in earnings on the value of its stock depends on whether returns on investments are in excess of, equal to, or less than the opportunity cost of funds. For example, consider a company that has earned \$1. The required return on equity is 15% and the company must decide whether to reinvest this \$1 in the business for one year and distribute the ending value as dividend after one year, or to pay out current earnings as dividends right now.

- If the company can only reinvest its earnings at 15% (cost of equity), the present value of the investment will be $\$1.15/1.15 = \1 . Since the NPV of the investment is 0, the company may as well distribute its earnings as dividends right now.
- However, if the company is able to reinvest its earnings at 25%, the present value of the investment will be $\$1.25/1.15 = \1.09 . Since the NPV of the investment is positive (\$0.09), the company should reinvest its earnings.

Note that any investment that has a positive return lower than the cost of equity will increase EPS, but will not maximize shareholder wealth as it would be a negative-NPV investment. Reinvestment of earnings only benefits shareholders if the return on investments is greater than the opportunity cost of funds.

Note that E_1 represents earnings next year. We assume that the company has assets in place to support growth for the next year ($t = 1$) compared to the prior year ($t = 0$). Therefore, E_1 represents earnings for the first year or no growth, and it is expected that the company's earnings will remain at this level.

The value of a stock can therefore be broken down into two components:

1. The value of the stock without the earnings reinvestment, known as **no-growth value per share**. This term is used for a company without any positive-NPV investment opportunities. Such a company should theoretically pay out all its earnings as dividends. With a dividend payout ratio of 100% and zero growth, earnings would be the same each year (earnings = ROE × Equity). Therefore, the no-growth value per share equals the present value of a perpetuity of an amount, E_1 , with a capitalization rate equal to the cost of equity, r .
2. **The present value of growth opportunities (PVGO).** The present value of growth opportunities is determined by (1) the company's options or opportunities to invest and (2) the company's available real options and managerial flexibility.

$$V_0 = \frac{E_1}{r} + PVGO$$

Example 3-4: Calculating PVGO

An analyst gathered the following information regarding Alpha Corp:

Expected EPS for 2010 = \$3.34

Retention rate = 0.4

Required return = 12%

Current stock price = \$40

Given that dividends are paid out at the end of the year and are expected to grow at 6% forever, calculate the following:

1. Intrinsic value of the company's stock at end of 2009.
2. Present value of growth opportunities (PVGO).
3. The fraction of the company's leading P/E ratio that comes from PVGO.

Solution:

$$1. D_{2010} = 3.34 \times (1 - 0.4) = \$2.00$$

$$V_{2009} = 2.00 / (0.12 - 0.06) = \$33.40$$

$$2. \text{No-growth value per share} = E_1/r = 3.34/0.12 = \$27.83$$

$$\text{PVGO} = \text{Market price} - \text{No-growth value per share} = 40 - 27.83 = \$12.17$$

$$3. \text{Leading P/E ratio (firm)} = 40/3.34 = 11.98$$

$$\text{P/E PVGO} = 12.17/3.34 = 3.64$$

$$\text{Fraction of the company's leading P/E ratio attributable to growth opportunities} \\ = 3.64/11.98 = 30.4\%$$

Negative PVGO

It is possible for a stock's current market price to imply a negative PVGO. This can be explained in the following ways:

- There may be an expectation that management's current competitive and investment strategy will destroy value.
- The stock may be severely undervalued (possibly as a result of a significant recent market crash).
- The estimate of the no-growth value may be too high (i.e., the earnings estimate is too high and/or required return estimate is too low).

LOS 27f: Calculate and interpret the justified leading and trailing P/Es using the Gordon growth model. Vol 4, pp 222–224

The P/E ratio is one of the most widely-used valuation multiples in the investment industry. The Gordon growth model can be used to develop an expression for the P/E ratio in terms of company fundamentals. A P/E ratio determined in this manner is known as a **justified** (based on fundamentals) P/E ratio.

The **leading (or forward looking) P/E ratio** is calculated as the price of the stock divided by expected earnings over the next 12 months (or over the next fiscal year). The **justified leading P/E multiple** based on the Gordon growth model is developed by dividing both sides of the equation for intrinsic value (V_0) by next year's earnings (E_1).

$$\text{Justified leading P/E ratio} = \frac{P_0}{E_1} = \frac{D_1/E_1}{r-g} = \frac{(1-b)}{r-g}$$

D_1/E_1 equals the dividend payout ratio, which can also be expressed as $(1 - b)$. b = retention ratio.

The **trailing P/E ratio** is calculated as the price of the stock divided by earnings over the last 12 months. The **justified trailing P/E multiple** based on the Gordon growth model is developed by dividing both sides of the equation for intrinsic value (V_0) by last year's earnings (E_0).

$$\text{Justified trailing P/E} = \frac{P_0}{E_0} = \frac{D_1/E_0}{r-g} = \frac{D_0(1+g)/E_0}{r-g} = \frac{(1-b)(1+g)}{r-g}$$

D_0/E_0 equals the dividend payout ratio, which can also be expressed as $(1 - b)$.

Note that if earnings are expected to grow by a factor of g , next year's earnings (E_1) will be greater than last year's earnings (E_0) by a factor of g , and the justified trailing P/E ratio will be greater than the justified leading P/E ratio by a factor of $(1 + g)$.

It would be more accurate to express the justified ratios as V_0/E_0 or V_0/E_1 because the "price" in the numerator is actually the intrinsic value estimate based on the Gordon growth model.

Example 3-5: Calculating Justified Leading and Trailing P/E

An analyst gathered the following information regarding Jupiter Inc.

Current market price = \$60

Current year EPS = \$5

Current year dividend per share = \$2.25

Required rate of return on equity = 10%

Given that dividends are expected to grow at a rate of 5.5% indefinitely, calculate the following:

1. Justified trailing P/E.
2. Justified leading P/E.
3. Comment on whether the company is currently undervalued, fairly valued, or overvalued.

Solution:

$$1. \text{ Justified trailing P/E} = \frac{(1 - b)(1 + g)}{r - g}$$

$$\text{Payout ratio} = \frac{2.25}{5} = 0.45$$

$$\text{Justified trailing P/E} = \frac{(0.45)(1.055)}{0.1 - 0.055} = 10.55$$

$$2. \text{ Justified leading P/E} = \frac{(1 - b)}{r - g}$$

$$\text{Justified leading P/E} = \frac{0.45}{(0.1 - 0.055)} = 10$$

3. The company's trailing P/E based on the market price ($60/5 = 12$) is greater than its justified trailing P/E (10.55). Therefore, the stock is currently overvalued.

LOS 27g: Calculate the value of noncallable fixed-rate perpetual preferred stock. Vol 4, pp 216–217

We briefly mentioned earlier that the Gordon growth model can also be used to value noncallable fixed-rate perpetual preferred stock. These securities:

- Are not callable;
- Have a specified fixed dividend rate;
- Have a claim on the company's earnings that is senior to the claim of common shareholders;
- Do not have a maturity date.

Recall the Gordon growth model equation:

$$V_0 = \frac{D_1}{(r - g)}$$

Since dividends on these securities are fixed, g equals 0, and their value can be computed as:

$$V_0 = \frac{D}{r}$$

Example 3-6: Calculating the Value of Fixed-Rate Perpetual Preferred Stock

Elite Corp. has \$100 par fixed-rate perpetual preferred stock outstanding with a dividend of 8%. Given a required rate of return of 10.5%, calculate the current value of the security.

Solution:

$$\text{Dividend} = 0.08 \times 100 = \$8$$

$$\text{Value of preferred stock} = 8/0.105 = \$76.19$$

LOS 27h: Describe strengths and limitations of the Gordon growth model and justify its selection to value a company's common shares.

Vol 4, pp 210–225

Strengths

- The model is applicable to stable, mature, dividend-paying companies.
- It is applicable to broad developed market equity indices.
- It is very simple and easy to implement.
- It can be used to determine the growth rate, cost of equity, and the present value of growth opportunities implied by a security's current market price.
- As you will see in the next section of this reading, it is used in multistage DDMs to compute company value in the mature phase.

Limitations

- Valuations are very sensitive to estimates of the required return on equity and the growth rate.
- The model cannot be applied to non-dividend-paying stocks.
- It cannot be applied to companies whose growth patterns are not expected to remain constant indefinitely.

LESSON 4: MULTISTAGE DIVIDEND DISCOUNT MODELS AND TERMINAL VALUE

LOS 27k: Describe terminal value and explain alternative approaches to determining the terminal value in a DDM. Vol 4, pp 228–229

When valuing stocks of companies we usually assume that the growth rate will eventually come down to a constant, stable rate comparable to the long run growth rate of the overall economy. The value estimated at the end of the high-growth stages, based on the assumption of a constant future growth rate, is referred to as the **terminal value of the stock** (also known as **continuing value**).

The terminal value of a stock may be calculated by either:

- Using the Gordon growth model; or
- Applying a multiple (e.g., P/E) to a forecasted value of a fundamental (e.g., earnings).

Example 4-1: Estimating Terminal Value

Ray Sorvino, CFA, is analyzing the stock of Mercury Inc. He expects the company's current annual dividend of \$0.50 to grow at a rate of 13% for the next 6 years and then stabilize at a long-term growth rate of 5%. The company's trailing P/E ratio at the end of the initial high-growth period is expected to be 8, and its retention rate is expected to be 30%. Given a required rate of return of 12%, calculate the terminal value of the stock at the end of Year 6 based on the:

1. Gordon growth model.
2. Earnings multiple approach.

Solution:

1. Terminal value at the end of Year 6 based on the Gordon growth model:

$$P_6 = \frac{D_6(1 + g_c)}{(r - g_c)} = \frac{(0.50 \times 1.13^6)(1 + 0.05)}{0.12 - 0.05} = \$15.61$$

2. Terminal value at the end of Year 6 based on the trailing P/E multiple:

First we compute the Year 6 dividend:

$$D_6 = 0.50 \times 1.13^6 = \$1.041$$

Given that the company's retention rate equals 30% and that the Year 6 dividend equals \$1.041, we can compute Year 6 earnings as:

$$\begin{aligned} D &= E \times (1 - RR) \\ 1.041 &= E_6 \times (1 - 0.3) \\ E_6 &= \$1.49 \end{aligned}$$

Finally, we apply the trailing P/E multiple of 8 to compute the value of the stock based on its Year 6 earnings of \$1.49:

$$P_6 = \frac{P_6}{E_6} \times E_6 = 8 \times 1.49 = \$11.90$$

LOS 27i: Explain the assumptions and justify the selection of the two-stage DDM, the H-model, the three-stage DDM, or spreadsheet modeling to value a company's common shares. Vol 4, pp 226–239

LOS 27j: Explain the growth phase, transitional phase, and maturity phase of a business. Vol 4, pp 232–237

LOS 27l: Calculate and interpret the value of common shares using the two-stage DDM, the H-model, and the three-stage DDM. Vol 4, pp 225–240

MULTISTAGE DIVIDEND DISCOUNT MODELS

It is virtually impossible to accurately forecast each and every individual dividend payment into the indefinite future. At the same time, it is impractical to assume a constant dividend growth rate for an infinite number of periods (as required by the Gordon growth model) for valuing companies. Therefore, analysts usually use multistage dividend discount models to value companies. They assume that growth may fall into three stages:

- The **growth phase** is characterized by abnormally high growth in earnings, high profit margins, low or zero dividend payout ratios, and negative free cash flow to equity due to heavy reinvestment requirements to finance the company's expansion.
- The **transition phase** is characterized by relatively lower (but still above-average) earnings growth, lower profit margins and sales growth, declining capital requirements, positive free cash flow, and increasing dividend payout ratios.
- In the **mature phase**, earnings growth rates, dividend payout ratios, and return on equity stabilize at sustainable levels. The Gordon growth model is appropriate for valuing a company in this phase.

Two-Stage Dividend Discount Model

There are two broad versions of the two-stage DDM: the **general two-stage model** and the **H-model**.

The General Two-Stage Dividend Discount Model

In the general two-stage model, the first stage represents a period of abnormal growth (e.g., 15%), while the second stage represents a period of mature, sustainable growth (e.g., 5%). The transition from abnormal growth to mature growth is quite abrupt. For example, use of the general two-stage dividend discount model would be appropriate for a company that enjoys patent protection (which enables it to earn abnormal profits) for a number of years. Once the patent expires, a flurry of competition would enter the market to reduce growth to a lower, more sustainable level.

$$V_0 = \sum_{t=1}^n \frac{D_0(1 + g_S)^t}{(1 + r)^t} + \frac{D_0(1 + g_S)^n(1 + g_L)}{(1 + r)^n(r - g_L)}$$

g_S = Short-term supernormal growth rate

g_L = Long-term sustainable growth rate

r = required return

n = Length of the supernormal growth period

Example 4-2: Calculating Value Based on the General Two-Stage DDM

Atlas Motors recently paid a dividend of \$2.50. Analysts forecast that the company's dividend will grow at a rate of 12% for the next 4 years after which the dividend growth rate will stabilize at 5% into perpetuity. Given a required rate of return of 13%, calculate the value of the company's stock today.

Solution:

First we determine dividend payments each year during the supernormal growth period:

$$D_1 = 2.50 \times 1.12 = \$2.80$$

$$D_2 = 2.50 \times 1.12^2 = \$3.136$$

$$D_3 = 2.50 \times 1.12^3 = \$3.512$$

$$D_4 = 2.50 \times 1.12^4 = \$3.934$$

To determine terminal value (at the end of Year 4) we also need to calculate the dividend payment for the first year of the constant growth period (Year 5):

$$D_5 = 3.934 \times 1.05 = \$4.13$$

We then calculate the terminal value (at the end of year 4).

$$V_4 = \frac{D_5}{(r - g)}$$

$$V_4 = \frac{4.13}{(0.13 - 0.05)} = \$51.631$$

Finally, we calculate the value of the stock today as the sum of the present values of the dividends received each year during the supernormal growth phase and the present value of the terminal value.

$$NPV = \frac{2.8}{(1.13)^1} + \frac{3.136}{(1.13)^2} + \frac{3.512}{(1.13)^3} + \frac{3.934 + 51.631}{(1.13)^4} = \$41.45$$

TI BA II Plus calculator keystrokes:

[CF] [2ND] [CE/C]
 [ENTER] [↓]
 2.8 [ENTER] [↓] [↓]
 3.136 [ENTER] [↓] [↓]
 3.512 [ENTER] [↓] [↓]
 55.565 [ENTER]
 [NPV] 13 [ENTER] [↓] [CPT]
 NPV = **\$41.45**

Notice that 76.4% (=31.67/41.45) of the total value of the stock comes from the present value of the terminal value. This makes the valuation more sensitive to the growth rate and required rate of return assumptions in the Gordon growth model.

Note that in this example we have used a constant required rate of return on equity for both stages of growth. Analysts sometimes use different discount rates for different phases of growth. Also note that the terminal value can be determined based on the Gordon growth model (as is the case in Example 4-2) or based on a multiples-based approach.

Valuing a Non-Dividend-Paying Stock

The two-stage DDM can also be used to value a non-dividend paying stock. As mentioned earlier in this reading, a company that is currently not paying any dividends would still be expected to pay dividends in the future (either when it liquidates or when growth slows down).

Example 4-3: Valuing a Non-Dividend Paying Stock

Jemco Electronics has recently commenced operations and is not expected to pay any dividends for the next 3 years. The company's EPS currently stands at \$3.15 and is expected to grow at 18% per annum over the next 3 years. Beginning in Year 4, the company's growth rate is expected to fall to 6% and remain at that level into perpetuity. From Year 4 onwards Jemco is also expected to distribute 30% of its earnings as dividends. Given a required rate of return of 10%, calculate the value of Jemco's stock today.

Solution:

We first need to calculate the first dividend of the constant growth period:

$$\begin{aligned}E_3 &= 3.15 \times 1.18^3 = \$5.176 \\E_4 &= 5.176 \times 1.06 = \$5.486 \\D_4 &= 5.486 \times 0.3 = \$1.646\end{aligned}$$

We then calculate the terminal value of the stock (at the end of Year 3) using the Gordon growth model.

$$V_3 = 1.646/(0.1 - 0.06) = \$41.146$$

Finally, we compute the present value of the terminal value.

$$V_0 = 41.146/1.1^3 = \$30.91$$

The H-Model

In the H-model, in the first stage, the growth rate declines linearly from supernormal growth (e.g., 15%) to mature growth (e.g., 5%), so the transition from supernormal growth to mature growth is relatively smooth. In the second stage, growth remains at the constant mature growth level (e.g., 5%). For example, it would be appropriate to use the H-model to value a company that currently enjoys high profit margins, but these margins are slowly coming under pressure from increasing competition in the industry. As a result, the company's dividend growth rate will fall each year for a number of years before levelling off at a lower, sustainable level.

Under the H-Model, the value of the dividend stream is calculated as:

$$V_0 = \frac{D_0(1 + g_L)}{r - g_L} + \frac{D_0 H(g_S - g_L)}{r - g_L}$$

Where:

g_S = Short-term high growth rate

g_L = Long-term sustainable growth rate

r = required return

H = Half-life = 0.5 times the length of the high growth period

Note that the longer the high growth period (the larger the value of H , which is one-half the length of the high growth period), the larger the extra growth in the high growth period, and the higher the value of the stock.

Example 4-4: Calculating Value Based on the H-Model

Consider the following information relating to Drillment Inc.

- Drillment's current per-share dividend is \$1.45.
 - Next year's expected dividend growth rate of 25% is expected to decline linearly over the following 9 years to a long-term constant growth rate of 7%.
 - Drillment's required rate of return on equity as 11%.
1. Using the H-Model, calculate the value of Drillment stock today.
 2. Calculate the value of Drillment stock if its normal growth period was to begin immediately.

Solution:

$$\begin{aligned} 1. \quad V_0 &= \frac{(1.45)(1.07)}{0.11 - 0.07} + \frac{[(1.45)(9/2)(0.25 - 0.07)]}{0.11 - 0.07} \\ &= \frac{1.5515}{0.04} + \frac{1.1745}{0.04} = 38.79 + 29.36 = \$68.15 \end{aligned}$$

2. If normal growth were to commence immediately, the value of the stock would equal the value of the first component of the H-model estimate, i.e., \$38.79. The extraordinary growth adds \$29.36 to Drillment's value.

Note that the H-model only provides an approximation of the value that would be obtained were each dividend payment during the high growth phase calculated and discounted individually. The H-model estimate provides a closer approximation for shorter high growth periods and smaller differences between the growth rates in the high and mature growth periods.

Three-Stage Dividend Discount Models

There are two versions of the three-stage DDM. The difference between the two lies in the modeling of the second stage.

In the first version, the company is assumed to have three stages of growth, where the growth rate during each stage is different but constant. For example, Stage 1 may have 25% growth for 3 years, Stage 2 may have 15% growth for 5 years, and Stage 3 could have 5% growth thereafter. Valuing the company under this DDM model requires the following steps:

- Estimate dividends for each year during the first two stages of growth and then discount them to the present.
- Estimate the dividend for the first year of the 3rd (constant growth into perpetuity) stage.
- Compute the terminal value at the beginning of the 3rd stage.
- Compute the present value of the terminal value.
- Add up the present values of the dividends over the first two stages and the present value of the terminal value.

Example 4-5: Calculating Value Based on the Three-Stage DDM

Paradise Tours Ltd. recently paid a dividend of \$1.80. The dividend is expected to grow at a rate of 22% for the next 3 years, followed by a 15% growth rate for 2 years, after which it is expected to stabilize at a perpetual constant growth rate of 6%. Given a required rate of return of 12%, calculate the value of the stock today.

Solution:

First we compute the dividend payment for each year during the first two stages:

$$\begin{aligned}D_1 &= 1.80 \times 1.22 = \$2.196 \\D_2 &= 1.80 \times 1.22^2 = \$2.679 \\D_3 &= 1.80 \times 1.22^3 = \$3.269 \\D_4 &= 3.269 \times 1.15 = \$3.759 \\D_5 &= 3.269 \times 1.15^2 = \$4.323\end{aligned}$$

Then we compute the dividend payment for the first year of the constant growth phase and calculate the terminal value of the stock as of the end of the second stage.

$$\begin{aligned}D_6 &= 4.323 \times 1.06 = \$4.582 \\V_5 &= 4.582 / (0.12 - 0.06) = \$76.366\end{aligned}$$

Finally we calculate the value of the stock today as the sum of the present values of the dividend payments over the first two stages and the present value of the terminal value.

$$NPV = \frac{2.196}{(1.12)^1} + \frac{2.679}{(1.12)^2} + \frac{3.269}{(1.12)^3} + \frac{3.759}{(1.12)^4} + \frac{4.323 + 76.366}{(1.12)^5} = \$54.597$$

TI BA II Plus calculator keystrokes:

[CF] [2ND] [CE/C]
 [ENTER] [↓]
 2.196 [ENTER] [↓] [↓]
 2.679 [ENTER] [↓] [↓]
 3.269 [ENTER] [↓] [↓]
 3.759 [ENTER] [↓] [↓]
 80.689 [ENTER]
 [NPV] 12 [ENTER] [↓] [CPT]
 NPV = **\$54,597**

Notice that the present value of the terminal value constitutes an overwhelming portion ($43.33/54.597 = 79.36\%$) of the total value of the stock.

In the second version of the three-stage DDM, the middle stage is similar to the first stage of the H-model. For example, Stage 1 may have 25% growth for 3 years, Stage 2 may see a linear decline in the growth rate to 5% over 5 years, and Stage 3 could have 5% growth into perpetuity. Valuing the company under this DDM model requires the following steps:

- Estimate dividends for each year during the first stage of growth and then discount them to the present.
- Apply the H-model to the second and third stages to obtain an estimate of value as of the beginning of the second stage. Then discount this estimate of value to the present.
- Add up the present values of the dividends over the first stage and the present value of value obtained from applying the H-model to the second and third stages.

Example 4-6: Three-Stage Growth Model with Growth Declining Linearly in Stage 2

ABC Company recently paid a dividend of \$2.25 per share. The dividend is expected to grow at a rate of 15% for the next 4 years and then decline linearly over the next 8 years to a constant growth rate of 5% into perpetuity. Given a required rate of return of 11%, calculate the value of the stock today.

Solution:

First we compute the dividend payment each year during the supernormal growth stage:

$$\begin{aligned}D_1 &= 2.25 \times 1.15 = \$2.588 \\D_2 &= 2.25 \times 1.15^2 = \$2.976 \\D_3 &= 2.25 \times 1.15^3 = \$3.422 \\D_4 &= 2.25 \times 1.15^4 = \$3.935\end{aligned}$$

Then we apply the H-model to compute the value of the dividend stream for Stages 2 and 3 combined.

$$V_4 = \frac{(3.935)(1.05) + [(3.935)(8/2)(0.15 - 0.05)]}{0.11 - 0.05} = \$95.102$$

The value of the stock equals the sum of the present values of the dividend payments in the first stage and the present value of the value obtained from the H-model.

$$NPV = \frac{2.588}{(1.11)^1} + \frac{2.976}{(1.11)^2} + \frac{3.422}{(1.11)^3} + \frac{3.935 + 95.102}{(1.11)^4} = \$72.49$$

TI BA II Plus calculator keystrokes:

```
[CF] [2ND] [CE|C]
[ENTER] [↓]
2.588 [ENTER] [↓] [↓]
2.976 [ENTER] [↓] [↓]
3.422 [ENTER] [↓] [↓]
99.037 [ENTER]
[NPV] 11 [ENTER] [↓] [CPT]
NPV = $72.49
```

LOS 27m: Estimate a required return based on any DDM, including the Gordon growth model and the H-model. Vol 4, pp 210–240

The Gordon growth formula can be rearranged to calculate the required rate of return given the other variables.

$$r = \frac{D_1}{P_0} + g$$

Example 4-7: Calculating Expected Return with the Gordon Growth Model

Mega Builders recently paid a dividend of \$1.20, which is expected to grow at a rate of 5.5% indefinitely. Given that the stock is fairly valued at its current price of \$32, calculate the required rate of return on the stock.

Solution:

$$r = \frac{(1.20 \times 1.055)}{32} + 0.055$$

$$r = 9.46\%$$

The H-model equation can be rearranged to calculate the required rate of return as follows:

$$r = \left(\frac{D_0}{P_0} \right) [(1 + g_L) + H(g_s - g_L)] + g_L$$

Example 4-8: Calculating Expected Return with the H-Model

Delicious Foods just paid out a dividend of \$2.50. The company's dividends have been growing at 11%, but going forward dividend growth is expected to slow down linearly over the next 8 years to 6.5%, and then remain at that level indefinitely. Given that the stock is currently trading at \$100, calculate the expected rate of return on the stock.

Solution:

$$r = \left(\frac{D_0}{P_0} \right) [(1 + g_L) + H(g_s - g_L)] + g_L$$

$$r = 0.025 [1.065 + 8/2 \times (0.11 - 0.065)] + 0.065$$

$$r = 0.031 + 0.065 = 9.61\%$$

Estimating the required rate of return from a two-stage DDM is an iterative process, as illustrated in Example 4-9.

Example 4-9: Estimating Expected Return with the Two-Stage DDM

Omega Industries recently paid a dividend of \$1.50. The dividend is expected to grow at 13% for the next 3 years and 7% thereafter into perpetuity. Given that the stock's current market price equals \$33, calculate the implied required return on equity.

Solution:

First we calculate the dividend payments for each year of the first stage, and for the first year of the constant growth phase.

$$D_1 = 1.50 \times 1.13 = \$1.695$$

$$D_2 = 1.50 \times 1.13^2 = \$1.915$$

$$D_3 = 1.50 \times 1.13^3 = \$2.164$$

$$D_4 = 2.164 \times 1.07 = \$2.316$$

We basically need to calculate "r" in the following equation:

$$33 = \frac{1.695}{(1+r)^1} + \frac{1.915}{(1+r)^2} + \frac{2.164}{(1+r)^3} + \left[\left(\frac{2.316}{r - 0.07} \right) \left(\frac{1}{(1+r)^3} \right) \right]$$

Our financial calculators are of little help here, so we will have to adopt a trial-and-error approach. We start by estimating a certain discount rate and then calculate the present value based on it. If the present value based on that discount rate differs from the fair value of the stock, we will alter the discount rate accordingly.

Let's assume that the terminal value in Year 3 is \$38. In that case, r is calculated as follows:

$$38 = \frac{(1.5)(1.13)^3(1.07)}{r - 0.07}$$

$$r = 13.09\%$$

Based on a cost of equity of 13.09%, the value of the stock is calculated as follows:

$$\text{NPV} = \frac{1.695}{(1.1309)^1} + \frac{1.915}{(1.1309)^2} + \frac{2.164 + 38}{(1.1309)^3} = \$30.77$$

TI BA II Plus Calculator keystrokes:

[CF] [2ND] [CE|C]
 [ENTER] [↓]
 1.695 [ENTER] [↓] [↓]
 1.915 [ENTER] [↓] [↓]
 40.164 [ENTER]
 [NPV] 13.09 [ENTER] [↓] [CPT]
 NPV = **\$30.77**

The stock's estimated value of \$30.77 is lower than the market price of the stock (\$33). Therefore, we must lower our estimate of required rate of return.

Now let's assume a required rate of return of 12.70%. The terminal value in Year 3 can be calculated as:

$$V_3 = \frac{(1.5)(1.13)^3(1.07)}{0.127 - 0.07} = \$40.63$$

The value of the stock can be calculated as:

$$\text{NPV} = \frac{1.695}{(1.127)^1} + \frac{1.915}{(1.127)^2} + \frac{2.164 + 40.63}{(1.127)^3} = \$32.91$$

TI BA II Plus Calculator keystrokes:

[CF] [2ND] [CE|C]
 [ENTER] [↓]
 1.695 [ENTER] [↓] [↓]
 1.915 [ENTER] [↓] [↓]
 42.79 [ENTER]
 [NPV] 12.70 [ENTER] [↓] [CPT]
 NPV = **\$32.91**

A required rate of return of 12.70% **approximately** makes the present value of the cash flows equal to the market price of the stock. The exact value for the required return can be calculated using a spreadsheet (Excel Solver). Note that this LOS does not ask you to be able to calculate the required return based on the two-stage DDM, just that you should be able to explain how to do so.

LESSON 5: THE FINANCIAL DETERMINANTS OF GROWTH RATES

LOS 27o: Calculate and interpret the sustainable growth rate of a company and demonstrate the use of DuPont analysis to estimate a company's sustainable growth rate. Vol 4, pp 241–246

Sustainable growth rate (SGR) is defined as the growth rate of dividends (and earnings) that the company can sustain for a given return on equity, assuming that the capital structure remains unchanged over time and no new equity is issued. The SGR is used as an input into the Gordon growth model.

The long-term sustainable growth rate can be calculated as earnings retention rate times return on equity:

$$g = b \times ROE$$

b = Earnings retention rate, calculated as $1 - \text{Dividend payout ratio}$

- The higher the return on equity, the higher the sustainable dividend (earnings) growth rate.
- The higher the earnings retention rate, the higher the sustainable dividend (earnings) growth rate. This relationship is referred to as **dividend displacement of earnings**.

ROE can be calculated as:

$$ROE = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Shareholders' equity}}$$

Therefore, (in what is known as the **PRAT model**) SGR can be computed as:

$$g = \text{Profit margin} \times \text{Retention rate} \times \text{Asset turnover} \times \text{Financial leverage}$$

$$g = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Net income} - \text{Dividends}}{\text{Net income}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Shareholders' equity}}$$

Note that two of the factors in the PRAT model are functions of the firm's financial performance (return on assets equals net profit margin times asset turnover), while the other two (financial leverage and retention rate) are determined by the firm's financial policies.

The technically correct way to perform the DuPont decomposition of ROE is by using beginning of period shareholders' equity (as retained earnings are usually not available for reinvestment until the end of the period). However, analysts and financial databases often use average equity as an approximation. On the exam, use whichever method is specified in the question.

Example 5-1: Calculating and Evaluating SGR

An analyst gathered the following information regarding two companies:

	Return on Assets	Retention Rate	Equity Multiplier
Tulip Inc.	12%	25%	1.20
Rose Inc.	12%	50%	1.65

1. Calculate the sustainable dividend growth rate for both companies.
2. Identify the factors that cause the difference in sustainable growth rates between the two companies.

Solution:

Sustainable growth rate = ROA × Retention rate × Equity multiplier

1. Tulip's sustainable growth rate = $0.12 \times 0.25 \times 1.20 = 3.6\%$
Rose's sustainable growth rate = $0.12 \times 0.50 \times 1.65 = 9.9\%$
2. Both companies have the same return on assets (12%). However, Rose has a higher earnings retention rate as well as higher financial leverage (equity multiplier), which results in a higher sustainable dividend growth rate.

Note that if a company wants to grow dividends at a rate greater than SGR, the growth rate will not be sustainable using internally-generated funds. Retained earnings would fall, which would mean that the company would have to seek outside financing to acquire the assets required to fuel sales growth.

LOS 27n: Explain the use of spreadsheet modeling to forecast dividends and to value common shares. Vol 4, pp 246–247

So far we have valued companies using dividend discount models with assumed stylized patterns of dividend growth. In reality, however, dividend growth rates can follow a variety of patterns. Spreadsheets enable analysts to build pro forma income statements and balance sheets, which can then be used to predict the company's ability to pay dividends in the future. Spreadsheets can also be used to conduct detailed scenario analysis using a variety of estimates.

The general steps listed below would be required to predict the dividend-paying capacity of a company.

- Estimate sales for next year and the sales growth rate over a horizon over which the analyst is quite confident of her forecasts.
- Make an assumption regarding the relationship between EBIT and sales going forward. This ratio may vary from year to year.
- Forecast interest expense (as a percentage of total debt).
- Forecast the effective tax rate.
- Forecast the dividend payout ratio.
- Make sure that net income net of dividend payments is added to retained earnings (equity).
- Shareholders' equity equals beginning shareholders' equity plus the change in retained earnings for the year.
- Estimate the required rate of return on equity.
- Estimate the terminal value of the company (using either the Gordon growth model or a multiples-based approach).
- Calculate the present value of the dividends over the initial growth stage and the present value of the terminal value.
- Add these present values to determine the value of the company today.

Relative to the stylized models presented in this reading, spreadsheets allow pro forma statements to be forecast over a much longer horizon.

LOS 27p: Evaluate whether a stock is overvalued, fairly valued, or undervalued by the market based on a DDM estimate of value.**Vol 4, pp 237–240**

A stock's current market price may deviate from its intrinsic value calculated from a DDM. If the current market price of a stock is:

- Equal to the intrinsic value obtained from the DDM, the stock is fairly valued.
- Greater than the intrinsic value obtained from the DDM, the stock is overvalued.
- Less than the intrinsic value obtained from the DDM, the stock is undervalued.

STUDY SESSION II: EQUITY VALUATION (3)

READING 28: FREE CASH FLOW VALUATION

LESSON 1: FCFF AND FCFE VALUATION APPROACHES

LOS 28a: Compare the free cash flow to the firm (FCFF) and free cash flow to equity (FCFE) approaches to valuation. Vol 4, pp 285–289

Analysts usually use the following two definitions of **free cash flow (FCF)** for valuation purposes:

Free cash flow to the firm (FCFF) is the cash flow available to all the firm's suppliers of capital after operating expenses (excluding interest expense, but including taxes) have been paid, and necessary investments in fixed and working capital have been made. In other words, it represents the cash flow available to be distributed to a firm's bondholders (in the form of interest payments or debt repayments), common stockholders, and sometimes, preferred stockholders.

In order to calculate the value of the **firm**, **FCFF** are discounted at the firm's **weighted average cost of capital (WACC)**. Recall that the WACC represents the company's average cost of (both debt and equity) capital.

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

$$\text{WACC} = \frac{\text{MV(Debt)}}{\text{MV(Debt)} + \text{MV(Equity)}} r_d(1 - \text{Tax Rate}) + \frac{\text{MV(Equity)}}{\text{MV(Debt)} + \text{MV(Equity)}} r_e$$

In order to calculate the value of the **firm's equity**, the **market value of debt** is subtracted from the value of the firm. This is known as the **indirect method** of valuing equity.

$$\text{Equity Value} = \text{Firm Value} - \text{Market value of debt}$$

Free cash flow to equity (FCFE) is the cash flow available to holders of **common equity** after all operating expenses, taxes, interest, and principal payments have been paid for, and necessary investments in fixed and working capital have been made.

In order to calculate the value of a **firm's equity**, FCFE is discounted at the **required rate of return on equity (r)**. This is known as the **direct method** of valuing equity.

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

The advantage of FCFF and FCFE over other earnings-related measures is that they can be inserted directly into a DCF model to value a firm or its equity. As we will see later in this reading, other earnings-related measures (e.g., CFO, net income, EBIT, EBITDA) require several adjustments before they can be used in a DCF framework. This could be due to any one, or more, of the following reasons:

- They may be before-tax measures.
- They may not account for after-tax interest expense, or for funds obtained from borrowers.
- They may not account for investments made by the company (in fixed and working) capital in order to maintain the firm's business operations.

However, using free cash flow (instead of dividends) in a valuation model is definitely more challenging because it requires the analyst to integrate cash flows from the company's operations with cash flows from investing and financing activities.

FCFE versus FCFF

Both the direct and the indirect methods of valuing equity should theoretically yield same estimates for the value of a firm's equity. However, there are instances when analysts might prefer one over the other:

- If the company's capital structure is relatively stable, using the FCFE approach is a more direct and simple approach than the FCFF approach.
- For a levered company with negative FCFE, analysts would prefer the FCFF approach.
- For a levered company with a changing capital structure, analysts would prefer the FCFF approach because:
 - Growth in FCFF may reflect a company's fundamentals more accurately than growth in FCFE, which would be affected by fluctuating amounts of net borrowing.
 - Going forward, the required return on equity would probably be more sensitive to changes in financial leverage than the WACC.

LOS 28b: Explain the ownership perspective implicit in the FCFE approach.

Vol 4, pg 285

LOS 28f: Compare the FCFE model and dividend discount models.

Vol 4, pp 315–316

In applying the free cash flow approach to valuing a company, the ownership perspective is that of a **controlling interest** as FCFE reflects cash flow that can be redeployed by the controlling interest without affecting the company's capital investments. Note that a **minority interest** may also use the free cash flow approach when there is a chance that the company will be acquired, in which case the stock price would be expected to reflect the price that the acquirer (prospective controlling interest) will pay for the company.

The discounted dividend approach takes the perspective of a **minority shareholder** who does not have any control over the timing and amount of dividend payments. If an acquirer is willing to pay a premium for control over the firm, there may be a difference in the values obtained from the discounted dividend and FCF models.

Analysts may prefer the free cash flow valuation approach to DDM models for the following reasons:

- Some companies pay no, or very low, cash dividends. Using the DDM to value these companies is difficult because it requires forecasts of (1) when dividends will be initiated, (2) the level of dividends at initiation, and (3) dividend growth rates going forward.
- Dividend payments are at the discretion of the board of directors. They may not necessarily reflect the company's long-run profitability.
- If the company being analyzed is a takeover target, free cash flow is the appropriate cash flow measure because once the takeover is complete, the new owners will have discretion over the use of free cash flow (including its distribution in the form of dividends).

LOS 28c: 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. Vol 4, pp 289–301

COMPUTING FCFF

Computing FCFF from Net Income

As mentioned earlier, FCFF is the cash flow available to all the firm's suppliers of capital after operating expenses (including taxes but excluding interest payments) have been paid and necessary investments in fixed and working capital have been made.

FCFF can be calculated from net income available to common shareholders (NI) as follows:

$$\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax Rate}) - \text{FCInv} - \text{WCInv} \quad \dots(\text{Equation 1})$$

Net income (NI) is the bottom line of the income statement. It represents income after depreciation, amortization, interest expense, income taxes, and preferred dividends (but not ordinary dividends).

Non-cash charges (NCC) reflect the net effect of **non-cash expenses** and **non-cash gains** on net income.

- **Non-cash expenses** are those that do not result in an outflow of cash, but are subtracted from revenue to arrive at net income. Since we are interested in determining cash flows here, non-cash charges must be **added back** to net income.
 - Examples of non-cash expenses include depreciation, amortization, losses on sales of long-lived assets, non-cash restructuring charges, amortization of bond discounts, and increases in deferred tax liabilities that are not expected to reverse.
- **Non-cash gains** are those that do not result in an inflow of cash, but are added to revenue to arrive at net income. Since we are interested in determining cash flows here, non-cash gains must be **subtracted** from net income.
 - Examples of non-cash gain include gains on sales of long-lived assets, reversals of restructuring charges, amortizations of bond premia, and increases in deferred tax assets that are not expected to reverse.

The cash flow effects of sales of long-lived assets are incorporated in fixed capital investment.

The best place to find historical non-cash charges on a company's financial statements is the statement of cash flows (when presented in the indirect format).

- If non-cash expenses exceed non-cash gains (which is typically the case), the difference (net amount) is added to net income (as indicated in Equation 1).
- If non-cash gains exceed non-cash expenses, the difference (net amount) is subtracted from net income.

An example of a non-cash restructuring charge is an asset write-down as part of a restructuring. An example of a cash restructuring charge is severance pay for laid-off employees. Therefore, there can be a difference in restructuring charges shown on the indirect cash flow statement (which presents just the non-cash amount) and the income statement (which presents the sum of cash and non-cash amounts).

Table 1-1: Non-cash Items and FCFF¹

Non-cash Item	Adjustment to NI to Arrive at FCFF
Depreciation	Added back
Amortization and impairment of intangibles	Added back
Restructuring charges (expense)	Added back
Restructuring charges (income resulting from reversals)	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 requires special attention

The impact of **interest expense (Int)** on net income must be reversed because we are trying to calculate FCFF (which represents cash flow available to all the company's providers of capital) and interest payments are due to one of the company's capital providers (bondholders). Therefore, interest expense net of the interest tax shield, or **after-tax interest expense, Int (1 – Tax rate)**, is **added back** to net income to determine FCFF.

Investment in fixed capital (FCInv) over the period refers to outflows of cash to purchase fixed capital (e.g., PP&E, trademarks). Investments in fixed assets must be netted off with the amount of cash proceeds from sales of fixed assets. The net amount spent on acquiring fixed capital cannot be distributed to the company's providers of capital, hence the **deduction** from net income in calculating FCFF.

$$\text{FCInv} = \text{Capital expenditures} - \text{Proceeds from sale of long-term assets}$$

Note that acquisitions of fixed capital through an exchange for stock or debt will not appear on the statement of cash flows (but is required to be disclosed in the footnotes). These non-cash expenditures have no impact on current FCFF, but such information should be used in developing forecasts of FCFF.

¹ Exhibit 8, Vol 4, CFA Program Curriculum 2020

Investment in working capital (WCInv) refers to the net increase in working capital over the period. Although working capital is generally defined as current assets minus current liabilities, for the valuation purposes, we exclude cash and short-term debt (notes payable and current portion of long-term debt) from the calculation to compute investment in working capital.

$$\text{WCInv} = \text{Change in working capital over the year}$$

$$\text{Working capital} = \text{Current assets (exc. cash)} - \text{Current liabilities (exc. short-term debt)}$$

- Cash and cash equivalents are excluded because it is the change in cash that we are trying to explain.
- Notes payable and current portion of long-term debt are excluded because they are liabilities that carry explicit interest costs, and are therefore financing rather than operating items.

Amounts spent on acquiring additional working capital cannot be distributed to the company's providers of capital, hence the **deduction** from net income in calculating FCFF.

Computing FCFF from CFO

Analysts often use **cash flow from operations, CFO** (taken from the statement of cash flows) as a starting point to calculate FCFF because CFO already accounts for adjustments (required to be made to NI) for non-cash charges and investment in working capital.

Recall that CFO is calculated as NI plus depreciation (NCC) minus increases (investment) in net working capital.

In order to estimate FCFF starting with CFO, we must first understand the treatment of interest and dividends paid on the cash flow statement. Recall the following table from Level I .

Table 1-2: IFRS versus U.S. GAAP Treatment of Interest and Dividends

	IFRS	U.S. GAAP
Interest received	CFO or CFI	CFO
Interest paid	CFO or CFF	CFO
Dividends received	CFO or CFI	CFO
Dividends paid	CFO or CFF	CFF

Under U.S. GAAP:

- Interest expense is treated as an operating activity. After-tax interest expense is subtracted from net income (and CFO). Since we are trying to determine cash flows available to all providers of capital (including bond holders), after-tax interest expense must be added back to CFO to calculate FCFF.
- Interest and dividends received are classified as operating activities. They represent cash flows available to the firm's suppliers of capital and since they are already included in CFO, no related adjustment is required to CFO when calculating FCFF.

- Dividends paid are classified as outflows from financing activities. These amounts are available to the company's providers of capital and since they have not been deducted from CFO, no related adjustment is required to CFO when calculating FCFF.

$$\text{FCFF} = \text{CFO} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} \quad \dots \text{ (Equation 2)}$$

Under IFRS:

- Dividends paid may be classified as an operating activity. If this is the case, then dividends paid to ordinary shareholders must be added back to CFO because they represent a use of cash available to providers of equity capital.
- Interest and dividends received may be classified as an investing or operating activity.
 - If they are classified as an investing activity, they should be added to CFO to calculate FCFF because they represent funds available to the company's providers of capital.
 - If they are included in operating activities, no adjustment to CFO is required.
- Interest paid may be classified as an operating or a financing activity.
 - If it is classified as a financing activity, after-tax interest expense has not been deducted from CFO, so no interest-related adjustment to CFO is required.
 - If it is classified as an operating activity, after-tax interest expense must be added back to CFO to calculate FCFF.

Computing FCFF from EBIT

The relationship between FCFF and EBIT can be derived as follows. Note that we are assuming that depreciation is the only non-cash charge.

We already know that:

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

Net income can be expressed as:

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

Inserting this expression for NI into Equation 1, we get:

$$\begin{aligned} \text{FCFF} &= \text{EBIT}(1 - \text{Tax rate}) - \text{Int}(1 - \text{Tax rate}) + \text{Dep} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} \\ &\quad - \text{WCInv} \end{aligned}$$

$$\text{FCFF} = \text{EBIT}(1 - \text{Tax rate}) + \text{Dep} - \text{FCInv} - \text{WCInv} \quad \dots \text{ (Equation 3)}$$

Note that several non-cash items are charged in the income statement after the calculation of EBIT. Therefore, these charges do not need to be added back to EBIT when calculating FCFF. In our derivation, we have assumed that depreciation is the only non-cash charge that appears above (**before**) EBIT on the income statement.

Computing FCFF from EBITDA

The relationship between FCFF and EBITDA can be derived as follows. Once again we are assuming that depreciation is the only non-cash charge.

Net income can be expressed as:

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

Inserting this expression for NI into Equation 1 we get:

$$\begin{aligned} \text{FCFF} &= \text{EBITDA}(1 - \text{Tax rate}) - \text{Dep}(1 - \text{Tax rate}) - \text{Int}(1 - \text{Tax rate}) \\ &\quad + \text{Dep} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv} \end{aligned}$$

$$\boxed{\text{FCFF} = \text{EBITDA}(1 - \text{Tax rate}) + \text{Dep}(\text{Tax rate}) - \text{FCInv} - \text{WCInv}} \quad \dots \text{ (Equation 4)}$$

Note that some non-charges affect taxes (and hence cash flow) while others do not. A non-cash charge that affects taxes must be accounted for. Depreciation comes **after** EBITDA so we do not need to add depreciation back to EBITDA (like we did to EBIT). However, since depreciation is tax-deductible (results in tax savings, thereby increasing cash flow), we must add the depreciation tax shield, $\text{Dep}(\text{Tax rate})$, to EBITDA in order to calculate FCFF.

Example 1-1: Sustainability of Working Capital and the Impact of Depreciation on CFO

The following information relates to Sunshine Inc. Analysts expect depreciation expense for company to rise substantially going forward (in line with its increasing capital expenditure over the years).

	2010	2009	2008
Operating Activities:			
Profit before tax	344,351	264,886	240,805
<u>Adjustments:</u>			
Depreciation	103,305	95,359	86,690
Decrease (increase) in inventories	723	(641)	(452)
Decrease (increase) in trade receivables	4,870	(5,855)	(3,520)
(Decrease) increase in trade payables	(21,806)	(10,320)	21,762
(Decrease) increase in accrued expenses	201,525	134,350	78,343
(Decrease) increase in other creditors	64,488	9,480	711
Net cash provided by operating activities	697,457	487,258	424,339
Investing Activities:			
Capital expenditure (Purchase of PP&E)	(557,436)	(529,115)	(493,482)

At Level I we assumed that depreciation had no impact on cash flow because we ignored the impact of taxes on cash flow.

1. Comment on the relationship between reported capital expenditures and depreciation expense.
2. Describe the implications of future growth in depreciation expense on CFO.
3. Explain the effects of changes in 2010 in working capital accounts including inventory, accounts receivable, and accounts payable on free cash flow.
Comment on the sustainability of these changes.

Solution:

1. During the period 2008–2010, depreciation expense was a relatively small fraction of capital expenditure (e.g., 18.5% in 2010). This implies that the company is growing as it is acquiring new fixed assets at a rate greater than the rate required to replace existing fixed assets.
2. Depreciation expense is a deduction in the calculation of net income. Specifically, net income falls by: $\text{Depreciation} \times (1 - \text{Tax rate})$.

In the calculation of CFO (indirect method), depreciation is added back (in its full amount) to net income.

Therefore, the difference between these two amounts i.e., the amount added to net income to compute CFO (depreciation expense in full) and the amount subtracted in the calculation of net income (depreciation expense times 1 minus the tax rate) represents a positive increment to CFO resulting from depreciation expense (depreciation tax shield). Depreciation reduces net income, but increases CFO as it results in lower taxes being paid.

$$\begin{aligned}\text{Positive increment to CFO from depreciation} &= \text{Depreciation} - \text{Depreciation}(1 - t) \\ &= \text{Depreciation}(t)\end{aligned}$$

3. For 2010, on the asset side, the **decreases** in accounts receivable and inventory are sources of cash for the company. Further, on the liabilities side, **increases** in accrued expenses and other creditors are also sources of cash for the company. Only the **decrease** in accounts payable represents a use of cash.

CFO is a component of FCFE so items that increase (decrease) CFO, i.e., sources (uses) of cash also increase (decrease) FCFE. The company seems to be doing well in the sense that its CFO has been growing over the years, and this has enabled the company to undertake significant fixed capital investments. However, the analyst should be wary of the increase in CFO as it seems to be the result of working capital “disinvestment.” Given that the company is growing, it should expect to see an increase in its working capital requirements going forward.

COMPUTING FCFE

Computing FCFE from FCFF

FCFE is the cash flow available to holders of common equity after paying for all operating expenses (including taxes), making all necessary (fixed and working) capital investments and completing all transactions with other suppliers of capital (bondholders and preferred stockholders). It can be calculated by (1) reducing FCFF by the after-tax amount of interest paid to debt holders, and (2) adding net borrowing (debt issued less debt repaid over the period).

$$\text{FCFE} = \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \quad \dots \text{ (Equation 5)}$$

FCFE can be looked upon as the amount of cash flow available to be distributed as dividends to common shareholders. However, FCFE often differs from dividends because:

- The dividend payout ratio is established in light of investment opportunities available to the company.
- Companies try to make stable or gradually increasing dividend payments. They are very reluctant to reduce dividends even when profitability has declined.

Computing FCFE from Net Income

We know that:

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

And that:

$$FCFE = FCFF - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \dots (\text{Equation 5})$$

Therefore:

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

$$FCFE = NI + NCC - FCInv - WCInv + \text{Net borrowing} \dots (\text{Equation 6})$$

Computing FCFE from CFO

We know that:

$$FCFF = CFO + \text{Int}(1 - \text{Tax rate}) - FCInv \dots (\text{Equation 2})$$

And that:

$$FCFE = FCFF - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \dots (\text{Equation 5})$$

Therefore:

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

$$FCFE = CFO - FCInv + \text{Net borrowing} \dots (\text{Equation 7})$$

Computing FCFE from EBIT

We know that:

$$FCFF = EBIT(1 - \text{Tax rate}) + Dep - FCInv - WCInv \dots (\text{Equation 3})$$

And that:

$$FCFE = FCFF - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \dots (\text{Equation 5})$$

Therefore:

$$\text{FCFE} = \text{EBIT}(1 - \text{Tax rate}) - \text{Int}(1 - \text{Tax rate}) + \text{Dep} - \text{FCInv} - \text{WCInv} + \text{Net borrowing} \quad \dots \text{ (Equation 8)}$$

Computing FCFE from EBITDA

We know that:

$$\text{FCFF} = \text{EBITDA}(1 - \text{Tax rate}) + \text{Dep}(\text{Tax rate}) - \text{FCInv} - \text{WCInv} \quad \dots \text{ (Equation 4)}$$

And that:

$$\text{FCFE} = \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \quad \dots \text{ (Equation 5)}$$

Therefore:

$$\text{FCFE} = \text{EBITDA}(1 - \text{Tax rate}) - \text{Int}(1 - \text{Tax rate}) + \text{Dep}(\text{Tax rate}) - \text{FCInv} - \text{WCInv} + \text{Net borrowing} \quad \dots \text{ (Equation 9)}$$

LOS 28d: Calculate FCFF and FCFE. Vol 4, pp 289–320

Example 1-2: Calculating FCFF and FCFE

The tables below provide the balance sheet and income statement for Saturn Inc. for 2009, and forecasted balance sheet and income statement for 2010. Saturn Inc. prepares its financial statements in accordance with U.S. GAAP.

Financial Statements for Saturn Inc.

Income Statement

	2010 (\$'000)	2009 (\$'000)
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
Pre-tax earnings	240	140
Taxes (40%)	72	42
Net income	168	98

Balance Sheet

	2010 (\$'000)	2009 (\$'000)
Gross property, plant and equipment	1,443	1,125
Less: Accumulated depreciation	260	200
Net property, plant and equipment	1,183	925
Total non-current assets	1,183	925
Inventory	53	45
Accounts receivable	8	15
Cash	24	20
Total current assets	85	80
 Total assets	1,268	1,005
Common stock	300	300
Retained earnings	503	335
Total equity	803	635
Long-term debt	365	290
Short-term debt	5	10
Accounts payable	38	30
Total current liabilities	100	80
 Total liabilities	465	370
 Total equity and liabilities	1,268	1,005

Forecast the company's FCFF and FCFE for 2010 starting with:

1. Net income
2. EBIT
3. EBITDA
4. CFO

Solution:**1. Calculating FCFF from net income:**

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

The positive change in gross PP&E indicates that there has been a purchase of fixed assets over the year.

$$\text{FCInv} = \text{Gross PP \& E}_{2010} - \text{Gross PP \& E}_{2009}$$

$$\text{FCInv} = 1,443 - 1,125 = \$318$$

Working capital investment is calculated as the change in net working capital over the year. Recall that for valuation purposes, we ignore cash and short-term debt from working capital.

$$\begin{aligned} \text{WCInv} &= (\text{Accounts receivable}_{2010} + \text{Inventory}_{2010} - \text{Accounts payable}_{2010}) \\ &\quad - (\text{Accounts receivable}_{2009} + \text{Inventory}_{2009} - \text{Accounts payable}_{2009}) \\ \text{WCInv} &= (8 + 53 - 38) - (15 + 45 - 30) = -7 \end{aligned}$$

A negative sign indicates that working capital actually decreased. A decrease in net working capital implies an inflow of cash for the company (working capital disinvestment).

Amounts for net income, non-cash charges (depreciation), interest expense, and the tax rate are available in the financial statements. Therefore, we can calculate FCFF as:

$$\begin{aligned} \text{FCFF} &= \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv} \\ \text{FCFF} &= 168 + 60 + [10 \times (1 - 0.3)] - 318 - (-7) = -\$69 \end{aligned}$$

Calculating FCFE from net income:

$$\text{FCFE} = \text{NI} + \text{NCC} - \text{FCInv} - \text{WCInv} + \text{Net borrowing} \dots \text{(Equation 6)}$$

Net borrowing equals the combined increase in short- and long-term debt over the year.

$$\text{Net borrowing} = (365 + 62) - (290 + 50) = \$87$$

$$\text{FCFE} = 168 + 60 - 318 - (-7) + 87 = \$4$$

Calculating FCFE from FCFF:

FCFE may also be calculated from FCFF as follows:

$$\begin{aligned} \text{FCFE} &= \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing} \dots \text{(Equation 5)} \\ \text{FCFE} &= -69 - [10 \times (1 - 0.3)] + 87 = \$4 \end{aligned}$$

2. Calculating FCFF from EBIT:

$$\text{FCFF} = \text{EBIT}(1 - t) + \text{Dep} - \text{FCInv} - \text{WCInv} \dots \text{(Equation 3)}$$

$$\text{FCFF} = [160 \times (1 - 0.3)] + 60 - 318 - (-7) = -\$69$$

Calculating FCFE from EBIT:

$$\begin{aligned} \text{FCFE} &= \text{EBIT}(1 - t) - \text{Int}(1 - t) + \text{Dep} - \text{FCInv} - \text{WCInv} + \text{Net borrowing} \\ &\dots \text{(Equation 8)} \end{aligned}$$

$$\text{FCFE} = [160 \times (1 - 0.3)] - 20(1 - 0.3) + 60 - (-7) + 87 = \$4$$

3. Calculating FCFF from EBITDA

$$\text{FCFF} = \text{EBITDA}(1 - t) + (\text{Dep} \times \text{tax rate}) - \text{FCInv} - \text{WCInv} \dots \text{(Equation 4)}$$

$$\text{FCFF} = [320 \times (1 - 0.3)] + (10 \times 0.3) - 318 - (-7) = -\$69$$

Calculating FCFE from EBITDA

$$\begin{aligned} \text{FCFE} &= \text{EBITDA}(1 - t) - \text{Int}(1 - t) + (\text{Dep} \times t) - \text{FCInv} - \text{WCInv} \\ &\quad + \text{Net borrowing} \dots \text{(Equation 9)} \end{aligned}$$

$$\text{FCFE} = [320 \times (1 - 0.3)] - 10 \times (1 - 0.3) + (60 \times 0.3) - 318 - (-7) + 87$$

$$\text{FCFE} = \$4$$

4. Forecasted CFO

	2010 (\$'000)
Net income	168
Add: Depreciation	60
Less: Working capital investment	-7
Cash flow from operations	235

Calculating FCFF from CFO

$$\text{FCFF} = \text{CFO} + \text{Int}(1 - t) - \text{FCInv} \quad \dots \text{ (Equation 2)}$$

$$\text{FCFF} = 235 + [10 \times (1 - 0.3)] - 318 = -\$69$$

Calculating FCFE from CFO

$$\text{FCFE} = \text{CFO} - \text{FCInv} + \text{Net borrowing} \quad \dots \text{ (Equation 7)}$$

$$\text{FCFE} = 235 - 318 + 87 = \$4$$

In the (highly unlikely) scenario that an exam question tries to catch you out on some fundamental accounting, we have included the following formulas in the reading so that you are able to recognize any subtle (not explicitly mentioned) purchases or sales of long-lived assets and understand their implications on free cash flow. We spent some time on these relationships at Level I (in the study guide and the lecture). They are reproduced below for your review.

The value of **gross fixed assets** indicates the *historical cost* of the fixed assets owned by the company at the balance sheet date. If the figure for gross fixed assets changes from one year to the next, there has been an investing activity. If gross fixed assets increase, there has been a fixed asset purchase, and if gross fixed assets decrease, there has been a fixed asset disposal.

Net fixed assets equal gross fixed assets minus accumulated depreciation on all assets held by the company at the end of the year.

Calculation of historical cost of sold equipment:

The historical cost and accumulated depreciation of a long-lived asset is removed from the balance sheet once it is sold.

$$\begin{aligned} &\text{Beginning gross fixed assets} + \text{Purchase price of new fixed assets} \\ &- \text{Historical of disposed fixed assets} = \text{Ending gross fixed assets} \end{aligned}$$

Calculation of accumulated depreciation on sold equipment:

$$\begin{aligned} &\text{Beginning accumulated depreciation} + \text{Current year's depreciation on all assets} \\ &- \text{Accumulated depreciation on assets sold} = \text{Ending accumulated depreciation} \end{aligned}$$

Calculation of book value of sold equipment:

$$\text{Book value of sold equipment} = \text{Historical cost} - \text{Accumulated depreciation}$$

Calculation of proceeds from sale of equipment:

$$\text{Selling price} = \text{Gain/loss on sale} + \text{Book value}$$

Up until now, we have been calculating free cash flow based on its **sources**. Another approach to calculating free cash flow is based on its **uses**. This based-on-uses approach can be used:

- To check the values of FCFF (and FCFE) obtained from the based-on-sources calculations.
The sources and uses approach should yield the same value for FCFF (and FCFE).
- To gain a better understanding of the company's capital structure policy and cash position.

Generally speaking, a company can use its positive FCFF for the following purposes:

- To increase cash on hand or to invest in marketable securities.
- To make payments to the providers of debt capital (i.e., interest payments and debt repayments in excess of new borrowings).
- To make payments to the providers of equity capital (i.e., dividend payments and/or share repurchases in excess of new share issuances).

Therefore, we can calculate uses of FCFF as follows:

Increases in cash balances

Plus: Net payments to providers of debt capital

- + Interest expense ($1 - \text{tax rate}$)
- + Repayment of principal
- New borrowings

Plus: Net payments to providers of equity capital

- + Cash dividends
- + Share repurchases
- New equity issues

= **Uses of FCFF**

FCFE reflects free cash flow to the firm net of cash used for payments to providers of debt capital.

Therefore, we can calculate uses of FCFE as:

Increases in cash balances

Plus: Net payments to providers of equity capital

- + Cash dividends
- + Share repurchases
- New equity issues

= **Uses of FCFE**

In Example 1-1, Saturn Inc's FCFF amounted to -\$69. FCFF can also be calculated based on the uses-of-free-cash-flow approach as follows:

Uses of FCFF

Increase in cash and cash equivalents ($= \$24 - \20)	\$4
Add: After-tax interest payments to providers of debt capital [$= 20 \times (1 - 0.3)$]	\$14
Less: Net borrowing	(\$87)
Plus: Dividends	0
Plus: Share repurchases	0
FCFF	-\$69

Note that the company is not using FCFF to make principal repayments to debt holders; rather it is issuing new debt, which is a source of FCFF and leads to an increase in the cash flow available to providers of equity capital.

In our example, the company had negative FCFF for 2010, which means that instead of using FCFF, it had to find a source of FCFF. The company borrows \$87 over the year, uses \$4 to increase cash and uses \$14 to pay interest (after tax).

Use of FCFE equals the increase in cash and cash equivalents, i.e., **\$4** ($= \$24 - \20).

LESSON 2: FORECASTING FREE CASH FLOW

LOS 28e: Describe approaches for forecasting FCFF and FCFE.

Vol 4, pp 310–314

Analysts may forecast FCFF and FCFE using either of two approaches:

The first approach is very straightforward. Analysts calculate the current level of free cash flow and apply a constant growth rate to project free cash flow into the future. Under the simplest approach, it is assumed that free cash flow will grow at its historical growth rate. This approach is appropriate if the company's free cash flow has tended to grow at a constant rate in the past and if historical relationships between free cash flow and fundamental factors are expected to continue.

The second approach is far more complex as it captures the relationships between the components of free cash flow. Under this approach, analysts forecast the individual components of free cash flow (e.g., after-tax operating income, non-cash charges, and investments in fixed and working capital). For example:

- EBIT can be forecasted by forecasting (1) sales and (2) the EBIT margin based on analysis of historical data and on the future outlook for the company.
- Forecasts of (1) investment in fixed capital in excess of depreciation (FCInv – Dep) and (2) investment in working capital (WCInv) can be linked to increases in sales.
 - Assuming that depreciation is the only non-cash charge, the equation for calculating FCFE can be simplified as follows:
 - $FCFE = NI - (FCInv - Dep) - WCInv + \text{Net borrowing}$
- Further, in order to forecast FCFE, it can be assumed that the company finances (1) net new investment in fixed capital (i.e., new fixed capital less depreciation expense) and (2) investment in working capital, based on a target debt ratio (DR).

The debt ratio indicates the amount of investment financed with debt. This makes it easier to forecast net borrowing.

- Net borrowing = DR(FCInv – Dep) + DR(WCInv)

FCFE can then be computed as:

- $FCFE = NI - (FCInv - Dep) - WCInv + DR(FCInv - Dep) + DR(WCInv)$; or
- $FCFE = NI - (1 - DR)(FCInv - Dep) - (1 - DR)(WCInv)$

Note that this approach to forecasting FCFE implicitly recognizes that capital expenditures have two components:

- Expenditures necessary to **maintain** existing capacity (**fixed capital replacement**), which are based on the current level of sales; and
- Incremental expenditures necessary to support **growth**; which are based on forecasts of sales growth.

Also keep in mind that this approach will result in a less accurate estimate of FCFE if depreciation is in fact not the only non-cash charge incurred by the firm.

For an illustration of this approach for forecasting FCFE, see Examples 3-3 and 3-4 toward the end of this reading.

LOS 28g: Explain how dividends, share repurchases, share issues, and changes in leverage may affect future FCFF and FCFE. Vol 4, pp 308–309

Recall the formulas for calculating FCFF and FCFE:

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

$$FCFE = NI + NCC - FCInv - WCInv + \text{Net borrowing} \quad \dots \text{ (Equation 6)}$$

Dividends, share repurchases, and share issuances do not show up in these formulas. Therefore, they have no impact on FCFF or FCFE. Dividends, share repurchases and share issuances represent **uses** of free cash flow. Transactions between the company and its shareholders do not affect free cash flow (i.e., cash flow **available** for distribution to all suppliers of capital).

Leverage changes do have an (albeit limited) impact on FCFE. Increased use of debt financing increases FCFE for the current period (increase in net borrowings). Going forward however, after-tax interest expense reduces net income and FCFE.

LOS 28h: Evaluate the use of net income and EBITDA as proxies for cash flow in valuation. Vol 4, pp 301–308

Net income is a poor proxy for FCFE for use in valuation. Recall that:

$$FCFE = NI + NCC - FCInv - WCInv + \text{Net borrowing} \quad \dots \text{ (Equation 6)}$$

From the formula above, it is obvious that net income inappropriately:

- Includes the effects of non-cash charges like depreciation that should be added back to compute cash flow available to equity holders.
- Ignores cash outflow for investment in fixed and working capital.
- Ignores cash inflow from net borrowings.

EBITDA is a poor proxy for FCFF for use in valuation. Recall that:

$$\text{FCFF} = \text{EBITDA}(1 - t) + (\text{Dep} \times \text{tax rate}) - \text{FCInv} - \text{WCInv} \quad \dots \text{ (Equation 4)}$$

From the formula above, it is obvious that EBITDA inappropriately:

- Does not account for cash outflow from taxes paid.
- Does not account for the contribution of the depreciation tax shield to FCFF.
- Ignores cash outflow for investment in fixed and working capital.

EBITDA is an even poorer proxy for FCFE. In addition to the above-mentioned shortcomings, EBITDA does not account for (1) cash outflow for after-tax interest expense and (2) cash flow effects of debt repayments and new borrowings.

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

... (Equation 9)

Free Cash Flow and Complicated Capital Structures

If the company also has preferred stock in its capital structure:

- Just like interest payments to bondholders, dividends on preferred stock are already deducted in calculating net income available to common shareholders. Therefore, they must be added back to NI in calculating FCFF.
 - Note that unlike interest payments to bondholders, dividends on preferred stock are not tax-deductible.
- Just like issuance (redemption) of bonds, issuance (redemption) of preferred stock increases (decreases) FCFE.

To summarize, preferred stock has many of the same effects on FCF as debt. The only difference is that dividends on preference shares are not tax-deductible.

LESSON 3: FREE CASH FLOW MODEL VARIATIONS

LOS 28i: Explain the single-stage (stable-growth), two-stage, and three-stage FCFF and FCFE models and select and justify the appropriate model given a company's characteristics. Vol 4, pp 320–332

LOS 28j: Estimate a company's value using the appropriate free cash flow model(s). Vol 4, pp 320–332

LOS 28l: Describe approaches for calculating the terminal value in a multistage valuation model. Vol 4, pp 320–332

On the exam, make sure you read the question carefully. Pay attention to the following:

- Are they asking for the value of the firm or the value of equity?
- Are they asking for the total value or a per share value?
- Is the data provided related to FCFF or FCFE?
- Is the discount rate data related to the WACC or the required return on equity?

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

Constant Growth FCFF Valuation Model

This model is similar to the Gordon growth model. It assumes that free cash flow grows at a constant growth rate (g) forever, and that this growth rate is lower than the WACC.

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

WACC = Weighted average cost of capital

g = Long-term constant growth rate in FCFF

Constant Growth FCFE Valuation Model

This model assumes that FCFE grows at a constant rate (g) forever, and that this growth rate is lower than the required rate of return on equity.

$$\text{Value of equity} = \frac{\text{FCFE}_1}{r - g} = \frac{\text{FCFE}_0(1 + g)}{r - g}$$

where:

r = Required rate of return on equity

g = Long-term constant growth rate in FCFE

Note that the growth rate of FCFF and the growth rate of FCFE are usually different.

Example 3-1: Calculating Value Based on the Constant Growth FCFF Valuation Model

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

- FCFF at the end of 2009 = \$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' weighted average cost of capital (WACC).
2. What is the intrinsic value of the company's stock at the end of 2009?

Solution:

1. $\text{WACC} = \left[\left(\frac{0.4}{1.4} \right) \times 0.045 \times (1 - 0.4) \right] + \left[\left(\frac{1}{1.4} \right) \times 0.11 \right] = 8.63\%$
2. The value of the firm is computed by applying the constant growth FCFF model:

$$\text{Value of the firm} = \frac{\text{FCFF}_{2010}}{\text{WACC} - g} = \frac{660m \times 1.05}{0.0863 - 0.05} = \$19,098.43 \text{ million}$$

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

$$\text{Value of equity} = 19,098.43m - 1,200m = \$17,898.43 \text{ million}$$

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

$$\text{Value per share} = \frac{17,898.43}{300m} = \$59.66$$

Example 3-2: Calculating Value Based on the Constant Growth FCFE Valuation Model

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

- FCFE at the end of 2009 = \$3.25 per share
- The company's weighted average cost of capital = 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 Beta's stock at the end of 2009.

Solution:

First we use the CAPM 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 we compute the value of the firm's equity based on the constant growth FCFE model:

$$\begin{aligned} \text{Value of equity} &= \frac{\text{FCFE}_{2010}}{r - g} \\ &= \frac{3.25 \times 1.055}{0.118 - 0.055} = \$54.42 \end{aligned}$$

An International Application of the Single-Stage Model

A variation of the constant growth FCFE model is used to value stocks (especially in an international context) when real discount rates and real growth rates can be estimated more accurately than nominal discount rates and nominal growth rates (e.g., when inflation rates are high and volatile). In this variation, real (inflation-adjusted) values are used.

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

To estimate real discount rates (r_{real}), analysts start with the real required rate of return on stocks for a particular country (country return) and then make adjustments to it for the company's industry, size and leverage.

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

The real growth rate (g_{real}) for the stock being analyzed is determined in light of the expected real economic growth rate for the relevant country.

Multi-Stage Free Cash Flow Valuation Models

Two-Stage Free Cash Flow Models

There are two popular versions of two-stage free cash flow models.

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 higher than the GDP growth rate.

Unlike multistage DDMs, where the growth rates referred to dividend growth rates, the growth rate here (as you will see in the examples that follow) can refer to FCFF, FCFE or any of the components of free cash flow.

These two versions are distinguished by the pattern of growth rates in the first stage.

- In one version, the growth rate is constant in Stage 1 and abruptly drops to the long-term sustainable growth rate in Stage 2.
- In the other version, during Stage 1 the growth rate gradually declines toward the long-term sustainable growth rate of Stage 2.

General expression for the two-stage FCFF model:

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

Firm value = PV of FCFF in Stage 1 + Terminal value × Discount Factor

General expression for the two-stage FCFE model:

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

Equity value = PV of FCFE in Stage 1 + Terminal value × Discount Factor

Note that the terminal value typically represents a substantial portion of the total value of equity.

Example 3-3: Calculating Value Based on the 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

Illustration of 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% of 15m = 1.275m	8.5% of 16.8m = 1.428m

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

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

Now we can 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.

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

TI BA II Plus Calculator Keystrokes:

```
[CF] [2ND] [CE/C]
[ENTER][↓]
4.93 [ENTER][↓][↓]
5.53 [ENTER][↓][↓]
6.19 [ENTER][↓][↓]
6.93 [ENTER][↓][↓]
90.06 [ENTER][NPV]
19 [ENTER][↓][CPT]
NPV = $52.92m
```

Example 3-4: 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%	20%	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%

Given that the company has 2 million shares outstanding, calculate the value of Violet's stock today.

Solution:

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

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 – Dep		1.313	1.519	1.645	1.645	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
FCFE (\$ millions)	0.595	0.803	1.056	1.352	1.681	2.023	

Illustration of Calculations for Year 1:

- $\text{FCInv} - \text{Dep} = 25\% \times (20.25 - 15) = 1.3125\text{m}$
- $\text{WCInv} = 8\% \times (20.25 - 15) = 0.42\text{m}$
- $\text{Net borrowings} = 35\% \times (1.3125 + 0.42) = 0.6063\text{m}$

FCFE in Year 1 can be calculated in 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:

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

Once we have calculated FCFE for each year during Stage 1, we 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%).

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

Now we can calculate the value of equity as the sum of the present values of Stage 1 FCFE and the present value of the terminal value.

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

TI BA II Plus Calculator Keystrokes:

[CF] [2ND] [CE|C]

[ENTER] [↓]

0.595 [ENTER] [↓][↓]

0.803 [ENTER][↓][↓]

1.056 [ENTER] [↓][↓]

1.352 [ENTER] [↓][↓] 30.582 [ENTER] [NPV]

13 [ENTER] [↓][CPT]

NPV = **\$19.31m**

Finally, the value of the stock is calculated as:

$$\text{Value per share} = \frac{19.31}{2\text{m}} = \$9.66$$

Three-Stage Growth Models

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

- In one version, each stage has a constant but different growth rate.
- In the second version, Stages 1 and 3 have constant (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.

Example 3-5: 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 three 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 onwards, FCFE will grow at a stable long-term growth rate of 5%, during which investors' required rate of return will be 10%.

Estimate the intrinsic value of the company's common stock.

Solution:

FCFE per share for the next 7 years and relevant present values are presented in the following table:

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	
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.

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

Determining Terminal Value

In each of the examples above, we have computed the terminal value at a point in time when forecasted free cash flows begin to grow at a constant stable rate using the constant growth (single-stage) FCF valuation model.

Another way of calculating terminal value is based on valuation multiples. Example 3-1 illustrates this straightforward calculation.

Terminal value in year n = Justified Trailing P/E × Forecasted Earnings in Year n

Terminal value in year n = Justified Leading P/E × Forecasted Earnings in Year n + 1

Example 3-6: Estimating Terminal Value with a P/E Multiple

An analyst forecasts the following EPS figures for a company:

- $\text{EPS}_{2007} = \$1.98$
- $\text{EPS}_{2008} = \$2.25$
- $\text{EPS}_{2009} = \$2.80$
- $\text{EPS}_{2010} = \$3.10$

Given that the median trailing industry P/E multiple at the end of 2009 is expected to be 28, estimate the value of the company.

Solution:

Terminal value at the end of 2009 = $2.80 \times 28 = \$78.40$

ESG Considerations in Free Cash Flow Models

Environmental, social, and governance (ESG) factors, both quantitative or qualitative, can have a material impact on a company's value. Quantitative ESG-related information (e.g., the effects of projected environmental fines or other penalties) is relatively easy to integrate into valuation models. Qualitative ESG-related information, however, is more difficult to integrate. The typical (albeit subjective) approach is to adjust the cost of equity by adding a risk premium in a valuation model.

For example, consider a copper mining company that just announced the acquisition of a new copper mine in a relatively dry area. In the typical FCF valuation model, an analyst would account for the increase in costs (labor costs, capital expenditures, etc.) and revenues from the new mine. However, a more robust valuation model should incorporate the impact of ESG factors as well. For example:

- *Water-related issues:* A large volume of water is used for mining operations, so water-related costs are typically among the largest expenditures for mining companies. Given that the development of the new mine is located in a relatively dry region, the analyst should examine where the water-related capital expenditures (an example of quantitative ESG-related information) are reflected in the valuation. If they are understated, cash flow forecasts should be adjusted accordingly.
- *Local government issues:* Companies are required to obtain licenses to operate new mines, and the application process requires a comprehensive rehabilitation plan indicating how the new mine's natural habitat will be restored. Analysts must evaluate (perhaps based on the company's past history in producing such rehabilitation plans and gaining government approvals) whether the company's stated time line for gaining required approvals and commencing mining operations is reasonable. Cash flow forecasts may need to be tweaked accordingly. This is another example of integrating quantitative ESG-related information into the analysis.
- *Labor issues:* The analyst must evaluate whether there is any potential for labor issues. Considerations may include how the company's compensation of employees compares with competitors', and whether the company executives' compensation is tied to worker safety. Problematic compensation policies that have the potential to give rise to labor unrest carry substantial reputational risk for the company. An

analyst may account for this risk (qualitative ESG-related information) by adjusting the cost of equity (and consequently the WACC) upward.

Once the analyst accounts for these ESG factors, her estimate of the stock's fair value will be revised downward.

Non-operating Assets and Firm Value

Free cash flow valuation focuses on estimating the value of those assets held by the company that directly generate, or are required in order to generate operating cash flows. If the company also holds significant non-operating assets (e.g., excess cash, excess marketable securities, or land held for investment purposes), analysts calculate the value of the firm as the sum of (1) the value estimated for its operating assets (via FCF valuation) and (2) the value of its non-operating assets.

$$\text{Value of the firm} = \text{Value of operating assets} + \text{Value of non-operating assets}$$

It is advisable to use market values (not book values) of non-operating assets in determining the value of the company. If a question in the exam lists some non-operating assets, be sure to add the value of these assets to the estimate of value obtained from the free cash flow model.

Example 3-7: Valuing Non-Operating 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 the given information, determine the value of PSM stock.

Solution:

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

$$\text{Value of non-operating assets} = 75 + 50 = \$125 \text{ million}$$

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

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

The value of equity equals the value of the firm less the value of debt:

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

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

LOS 28k: Explain the use of sensitivity analysis in FCFF and FCFE valuations. Vol 4, pp 321–322

Sensitivity analysis is used to assess the impact of changes in the value of inputs of the free cash flow valuation model on output of the model (value). Through the examples in this reading, you must have noticed how the estimates of firm and equity value are dependent on forecasts of sales growth, capital expenditure, etc. Sensitivity analysis allows us to gauge the impact of potential errors in these forecasts on value obtained from the model.

There are two major sources of errors in the valuation exercise.

1. Errors in estimating **growth rates** of FCFE and FCFF. These growth forecasts are dependent on a variety of factors including the company's sales growth, net profit margins, capital requirements, and industry profitability.
2. Errors in estimating the **base-year values** of FCFF and FCFE. Given the same set of growth forecasts, the estimate of value obtained from the model will vary with different base year values for FCFF and FCFE.

As an example of sensitivity analysis, consider an analyst applying the constant growth FCFE model. She may specify different sets of forecasts regarding base year FCFE, the FCFE growth rate, risk-free rate, equity market premium, and beta to evaluate the impact of changes in these forecasts on the estimated value of equity.

LOS 28m: Evaluate whether a stock is overvalued, fairly valued, or undervalued based on a free cash flow valuation model. Vol 4, pp 320–337

- If the value of equity from the model is *lower* than the market value of equity, the stock is overvalued.
- If the value of equity from the model is *higher* than the market value of equity, the stock is undervalued.
- If the value of equity from the model is *same* as the market value of equity, the stock is fairly valued.

READING 29: MARKET-BASED VALUATION: PRICE AND ENTERPRISE VALUE MULTIPLES

LESSON 1: INTRODUCTION: THE METHOD OF COMPARABLES VERSUS THE METHOD OF FORECASTED FUNDAMENTALS

- **Price multiples** are ratios of a stock's market price to a measure of fundamental value per share (e.g., earnings per share).
- **Enterprise value multiples** are ratios of the total market value of all of a company's sources of capital to a measure of fundamental value for the entire company (e.g., EBITDA).
- **Momentum indicators** relate either the stock price or a fundamental (e.g., earnings) to its value in the past.

LOS 29a: Distinguish between 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. Vol 4, pp 379–382

LOS 29b: Calculate and interpret a justified price multiple. Vol 4, pg 382

Price and enterprise value multiples are used by analysts in two ways: (1) the method of comparables and (2) the method of forecasted fundamentals.

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,” i.e., 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 earnings per share 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.

The Method Based on Forecasted 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 making comparisons with other companies). **Company fundamentals** refer to characteristics of the business related to profitability, growth, or financial strength. In an earlier reading we illustrated the derivation of leading and trailing P/E multiples based on fundamentals.

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. Basically the justified price multiple is the value that the multiple would take where the stock 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 1-1: 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 higher than average trailing P/E of peer companies (12), it is relatively overvalued.

Alternatively, we can 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 1-2: Calculating P/E Based on the 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:

1. Leading P/E ratio = $27/3 = 9$
2. Next year's expected dividend = $3 \times 0.4 = 1.2$

$$\begin{aligned}\text{Intrinsic value} &= \frac{D_1}{(r - g)} \\ &= \frac{1.2}{(0.12 - 0.06)} = \$20\end{aligned}$$

$$\text{Leading P/E ratio} = 20/3 = 6.67$$

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.

LESSON 2: PRICE MULTIPLES BASED ON THE METHOD OF COMPARABLES

LOS 29c: Describe rationales for and possible drawbacks to using alternative price multiples and dividend yield in valuation. Vol 4, pp 379–392, 412–414, 422–424, 429–431

LOS 29d: Calculate and interpret alternative price multiples and dividend yield. Vol 4, pp 413–426, 446–448, 457–459, 459–463

Price-to-Earnings Ratio

Advantages

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

Disadvantages

- Companies that make losses have negative EPS and P/Es. Negative P/E ratios are useless as far as relative valuation is concerned.
- Earnings of some companies are very volatile, which makes it difficult to separate the recurring component of earnings (that drives intrinsic value) from the transient component.
- Management may use different accounting assumptions to prepare financial statements, which (1) distorts reported EPS and (2) reduces the comparability of P/E ratios across companies.

There are two definitions of the P/E ratio based on alternative specifications of earnings:

The **trailing P/E ratio** is calculated by dividing the company's current stock price by earnings over the last four quarters. The trailing P/E ratio is generally used when earnings are expected to be volatile going forward and cannot be forecasted accurately (which makes it difficult to apply the P/E ratio).

The **leading (or forward) P/E ratio** is calculated by dividing the company's current stock price by next year's expected earnings. Earnings over any of (1) the next four quarters, (2) the next 12 months, or (3) the next fiscal year can be used as next year's expected earnings. The leading P/E ratio should be used if a company's business has changed fundamentally (e.g., due to an acquisition or divesture) such that use of the trailing P/E (which is based on past EPS) would not be appropriate.

Example 2-1: Calculating Trailing and Forward P/E Ratios

On December 31, 2009, the stock of Alpha Associates was trading at \$32.80. The following information is provided:

- EPS for 2009 = \$2.50
- Expected EPS in the first quarter of 2010 = \$0.47
- Expected EPS in the second quarter of 2010 = \$0.75
- Expected EPS in the third quarter of 2010 = \$0.83
- Expected EPS in the fourth quarter of 2010 = \$0.80

Calculate Alpha's:

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

Solution:

$$\begin{aligned}
 1. \text{ Trailing P/E ratio} &= \frac{\text{Current Stock Price}}{\text{EPS}_{2009}} \\
 &= \frac{32.80}{2.50} = 13.12
 \end{aligned}$$

$$\begin{aligned}
 2. \text{ Forward P/E ratio} &= \frac{\text{Current Stock Price}}{\text{Expected EPS}_{2010}} \\
 &= \frac{32.80}{(0.47 + 0.75 + 0.83 + 0.80)} = 11.51
 \end{aligned}$$

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

Price-to-Book Value

Advantages

- Book value usually remains positive even when the company reports negative earnings. Thus, P/B can be used for loss-making companies as well.
- Book value is typically more stable over time compared to reported earnings.
- For financial sector companies that have significant holdings of liquid assets, P/B is more meaningful as 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.

Disadvantages

- Book values ignore nonphysical 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 (and serves as an "assembler") will have fewer assets and a higher P/B ratio than a similar firm that does not outsource (and chooses to serve as a "manufacturer").
- Accounting differences can impair the comparability of P/B ratios across companies. For example, rules for capitalization of R&D costs vary across sets of accounting standards.
- In most cases, book values of assets are based on historical cost adjusted for accumulated depreciation. Over time, inflation and changes in technology may result in significant differences between accounting book values and actual market values of a company's assets, and can reduce the comparability of P/B ratios across companies.
- Share repurchases or issuances can distort historical P/B comparisons.

The P/B ratio is calculated as:

$$\text{P/B ratio} = \frac{\text{Market price per share}}{\text{Book value per share}}$$

$$\text{P/B ratio} = \frac{\text{Market value of common shareholders' equity}}{\text{Book value of common shareholders' equity}}$$

$\text{Book value of equity} = \text{Common shareholders' equity}$
 $= \text{Shareholders' equity}$
 $- \text{Total value of equity claims that are senior to common stock}$

$\text{Book value of equity} = \text{Total assets} - \text{Total liabilities} - \text{Preferred stock}$

Analysts usually make the following adjustments to book value in order to (1) make book value more reflective of shareholders' investment and (2) to increase its comparability across companies:

- Certain intangible assets are removed from total assets on the balance sheet, and shareholders' equity is adjusted (downwards) accordingly.
 - It makes sense to remove items such as goodwill from book value because goodwill is not a separately identifiable asset and merely represents an "overpayment" for an acquisition.
 - However, removal of individual intangibles such as patents may not be justified as they can be separated from the entity and sold.
- Certain adjustments are required to eliminate the effects of differences in accounting standards across companies. For example, in an inflationary environment, the book value (and assets) of a LIFO firm must be revised upwards to make comparisons with a FIFO firm.
- Certain off-balance sheet assets and liabilities (e.g., debt guarantees) must be accounted for in the calculation of book value.
- Certain balance sheet (historical) values may need to be adjusted to reflect (current) fair value.

Example 2-2: Calculating P/B Ratio

The following table contains the equity portion of ADF Company's balance sheet:

	Dec 10
Common stock (issued 20,000 common shares)	\$200,000
Preferred stock (issued 1,000 preferred shares)	\$25,000
Additional paid-in capital	\$1,000
Retained earnings	\$43,875
Total shareholders' equity	\$269,875

The current market price of ADF stock is \$14.35. Calculate its P/B ratio.

Solution:

$$\begin{aligned}\text{Common shareholders' equity} &= \text{Total shareholders' equity} \\ &\quad - \text{Total value of preferred stock} \\ &= \$269,875 - \$25,000 = \$244,875\end{aligned}$$

$$\text{Book value per share} = \frac{\$244,875}{20,000} = \$12.24$$

$$\text{P/B ratio} = \frac{\$14.35}{\$12.24} = 1.17$$

Price-to-Sales**Advantages**

- Sales are less prone to manipulation by management than earnings and book values.
- Sales are positive even when earnings are negative.
- The P/S ratio is usually more stable than the P/E ratio as earnings reflect operational and financial leverage.
- P/S ratios are especially appropriate for valuing mature, cyclical, and loss-making companies.
- Studies have shown that differences in price-to-sales ratios are related to differences in long-term average returns on stocks.

Disadvantages

- Using sales reveals no information about the operating profitability of a company. Ultimately, a company derives its value from its ability to generate profits.
- Using the P/S ratio does not reflect differences in cost structure and operating efficiency between companies.
- There is a “logical mismatch” when price (which reflects the effects of debt finance, profitability, and risk) is compared with sales (which is a pre-financing measure of income).
- Management can come up with ways to manipulate revenue figures (e.g., recognizing sales made on bill-and-hold basis in the current period, or inflating sales through barter transactions).
- Due to the relatively stable nature of sales, they may not reflect a sudden change in a key indicator (e.g., rise in interest expense causes a sharp decline in earnings when the sales are stable).

The P/S ratio is calculated as:

$$\text{P/S ratio} = \frac{\text{Market price per share}}{\text{Sales per share}}$$

Analysts should also be familiar with the relationship between the P/E ratio and the P/S ratio.

$$\text{P/E} \times \text{Net profit margin} = (\text{P/E}) \times (\text{E/S}) = \text{P/S}$$

Therefore, for two companies with the same positive P/E ratios, the company with the higher P/S ratio will have a higher net profit margin.

Example 2-3: Calculating P/S Ratios

The stock of Gamma Corp. is currently trading at \$25. The company just reported sales amounting to \$12.5 million and has 2 million shares outstanding. Given that the benchmark P/S multiple is 5.5, comment on whether the stock is undervalued, overvalued, or fairly valued on a relative basis.

Solution:

First we calculate sales per share:

$$\text{Sales per share} = 12.5\text{m}/2\text{m} = \$6.25$$

And then compute the P/S ratio:

$$\text{P/S} = 25/6.25 = 4$$

Since the benchmark P/S multiple (5.5) is higher than the Gamma's P/S multiple (4), the stock appears to be relatively undervalued.

Price-to-Cash Flow

Advantages

- Cash flows are less prone to management manipulation than earnings.
- P/CF is more stable than the P/E ratio.
- Using the price to cash flow ratio gets around the problem related to differences in the quality of earnings reported by companies.
- Research has shown that differences in price-to-cash flow ratio over time are related to differences in long-term average returns on stocks.

Disadvantages

- When “EPS plus non-cash charges” is used as the definition for cash flow, non-cash revenue and changes in working capital items are ignored.
- FCFE is more appropriate for valuing a company than operating cash flow. However, FCFE has the following drawbacks:
 - For many businesses, it is more volatile than operating cash flow.
 - It is more frequently negative than operating cash flow.
- Management may be able to inflate reported CFO by:
 - Securitizing accounts receivable.
 - Outsourcing payments of accounts payable (to delay outflows of cash).

The P/CF ratio is calculated as:

$$\text{P/CF ratio} = \frac{\text{Market price per share}}{\text{Free cash flow per share}}$$

Analysts usually calculate the trailing P/CF ratio, which uses cash flow from the four most recent quarters in the denominator.

Example 2-4: Calculating P/CF Ratio

An analyst gathered the following information regarding Mercury Inc:

- Market price per share = \$26
- Total earnings = \$4.8 million
- Depreciation and amortization = \$0.85 million
- Total number of shares outstanding = 2 million

Using EPS plus non-cash charges as a proxy for free cash flow, calculate the company's P/CF ratio.

Solution:

$$\text{EPS} = \$4.8\text{m}/2\text{m} = \$2.40$$

$$\text{Depreciation and amortization per share} = \$0.85\text{m}/2\text{m} = \$0.425$$

$$\begin{aligned}\text{Free cash flow per share} &= \text{EPS} + \text{Non-cash charges/share} \\ &= 2.40 + 0.425 = \$2.825\end{aligned}$$

$$\text{P/CF} = 26/2.825 = 9.2$$

Dividend Yield

Advantages

- The dividend yield is a component of total return.
- The dividend yield component of total return is less risky than the capital gains component.

Disadvantages

- The dividend yield is only one of the (two) components of total return. Ignoring the capital appreciation component in valuation is risky.
- Dividends paid now “displace” earnings in future periods. A higher dividend yield usually implies a lower earnings growth rate going forward.
- The argument that dividends are relatively safe (less risky) assumes that the market prices reflect differences in relative risk between the two components of total return.

The dividend yield is calculated as dividend per share divided by the price of the stock.

- The **trailing dividend yield** is calculated by dividing the **dividend rate** by the current market price of the stock.
 - For companies paying quarterly dividends, the dividend rate equals four times the most recent quarterly dividend.
 - For companies that pay semiannual dividends where the interim dividend typically differs from the final dividend, the dividend rate equals the most recent annual per-share dividend.
- The **leading dividend yield** is calculated by dividing next year's forecasted dividends per share (dividends expected over the next four quarters, the next 12 months, or the next fiscal year) by the current market price of the stock.

Example 2-5: Calculating Trailing and Leading Dividend Yield

On June 30, 2010, the stock of Pyramid Inc. was trading at \$42.50 per share. The following information regarding the company's quarterly dividends is also available:

Dividends paid per share on:

- September 30, 2009 = \$0.45
- December 31, 2009 = \$0.48
- March 31, 2010 = \$0.50
- June 30, 2010 = \$0.50

Further, next year's dividend is expected to be \$2.40 per share.

1. Calculate the company's trailing dividend yield.
2. Calculate the company's leading dividend yield.

Solution:

1. Since the company makes quarterly dividend payments, the dividend rate is calculated on the basis of the most recent dividend declared.

$$\text{Dividend rate at June 30, 2010} = 0.50 \times 4 = \$2.00$$

$$\begin{aligned}\text{Trailing dividend yield} &= \text{Dividend rate/Current price per share} \\ &= 2/42.5 = 4.71\%\end{aligned}$$

2. Leading dividend yield = Next year's dividend/Current price per share
 $= 2.40/42.5 = 5.65\%$

Example 2-6: Calculating Trailing Dividend Yield

On June 30, 2011, the stock of Alton Associates was trading at \$22.80 per share. The following information regarding the company's historical semi-annual dividends is also available:

Dividends paid per share on:

- December 31, 2009 = \$0.75
- June 30, 2010 = \$0.36
- December 31, 2010 = \$0.80
- June 30, 2011 = \$0.40

Calculate the company's trailing dividend yield.

Solution:

Since the interim semi-annual dividends significantly differ in magnitude from the final dividend, the dividend rate is calculated as total dividend for the most recent year.

$$\text{Dividend rate at June 30, 2011} = 0.40 + 0.80 = \$1.20$$

$$\begin{aligned}\text{Trailing dividend yield} &= \text{Last year's dividend/Current price per share} \\ &= 1.20/22.80 = 5.26\%\end{aligned}$$

LESSON 3: NORMALIZED EARNINGS AND THE EARNINGS YIELD

LOS 29e: Calculate and interpret underlying earnings, explain methods of normalizing earnings per share (EPS), and calculate normalized EPS.

Vol 4, pp 386–388

When calculating trailing P/E, the following issues must be considered in determining the EPS used in the denominator:

1. Potential dilution in EPS.
2. Transitory, nonrecurring components of earnings that are company specific.
3. Transitory components of earnings that can be attributed to business or industry cyclicalities.
4. Differences in accounting methods used by companies being compared.

1. The **potential dilution of earnings** is easy for analysts to deal with since companies are required to disclose basic and diluted EPS on the face of the income statement. Diluted EPS reflects the impact of all outstanding potentially dilutive securities on (1) income available to common shareholders and on (2) the weighted average number of common shares outstanding. Typically, the P/E calculated based on diluted EPS is greater than P/E calculated based on basic EPS (as diluted EPS is typically lower than basic EPS).
2. **Company-specific nonrecurring items** (items in earnings that are not expected to recur in the future) are removed by analysts because the valuation exercise is based on future cash flows. Analysts therefore look to estimate **underlying earnings** (also known as **persistent earnings**, **continuing earnings**, and **core earnings**) that exclude nonrecurring items.

Important:

- There are no prescribed rules for calculating underlying earnings.
- Analysts should not rely on company-reported core or continuing earnings.
- Analysts should compute the adjusted P/E ratio based on their own judgement regarding how the company's underlying earnings should be calculated, and the same basis should then be applied for all stocks under review.
- Non-recurring components of earnings cannot easily be identified by just looking at the income statement. The financial statement footnotes and the MD&A section can be important sources of information in this regard.
- Earnings may also be segregated into their cash flow and accrual component. A greater weight should be assigned to the cash flow component in valuation.
- 3. Analysts also need to adjust for **business or industry cycle influences on earnings**. These effects are different from company-specific effects (e.g., restructuring costs) in that, even though they are transitory, they can be expected to recur in subsequent cycles.

Business or industry cycles can result in the four most recent quarters of earnings not accurately reflecting the average or long-term earning power of the business, especially for cyclical businesses like automobile and steel manufacturers.

For these companies, trailing EPS are lower (greater) than long-term average profitability at the bottom (top) of the business cycle, resulting in high (low) P/Es. This countercyclical property of P/Es is referred to as the **Molodovsky effect**.

In order to estimate EPS that reflects mid-cycle conditions, analysts calculate **normalized earnings** using one of the following methods:

- **Under the method of historical average EPS**, normalized EPS is calculated as average EPS over the most recent full cycle.
 - This method does not account for changes in a company's size over the period.
 - **Under the method of average return on equity**, normalized EPS is calculated as current book value per share times the average return on equity over the most recent full cycle.
 - This method does account for changes in a company's size.
 - **Other methods** (that are particularly useful when a cyclical company reports a loss) include (1) multiplying total assets by estimated long-run return on assets and (2) multiplying shareholders' equity by estimated long-run return on equity.
4. Analysts adjust EPS for **differences in accounting methods** used by companies that are part of the relative valuation analysis (both subject and peer companies) to make them comparable. For example, if some firms use FIFO to value inventory, while others use LIFO, adjustments must be made to earnings reported by the firms to reflect the same inventory cost flow assumption.

Example 3-1: Calculating Trailing P/E Ratio Based on Underlying Earnings

On December 31, 2009, the stock of Pluto Manufacturers was trading at \$23 per share. The company reported EPS of \$2.08 at the end of 2009, which included the following:

- Restructuring costs = \$0.05/share
 - Amortization of intangibles arising from acquisitions = \$0.08/share
 - Write-down of inventory to reflect its carrying amount = \$0.06/share
1. Calculate the company's trailing P/E ratio based on reported EPS.
 2. Calculate the company's trailing P/E ratio based on underlying EPS given that you conclude that the amortization of intangibles is a recurring expense for the company.

Solution:

1. P/E ratio based on reported EPS = $23/2.08 = 11.06$
2. Underlying EPS equals reported EPS adjusted for non-recurring items (restructuring costs and write-down of inventory)

$$\text{Underlying EPS} = 2.08 + 0.05 + 0.06 = \$2.19$$

$$\text{Adjusted P/E ratio} = 23/2.19 = 10.5$$

Example 3-2: Calculating Normalized EPS

Susan is analyzing the stock of Classic Automobiles, which is trading at \$18.50 today (January 1, 2011). Due to the cyclical nature of the auto industry, Susan decides to normalize earnings as part of her analysis. She is of the view that data from 2004 onwards reasonably captures the most recent business cycle. She gathers the following information regarding the company's earnings per share (EPS), book value per share (BVPS), and return on equity (ROE) from 2004–2010:

Measure	2004	2005	2006	2007	2008	2009	2010
EPS (\$)	0.52	0.61	0.69	0.78	1.03	0.92	1.05
BVPS (\$)	2.85	3.15	3.88	4.24	4.75	5.05	5.3
ROE (%)	7.80	9.10	10.50	13.50	24.20	26.50	25.80

1. Calculate normalized EPS based on historical average EPS, and the P/E ratio based on that estimate of normalized EPS.
2. Calculate normalized EPS based on average ROE, and the P/E ratio based on that estimate of normalized EPS.
3. Comment on the differences in normalized EPS calculated by the two methods and contrast the impact on the estimated normalized P/E ratio.

Solution:

1. Average EPS = $(0.52 + 0.61 + 0.69 + 0.78 + 1.03 + 0.92 + 1.05)/7 = \0.80
P/E ratio = $18.50/0.80 = 23.125$
2. Average ROE = $(7.8\% + 9.1\% + 10.5\% + 13.5\% + 24.2\% + 26.5\% + 25.8\%)/7 = 16.7714\%$
Based on current BVPS of \$5.30, normalized EPS = $16.7714\% \times 5.30 = \0.89
P/E ratio = $18.50/0.89 = 20.81$
3. Notice that the company's BVPS increased from \$2.85 in 2004 to \$5.30 in 2010 (an increase of approximately 86%). This increase in the company's size is not reflected in the normalized EPS based on the average historical EPS (\$0.80).

On the other hand, the average ROE method does take into account the current size of the company as the calculation of normalized EPS is based on current book value. Therefore, estimated normalized EPS is higher under this method (\$0.89).

The company seems to be more conservatively valued (as indicated by a lower P/E ratio) when the average ROE method is used.

LOS 29f: Explain and justify the use of earnings yield (E/P).

Vol 4, pp 390–399

Analysts often rank stocks on the basis of their P/Es (from lowest to highest). All other things remaining the same, companies with the lower P/Es are preferred as they can be purchased at a lower cost per currency unit of earnings. However, this rationale does not hold for companies with zero or negative earnings.

- The P/E ratio cannot be calculated for companies with zero earnings. The P/E ratio is undefined because the denominator equals zero.
- Companies with negative earnings have negative P/E ratios. Mathematically, negative P/E ratios are “lower” than low-positive P/E ratios, but practically speaking, negative P/E securities are the most expensive in terms of earnings purchased. Negative P/E stocks would (incorrectly) be on top of a list that ranks securities based on their P/Es from lowest to highest.

One solution for analysts interested in ranking securities is to use the reciprocal of the P/E ratio, the **earnings yield**. Rankings based on the earnings yield (from highest to lowest) would correctly rank stocks from cheapest to most expensive in terms of the amount of earnings that can be purchased with one unit of currency. Negative P/E stocks would (correctly) be at the bottom of this list.

Companies with low-positive earnings can have extremely high P/Es especially if an increase in earnings is expected. These inflated P/Es can result in heavily skewed estimates of average industry P/E. Analysis based on average industry earnings yield is more appropriate in such situations because the average earnings yield is mathematically less susceptible to outlier-induced skewness (as it usually lies between 0 and 1).

LESSON 4: PRICE MULTIPLES BASED ON THE METHOD OF FORECASTED FUNDAMENTALS (JUSTIFIED MULTIPLES)

LOS 29g: Describe fundamental factors that influence alternative price multiples and dividend yield. Vol 4, pp 419–424, 429–430, 435–439

LOS 29h: Calculate and interpret the justified price-to-earnings ratio (P/E), price-to-book ratio (P/B), and price-to-sales ratio (P/S) for a stock, based on forecasted fundamentals. Vol 4, pp 395–396, 419–424, 429–430, 435–439

Justified P/E Multiple Based on Fundamentals

Calculating the justified P/E ratio helps analysts determine the value that the market should place on a dollar of earnings given forecasts of the company's profitability, growth, and cost of capital.

Recall the following expression for calculating the intrinsic value of a security based on the Gordon growth model:

$$V_0 = \frac{D_1}{(r - g)}$$

The **justified (based on fundamentals) leading P/E multiple** is developed by dividing both sides of the Gordon growth model equation for intrinsic value (V_0) by next year's expected earnings (E_1)

$$\text{Justified leading P/E} = \frac{P_0}{E_1} = \frac{D_1/E_1}{r - g} = \frac{(1 - b)}{r - g}$$

(1 – b) is the payout ratio.

The **justified trailing P/E multiple** based on the Gordon growth model is developed by dividing both sides of the equation for intrinsic value (V_0) by last year's earnings (E_0).

$$\text{Justified trailing P/E} = \frac{P_0}{E_0} = \frac{D_1/E_0}{r - g} = \frac{D_0(1 + g)/E_0}{r - g} = \frac{(1 - b)(1 + g)}{r - g}$$

Note that if earnings are expected to grow by a factor of g , next year's earnings (E_1) will be greater than last year's earnings (E_0) by a factor of g , and the justified trailing P/E ratio will be greater than the justified leading P/E ratio by a factor of $(1 + g)$.

Example 4-1: Calculating Justified Trailing and Forward P/E Ratios Based on Fundamentals

Natasha is considering the purchase of Tiara Corp. stock, which is currently trading at \$18.

The company's payout ratio is 40% and its forecasted long-term growth rate is 5%. Further, the required rate of return on the stock is 11%.

1. Calculate the company's justified trailing and forward P/E ratios based on these fundamentals.
2. Given that Tiara's next year's EPS is expected to be \$1.90, comment on whether the stock is undervalued, overvalued, or fairly valued.

Solution:

$$1. \text{ Justified trailing P/E ratio} = \frac{P_0}{E_0} = \frac{(1 - b)(1 + g)}{r - g} = \frac{0.4 \times 1.05}{0.11 - 0.05} = 7$$

$$\text{Justified forward P/E ratio} = \frac{P_0}{E_1} = \frac{1 - b}{r - g} = \frac{0.4}{0.11 - 0.05} = 6.67$$

2. The company is currently trading at a leading P/E ratio of 9.47 ($=18/1.90$). The company's justified leading P/E (6.67) is less than its current P/E (9.47), which implies that the stock is overvalued.

Justified P/B Multiple Based on Fundamentals

The justified P/B ratio can be calculated based on a company's fundamentals. We illustrate the derivation of the justified P/B multiple below:

According to Gordon growth model,

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

ROE can be defined as:

$$\text{ROE} = \frac{E_1}{B_0}$$

Substituting $E_1 = B_0 \times \text{ROE}$ into the Gordon growth model, we have:

$$P_0 = \frac{B_0 \times \text{ROE} \times (1 - b)}{r - g}$$

Also, we know that sustainable growth rate equation is:

$$g = b \times \text{ROE}$$

Substituting $b = g/ROE$ into the expression for the Gordon growth model, we get:

$$\frac{P_0}{B_0} = \frac{ROE \times \left(1 - \frac{g}{ROE}\right)}{r - g}$$

Therefore:

$$\frac{P_0}{B_0} = \frac{ROE - g}{r - g}$$

where:

ROE = Return on equity

r = Required return on equity

g = Sustainable growth rate

All other things remaining the same, the larger the ROE in relation to r , the higher the justified P/B multiple based on fundamentals. This should make sense because the greater the spread between the return on equity and the required return on equity, the greater the value created by the company for its shareholders.

Example 4-2: Calculating Justified P/B Ratio Based on Fundamentals

An analyst gathered the following information regarding Jemco Pharmaceuticals' stock:

- Current market price = \$12
 - Book value per share = \$3.50
 - Return on equity = 14%
 - Required rate of return on equity = 10%
 - Sustainable growth rate = 6%
1. Calculate the stock's actual P/B multiple.
 2. Calculate the stock's justified P/B multiple based on forecasted fundamentals.
 3. Based on the justified P/B calculated in Part 2, comment on whether the stock is undervalued, overvalued, or fairly valued.

Solution:

1. Actual P/B multiple = $12/3.5 = 3.43$
2. Justified P/B multiple = $\frac{ROE - g}{r - g} = \frac{0.14 - 0.06}{0.1 - 0.06} = 2$
3. The stock's actual P/B multiple (3.43) is higher than the justified P/B multiple (2). Therefore, it is overvalued.

Justified P/S Multiple Based on Fundamentals

The justified P/S ratio based on fundamental can be derived as follows:

According to Gordon growth model,

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

We know that $D_0 = E_0 (1 - b)$

Substituting $D_0 = E_0 (1 - b)$ into the Gordon growth model, we get:

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

Dividing both sides of above expression by S_0 , we get:

$$\frac{P_0}{S_0} = \frac{(E_0/S_0)(1 - b)(1 + g)}{r - g}$$

where:

E_0/S_0 = Net profit margin

$1 - b$ = Payout ratio

- The justified P/S ratio based on fundamentals is positively related to the net profit margin (E_0/S_0) and to the earnings growth rate (g).
- Further, the profit margin affects the P/S ratio not only directly, but also through its influence on the growth rate. Recall that:
 - $g = \text{Retention rate} \times \text{ROE and ROE}$
 $= \text{NP margin} \times \text{Asset turnover} \times \text{Equity multiplier}$

Therefore, a higher profit margin will result in a higher growth rate as long as sales do not decrease proportionately. A reduction in sales would lower asset turnover, which may offset the impact of the increase in net profit margin on the growth rate.

Example 4-3: Calculating the Justified P/S Ratio Based on Forecasted Fundamentals

Sarah is evaluating the stock of Global Investments, which is currently trading at \$26. She gathers the following information regarding the company:

- Long-term profit margin = 9.5%
 - Dividend payout ratio = 40%
 - Earnings growth rate = 11%
 - Required rate of return = 12%
1. Calculate the company's justified P/S ratio based on these fundamentals.
 2. Based on its justified P/S ratio, and given that sales per share amount to \$5.50, calculate Global's intrinsic value and comment on whether the stock is currently undervalued, overvalued, or fairly valued.

Solution:

$$\begin{aligned} 1. \text{ Justified P/S ratio} &= \frac{(E_0/S_0)(1 - b)(1 + g)}{r - g} \\ &= \frac{0.095 \times 0.4 \times 1.11}{0.12 - 0.11} = 4.218 \end{aligned}$$

$$\begin{aligned} 2. \text{ Intrinsic value} &= P/S \times \text{sales per share} \\ &= 4.218 \times 5.50 = \$23.20 \end{aligned}$$

Given that the company's market price (\$26) is greater than its intrinsic value estimate (\$23.20) based on the justified P/S ratio, the stock appears to be overvalued.

Justified P/CF Multiple Based on Fundamentals

The justified P/CF multiple based on fundamentals can be determined by first computing the intrinsic value of the stock using a discounted cash flow model and then dividing the intrinsic value estimate by the chosen definition of cash flow.

For example, the constant growth FCFE model is given as:

$$V_0 = \frac{FCFE_0(1 + g)}{(r - g)}$$

We could divide both sides of this equation by our desired definition of cash flow to obtain the justified P/CF multiple for a stock.

- The justified P/CF multiple is positively related to the growth rate of cash flows (g).
- The justified P/CF multiple is inversely related to stock's required rate of return (r).

Example 4-4: Calculating the Justified P/CF Ratio Based on Fundamentals

Samantha is evaluating the stock of Theta Corp., which is trading at a price of \$37. She gathers the following information regarding the company:

- Trailing FCFE = \$1.80
 - Expected growth rate = 7.5%
 - Required rate of return = 12%
 - Trailing CF (earnings plus non-cash charges) = \$4.50
1. Calculate the intrinsic value of the stock according to the constant growth FCFE model.
 2. Calculate the stock's justified P/FCFE ratio based on forecasted fundamentals.
 3. Calculate the stock's justified P/CF ratio based on forecasted fundamentals.

Solution:

$$1. V_0 = \frac{FCFE_0(1 + g)}{(r - g)}$$

$$V_0 = \frac{1.80 \times (1 + 0.075)}{(0.12 - 0.075)} = \$43$$

2. Justified P/FCFE ratio = 43/1.80 = 23.89
3. Justified P/CF ratio = 43/4.50 = 9.56

Justified Dividend Yield

The expression for the justified dividend yield based on fundamentals can be derived as follows:

According to Gordon growth model,

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

Rearranging the above expression, we get:

$$\frac{D_0}{P_0} = \frac{r - g}{1 + g}$$

- The dividend yield is positively related to the required rate of return on equity (r).
- The dividend yield is negatively related to the expected rate of growth in dividends (g).

This implies that investing in a low dividend yield stock reflects a growth rather than a value strategy.

Example 4-5: Calculating the Justified Dividend Yield Based on Fundamentals

An analyst gathered the following information regarding the stock of Ikini Corp.:

- Current market price = \$32
 - Required rate of return on equity = 11.5%
 - Consensus growth forecast = 6%
1. Compute the stock's justified dividend yield based on these fundamentals.
 2. If the stock currently offers a dividend yield of 6%, comment on whether Ikini is currently undervalued, overvalued, or fairly valued.

Solution:

1. Justified dividend yield = $\frac{r - g}{1 + g} = \frac{0.115 - 0.06}{1 + 0.06} = 5.19\%$
2. Since the stock's current dividend yield (6%) is greater than the justified dividend yield (5.19%) Ikini appears to be undervalued. Its price would need to increase in order for its current dividend yield to fall to its justified dividend yield.

LOS 29i: Calculate and interpret a predicted P/E, given a cross-sectional regression on fundamentals, and explain limitations to the cross-sectional regression methodology. Vol 4, pp 397–398

A company's P/E ratio can also be estimated by regressing its historical P/Es on fundamentals (e.g., growth rate in earnings, dividend payout ratio, and beta). While this method offers some useful perspectives on valuation, it has the following limitations:

- The regression only captures the relation between price and fundamentals for a particular stock (or stocks) over the sample period. The regression may have poor predictive quality when applied to other stocks, or outside the sample period.
- The relationships between P/E and company fundamentals may change over time, diminishing the predictive power of the model.
- Such regressions tend to suffer from multicollinearity (correlations within linear combinations of independent variables), which makes it difficult to interpret individual regression coefficients.

Example 4-6: Predicted P/E Based on a Cross-Sectional Regression

Melissa is valuing ABC Company's stock. The stock has a beta of 0.8, a dividend payout ratio of 40%, and an earnings growth rate of 6%. She estimates the following regression equation based on stocks of peer companies.

$$\text{Predicted P/E} = 11.15 + (2.40 \times \text{DPR}) - (0.25 \times \text{Beta}) + (14.50 \times \text{EGR})$$

- DPR = Dividend payout ratio
- EGR = Earnings growth rate

1. Estimate ABC's P/E ratio based on the regression equation.
2. Given that ABC is currently trading at a trailing P/E of 9.4, comment on whether the stock is undervalued, overvalued, or fairly valued.

Solution:

1. Predicted P/E = $11.15 + (2.40 \times 0.4) - (0.25 \times 0.8) + (14.50 \times 0.06) = 12.78$
2. Since ABC's predicted P/E (12.78) is greater than its current P/E (9.40), the stock appears to be undervalued.

LOS 29j: Evaluate a stock by the method of comparables and explain the importance of fundamentals in using the method of comparables.

Vol 4, pp 398–412

LOS 29r: Evaluate whether a stock is overvalued, fairly valued, or undervalued based on comparisons of multiples. Vol 4, pp 398–412

Under the method of comparables:

- The value of a stock can be estimated based on a benchmark multiple and compared to its current market price; or equivalently
- The stock's actual price multiple can be compared to the benchmark multiple.

Steps Required for Valuation Based on Comparables

The following steps are required when using any of the multiples discussed in this section for valuation based on comparables.

1. Select and calculate the multiple that will be used in the comparison.
2. Select the benchmark (asset or group of assets) and compute the value of the multiple for the benchmark (known as the **benchmark value of the multiple**).
 - If the benchmark is a group of assets, calculate the mean and median value of the benchmark value of the multiple.
3. Use the benchmark multiple to estimate the value of the company's stock.
4. Assess whether differences between the actual price of the stock and the estimated stock price (based on the benchmark multiple) are driven by differences in the fundamental determinants of price. Make appropriate modifications to the conclusions drawn from the valuation.

Application of the P/E Ratio in Valuation Based on Comparables

For a comparables-based valuation that focuses on the P/E ratio, the benchmark value of the multiple may be any of the following:

- The P/E of another company that operates in the same industry and has similar operating characteristics as the subject company.
- The average or median P/E for the subject company's peers in the industry.
- The average or median P/E for the subject company's industry or sector.
- The P/E for a representative equity index.
- The average historical P/E for the stock.

The basic idea behind the method of comparables is to compare the price of the stock to its estimated value based on the benchmark value of the multiple. All other things remaining the same:

- If the price of the stock is greater than the price based on the benchmark multiple, the stock is relatively overvalued.
- If the price of the stock is lower than the price based on the benchmark multiple, the stock is relatively undervalued.

However, before drawing any conclusions regarding relative value, we must ensure that the fundamentals of the stock are similar to the fundamentals of the benchmark. Stated differently, we must ensure that we are comparing apples to apples. For example, consider the P/E ratio. Earlier in the reading, we learned that justified (based on fundamentals) P/E ratios are positively related to expected growth rates and inversely related to required rates of return. If the subject company's market price is greater than the price estimate based on the benchmark multiple, it is possible that:

- The subject company is overvalued.
- The subject company is fairly valued as it has a higher expected growth rate than the benchmark (which leads to a higher P/E).
- The subject company is fairly valued as it has a lower required rate of return (due to lower risk) than the benchmark (which leads to a higher P/E).

When analyzing a stock based on comparables, it is imperative that we also examine the fundamental factors underlying the price of the stock and the benchmark. Only if their fundamental drivers of value are similar, will the stock and benchmark be truly "comparable," and only then will conclusions regarding relative value be valid.

Example 4-7: Comparing P/E Multiples of Peer Companies

Jason is analyzing the stock of Beta Corp, which is currently trading at 11.65 times last year's earnings. He gathers the following information about companies that operate in the same industry as Beta:

Company	Trailing P/E
Company A	8.24
Company B	74.35
Company C	3.95
Company D	12.58
Company E	5.63
Mean P/E	20.95
Median P/E	8.24

1. Based on the information given, determine the most appropriate benchmark value of the P/E multiple.
2. Evaluate whether Beta is undervalued, overvalued, or fairly valued relative to the benchmark.

Solution:

1. The P/E multiple of Company B (74.35) is clearly an outlier. Therefore, we will use median P/E multiple of 8.24 (as opposed to mean P/E multiple of 20.95) as the benchmark.
2. Since Beta's P/E multiple (11.65) is greater than the benchmark P/E multiple (8.24), it appears that the stock is relatively overvalued. Before drawing this conclusion, however, Jason should evaluate whether Beta's higher P/E multiple is the result of a higher expected growth rate and/or a lower required rate of return (due to lower risk) relative to its peers.

Application of the P/B Ratio in Valuation Based on Comparables

To use the method of comparables based on P/B, we use the same steps defined earlier in the LOS. You should also note that:

- Unlike EPS forecasts, forecasts of book value are not compiled and made available by financial data vendors. Therefore, analysts typically use trailing P/B ratios in their analyses.
- Relative valuation based on P/Bs should account for differences in ROE, required return (risk), and expected growth of earnings before drawing conclusions.

Example 4-8: P/B Comparables Approach

Howard wants to evaluate the stock of Mercury Inc. relative to its two closest competitors, Venus Inc. and Jupiter Inc. Information regarding the three companies as of December 31, 2011 is given in the table below:

Firm	Price to Book Value					5-Year Average	Current	Forecasted	
	2006	2007	2008	2009	2010			ROE	Beta
Mercury Inc.	2.4	2.0	2.2	2.3	2.1	2.2	1.7	12.4%	1.25
Venus Inc.	1.7	1.6	1.9	1.8	2.0	1.8	1.7	16.2%	1.10
Jupiter Inc.	1.4	1.7	1.5	1.9	2.0	1.7	1.5	14.5%	1.0
Industry Avg.							2.1	12.0%	

Comment on whether Mercury's stock is undervalued, overvalued, or fairly valued relative to the industry and each of its peers.

Solution:

Compared to the industry's mean P/B ratio, Mercury seems to be undervalued. This is because it is currently trading at a P/B (1.7) that is approximately 81% of the industry average (2.1), while its forecasted ROE (12.4%) is slightly higher than the industry's (12%).

However, when we compare the stock with its two closest competitors, it appears to be relatively overvalued.

- Mercury currently trades at the same P/B as Venus (1.7), but has a lower forecasted ROE (12.4% versus 16.2%) and higher risk, as measured by beta (1.25 versus 1.1).
- Mercury currently trades at a higher P/B than Jupiter (1.7 versus 1.5), but has a lower forecasted ROE (12.4% versus 14.5%) and higher risk, as measured by beta (1.25 versus 1.0).

Application of the P/S Ratio in Valuation Based on Comparables

To use the method of comparables based on P/S, we use the same steps defined earlier in the LOS. You should also note that:

- Even though reported P/S ratios are typically based on trailing sales, analysts may use forecasted sales in relative valuation.
- Relative valuation based on P/S should consider differences in profit margins, required return (risk), expected growth of earnings, and the quality of accounting before drawing conclusions.

Example 4-9: P/S Comparables Approach

Aliya is analyzing the stock of Alpha Corp. She gathers the following information:

Measure	Alpha	Beta	Gamma
Current price-to-sales	1.4	3.2	2.0
Prior-year profit margin	6.5%	14.5%	8.2%
Forecasted profit margin	7.3%	14.8%	10.6%
Long-term growth forecast	9%	12%	8%
Beta	0.91	0.75	0.88

1. Based on just the current P/S ratios (without considering any other information), comment on whether Alpha is relatively undervalued, overvalued, or fairly valued.
2. State and justify which peer company Alpha is more comparable to.

Solution:

1. Based solely on the current P/S ratio, Alpha appears to be relatively undervalued.
2. Based on the information provided, Alpha appears to be more comparable to Gamma than Beta. This is because Alpha's key fundamentals (for the P/S approach), i.e., the profit margin, growth rate, and risk are much closer to Gamma's fundamentals than Beta's.

Application of the P/CF Ratio in Valuation Based on Comparables

To use the method of comparables based on P/CF, we use the same steps defined earlier in the LOS.

Example 4-10: P/CF Comparables Approach

Samantha is evaluating the stock of Violet Inc. She gathers the following information regarding the company and a close competitor, Rose Inc.:

Company	Current Price (\$)	Trailing CF per Share (\$)	P/CF	Trailing FCFE per Share (\$)	P/FCFE	5-Year Growth Forecast	Beta
Violet	20	2.5	8	0.40	50	12.5%	1.2
Rose	15	1.5	10	-0.80	NA	8.0%	1.2

Based on this information, comment on whether Violet is undervalued, overvalued, or fairly valued relative to Rose.

Solution:

Violet is trading at a lower P/CF ratio than Rose (8 versus 10). Further, Violet's expected growth rate is higher than that of Rose (12.5% versus 8.0%). This leads us to conclude that Violet is relatively undervalued compared to Rose.

This conclusion is reinforced when we look at the two companies' FCFE.

- Violet has positive FCFE, which implies that the company has sufficient cash flow to meet its capital investment requirements.
- Rose has negative FCFE, which indicates that it may need external financing.

The fundamentals seem to suggest that Violet should be trading at a greater P/CF than Rose. Since Violet is currently trading at a lower P/CF than Rose, it is relatively undervalued.

Application of the Dividend Yield in Valuation Based on Comparables

To use the method of comparables based on the dividend yield, we use the same steps defined earlier in the LOS. You should also note that:

- Relative valuation based on dividend yields should consider differences in required returns (risk), expected growth rates, and the security of the dividend. The security of the dividend can be analyzed based on:
 - The payout ratio. The lower (higher) the payout ratio the more (less) secure the dividend.
 - Ratio analysis, especially the interest coverage ratio (higher ratio implies more secure dividend) and the ratio of net debt to EBITDA (lower ratio implies more secure dividend).

Example 4-11: Dividend Yield Comparables

An analyst is comparing the stocks of three companies. The following information is provided:

Company	Consensus Growth Forecast (%)	Beta	Dividend Yield	Payout Ratio (%)
Alpha	6.4%	0.60	7.4%	80%
Beta	16.5%	0.65	3.7%	35%
Gamma	7.9%	0.70	5.2%	40%

Comment on the relative valuation of the stocks.

Solution:

Based on the given information, we can infer the following:

- All three companies exhibit low market risk, as their betas are lower than 1.0.
- Alpha has the highest dividend yield (7.4%) and (appropriately) the lowest growth forecast (6.4%). Alpha also has the highest dividend payout ratio (80%). A high dividend payout ratio may raise concerns regarding the security of the dividend.

LESSON 5: THE P/E-GROWTH RATIO AND USING MULTIPLES TO DETERMINE TERMINAL VALUE

LOS 29k: Calculate and interpret the P/E-to-growth ratio (PEG), and explain its use in relative valuation. Vol 4, pp 403–405

The **P/E-to-growth (PEG) ratio** captures the impact of growth on the P/E ratio. It is calculated as the stock's P/E ratio divided by the expected earnings growth rate **in percent**. All else being equal, investors prefer stocks with lower PEGs over stocks with higher PEGs. While it is quite useful, the PEG ratio has the following drawbacks:

- It incorrectly assumes a linear relationship between P/E and growth.
- It does not account for the differences in risk, which have a significant impact on P/E.
- It does not account for differences in the duration of growth. For example, using a short-term growth forecast may not account for differences in growth over the long term.

Example 5-1: Calculating P/E-to-Growth Ratio

Sophia is comparing the stocks of Venus Inc., Mars Inc., and Pluto Inc. She gathers the following information:

Company	Forward P/E	5-Year EPS Growth Forecast	
		Growth Forecast	Beta
Venus	8.51	11%	1.2
Mars	10.38	12%	0.8
Pluto	11.26	9%	0.9

Calculate the P/E-to-growth ratio for the three stocks and comment on their relative values.

Solution:

PEG Ratios:

- Venus: $8.51 / 11 = 0.77$
- Mars: $10.38 / 12 = 0.87$
- Pluto: $11.26 / 9 = 1.25$

Based on PEG ratios, Venus seems to be the most attractive as it has the lowest P/E per percentage point of expected growth. However, Venus also has the highest level of risk ($\beta = 1.2$). Therefore, Mars may actually be a better investment as its PEG ratio is only slightly higher than Venus', but its beta (risk) is much lower ($\beta = 0.8$).

LOS 29l: Calculate and explain the use of price multiples in determining terminal value in a multistage discounted cash flow (DCF) model.

Vol 4, pp 412–414

In earlier readings, we have seen how the terminal value of a stock is estimated based on the Gordon growth model and on the constant growth FCF model. The key condition that must be satisfied in computing terminal value is that it should reflect the rate of growth that the company can sustain over the long run. Analysts may also use price multiples (especially the P/E and P/B multiples) to determine terminal value.

There are two broad approaches to computing terminal value based on multiples.

The first approach computes the **terminal price based on fundamentals**. Under this approach, the terminal value is calculated as the product of the justified (based on fundamentals) multiple and the estimate of the fundamental for the company. For example, the terminal value based on justified P/E can be calculated as:

$$\begin{aligned} TV_n &= \text{Justified leading P/E} \times \text{Forecasted earnings}_{n+1} \\ TV_n &= \text{Justified trailing P/E} \times \text{Forecasted earnings}_n \end{aligned}$$

The second approach computes the **terminal price based on comparables**. Under this approach, the terminal value is calculated as the product of the benchmark multiple and the estimate of the fundamental for the company. For example, the terminal value based on the benchmark P/E can be calculated as:

$$\begin{aligned} TV_n &= \text{Benchmark leading P/E} \times \text{Forecasted earnings}_{n+1} \\ TV_n &= \text{Benchmark trailing P/E} \times \text{Forecasted earnings}_n \end{aligned}$$

The advantage of the comparables approach is that it is based on market data. On the other hand, the fundamentals approach is based on estimates of company fundamentals (e.g., required rate of return, dividend payout ratio, and the mature stage growth rate), and errors in these estimates can have a significant impact on the terminal value estimate.

A disadvantage of the comparables approach is that the estimate of terminal value will be erroneous if the benchmark reflects a mispricing.

Example 5-2: Estimating Terminal Value

An analyst gathered the following information regarding the stock of Saturn International:

- Average dividend payout ratio for companies in the same industry = 0.40
- Required rate of return = 11%
- Industry average ROE = 0.14
- EPS forecast for 2015 = \$2.50
- Industry average P/E = 15.25

Estimate the stock's terminal value at the end of 2015 using:

1. The method based on forecasted fundamentals.
2. The method of comparables using the industry average as the benchmark.

Solution:

$$1. \text{ Gordon growth model} = P_{2015} = \frac{D_{2016}}{r - g}$$

$$\begin{aligned} D_{2015} &= E_{2015} \times \text{Payout ratio} \\ &= 2.50 \times 0.4 = \$1.00 \end{aligned}$$

$$\begin{aligned} g &= \text{Retention rate} \times \text{ROE} \\ &= (1 - 0.4) \times 0.14 = 0.084 = 8.4\% \end{aligned}$$

$$\text{Therefore, } D_{2016} = 1 \times 1.084 = \$1.084$$

$$P_{2015} = \frac{1.084}{(0.11 - 0.084)} = \$41.69$$

Note that you would obtain the same answer if you multiplied the justified trailing P/E multiple by earnings for 2015. This is illustrated below:

$$\text{Justified trailing P/E} = \frac{(1 - b) \times (1 + g)}{r - g} = \frac{0.4 \times 1.084}{0.11 - 0.084} = 16.68$$

$$\begin{aligned} P_{2015} &= \text{Trailing P/E} \times E_{2015} \\ &= 16.68 \times 2.5 = \$41.69 \end{aligned}$$

$$\begin{aligned} 2. \quad P_{2015} &= \text{Industry average P/E} \times E_{2015} \\ &= 15.25 \times 2.5 = \$38.125 \end{aligned}$$

LESSON 6: ENTERPRISE VALUE MULTIPLES

LOS 29m: Explain alternative definitions of cash flow used in price and enterprise value (EV) multiples and describe limitations of each definition.
Vol 4, pp 431–432

Analysts may use any of the following as proxies for cash flow in calculating cash flow multiples:

EPS Plus Non-Cash Charges (CF)

- Calculated as EPS + Depreciation + Amortization.
- Ignores non-cash revenue and changes in working capital items.

Cash Flow from Operations (CFO)

- May require adjustments for nonrecurring components of cash flow.
- Adjustments may be required when comparing companies that use different accounting standards.
 - For example, interest expense may be classified as CFO or CFF under IFRS, but must be classified as CFO under U.S. GAAP.

Free Cash Flow to Equity (FCFE)

- Calculated as CFO – FCInv + Net borrowing.
- Theoretically, it is the most suitable definition for free cash flow.
- However, it may be more volatile than CFO.
- It may also be more frequently negative than CFO.

EBITDA

- Calculated by adding depreciation and amortization to EBIT.
- Since it represents a flow available to both equity holders and bond holders, it is more suited for calculating the value of the company; not the value of equity.

LOS 29n: Calculate and interpret EV multiples and evaluate the use of EV/EBITDA. Vol 4, pp 440–448

We have just learned that EBITDA represents a flow to equity holders and bond holders. In order to be used in a valuation multiple, EBITDA should be used with a measure of total company value (value belonging to both debt and equity holders) in the numerator. **Enterprise value (EV)** achieves this purpose as it represents total company value. Enterprise value is calculated as:

$$\begin{aligned} \text{Enterprise value} = & \text{Market value of common equity} + \text{Market value of preferred stock} \\ & + \text{Market value of debt} + \text{Minority interest} \\ & - \text{Value of cash and short-term investments} \end{aligned}$$

- Cash and investments (known as **nonearning assets**) are subtracted because EV aims to measure the net price that an acquirer would pay for the company as a whole. The acquirer would buy out current debt and equity holders and use nonearning assets to subsidize the total cost of acquisition.

- Market values are used for the same reason. For example, in order to repurchase the company's debt, an acquirer would have to pay market prices.
 - When market values are difficult to ascertain/obtain, analysts use book values.

Enterprise Value to EBITDA

The **enterprise value to EBITDA (EV/EBITDA)** multiple is the most commonly used enterprise value multiple.

Advantages:

- It is more useful than P/E for comparing companies with different levels of financial leverage.
- Unlike net income, EBITDA controls for differences in depreciation and amortization between companies and is therefore more appropriate for valuing capital-intensive businesses.
- EBITDA is often positive even when EPS is negative.

Disadvantages:

- EBITDA ignores the effects of differences in revenue recognition policies on cash flow from operations.
- EBITDA may overstate cash flow from operations if working capital is growing.
- Free cash flow to the firm (FCFF) may be a better measure (than EBITDA) because it reflects the amount required for capital expenditures and is therefore more strongly linked to valuation theory. EBITDA will reflect differences in capital programs only if depreciation expenses match capital expenditures.

Example 6-1: Calculating EV/EBITDA

An analyst gathered the following information regarding Global Investments:

- Number of common shares outstanding = 300,000
- Market price per share = \$20
- Market value of preferred stock = \$1.5 million
- Market value of debt = \$3.5 million
- Cash and short-term investments = \$0.8 million
- Revenues = \$8 million
- Depreciation and amortization expense = \$0.60 million
- Interest expense = \$0.10 million
- Taxes = \$0.35 million
- Net income = \$2.4 million

Calculate the company's EV/EBITDA ratio.

Solution:

$$\begin{aligned}\text{Enterprise value} &= \text{Market value of common equity} + \text{Market value of preferred stock} \\ &\quad + \text{Market value of debt} - \text{Value of cash and short-term investments} \\ &= (300,000 \times 20) + 1.5 \text{ m} + 3.5 \text{ m} - 0.8 = \$10.2 \text{ million}\end{aligned}$$

$$\begin{aligned}\text{EBITDA} &= \text{Net income} + \text{Interest} + \text{Taxes} + \text{Depreciation and amortization} \\ &= 2.4 \text{ m} + 0.1 \text{ m} + 0.35 \text{ m} + 0.6 \text{ m} = \$3.45 \text{ million}\end{aligned}$$

$$\text{EV/EBITDA} = 10.2 \text{ m}/3.45 \text{ m} = 2.96$$

Invested capital is another measure of total firm value. Unlike enterprise value, it includes cash and investments. When analyzing ratios such as EV/EBITA, ROIC is the relevant profitability measure because EBITA flows to all providers of capital.

Valuation Based on Forecasted Fundamentals

All other things remaining the same, the justified EV/EBITDA multiple based on fundamentals is:

- Positively related to the expected growth rate of FCFF.
- Positively related to the return on invested capital, ROIC (expected profitability).
 - ROIC is calculated as operating profit after tax divided by total invested capital.
- Negatively related to the WACC.

Valuation Based on Comparables

All else remaining the same, a lower EV/EBITA multiple than the benchmark suggests that the company is relatively undervalued.

Alternative Denominators in Enterprise Value Multiples

Free Cash Flow to the Firm =	Net Income	plus Interest Expense	minus Tax Savings on Interest	plus Depreciation	plus Amortization	less Investment in Working Capital	less Investment in Fixed Capital
EBITDA =	Net Income	plus Interest Expense	plus Taxes	plus Depreciation	plus Amortization		
EBITA =	Net Income	plus Interest Expense	plus Taxes		plus Amortization		
EBIT =	Net Income	plus Interest Expense	plus Taxes				

Enterprise Value to Sales

The **enterprise value to sales (EV/Sales)** multiple is used as an alternative to the P/Sales ratio. It is particularly useful in comparing companies with different capital structures.

Example 6-2: Comparable Enterprise Value Multiples

Susan wants to evaluate the stock of Datha Corp. relative to its peers. She gathers the following information:

Measure	Alpha	Beta	Gamma
Price	30.00	14.00	18.00
Times: Shares outstanding	240	2,100	600
Equals: Equity market cap	7,200	29,400	10,800
Plus: Debt (most recent quarter)	740	3,200	1,250
Plus: Preferred stock	0	0	0
Equals: Total invested capital (TIC)	7,940	32,600	12,050
Less: Cash	900	5,500	1,600
Equals: Enterprise Value (EV)	7,040	27,100	10,450
EBITDA (TTM)	1,450	2,850	2,600
TIC/EBITDA	5.48	11.44	4.63
EV/EBITDA	4.86	9.51	4.02
Debt/Equity	22.40%	28.90%	40.70%
ROIC (TTM)	7.50%	4.20%	8.80%
Quarterly revenue growth (YoY)	42.50%	18.60%	9.40%

1. In the given scenario, ranking based on both TIC/EBITDA and EV/EBITDA is the same. State the circumstances in which rankings based on these two measures might differ.
2. Based solely on the information given, comment on the relative valuation of Alpha Inc.

Solution:

1. Total invested capital and enterprise value differ in that enterprise value does not take into account cash, cash equivalents, and marketable securities. Therefore, a material change in any of these accounts relative to EBITDA could cause a rankings based on TIC/EBITDA and EV/EBITDA to vary.
2. From the table, we can see that Alpha is trading at a lower TIC/EBITDA and EV/EBITDA (5.48 and 4.86) compared to Beta (11.44 and 9.51), and therefore seems relatively undervalued. Further, Alpha has a higher ROIC (7.5% versus 4.2%) and a higher revenue growth rate (42.5% versus 18.6%) than Beta, which give us more reasons to believe that Alpha is relatively undervalued compared to Beta.

Compared to Gamma, Alpha is trading at higher TIC/EBITDA and EV/EBITDA multiples despite the fact that it has a lower ROIC (7.5% versus 8.8%). However, Alpha's higher multiples may be justified based on its lower leverage (22.4% versus 40.7%) and higher revenue growth rate (42.5% versus 9.4%) compared to Gamma.

LESSON 7: INTERNATIONAL CONSIDERATIONS, MOMENTUM VALUATION INDICATORS AND ISSUES IN PRACTICE WITH VALUATION INDICATORS

LOS 29o: Explain sources of differences in cross-border valuation comparisons. Vol 4, pp 410–412

Comparing companies across borders (when applying relative valuation techniques) is difficult due to differences in accounting methods, cultural differences, and differences in risk and growth opportunities resulting from different economic and political environments. Further, benchmarking is difficult because (1) P/Es for companies in the same industry vary across countries and (2) P/Es of national markets can vary substantially at a given point in time.

Areas where differences in accounting treatment exist include inventory, goodwill, R&D expenses, and foreign exchange adjustments. Cash flow ratios, such as P/CFO and P/FCFE, are least affected by accounting differences, while P/B, P/E, and EBITDA multiples are affected to a greater extent as they are based on accounting earnings.

An example of the differences in macroeconomic environments on price multiple is the impact of differences in inflation and differences in the ability of companies to pass on higher prices to customers. If a company's entire growth comes from inflation, the justified forward P/E after accounting for inflation is given as:

$$\frac{P_0}{E_1} = \frac{1}{\rho + (1 - \lambda)I}$$

where:

λ = The percentage of inflation in costs that the company can pass through to revenue.

ρ = Real rate of return.

I = Rate of inflation.

Based on this expression for the justified forward P/E, we can conclude that all other things remaining the same:

- For companies with the same ability to pass on inflation to customers, the company operating in the environment with higher inflation will have a lower justified P/E.
- For companies operating in environments where inflation rates are equal, the company with the greater ability to pass on higher prices to customers will have a higher justified P/E.

LOS 29p: Describe momentum indicators and their use in valuation. Vol 4, pp 445–456

Momentum indicators relate either the price or a fundamental (e.g., earnings) of a company to the time series of its historical or expected value. Momentum indicators include:

- **Unexpected earnings (UE)** or **earnings surprise**, which is the difference between reported earnings and expected earnings. It is generally believed that positive earnings surprises are associated with persistent positive risk-adjusted returns (alpha).
 - $UE_t = EPS_t - E(EPS_t)$

In applying this concept to valuation, analysts usually calculate the **scaled earnings surprise**, which equals unexpected earnings divided (scaled) by the standard deviation of analysts' forecasts. The underlying principle here is that the lower the divergence in analysts' forecasts, the more meaningful the forecast error relative to the mean.

- **Standardized unexpected earnings (SUEs)** is calculated as:

$$SUE_t = \frac{EPS_t - E(EPS_t)}{\sigma [EPS_t - E(EPS_t)]}$$

where:

EPS_t = Actual EPS for time t

$E(EPS_t)$ = Expected EPS for time t

$\sigma [EPS_t - E(EPS_t)]$ = Standard deviation of $[EPS_t - E(EPS_t)]$

SUE basically scales unexpected earnings by a measure of the size of historical forecast errors or surprises. The underlying principle here is that the lower the historical size of the forecast error, the more meaningful the given forecast error.

- **Relative-strength indicators** compare a stock's performance during a particular period either with its own past performance, or with the performance of a group of stocks. Relative strength indicators include:
 - Price momentum, which is basically the stock's compounded rate of return over the recent past.
 - Moving-average oscillators and resistance and support levels that are defined based on the relationship between a stock's return over a recent period and its return over a longer period.
 - The ratio of the stock's performance to the performance of an equity index.

The rationale for the use of relative strength indicators is that patterns of persistence or reversal in returns may exist.

LOS 29q: 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. Vol 4, pp 457–463

Average Multiples: The Harmonic Mean

Analysts usually use harmonic mean and the weighted harmonic mean to calculate the average of a group of price multiples.

Consider a portfolio consisting of 100 shares each of Stock A and Stock B:

- Stock A is trading at \$48 with an EPS of \$4, resulting in a P/E of 12.
- Stock B is trading at \$27 with an EPS of \$3, resulting in a P/E of 9.

We can calculate the P/E of the portfolio directly by dividing the combined market value of the stocks by the combined earnings:

$$\text{Portfolio's P/E} = (4,800 + 2,700)/(400 + 300) = 10.71$$

Now we are going to assess which method of computing the portfolio's average P/E best reflects the value of 10.71. We will compute the arithmetic mean, weighted mean, harmonic mean, and weighted harmonic mean for our portfolio:

$$\text{Arithmetic mean P/E} = (12 + 9)/2 = 10.50$$

$$\begin{aligned}\text{Weighted mean P/E (based on portfolio value weights)} &= [(48/75) \times 12] + [(27/75) \times 9] \\ &= 10.92\end{aligned}$$

$$\text{Simple harmonic mean} = X_H = \frac{n}{\sum_{i=1}^n (1/X_i)} = \frac{2}{[(1/12)+(1/9)]} = 10.29$$

$$\begin{aligned}\text{Weighted harmonic mean} = X_{WH} &= \frac{1}{\sum_{i=1}^n (w_i/X_i)} \\ &= \frac{1}{\{(48/75) \times (1/12)\} + \{(27/75) \times (1/9)\}} = 10.71\end{aligned}$$

As you can see, the weighted harmonic mean is the most precise measure for computing the average of a group of price multiples. Also note that:

- The simple harmonic mean (10.29) is lower than the arithmetic mean (10.50). This makes sense because simple harmonic mean inherently gives a lower weight to higher P/Es and a higher weight to lower P/Es.
- Using the median (as opposed to the mean) mitigates the effect of outliers.
- The harmonic mean may also be used to reduce the impact of outliers. However, while the harmonic mean mitigates the impact of large outliers, it may actually aggravate the impact of small outliers.
- For an equal-weighted index, simple harmonic mean and weighted harmonic mean are equal.

Using Multiple Valuation Indicators

Analysts typically use multiple valuation indicators as different indicators provide them with different pieces of information. Valuation indicators are used by analysts to define their universe of investments through a process called **screening**. Stock screens usually define criteria for including stocks in an investor's portfolio and are an efficient way to narrow down a search for investments. Limitations of stock screens include:

- The lack of control over the calculation of important inputs in vendor-provided data.
- The absence of qualitative factors.

READING 30: RESIDUAL INCOME VALUATION

LESSON 1: THE RESIDUAL INCOME MODEL

LOS 30a: Calculate and interpret residual income, economic value added, and market value added. Vol 4, pp 492–497

Residual Income

The income statement only deducts an expense for the cost of debt capital (i.e., interest expense). It does not account for any costs of equity capital. **Accounting net income** reflects earnings available to common shareholders, but since no charge for equity capital is deducted on the income statement, shareholders must themselves determine whether the company is earning enough to cover their opportunity cost of supplying capital to the company (required return on equity).

Note that the cost of equity is a marginal cost, i.e., the cost of additional (internally generated or newly issued) equity.

Residual income on the other hand, explicitly deducts a charge for equity capital to determine whether the company is earning an abnormal return (i.e., a return in excess of opportunity costs) for equity investors.

$$\text{Residual income} = \text{Net income} - \text{Equity charge}$$

$$\text{Equity charge} = \text{Cost of equity capital} \times \text{Equity capital}$$

Example 1-1: Calculating Residual Income

The total assets of Gamma Associates are carried at a book value of \$5 million. Gamma's assets are financed by 60% equity and 40% debt. The company's cost of equity and cost of debt are 10% and 6% respectively. Given that EBIT for the year 2010 was \$500,000, calculate Gamma's accounting income and residual income assuming a tax rate of 35%.

Solution:

Gamma's operating income before taxes (EBIT) is given as \$500,000.

40% of the \$5 million worth of assets (which equals \$2 million) are financed with debt.

Therefore:

$$\text{Interest expense} = 6\% \times 2,000,000 = \$120,000$$

2010	
EBIT	\$500,000
Less: Interest expense	120,000
Pre-tax income	380,000
Less: Income tax expense @ 35%	133,000
Net income	\$247,000

Gamma has earned positive accounting income over the year. This, however, only tells us that it has generated some positive return for its shareholders. What we need to determine now is whether Gamma's earnings for the year have exceeded the return that its equity holders require for providing capital to the company. The calculation of residual income enables us to make this determination.

We have calculated accounting net income for the year. In order to compute residual income we simply deduct a charge for equity capital (worth 60% of the company's assets) from net income.

$$\text{Equity charge} = \text{Cost of equity capital} \times \text{Equity capital}$$

$$\text{Equity charge} = 10\% \times (5,000,000 \times 60\%) = \$300,000$$

$$\text{Therefore, residual income} = 247,000 - 300,000 = -\$53,000$$

Gamma has negative residual income for 2010, which indicates that the company's earnings for 2010 do not cover its cost of equity capital.

Calculating Residual Income: Alternative Approach

A second approach to calculating residual income takes the perspective of all providers of capital to the company (debt holders and equity holders). Under this approach, a **capital charge** (the company's total cost of capital in dollar terms) is deducted from the company's after-tax operating profit.

$$\text{Residual income} = \text{After-tax operating profit} - \text{Capital charge}$$

$$\text{Capital charge} = \text{Equity charge} + \text{Debt charge}$$

$$\text{Debt charge} = \text{Cost of debt} \times (1 - \text{Tax rate}) \times \text{Debt capital}$$

Note that this approach assumes that:

- The marginal cost of debt equals the current cost of debt.
- The weights used to compute the capital charge are based on book values of debt and equity.

To illustrate this approach, we have presented the computation of Gamma's 2010 residual income below:

	2010
EBIT	\$500,000
Less: Income tax expense @ 35%	175,000
Operating profit after tax	325,000
Less: After-tax cost of debt capital	78,000
Less: Cost of equity capital	300,000
Residual income	-\$53,000

$$\text{After-tax cost of debt capital} = [6\% \times (1 - 35\%)] \times (5,000,000 \times 40\%) = \$78,000$$

Economic Value Added

Economic value added (EVA) is a variation of residual income. Broadly speaking, its calculation is quite similar to the second approach for calculating residual income (based on the capital charge) that we just illustrated. EVA is calculated as net operating profit after tax minus a capital charge:

$$\text{EVA} = \text{NOPAT} - (\text{C}\% \times \text{TC})$$

NOPAT = Net operating profit after tax = $\text{EBIT} (1 - \text{Tax rate})$

$\text{C}\%$ = Cost of capital (WACC)

TC = Total capital

In this model, both NOPAT and TC are calculated based on generally accepted accounting principles, but adjusted for the following items:

- Research and development (R&D) expenses are capitalized and amortized instead of being expensed.
 - Therefore, R&D expenses are added back to compute NOPAT.
- For strategic investments that are not expected to generate an immediate return, a charge for capital is suspended until a later date.
- Goodwill is capitalized and not amortized. Therefore:
 - Expenses associated with amortization of goodwill are added back in computing NOPAT.
 - Accumulated amortization is added back to capital.
- Deferred taxes are eliminated. Only cash taxes are treated as an expense.
- Any LIFO reserve is added to capital. The increase in LIFO reserve over the year is added to NOPAT.
- Operating leases are treated as capital leases, and non-recurring items are adjusted. As a result of these adjustments, the numerical value of EVA usually differs from that of RI.

Market Value Added

Market value added (MVA) equals the difference between the market values of the company's debt and equity and the book values of debt and equity (invested capital). It measures the value created by management for the company's investors by generating economic profits over the life of the company.

$$\text{MVA} = \text{Market value of the company} - \text{Accounting book value of total capital}$$

$$\text{Market value of company} = \text{Market value of debt} + \text{Market value of equity}$$

Example 1-2: Calculating EVA and MVA

An analyst gathered the following information regarding Alpha Trading:

- NOPAT = \$3,000,000
- Total number of shares outstanding = 1,000,000
- Market price per share = \$30
- Market value of debt = \$10,000,000
- Total invested capital = \$35,000,000

Given a WACC of 11%, calculate the company's economic value added and market value added.

Solution:

$$\begin{aligned}\text{Economic value added} &= \text{NOPAT} - (\text{C}\% \times \text{TC}) \\ &= 3,000,000 - (11\% \times 35,000,000) = -\$850,000\end{aligned}$$

$$\begin{aligned}\text{Market value of the company} &= \text{Market value of equity} + \text{Market value of debt} \\ &= (1,000,000 \times 30) + 10,000,000 = \$40,000,000\end{aligned}$$

$$\begin{aligned}\text{Market value added} &= \text{Market value of the company} - \text{Accounting book value of total capital} \\ &= 40,000,000 - 35,000,000 = \$5,000,000\end{aligned}$$

LOS 30b: Describe the uses of residual income models. Vol 4, pp 497–512

Uses of Residual Income Models

- Residual income, economic value added, and market value added are used to measure internal corporate performance and to determine executive compensation.
 - If a company is generating more (less) income than its cost of capital, it is generating positive (negative) residual income, and therefore creating (destroying) value.
- Residual income models have also been used to value individual stocks and equity indices.
 - Companies that generate positive (negative) residual income should trade at a premium (discount) to book value.
 - All else equal, companies that generate high (low) residual income should be expected to trade at high (low) P/B multiples.
- Standard-setters have also proposed the use of residual income models to measure impairment of goodwill.

LOS 30c: Calculate the intrinsic value of a common stock using the residual income model and compare value recognition in residual income and other present value models. Vol 4, pp 512–515

The Residual Income Model

Residual income is calculated as net income minus an equity charge:

$$RI_t = E_t - (r \times B_{t-1})$$

where:

RI_t = Residual income at time t

E_t = Earnings at time t

r = Required rate of return on equity

B_{t-1} = Book value at time t-1

The residual income model breaks down the intrinsic value of common stock into two components:

- The current book value of equity; and
- The present value of expected future residual income.

Therefore, the intrinsic value of a stock can be calculated as:

$$V_0 = B_0 + \sum_{t=1}^{\infty} \frac{RI_t}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{E_t - rB_{t-1}}{(1+r)^t}$$

where:

V_0 = Intrinsic value of the stock today

B_0 = Current book value per share of equity

B_t = Expected book value per share of equity at any time t

r = Required rate of return on equity

E_t = Expected EPS for period t

RI_t = Expected residual income per share

Example 1-3: Forecasting Residual Income

Veronica Lange, CFA, wants to forecast the residual income of Omega Printers for the next 2 years, (2009 and 2010). She gathers the following information regarding the company:

- Market price of stock at December 31, 2008 = \$50
- Book value per share at December 31, 2008 = \$20
- Consensus annual EPS forecasts:
 - 2009 = \$2.35
 - 2010 = \$2.50

The company's dividend payout ratio is expected to remain constant at 60%. Given a cost of equity of 10%, compute the company's residual income for 2009 and 2010.

Solution:

Omega Printers Residual Income Forecasts

	2009	2010
Beginning book value per share (B_{t-1})	20.00	20.94
Add: Forecasted earnings per share (E_t)	<i>Provided information</i>	2.35
Less: Forecasted dividends per share	60% of EPS_t	1.41
Ending book value per share (B_t)	$B_{t-1} + EPS_t - DPS_t$	20.94
Forecasted earnings per share (E_t)	2.35	2.50
Less: Equity charge per share ($r \times B_{t-1}$)	<i>Cost of equity</i> $\times B_{t-1}$	2.00
Residual income per share	$E_t - (rB_{t-1})$	0.35
		0.41

Beginning BVPS₂₀₁₀ equals ending BVPS₂₀₀₉ = \$20.94

Example 1-4: Using the Residual Income Model

An analyst is provided the following information regarding Alpha Ltd.

- The company's current book value per share equals \$8.00.
- The company's EPS for the next 3 years is expected to be \$2.25, \$3.00, and \$4.50 respectively.
- The company's DPS for the next 3 years is expected to be \$1.25, \$2.00, and \$14.50 respectively.
- The Year 3 dividend is expected to be a liquidating dividend, i.e., the company is expected to cease its operations at the end of Year 3 and distribute its entire book value in a dividend.

Given a required rate of return on equity of 10%:

1. Calculate Alpha's book value and residual income for the next 3 years.
2. Estimate the intrinsic value of Alpha's stock using the residual income model.
3. Estimate the intrinsic value of Alpha's stock using the dividend discount model.

Solution:

1. Alpha's book value per share and residual income per share for the next 3 years are calculated in the table below:

Year	1	2	3
Beginning book value per share (B_{t-1})	8.00	9.00	10.00
Add: EPS (E_t)	2.25	3.00	4.50
Less: Dividends (D_t)	1.25	2.00	14.50
Ending book value per share (B_t)	9.00	10.00	0.00
EPS (E_t)	2.25	3.00	4.50
Less: Equity charge per share ($r \times B_{t-1}$)	0.80	0.90	1.00
Residual income per share [$E_t - (r \times B_{t-1})$]	1.45	2.10	3.50

2. Under the residual income model, the intrinsic value of a stock is calculated as the sum of its current book value per share and the present value of expected future residual income per share (discounted at the required rate of return on equity).

$$\text{Intrinsic value} = 8 + \frac{1.45}{(1.1)^1} + \frac{2.10}{(1.1)^2} + \frac{3.50}{(1.1)^3} = \$13.68$$

TI BA II Plus calculator keystrokes:

[CF] [2ND] [CE|C]

8 [ENTER] [↓]

1.45 [ENTER] [↓] [↓]

2.10 [ENTER] [↓] [↓]

3.50 [ENTER] [NPV]

10 [ENTER] [↓] [CPT]

NPV = 13.68

3. Under the dividend discount model, the intrinsic value of a stock is calculated as the sum of the present values of expected future dividends (discounted at the required rate of return on equity).

$$\text{Intrinsic value} = \frac{1.25}{(1.1)^1} + \frac{2}{(1.1)^2} + \frac{14.50}{(1.1)^3} = \$13.68$$

TI BA II Plus calculator keystrokes:

[CF] [2ND] [CE|C]

0 [ENTER] [↓]

1.25 [ENTER] [↓] [↓]

2.00 [ENTER] [↓] [↓]

14.50 [ENTER] [NPV]

10 [ENTER] [↓] [CPT]

NPV = 13.68

Takeaways:

- Given consistent assumptions, intrinsic value estimates based on the residual income and dividend discount models will be equal.
- Recognition of value typically occurs earlier in the residual income model than in the dividend discount model.
 - Under the residual income model, a substantial proportion of intrinsic value comes from current (Year 0) book value (\$8).
 - Under the DDM, \$10.89 of the total intrinsic value of \$13.68 can be attributed to the final time period (Year 3).

Residual Income Model (Alternative Approach)

So far, when forecasting residual income, we have computed residual income by subtracting the dollar amount of the equity charge for the period from EPS for the period.

$$RI_t = EPS_t - (r \times B_{t-1})$$

Another (equivalent) way to compute residual income is by applying the difference between the actual return on equity (ROE) and the required return on equity (r) to the beginning-of-period book value.

$$EPS_t = ROE \times B_{t-1}$$

Therefore:

$$RI_t = (ROE - r) B_{t-1}$$

As a result, the general residual income model may also be expressed as:

$$V_0 = B_0 + \sum_{t=1}^{\infty} \frac{(ROE_t - r) B_{t-1}}{(1+r)^t}$$

Below, we use the data from Example 1-2 to illustrate the calculation of intrinsic value using this alternative approach. Note that the value obtained for the intrinsic value of the stock is the same under either approach.

Year	1	2	3
Earnings per share (EPS _t)	2.25	3.00	4.50
Beginning book value per share (B _{t-1})	8.00	9.00	10.00
Return on equity (EPS _t / B _{t-1})	28.13%	33.33%	45.00%
Less: Required rate of return on equity (r)	10.00%	10.00%	10.00%
Abnormal rate of return (ROE – r)	18.13%	23.33%	35.00%
Residual income [(ROE_t – r) × B_{t-1}]	1.45	2.10	3.50

$$\text{Intrinsic value} = 8 + \frac{1.45}{(1.1)^1} + \frac{2.10}{(1.1)^2} + \frac{3.50}{(1.1)^3} = \$13.68$$

LOS 30d: Explain fundamental determinants of residual income. Vol 4, pp 505–506

LOS 30e: Explain the relation between residual income valuation and the justified price-to-book ratio based on forecasted fundamentals. Vol 4, pp 512–515

The fundamental drivers of residual income can be identified by assuming constant growth in dividends and earnings. Recall the following expression for the justified P/B ratio based on fundamentals:

$$\frac{P_0}{B_0} = \frac{ROE - g}{r - g}$$

This equation can mathematically be manipulated into the following expression:

$$\frac{P_0}{B_0} = 1 + \frac{ROE - r}{r - g}$$

Since the justified price equals the stock's intrinsic value, the intrinsic value of a stock under the residual income model can be expressed as:

$$V_0 = B_0 + \frac{ROE - r}{r - g} B_0$$

Under this constant growth residual income model, the intrinsic value of a stock equals the sum of:

- Its current book value (B_0); and
- The present value of its expected stream of residual income $[(ROE - r) \times B_0 / (r - g)]$. This term represents the additional value created as a result of the company's ability to generate returns in excess of its cost of equity.

Also note that:

- If the return on equity (ROE) equals the required return on equity (r), the intrinsic value of the stock would equal its book value.
- If the return on equity (ROE) is greater than the required return on equity (r), the present value of the expected stream of residual income will be positive, the intrinsic value of the stock will be greater than its book value, and the justified P/B ratio will be greater than 1.
- If the return on equity (ROE) is less than the required return on equity (r), the present value of the expected stream of residual income will be negative, the intrinsic value of the stock will be lower than its book value, and the justified P/B ratio will be less than 1.

Therefore, a stock's justified P/B ratio is directly related to the company's expected future residual income.

Another concept that is closely related to the P/B ratio is **Tobin's q**.

$$\text{Tobin's q} = \frac{\text{Market value of debt and equity}}{\text{Replacement cost of total assets}}$$

Tobin's q is different from the P/B in the following respects:

- It uses the market value of equity and debt (rather than just equity) in the numerator and uses book value of total assets (rather than just equity) in the denominator.
- Assets are valued at replacement cost (as opposed to book or accounting values).

All else equal, the greater the productivity of a firm's assets, the higher the Tobin's q.

LOS 30f: Calculate and interpret the intrinsic value of a common stock using single-stage (constant growth) and multistage residual income models. Vol 4, pp 506–511

LOS 30h: Explain continuing residual income and justify an estimate of continuing residual income at the forecast horizon, given company and industry prospects. Vol 4, pp 500–511

LOS 30l: Evaluate whether a stock is overvalued, fairly valued, or undervalued based on a residual income model. Vol 4, pp 506–511

Single-Stage Residual Income Model

The single-stage (constant growth) residual income model assumes that the company has a constant return on equity and a constant earnings growth rate forever. We derived the expression for the constant growth RI model in the previous section:

$$V_0 = B_0 + \frac{ROE - r}{r - g} B_0$$

Example 1-5: Calculating Residual Income Based on the Single-Stage Model

Henry wants to evaluate the stock of Beta Inc. He gathers the following information:

- Current market price per share = \$44
- Current book value per share = \$20
- Perpetual ROE = 18%
- Perpetual growth rate = 6%
- Required rate of return on equity = 12%

Calculate the stock's intrinsic value and comment on whether the stock is undervalued, overvalued, or fairly valued.

Solution:

$$\begin{aligned} V_0 &= B_0 + \frac{(ROE - r) \times B_0}{r - g} \\ &= 20 + \frac{(0.18 - 0.12) \times 20}{0.12 - 0.06} = \$40 \end{aligned}$$

Given that the stock's current market price (\$44) is higher than its intrinsic value (\$40), the stock appears to be overvalued.

One of the assumptions of the single-stage RI model is that the return on equity will remain in excess of the required rate of return on equity (resulting in positive RI) forever. This assumption is rather unrealistic as ROE will probably fall to some mean value over time and future residual income will be 0 at some point. This is because abnormally high ROEs will attract competition, which will lead to lower returns. Therefore, analysts use multistage models that allow them to relax the assumption of indefinite persistence of abnormal earnings by incorporating a **persistence factor (ω)** into the valuation model (See Part 3 of Example 1-6).

Multi-Stage Residual Income Valuation

The multi-stage residual income approach (similar to multi-stage DDM and FCF models) is used to forecast residual income over a certain time horizon and then estimate terminal value based on continuing residual income at the end of that horizon. As was the case with the other models that we have studied, the initial stage should be a horizon for which the analyst is quite confident of her forecasts of inputs. Beyond the initial horizon, the analyst may assume any of the following regarding continuing residual income:

- It continues indefinitely at a positive level.
- It equals zero from the terminal year forward. This is the case when competition results in ROE abruptly falling to the level of the required rate of return on equity.

- It gradually declines to zero as ROE reverts to the required return on equity through time.
- It reflects the reversion of ROE to some mean level. This is the case when ROE declines to a normal long-run level consistent with a mature industry.

Example 1-6: Multi-Stage Residual Income Models

Sasha wants to evaluate the stock of Shebby Inc. She gathers the following information:

- Current book value per share = \$11
- ROE = 15%
- Expected EPS for Years 1-5 is calculated as ROE times beginning book value per share.
- Dividend payout ratio = 30%
- Required rate of return on equity = 10%

Calculate the stock's intrinsic value using the residual income model based on the assumption that:

1. After Year 5, ROE will fall to 10% (same as required rate of return on equity) so continuing residual income will fall to zero.
2. From Year 5 onwards, yearly continuing residual income will remain constant at the Year 5 level into perpetuity.
3. ROE will start to decline in Year 6 and beyond towards the required return on equity with a persistence factor of 0.6.
4. ROE will decline to the long-run industry average and the stock will trade at a P/B multiple of 1.3 at the end of Year 5.

Given that the stock is currently trading at \$20, for each of the assumptions listed above comment on whether it is fairly valued, overvalued, or undervalued.

Solution:

Residual income for Years 1 through 5 is calculated in the table below:

Year	0	1	2	3	4	5
Beginning book value per share (B_{t-1})	11.00	12.16	13.43	14.84	16.40	
Add: EPS ($E_t = \text{ROE} \times B_{t-1}$)	1.65	1.82	2.01	2.23	2.46	
Less: Dividends (30% of EPS)	0.50	0.55	0.60	0.67	0.74	
Ending book value per share (B_t)	11.00	12.16	13.43	14.84	16.40	18.12
Earnings per share (E_t)	1.65	1.82	2.01	2.23	2.46	
Less: Equity charge per share ($r \times B_{t-1}$)	1.10	1.22	1.34	1.48	1.64	
Residual income per share [$E_t - (r \times B_{t-1})$]	0.55	0.61	0.67	0.74	0.82	

*Note: Calculations may not appear to be consistent with the numbers presented due to rounding.

1. If residual income falls to zero after Year 5, the intrinsic value of the stock is calculated as the sum of its current book value per share and the present values

of the residual income earned over the 5 years. Terminal value equals zero in this scenario.

$$\text{Intrinsic Value} = 11 + \frac{0.55}{(1.1)^1} + \frac{0.61}{(1.1)^2} + \frac{0.67}{(1.1)^3} + \frac{0.74}{(1.1)^4} + \frac{0.82}{(1.1)^5} = \$13.52$$

TI BA II Plus calculator keystrokes:

[CF] [2ND] [CE|C]
 11 [ENTER] [↓]
 0.55 [ENTER] [↓] [↓]
 0.61 [ENTER] [↓] [↓]
 0.67 [ENTER] [↓] [↓]
 0.74 [ENTER] [↓] [↓]
 0.82 [ENTER] [NPV]
 10 [ENTER] [↓] [CPT]
NPV = \$13.52

The intrinsic value of the stock (\$13.52) is lower than its market price (\$20) which suggests that it is overvalued. The market may be estimating a higher terminal premium and/or a lower cost of equity for Shebby.

2. If continuing residual income remains constant at the Year 5 level (\$0.82) forever, the terminal value as of the end of Year 5 can be calculated as follows:

$$\text{Terminal value at the end of Year 5} = 0.82 / 0.1 = \$8.20$$

Therefore, the stock's intrinsic value will now be calculated as follows:

$$\text{Intrinsic Value} = 11 + \frac{0.55}{(1.1)^1} + \frac{0.61}{(1.1)^2} + \frac{0.67}{(1.1)^3} + \frac{0.74}{(1.1)^4} + \frac{0.82 + 8.20}{(1.1)^5} = \$18.61$$

TI BA II Plus calculator keystrokes:

[CF] [2ND] [CE|C]
 11 [ENTER] [↓]
 0.55 [ENTER] [↓] [↓]
 0.61 [ENTER] [↓] [↓]
 0.67 [ENTER] [↓] [↓]
 0.74 [ENTER] [↓] [↓]
 9.02 [ENTER] [NPV]
 10 [ENTER] [↓] [CPT]
NPV = \$18.61

The intrinsic value of the stock (\$18.61) is lower than its market price (\$20) which suggests that it is overvalued. The market is estimating an even higher terminal premium and/or a lower interim cost of equity for Shebby.

3. When residual income fades over time as ROE declines toward the required return on equity, the intrinsic value of a stock is calculated using the following formula:

$$V_0 = B_0 + \sum_{t=1}^{T-1} \frac{(E_t - rB_{t-1})}{(1+r)^t} + \frac{E_T - rB_{T-1}}{(1+r-\omega)(1+r)^{T-1}}$$

where:

ω = Persistence factor

- A persistence factor of 1 means that residual income will not decline at all; it will continue at the same level forever.
 - In Part 2 of this example, residual income had a persistence factor of 1.
- A persistence factor of 0 means that there will be no residual income after the initial forecast horizon.
 - In Part 1 of this example, residual income had a persistence factor of 0.
- The higher the persistence factor, the higher the stream of residual income in the final stage, and the higher the value of the stock.

Given a persistence factor of 0.6, terminal value at the end of Year 5 will be calculated as:

$$\text{Terminal value at the end of Year 5} = \frac{0.906}{(1+0.1-0.6)} = \$1.8122$$

where:

$$E_6 = \text{ROE} \times B_5 = 0.15 \times 18.12 = 2.718$$

$$r \times B_5 = 0.1 \times 18.12 = 1.812$$

$$RI_6 = E_6 - (r \times B_5) = 0.906$$

Therefore, the stock's intrinsic value will be calculated as follows:

$$\text{Intrinsic Value} = 11 + \frac{0.55}{(1.1)^1} + \frac{0.61}{(1.1)^2} + \frac{0.67}{(1.1)^3} + \frac{0.74}{(1.1)^4} + \frac{0.82 + 1.81}{(1.1)^5} = \$14.65$$

TI BA II Plus calculator keystrokes:

[CF] [2ND] [CE|C]

11 [ENTER] [↓]

0.55 [ENTER] [↓] [↓]

0.61 [ENTER] [↓] [↓]

0.67 [ENTER] [↓] [↓]

0.74 [ENTER] [↓] [↓]

2.63 [ENTER] [NPV]

10 [ENTER] [↓] [CPT]

NPV = **\$14.65**

The intrinsic value of the stock (\$14.65) is lower than its market price (\$20) which suggests that it is overvalued.

4. Given an expected P/B ratio at the end of Year 5 of 1.3, the market price of the stock would equal \$23.56 ($= 1.3 \times \18.12) at the end of the initial stage. The excess of the market price over Year 5 book value represents continuing residual income, \$5.44 ($= 23.56 - 18.12$).

The stock's intrinsic value is calculated as the sum of the present value of residual income earned over the first five years and the present value of continuing residual income.

$$V_0 = B_0 + \sum_{t=1}^T \frac{(E_t - rB_{t-1})}{(1+r)^t} + \frac{P_T - B_T}{(1+r)^T}$$

TI BA II Plus calculator keystrokes:

[CF] [2ND] [CE|C]

11 [ENTER] [↓]

0.55 [ENTER] [↓] [↓]

0.61 [ENTER] [↓] [↓]

0.67 [ENTER] [↓] [↓]

0.74 [ENTER] [↓] [↓]

6.26 [ENTER] [NPV]

10 [ENTER] [↓] [CPT]

NPV = **\$16.90**

The intrinsic value of the stock (\$16.90) is lower than its market price (\$20) which suggests that it is overvalued.

LOS 30g: Calculate the implied growth rate in residual income, given the market price-to-book ratio and an estimate of the required rate of return on equity. Vol 4, pp 506–507

The expression for the single-stage RI model can be rearranged to calculate the growth rate implied by the current market price. The assumption here is that the current market price equals the stock's intrinsic value.

$$g = r - \left[\frac{(ROE - r) \times B_0}{V_0 - B_0} \right]$$

Example 1-7: Calculating Implied Growth Rate

Andrew wants to estimate the growth rate implied in the current market price of Global Corp. He obtains the following information:

Current market price per share = \$52

- Current book value per share = \$15
- Expected long-term ROE = 16%
- Required rate of return on equity = 10%

Given that the stock's market price reflects its intrinsic value, calculate the implied growth rate.

Solution:

$$g = r - \left[\frac{(ROE - r) \times B_0}{V_0 - B_0} \right]$$

$$g = 0.10 - \left[\frac{(0.16 - 0.10) \times 15}{52 - 15} \right] = 7.57\%$$

LESSON 2: RESIDUAL INCOME VALUATION IN RELATION TO OTHER APPROACHES

LOS 30i: Compare residual income models to dividend discount and free cash flow models. Vol 4, pp 512–514

Dividend discount models and free cash flow models compute the intrinsic value of a stock by discounting a stream of expected future cash flows at the required rate of return. The RI model on the other hand, begins with a balance sheet value (book value of equity) and adjusts this value by adding the present value of expected future residual income. As a result of the difference in these approaches to the valuation process, the recognition of value is different.

- Under the RI model, a significant proportion of the total intrinsic value of a stock comes from its **current** book value, which can easily be calculated and does not entail any significant level of uncertainty.
- Under DDM and FCF models, a significant proportion of intrinsic value comes from the estimate of **future** terminal value, which is highly susceptible to forecast error because:
 - It is based on cash flows that are expected to be realized far out into the future.
 - It is highly sensitive to the assumptions of (1) required rate of return and (2) the sustainable growth rate.

Theoretically, if the assumptions used in both the approaches are the same, the intrinsic value estimate obtained from them should also be the same. Practically speaking, however, inputs for the different models are forecasted with varying degrees of accuracy, resulting in different values. Significant inconsistencies in the results offered by different models should prompt analysts to question the validity of their assumptions, and examine the relative appropriateness of the models for the subject company.

LOS 30j: Explain strengths and weaknesses of residual income models and justify the selection of a residual income model to value a company's common stock. Vol 4, pp 514–515

Strengths:

- Unlike DDM and FCF valuation models, the terminal value does not constitute a significant proportion of total intrinsic value.
- RI models use accounting data which is easily available.
- RI models are applicable to companies that do not pay any dividends and to those that have negative free cash flows.

- RI models are applicable to companies with unpredictable cash flows.
- RI models focus on economic profitability.

Weaknesses:

- Accounting data can be manipulated by management.
- Accounting data may need to be adjusted significantly to be used in the model.
- RI models assume that the clean surplus relation holds:
 - The **clean surplus relation** holds when, excluding ownership transactions, the increase in book value over the year equals retained earnings ($B_t = B_{t-1} + E_t - D_t$). We have used this relation in all our examples to compute ending book value. However, if there are any charges that bypass the income statement and are taken directly to equity accounts (e.g., unrealized gain on AFS securities), the clean surplus relation will not hold.
- By using accounting income, RI models assume that interest expense appropriately reflects the cost of debt capital.

Scenarios when the residual income model is appropriate:

- The company does not have a history of paying dividends, or dividends cannot be predicted with certainty.
- The company's free cash flows are expected to remain negative for the foreseeable future.
- The estimates of terminal value using alternative valuation models entail a great amount of uncertainty.

Scenarios when the residual income model is not appropriate:

- There are significant violations of the clean surplus relation.
- It is difficult to predict the main determinants of residual income, i.e., book value and ROE.

LESSON 3: ACCOUNTING AND INTERNATIONAL CONSIDERATIONS

LOS 30k: Describe accounting issues in applying residual income models. Vol 4, pp 516–530

The two main drivers of residual income are ROE and book value. In order to forecast future ROE and book values for the application of the residual income model, analysts must consider the following:

- Violations of the clean surplus relationship;
- Balance sheet adjustments for fair value;
- Intangible assets;
- Non-recurring items;
- Aggressive accounting practices; and
- International considerations.

Violations of the Clean Surplus Relationship

As stated previously, the residual income model is based on the assumption that the clean surplus relation holds, i.e.:

$$\text{Ending book value} = \text{Beginning book value} + \text{Net income} - \text{Dividends.}$$

The clean surplus relation is violated if gains/losses bypass the income statement and are charged directly to equity. Examples of such items include foreign currency translation adjustments, certain pension adjustments, and changes in the fair value of available-for-sale financial assets. Recall that under U.S. GAAP, these items are included in **other comprehensive income (OCI)** in the equity section of the balance sheet. Since these items are not included in net income, they are not reflected in the historical ROE data. Therefore, if the clean surplus relation does not hold, and violations are not expected to offset in future years, analysts should try to incorporate explicit assumptions about future amounts of OCI into their analyses. This would bring residual income forecasts closer to what they would be if the clean surplus relation held.

Note that under IFRS, revaluation of fixed assets may bypass the income statement and directly affect equity.

Balance Sheet Adjustments for Fair Value

In order to reliably measure the book value of equity, analysts should:

- Examine significant off-balance sheet assets and liabilities (e.g., operating leases and securitizations via SPEs) and consider the impact of their recognition on the financial statements on equity and future earnings.
- Make adjustments to the carrying amount of assets and liabilities so that they reflect fair values.

Intangible Assets

For the purposes of valuation based on the residual income model, the calculation of book value of equity should include (1) separately identifiable intangible assets that can be sold and (2) goodwill resulting from an acquisition.

Another intangible asset that requires careful consideration is research and development (R&D) expenditure.

- If a company's R&D expenses tend to be unproductive, residual income going forward will be depressed as a result of these expenditures.
- If a company's R&D expenses tend to be productive, residual income going forward will be higher as a result of increasing revenues.
- For a mature company, ROE should reflect the productivity of R&D expenditures.

Non-Recurring Items

Forecasts of residual income should be made based on recurring income. Net income forecasts (used to determine future residual earnings) should exclude nonrecurring items such as:

- Unusual items
- Extraordinary items
- Restructuring charges
- Discontinued operations
- Accounting changes

Analysts should carefully examine the income statement to identify recurring income and expense items. They should not rely on accounting definitions such as “income from continuing operations” or “operating earnings” as a proxy for recurring earnings.

Note that the above-mentioned items do not require any adjustments to book value as non-recurring gains and losses are reflected in the value of assets in place.

Aggressive Accounting Practices

Companies may sometimes engage in aggressive accounting practices that overstate the value of assets (book value) and earnings. These manipulative activities have been described in detail in the financial reporting and analysis section. When forecasting residual earnings, analysts should carefully evaluate a company’s accounting policies and also consider the integrity of management in estimating the inputs for the model.

International Considerations

Empirical studies have found that, when applied in the global valuation setting, residual income models work best in situations where:

- Reliable earnings forecasts are available;
- Clean surplus violations are limited; and
- Accounting rules do not allow delayed recognition of material events, and presented financial statements along with disclosures allow the analyst to understand the “economic reality” of the business.

READING 31: PRIVATE COMPANY VALUATION

LESSON 1: THE SCOPE OF PRIVATE COMPANY VALUATION AND DEFINITIONS (STANDARDS OF VALUE)

LOS 31a: Compare public and private company valuation. Vol 4, pp 556–558

There are significant differences between private and public companies, but enough similarities exist so that traditional valuation methods can be used for both. An awareness of those key differences is essential to accurately gauge value for private companies.

Company-Specific Factors

- **Stage in lifecycle:** Generally speaking, public companies tend to be much more advanced in their lifecycles, while private companies tend to be younger and less mature. Further, private companies are more likely to have fewer employees, minimal capital, and lower assets. However, note that private companies also include some large, stable companies and companies nearing liquidation.
- **Size:** Private companies tend to be smaller than public companies, whether measured in terms of assets or sales. Smaller size means that private firms (1) entail higher levels of risk and (2) have limited access to capital markets.
 - Due to the higher risk, analysts usually apply a premium for small size in estimating required rates of return for private companies.
 - Due to their limited access to capital, private companies may find it difficult to finance expansions of their operations.
- **Overlap of shareholders and management:** Generally speaking, private companies are owned and operated by the same people, while ownership of public companies is usually more widely dispersed. As a result, private companies are not under as much pressure from external investors (e.g., to meet earnings expectations, etc.) as public companies are. Further, since top management usually has a controlling interest in private companies, agency issues are less of a problem and management is more likely to take a long-term perspective in decision-making.
- **Quality and depth of management:** Generally speaking, private companies have fewer resources, so they are less likely to attract highly skilled managers. Further, their (smaller) scale of operations may lead to less management depth compared to public companies. These factors may hinder private company growth and lead to higher risk.
- **Quality of financial and other information:** Public companies are required to disclose detailed and timely financial (and other) information. There are no such requirements on private companies, so the lack of reliable, relevant data leads to higher uncertainty, higher risk, and lower valuations. However, note that private companies are required to provide unlimited access to financial records and other information in certain valuations (e.g., for issuing fairness opinions in the context of an acquisition).
- **Short-term pressure from investors:** Generally speaking, managers at public companies are under enormous pressure to meet short-term earnings expectations, which may result in management taking decisions based on their anticipated impact on earnings and stock price performance in the near term. This pressure is not nearly as great at the private company level, so their managers can afford to make decisions focused purely on long-term wealth maximization.

- **Tax concerns:** Private companies place more importance on reducing corporate taxes because lower taxes directly benefit management (as owners).

Stock-Specific Factors

- **Liquidity of equity interests in the business:** Generally speaking, private companies tend to have fewer shareholders and their shares tend to be more illiquid than public company shares, which are traded on stock exchanges and registered with various government agencies.
- **Concentration of control:** Ownership and control of private companies is generally concentrated in the hands of a few shareholders, which can lead to perquisites (e.g., above-market compensation for a controlling shareholder) and other benefits to owners and managers at the expense of other shareholders.
- **Potential agreements restricting liquidity:** Some private companies have agreements in place that restrict shareholders from selling their shares for a specified period. Such agreements reduce the marketability of shares.

Overall, stock-specific factors usually have a negative impact on private company valuations, while company-specific factors may have a negative (e.g., lack of quality/depth of management), or a positive (e.g., overlap of shareholders and management) impact on private company valuations.

Also note that the range of risk and return characteristics vary more widely for private companies compared to public companies. Consequently, valuation methods for private companies vary widely as well.

LOS 31b: Describe uses of private business valuation and explain applications of greatest concern to financial analysts. Vol 4, pp 558–560

Reasons for performing private company valuations fall into three categories: (1) transaction related, (2) compliance related, and (3) litigation related.

Transaction-Related Valuations

Transactions refer to events that affect the ownership or financing of a business. Private company transactions include the following:

- **Private financing:** All firms in the early stages of development need capital to expand. For private companies, the main source of early-stage financing is **venture capitalists (VCs)**. VCs typically provide funding over multiple rounds of financing, which are contingent upon the company meeting certain predefined performance “milestones.” Venture capital firms perform valuations to determine the level of investment required for an equity stake in the private company. Note that since cash flow forecasts entail a great deal of uncertainty, valuations are often informal and based on negotiations between the company and prospective investors.
- **Initial public offering (IPO):** When a private company decides to go public, an investment bank will perform a valuation (typically using similar publicly-traded companies as the benchmark) as part of the IPO process.
- **Acquisition:** Private companies (both development stage and mature) are often sold by owners to generate liquidity. Valuations in such transactions are usually performed by both the target and the buyer and then negotiated upon by the parties.

- **Bankruptcy:** Valuations for firms nearing bankruptcy are critical in determining whether they should be (1) reorganized and allowed to continue operating, or (2) liquidated. If it is found that the company is viable as a going concern, insights from the valuation can assist in the restructuring process.
- **Share-based compensation:** If a company compensates management with stock option grants, restricted stock grants, or through employee stock ownership plans, valuations are necessary for accounting and tax purposes.

Compliance-Related Valuations

These valuations are required by law or regulation. The primary focus of compliance-related valuations is financial reporting and tax reporting.

- **Financial reporting:** Financial reporting valuations are increasingly gaining importance. One of the most important applications of valuations in this context is testing for impairment of goodwill. Private company valuation techniques are used to value components (cash-generating units under IFRS and reporting units under U.S. GAAP) of public companies to determine whether goodwill is impaired. For private companies, stock option grants require frequent valuations in order to determine the value of share-based compensation expense.
- **Tax reporting:** Private company valuations may be required for corporate or individual tax reporting.
 - At the corporate level, valuations may be required for corporate restructurings, transfer pricing, and property tax matters.
 - At the individual level, private company valuations may be required for estate and gift taxation.

Litigation-Related Valuations

These refer to valuations required for legal proceedings related to damages, lost profits, shareholder lawsuits, and divorces.

Due to the differences in the valuation methods applicable in each of the three categories of valuations described above, valuation professionals usually specialize in one of the categories:

- Transaction-related valuations are usually performed by investment bankers.
- Compliance-related valuations are usually performed by professionals familiar with relevant accounting and tax regulations.
- Litigation-related valuations are usually performed by professionals who are comfortable in a legal setting and well versed in applicable laws.

LOS 31c: Explain various definitions of value and demonstrate how different definitions can lead to different estimates of value. Vol 4, pp 560–562

There are various recognized definitions of value for analysts. The exact definition that must be applied depends on (1) the status of the company (i.e., whether or not it is a going concern) and (2) how the valuation will be used.

Fair market value (FMV): The price that similarly-informed buyers and sellers would agree to trade an asset where the trade must be an arm's length transaction and neither the buyer nor seller is under any external pressure to trade.

- Fair market value is mostly used for tax reporting purposes.

Market value: The “estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arm’s length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently, and without compulsion.”¹

- Market value is frequently used in appraisals of real estate and tangible assets when they are used as collateral for borrowings.

Fair value (financial reporting): Under IFRS, fair value is defined as “the price that would be received for an asset or paid to transfer a liability in a current transaction between two marketplace participants in the reference market for the asset or liability.” Under U.S. GAAP, fair value is defined as “the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.”

- This value is used in financial reporting and is very similar to the fair market value.

Fair value (litigation): The definition of fair value in a legal setting is generally similar to the definitions of fair value for financial reporting.

Investment value: The value of an asset to a particular buyer based on her investment requirements and expectations. Different investors may have different investment values for the same asset due to different earnings expectations, return requirements, financing costs, and potential synergies. The value emphasis here is not on market consensus, but on the specific investor.

- Investment value is important in acquisitions of private companies.

Intrinsic value: The “true” or “real” value of an asset based on its risk-return expectations absent short-term mispricings.

- Intrinsic value is often used in investment analysis.

The Effect of Definitions of Value on Valuation Estimates

Each of these definitions of value could theoretically lead to different assessments of value for the same asset. For example, one potential buyer may consider the **investment value** of a company to be \$50m. Other potential buyers who recognize potential synergistic value in acquiring the company may value the company at \$60m. Since there is sufficient buying interest at a value of \$60m, this value will be considered the **fair market value** of the company as it is based on market demand and supply.

Complexities also arise due to differences across standards in definitions of value. For example, under U.S. GAAP, fair value is defined as the price received to *sell* an asset or transfer a liability (the exit price), which is typically lower than the entry price paid to *buy* the asset. In contrast, IFRS does not specify an exit or entry perspective when defining fair value.

¹ Defined by International Valuation Standards Committee (IVSC).

Since different definitions of value yield different valuation estimates, a user must always consider whether a specific valuation and its definition of value are applicable, given her own perspective. For example, the value placed by an investor for acquiring a controlling interest in a company might be very different from the value placed by an investor hoping to acquire a minority interest with little influence on corporate activities. The valuation of a minority interest may include minority and/or marketability discounts that may not apply when valuing a controlling stake in the same company.

Finally, note that valuation assumptions used for tax purposes may need to be adjusted before they can be used for financial reporting purposes.

LESSON 2: PRIVATE COMPANY VALUATION: EARNINGS NORMALIZATION AND CASH FLOW ESTIMATION ISSUES

LOS 31d: Explain the income, market, and asset-based approaches to private company valuation and factors relevant to the selection of each approach.

Vol 4, pp 562–563

There are three major approaches to valuing private companies:

1. The **income approach** is similar to the discounted cash flow approach applied to public companies. It determines the value of an asset as the present value of its expected future income.
2. The **market approach** determines the value of an asset based on price and enterprise value multiples from comparable assets recently sold in the market.
3. The **asset-based approach** determines the value of a business as the value of its net assets, i.e., the fair value of its assets less the fair value of its liabilities.

The income and asset-based approaches are **absolute valuation models**, while the market approach is a **relative valuation model**.

A variety of factors must be considered when deciding on one of these approaches to determine value, including:

Nature of operations and life cycle stage: Generally speaking:

- A company in the earliest stages of development should be valued using the asset-based approach as future cash flows might be too unpredictable and there is no guarantee that the company will be able to operate as a going concern for the foreseeable future.
- A company that has successfully negotiated the early development stage and is witnessing high growth should be valued using the income approach (based on discounted expected future cash flows).
- A stable, relatively mature company should be valued using the market approach.

Company size: Generally speaking:

- Use of multiples from larger public companies is not appropriate for smaller, relatively mature private firms with limited growth prospects.

- Use of multiples from larger public companies is not appropriate for smaller private firms that entail significantly more risk.

Finally, note that non-operating assets (e.g., excess cash and investments) that are not part of the firm's core business should be accounted for in the valuation of an entity regardless of the valuation approach or method used.

LOS 31e: Explain cash flow estimation issues related to private companies and adjustments required to estimate normalized earnings. Vol 4, pp 563–569

Normalized Earnings

Normalized earnings are defined as “economic benefits adjusted for nonrecurring, non-economic, or other unusual items to eliminate anomalies and/or facilitate comparisons.”² In the private company context, the aim of adjusting reported earnings (to reflect normalized earnings) is to have them reflect the amount that the company would earn if it were acquired. Normalized earnings for private companies may require certain **compensation-related** adjustments:

For profitable private companies, earnings may need to be adjusted upwards due to the following reasons:

- If the subject company has significant transactions with its owners, or with other businesses controlled by its owners, expenses may be overstated.
- Company owners may be taking above-market compensation from the company in order to reduce taxes payable. This would also allow them to receive a disproportionate return compared to other shareholders.
- Family members of owners may also be receiving above-market compensation from the company.
- Owners may be charging personal expenses and significant perquisites to the company.
- Owners may also have taken loans from the company.

For unprofitable private companies, earnings may need to be adjusted downwards as owners may not be taking compensation commensurate with market levels in order to keep the company running.

Another area that requires careful consideration is **real estate**. If a private company owns real estate on which it earns rental income, analysts typically separate real estate-related items from the firm's operating earnings. Revenues and expenses associated with the real estate are removed from the income statement because:

- The real estate may have different risk characteristics and prospects for growth than the company's operations.
- Depreciation charges on the real estate would reflect historical cost, not replacement cost so they would understate the current market rate for use of the asset.

²Defined in International Glossary of Business Valuation Terms.

The value of the firm's operations is determined based on earnings forecasts that exclude real estate-related revenues and expenses, and then the value of real estate is added to the value of operations to determine total firm value.

If a private company owns the real estate that it uses, a market rental charge for the asset must be included in the company's expenses to calculate normalized earnings, and to value the firm's operations. Since the asset is still owned by the company, it is included in total company value as a non-operating asset.

Also note that if real estate used by the company is leased from a related entity, the rental expense reported may require an adjustment to reflect the market rental rate.

Other adjustments that may be required to private company financials include adjustments related to **inventory accounting methods, depreciation assumptions, and capitalization versus expensing of various costs**. Analysts must also bear in mind that private company financials are typically only reviewed or compiled, but not audited. Reviews and compilations provide less assurances compared to audits regarding the fairness and reliability of the company's financial statements.

Example 2-1: Calculating Normalized Earnings

Sophia is valuing Alpha Inc., a private manufacturing company. She gathers the following information regarding the company:

- Alec Stewart is the principal shareholder and CEO of Alpha Inc. His compensation for the year was \$2 million, which was included in the company's selling, general, and administrative expenses (SG&A). Sophia believes that a market-based compensation expense of \$1 million is suitable for a CEO for this company.
- The company incurred expenses amounting to \$500,000 on a farmhouse, which Sophia does not consider necessary for the core operations of the company. \$350,000 worth of expenses was included in SG&A, while \$150,000 was included in depreciation expense.
- Alpha has debt amounting to \$1.5m outstanding on which it pays interest at the rate of 7%. Sophia believes that the company's current leverage levels are less than optimal so she decides to use an earnings figure that excludes interest expense altogether in her analysis. This is because, in the event that the company is acquired, the acquirer would likely change the company's capital structure (by increasing leverage), which would result in a change in interest expense and therefore, in profit after taxes.

Based on the company's financial statements, she computed operating income after taxes as follows:

Alpha Manufacturers
Operating Income after Taxes

	Reported
Revenues	\$100,000,000
Less: Cost of goods sold	<u>60,000,000</u>
Gross profit	40,000,000
Less: Selling, general, and admin. expenses	<u>15,000,000</u>
EBITDA	25,000,000
Less: Depreciation and amortization	<u>1,500,000</u>
Earnings before interest and taxes	23,500,000
Less: Pro forma taxes (at 35%)	<u>8,225,000</u>
Operating income after taxes	\$15,275,000

1. Based on the information given, identify the adjustments that Sophia should make to Alpha's reported income to estimate normalized earnings assuming that the firm will be acquired.
2. Based on your answer to Part 1, construct a pro forma statement of normalized operating income after taxes for the company.

Solution:

1. Sophia must make the following adjustments to reported income to estimate normalized earnings:
 - Since the appropriate market-based compensation expense for the CEO is \$1 million, SG&A expenses must be reduced by \$1 million ($= 2m - 1m$).
 - Since the farmhouse is not required for the company's core operations, related expenses should be removed from operating income. Therefore, SG&A expenses must be reduced by \$350,000 and depreciation expense by \$150,000.
2. The pro forma statement of normalized operating income after taxes is given below:

Alpha Manufacturers
Operating Income after Taxes

	Adjusted
As of December 31, 2009	
Revenues	\$100,000,000
Less: Cost of goods sold	<u>\$60,000,000</u>
Gross profit	\$40,000,000
Less: Selling, general, and admin. expenses	<u>\$13,650,000</u>
EBITDA	\$26,350,000
Less: Depreciation and amortization	<u>\$1,350,000</u>
Earnings before interest and taxes	\$25,000,000
Less: Pro forma taxes (at 35%)	<u>\$8,750,000</u>
Operating income after taxes	\$16,250,000

Cash Flow Estimation Issues

- We have already described how the equity interest being valued and the purpose of the valuation determine the appropriate definition of value that should be applied in a valuation. For example, assumptions used for cash flow estimates will be different when valuing a minority interest as opposed to a controlling interest, resulting in different values.
- There is significant uncertainty regarding future operations and cash flows of private companies. Typically, analysts develop cash flow forecasts for several different scenarios.
 - For development stage firms, possible scenarios may include an IPO, acquisition, continued operation as a private company, or bankruptcy.
 - For larger, more mature companies, scenarios may be based on different levels of growth and profitability.
- The discount rate used to compute present values of expected cash flows in each scenario should be based on the risk associated with the cash flows in that particular scenario. Each scenario is assigned a probability based on its likelihood of occurring and the value of the firm is computed as the probability-weighted average of the values obtained from the scenarios. Alternatively, analysts may apply a single discount rate to weighted-average scenario cash flows.
- Since management typically has more information about the private company's business than outside analysts, cash flow forecasts are typically made in consultation with management. Appraisers should therefore be cognizant of the possibility of biases creeping into management estimates. For example, managers have incentives to over-estimate revenues and growth prospects, and to underestimate future capital needs.
- Finally, appraisers must determine whether to use the FCFF or FCFE approach to valuation. As mentioned in an earlier reading, the FCFF approach should be used if the company is expected to undergo substantial capital structure changes in the future. This is because the WACC is less sensitive than the cost of equity to changes in financial leverage.

Example 2-2: Estimating Free Cash Flow to the Firm

Continuing from Example 2-1, Sophia decides to estimate Alpha's FCFF the following year (2010). She makes the following assumptions:

- Long-term growth rate in revenue = 6%
- Gross profit margin = 40%
- Depreciation as a percentage of revenue = 1.35%
- SG&A expenses are likely to remain at their normalized level of 2009
- Investment in working capital = 15% of the increase in revenue
- Investment in fixed capital = Depreciation expense plus 4% of incremental revenue

Estimate the company's expected FCFF for 2010.

Solution:

When valuing a private company as a prospect for an acquisition, FCFF must be estimated on the basis of normalized earnings (not reported earnings) as they reflect earnings expected by a willing buyer more accurately.

Based on the information provided, Alpha's FCFF for 2010 can be estimated as follows:

Alpha Manufacturers	\$
Revenues ($= 100m \times 1.06$)	106,000,000
Less: Cost of goods sold [$= 106m \times (1 - 40\%)$]	63,600,000
Gross profit ($= 106m \times 40\%$)	42,400,000
Less: SG&A expenses (normalized 2010 level)	13,650,000
EBITDA	28,750,000
Less: Depreciation and amortization ($106m \times 1.35\%$)	1,431,000
EBIT	27,319,000
Less: Pro forma taxes (35%)	9,561,650
Operating income after taxes	17,757,350
Plus: Depreciation and amortization	1,431,000
Less: Capital expenditures	1,671,000
Less: Increase in working capital	900,000
Free cash flow to the firm	16,617,350

Capital expenditures = $1,431,000 + [0.04(106m - 100m)] = \$1,671,000$

Increase in working capital = $0.15 \times (106m - 100m) = \$900,000$

LESSON 3: PRIVATE COMPANY VALUATION APPROACHES: (1) INCOME APPROACH

LOS 31f: Calculate the value of a private company using free cash flow, capitalized cash flow, and/or excess earnings methods. Vol 4, pp 575–578

The free cash flow, capitalized cash flow, and excess earnings methods all fall under the **income approach** to private company valuation.

The Free Cash Flow Method

Under this method, forecasted free cash flows are discounted at a rate that reflects their risk. Typically, appraisers forecast discrete cash flows over an initial stage (typically 5 years) over which they are fairly confident of their forecasts and growth is not constant. Then they compute the **terminal value** of the enterprise at the end of this initial stage under the assumption that cash flows will grow indefinitely at a constant rate.

To compute the terminal value, analysts may adopt one of two approaches:

- Use the **constant growth model** based on an assumption of constant growth into perpetuity. This is the theoretically preferred approach.
- Apply a **price multiple** (the market approach). The problem with this approach is that a market multiple (based on the current market prices of comparable

companies) incorporates the rapid near-term growth and the normal growth into the indefinite future. Applying this multiple to compute terminal value (which only represents the value coming from the normal-growth phase) would inflate the terminal value estimate. Essentially, the rapid growth would be accounted for twice: once in the discrete cash flows over the initial stage, and then in the estimate of terminal value.

The free cash flow model that we have described here is essentially a two-stage FCF model.

Example 3-1: Estimating Firm Value Based on the Free Cash Flow Approach

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

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

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

Now we can 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.

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

TI BAII Plus Calculator Keystrokes:

```
[CF] [2ND] [CE|C]
[ENTER] [↓]
4.93 [ENTER] [↓] [↓]
5.53 [ENTER] [↓] [↓]
6.19 [ENTER] [↓] [↓]
6.93 [ENTER] [↓] [↓]
90.06 [ENTER] [NPV]
19 [ENTER] [↓] [CPT]
NPV = $52.92m
```

The Capitalized Cash Flow Method

The capitalized cash flow model (CCM) is essentially the constant growth FCF model. It requires just one future cash flow estimate and assumes a constant growth in cash flows over an infinite period. A forecast of FCF, and estimates of the discount rate and the constant growth rate are the only inputs required in this model.

The capitalized cash flow method is only appropriate for valuing a relatively small private company when future projections are uncertain and comparable company market data are not available, but stable growth is expected. The CCM can also be used to assess the discount rate or growth rate embedded in estimates obtained from the market approach.

$$V_f = \frac{FCFF_1}{WACC - g_f}$$

V_f = Value of the firm

$FCFF_1$ = Free cash flow to the firm for next twelve months

WACC = Weighted average cost of capital

g_f = Sustainable growth rate of free cash flow to the firm

The value of equity can either be calculated by subtracting the market value of debt from the value of firm or by using the capitalized cash flow method as follows:

$$V = \frac{FCFF_1}{r - g}$$

V = Value of the equity

$FCFE_1$ = Free cash flow to the equity for next twelve months

r = Required return on equity

g = Sustainable growth rate of free cash flow to the equity

Example 3-2: Estimating Firm Value Based on the Capitalized Cash Flow Method

Ned Booker, CFA, views Berks Risk Management Company (BRM) as a stable growth private firm. Booker is valuing BRM and has chosen to use the CCM for valuation purposes. Booker believes that free cash flow to firm will be \$28.94 million in one year's time. He estimates the WACC to be 11.83% while growth in FCFF should be 2.5% annually. Given that BRM has debt with a market value of 50m outstanding compute the value of BRM's equity.

Solution:

$$\begin{aligned} \text{Value of the firm} &= \frac{FCFF_1}{WACC - g} \\ &= \frac{28.94m}{0.1183 - 0.025} = \$310.18m \end{aligned}$$

$$\begin{aligned} \text{Value of equity} &= \text{Value of the firm} - \text{Market value of debt} \\ &= 310.18m - 50m = \$260.18m \end{aligned}$$

The Excess Earnings Method

The excess earnings method is used to estimate the value of a company's intangible assets, which is computed as the present value of **excess earnings**.

- Excess earnings refer to earnings after deducting required returns (in dollar terms) to fixed assets and working capital.
- The present value is computed by applying the growing perpetuity formula from the capitalized cash flow method.

The excess earnings method is not usually used for valuing private businesses, but it can be used for very small private firms when other methods are not applicable and/or intangible assets are significant. However, appraisers should keep in mind that return requirements for working capital and fixed assets, and excess earnings associated with intangible assets are subject to estimation error.

Note that to value an entire business, the values of fixed and working capital must be added to the value of intangible assets (excess earnings).

Steps Required in Applying the Excess Earnings Method

1. Determine values of working capital and fixed assets.
2. Compute normalized earnings.
3. Estimate required rates of return for working capital and fixed assets.

4. Determine the dollar amounts of returns required on working capital and fixed assets.
5. Subtract the required return on working capital and fixed assets from normalized earnings to determine excess earnings (or residual income).
6. Estimate the discount rate and capitalization rate for intangible assets.
7. Use the growing perpetuity formula to compute the value of intangible assets.
8. Compute the value of the firm as the sum of the values of working capital, fixed assets, and intangible assets.

Example 3-3: Estimating Firm Value Based on the Excess Earnings Method

Ray's Fishing Services (RFS) is a small private business that harvests seafood from Chesapeake Bay in Maryland and sells to restaurants in five states. RFS has \$22,000 in working capital requirements and fixed assets with a fair value of \$230,000. RFS's required returns on working capital, fixed assets, and intangible assets are estimated as 3%, 9%, and 11%, respectively. Normalized earnings for the year just ended amounted to \$82,000 and residual income is expected to grow at 2% per year. Determine the value of RFS using the excess earnings method.

Solution:

First we determine residual income for the year just ended by subtracting returns required from working capital and fixed assets from normalized earnings.

$$\text{Residual income} = 82,000 - (0.03 \times 22,000) - (0.09 \times 230,000) = \$60,640$$

Then we compute the value of intangible assets by applying the growing perpetuity formula

$$\text{Intangible assets} = \frac{60,640 \times 1.02}{0.11 - 0.02} = \$687,253$$

Finally, we compute the value of the firm as the sum of the values of working capital, fixed assets, and intangible assets.

$$\text{Firm value} = 22,000 + 230,000 + 687,253 = \$939,253$$

LOS 31g: Explain factors that require adjustment when estimating the discount rate for private companies. Vol 4, pp 570–577

LOS 31h: Compare models used to estimate the required rate of return to private company equity (for example, the CAPM, the expanded CAPM, and the build-up approach). Vol 4, pp 570–574

The following factors must be considered when estimating the required rate of return in private company valuation:

- **Application of size premiums:** Size premiums are often applied when determining the required rate of return for private companies. However, the appraiser must be careful not to simply use a premium similar to the one used for small cap public

firms because those premiums may include compensation for the risk of financial distress that may not be relevant.

- **Use of the CAPM:** The use of the CAPM to determine the required rate of return for private companies has been questioned in certain quarters due to perceived differences between large public companies and smaller private companies. Some private companies are not likely to ever go public or be acquired, so the use of market-based beta estimates in computing their required returns is thought to be inappropriate. Therefore, the expanded CAPM (that adds a premium for small size and company-specific risk) has become more common in the private company valuation arena.
- **Elements of the build-up approach:** The build-up approach for estimating beta for private companies was introduced in an earlier reading. Just like the expanded CAPM, it models an equity risk premium, a small-company risk premium, and a company-specific risk premium, but it does not apply beta to the equity risk premium. Since betas that are different from 1.0 may reflect industry risk, it has been suggested that an industry premium should also be added when applying the build-up approach.
- **Discount rates in an acquisition context:** In evaluating a target for an acquisition, when calculating the WACC, the acquirer should use a cost of capital that is consistent with the risk inherent in the target's cash flows (not its own cost of capital), and use the capital structure of the target (not its own capital structure) in computing the cost of capital. Since the cost of capital of a large, mature acquirer is likely to be lower than the WACC of a target that is a smaller, more risky private company, the acquirer may end up paying a higher-than-required price for the target if it applies its own WACC to value the company.
- **Relative debt availability and cost of debt:** Generally speaking, private firms have less access to debt financing compared to public firms. Therefore, private firms need to rely on equity financing to a greater extent, which tends to increase their WACC. Further, their relatively smaller sizes and higher operating risk result in a higher cost of debt.
- **Discount rate adjustment for projection risk:** Appraisers may adjust the discount rate used in the valuation upwards to reflect the greater uncertainty associated with forecasting a private company's cash flows as opposed to a similar public company's cash flows. Projection risk may arise because:
 - Information regarding a private company's operations or business model may not be as easily available as for a similar public company.
 - Analysts usually rely on management when building forecasts for private companies, but managers may not necessarily have the experience in making financial forecasts and their expectations may be biased.
- **Lifecycle stage:** Estimating discount rates for early stage companies is particularly difficult. Since early-stage firms have high levels of company-specific risk, use of the CAPM would be inappropriate. Finally, even though ranges of required returns are available for each lifestyle stage, there can be uncertainty in determining the lifecycle stage that a company is currently in.

See Example 3-4 to understand the difference between the expanded CAPM and the build-up method.

Methods Used to Estimate the Required Rate of Return for a Private Company

Capital Asset Pricing Model

$$\text{Required return on equity} = \text{Risk-free rate} + (\text{Beta} \times \text{Market risk premium})$$

Expanded CAPM

$$\text{Required return on equity} = \text{Risk-free rate} + (\text{Beta} \times \text{Market risk premium}) \\ + \text{Small stock premium} + \text{Company-specific risk premium}$$

Build-Up Approach

$$\text{Required return on equity} = \text{Risk-free rate} + \text{Equity risk premium} + \text{Small stock premium} \\ + \text{Company-specific risk premium} + \text{Industry risk premium}$$

Example 3-4: Estimating the Discount Rate

Continuing from Example 2-2, Sophia now wants to determine the appropriate discount rate to compute the present value of Alpha's expected future cash flows. She gathers the following information regarding Alpha:

- Estimated beta (based on publicly-traded comparables) = 0.9
- Small stock premium = 4%
- Company-specific risk premium = 1.5%
- Industry risk premium (for the build-up method) = 1%
- After-tax cost of debt = 6%
- Current debt-to-equity ratio = 0.33
- Optimal debt-to-equity ratio = 0.60

Given that the risk-free rate equals 4.5% and the expected return on the equity market is 10%, calculate:

1. The required return on equity based on the CAPM.
2. The required return on equity based on the expanded CAPM.
3. The required return on equity based on the build-up method.
4. The company's WACC based on its current debt-to-equity ratio and a cost of equity of 15%.
5. The company's WACC based on the optimal debt-to-equity ratio and a cost of equity of 15%.

Solution:

1. Required return on equity = Risk-free rate + (Beta × Market risk premium)
 $= 0.045 + [0.9 \times (0.1 - 0.045)] = 9.45\%$
2. Required return on equity = Risk-free rate + (Beta × Market risk premium)
 $+ \text{Small stock premium} + \text{Company-specific risk premium}$
 $= 0.045 + [0.9 \times (0.1 - 0.045)] + 0.04 + 0.015 = 14.95\%$
3. Required return on equity = Risk-free rate + Equity risk premium
 $+ \text{Small stock premium} + \text{Company-specific risk premium} + \text{Industry risk premium}$
 $= 0.045 + (0.1 - 0.045) + 0.04 + 0.015 + 0.01 = 16.5\%$

4. $\text{WACC} = (0.15 \times 1 / 1.33) + (0.06 \times 0.33 / 1.33) = 12.77\%$
5. $\text{WACC} = (0.15 \times 1 / 1.6) + (0.06 \times 0.6 / 1.6) = 11.63\%$

Notice that the WACC assuming the optimal capital structure is lower than Alpha's current WACC (11.63% versus 12.77%). This is because the weight of (relatively cheaper) debt is greater in the optimal capital structure than in Alpha's current capital structure (37.5% versus 24.81%). For valuation in a potential sale of Alpha, the optimal capital structure should be used to determine the WACC because an acquirer would be able to establish the optimal capital structure (by taking on more debt) and would be willing to do this (as it lowers the cost of capital).

Also note that the weight of debt of public comparable companies may be higher than what is optimal for Alpha (which is a private company). Public companies have greater access to public debt markets, and also entail lower risk due to their relatively large sizes. Both these factors result in public companies having a lower cost of debt than private companies.

LESSON 4: PRIVATE COMPANY VALUATION APPROACHES: (2) MARKET APPROACH AND (3) ASSET-BASED APPROACH

LOS 31i: Calculate the value of a private company based on market approach methods and describe advantages and disadvantages of each method. Vol 4, pp 579–586

Market Approach

As mentioned previously, this approach values a private company based on price multiples obtained from public companies, or from sales of comparable companies. The market approach has the following variations:

- **The guideline public company method (GPCM)** calculates the value of a private company based on valuation multiples of comparable public companies. The observed public company multiple is adjusted for differences in risk and growth prospects between the subject company and the guideline public companies.
- **The guideline transaction method (GTM)** calculates the value of a private company based on multiples obtained from prices at which similar public or private companies were acquired.
- **The prior transaction method (PTM)** values a private company based on actual transactions in its own stock.

The multiple obtained from GPCM could be from a trade of any size, but the multiple obtained from GTM is from sales of entire companies.

The market approach relies on data from actual market transactions, so it is preferred to the income and asset-based approaches for private company valuation by some practitioners (including U.S. tax courts).

The primary assumption of the market-based approach is that the reference companies are reasonably comparable to the subject company. One of the major problems in using the market-based approach is the difficulty in finding comparable companies and in assessing their pricing. Market multiples reflect risk and growth characteristics of guideline companies so analysts must (1) identify the risk and growth assumptions made by the market in pricing them, (2) assess how they are different from their expectations regarding the subject company, and then (3) adjust those multiples accordingly before applying them

to value the subject company. Company-specific risks and the limited marketability of interests in private companies are also factors that must be considered in applying market multiples to private companies.

Generally speaking, key factors for identifying comparable companies include industry membership, form of operations and current operating status. Analysts should bear in mind that differences in size and lifecycle stage may create difficulties in applying the market approach.

The type of valuation multiple applied in private company valuation generally tends to vary with company size:

- For large, mature private companies, EBITDA or EBIT multiples are quite popular. One example is the market value of invested capital (MVIC) to EBITDA ratio, where MVIC equals the market value of a company's debt and equity. If the market value of debt is difficult to ascertain:
 - The book value of debt should be used if the company has low financial leverage and is operationally stable.
 - An estimate of market value from matrix prices (based on debt characteristics) should be used if the company is highly leveraged and/or if future financial performance is expected to remain volatile.
- For smaller private companies, net income-based multiples are more commonly used than EBITDA multiples.
- For even smaller private companies revenue multiples have been applied quite often.
- In certain industries, nonfinancial metrics are also applied in valuation. An example would be the use of "price per bed" when valuing a hospital.

Guideline Public Company Method (GPM)

To value a private company using the GPCM, a sample of guideline firms must first be identified. Relevant pricing multiples must be determined and adjusted to account for growth and risk differences between the subject company and the guideline companies.

The great advantage of this method is the potentially large sample of firms available for comparison along with the wealth of publicly available financial information relating to those firms. Disadvantages include the possibility that the appraiser will be unable to find comparable firms and the difficulty in determining growth and risk-related adjustments to multiples.

Market prices of publicly-traded stocks reflect the value of small equity interests that lack control over the company. Therefore, when valuing a controlling interest, a **premium for control** must be added to the value obtained from the GPCM (where market multiples are applied in valuations). A control premium is defined as "the amount or percentage by which the pro rata value of a controlling interest exceeds the pro rata value of a non-controlling interest in the business enterprise, to reflect the power of control."³

Control premiums are estimated from transactions in which public companies were acquired. The following factors must be considered when estimating a control premium:

- **Type of transaction:** Control premiums for strategic transactions (where there are significant synergies to be realized from the acquisition) tend to be higher than

³ Defined in International Glossary of Business Valuation Terms.

for financial transactions (where the buyer will have no material synergies with the target).

- **Industry factors:** Industries that are currently experiencing significant acquisition activity are considered to be “in-play.” During such times, stock prices of industry companies may already reflect a premium for control to a certain extent. Applying a standard control premium to these prices will overestimate the value of the controlling interest.
- **Form of consideration:** Control premiums might be more difficult to assess when acquisitions are paid for in the form of stock because companies are more likely to use their own shares to pay for an acquisition when they consider their shares overvalued.
- **Reasonableness:** Control premiums based on market transactions must be checked for reasonableness. For example, assume that a comparable company was recently acquired at a 10x price multiple, which reflected a 30% premium over the stock price prior to the acquisition. If comparable companies are currently trading at a 14x price multiple, application of a 30% control premium would result in almost an 18x multiple, which must be assessed for reasonableness in light of the recent 10x multiple applied in the acquisition.

Example 4-1: Valuing a Company’s Equity Using the Guideline Public Company Method (GPCM)

Alex Donovan is interested in valuing the equity of Star Enterprise (SE), a private company, using the GPCM. He gathers the following information regarding comparable public companies in the same industry as SE:

- Average MVIC-EBITDA multiple = 6.5
- A downward adjustment of 20% to the average comparable public company MVIC-EBITDA ratio is required to reflect the relative risk and growth characteristics of SE.
- Based on past acquisitions of public companies in the industry, a 15% premium for control is considered appropriate.

Alex obtains the following information regarding SE:

- Normalized EBITDA = \$18.5 million
- Market value of debt = \$12 million
- Normalized D/E ratio = 0.5

Estimate the value of SE’s equity using the GPCM.

Solution:

The average MVIC-EBITDA of other public companies in the industry needs to be adjusted downwards by 20% to reflect the relative risk and growth characteristics of SE. Therefore, we will use an MVIC-EBITDA ratio of 5.2 [= 6.5 × (1 – 0.2)] in the valuation.

This MVIC-EBITDA then needs to be adjusted to reflect a control premium of 15%. This is where you need to be very careful. A control premium is only applied to a company’s equity, not to its debt. Therefore, we cannot simply apply the 15% control

premium to SE's MVIC-EBITDA multiple as the MVIC reflects the value of both equity and debt. Given the normalized capital structure of 1/3 debt and 2/3 equity (D/E ratio = 0.5), we would apply a 10% ($= 2/3 \times 15\%$) premium for control on the MVIC-EBITDA multiple. Therefore, we will use an MVIC to EBITDA ratio of 5.72 ($= 5.2 \times 1.10$).

$$\text{Market value of SE's invested capital} = 5.72 \times 18.5\text{m} = \$105.82 \text{ million}$$

$$\begin{aligned}\text{Market value of SE's equity} &= \text{Total market value} - \text{Market value of SE's debt} \\ &= 105.82\text{m} - 12\text{m} = \$93.82 \text{ million}\end{aligned}$$

Guideline Transaction Method (GTM)

The GTM is similar to the GPCM, but only uses prices from recent acquisitions in deriving multiples. Since acquisition prices already reflect the control premium, the valuation multiple does not need to be adjusted. Although transactions data for public companies are easily available from government bodies such as the SEC, data relating to private firms are limited and generally unreliable. When applying multiples from historical transactions, the following issues must be considered:

- **Synergies.** The prices paid in strategic transactions will likely include a premium for expected synergies. This premium must be adjusted on a case-by-case basis.
- **Contingent consideration.** Contingent consideration refers to potential future payments to the seller that are contingent upon the company achieving some pre-defined targets (e.g., a target level of EBITDA). Transactions with contingent consideration must be carefully analyzed as the valuation multiple derived from them may need to be adjusted to reflect the higher risk faced by the seller in these transactions.
- **Non-cash consideration.** When an acquisition is paid for in the form of stock of the acquirer, the transaction price may be inflated if the acquirer's stock is overvalued in the market.
- **Availability of transactions.** Finding guideline transactions is not always easy or straightforward in certain industries.
- **Changes between the transaction date and the valuation date.** Historical transaction prices may no longer be relevant due to changes in the industry or economic environment.

Example 4-2: Valuing a Company's Equity Using the Guideline Transactions Method (GTM)

Using the data from Example 4-1, now suppose that Donovan is able to find several comparable companies that have recently been sold. Acquisition prices in those transactions indicate an average MVIC-EBITDA ratio of 6.2. Given that the risk and growth prospects of SE are similar to those of the acquired companies, calculate the value of SE's equity using the GTM.

Solution:

The MVIC-EBITDA multiple provided in the question does not need to be adjusted for control (as the multiple already reflects the control premium embedded in acquisition prices) or for risk and growth prospects. Therefore, the market value of SE's equity can be calculated as follows:

Market value of SE = $6.2 \times 18.5\text{m} = \114.7 million

$$\begin{aligned}\text{Market value of SE's equity} &= \text{Total market value} - \text{Market value of SE's debt} \\ &= 114.7\text{m} - 12\text{m} = \$102.7\text{ million}\end{aligned}$$

Prior Transaction Method

This method uses data from trades involving the subject company itself. It is most useful for valuing minority interests in a private company. A potential problem is that there may be no, or very few, prior transactions in the company's stock.

If prior transactions are available at arm's length, the prior transaction method provides the most insightful estimates of value. However, if transactions are infrequent, significant adjustments may be required.

LOS 31j: Describe the asset-based approach to private company valuation. Vol 4, pp 586–588

The **asset-based approach** computes the value of a company as the fair value of its assets minus the fair value of its liabilities. It is generally not used to value going concerns because (1) limited market data is available for valuing their intangible assets, (2) it can be difficult to value some of their tangible assets (e.g., special-use PP&E), and (3) it is easier to find comparable data at the firm level than at the individual asset level. Of all the available methods for private company valuation, the asset-based approach typically yields the lowest value.

The asset-based approach may be used in the following circumstances:

- To value companies that are making minimal profits relative to the value of their assets, and have bleak prospects for growth. The liquidation value of such companies may be greater than their going-concern values as purchasers of their assets may be able to use them more productively.
- To value banks and financial companies as market prices of their assets and liabilities are readily available, or can be reliably estimated.
- To value holding (investment) companies such as real estate investment trusts (REITs) and closed-end investment companies (CEICs) as their investment portfolios primarily consist of assets that were valued using the market or income approaches. However, bear in mind that:
 - Management fees may result in a value lower than the net asset value (NAV) per share.
 - Management expertise may result in a value greater than the net asset value (NAV) per share.
- To value small or early stage companies with negligible intangible assets.
- To value natural resource companies whose assets can be valued using market prices of their output.

LESSON 5: VALUATION DISCOUNTS AND PREMIUMS, AND BUSINESS VALUATION STANDARDS AND PRACTICES

LOS 31k: Explain and evaluate the effects on private company valuations of discounts and premiums based on control and marketability. Vol 4, pp 588–595

The application of discounts on firm value depends, in part, on the starting point of the valuation.

- The highest possible value for an entity would be the investment value of the company to a strategic acquirer who would extract the greater value (or synergies) from the acquisition. This value would also reflect a premium for control.
- Below this value would be the (stand-alone) value of the entity to a financial buyer (one that gains no synergistic value from the acquisition). This value would also reflect a premium for control.
- Next would be the “as if freely traded/minority interest value” that represents the value of a non-controlling interest that is readily marketable but does not have control. This value would be equal to the price at which most publicly traded stocks trade in the market.
- Finally, we would have the “nonmarketable/minority interest value” which reflects the lack of control and lack of marketability associated with small equity interests in private companies.

Other than the perspective of the investor, applicable discounts may vary based on:

- The relative difficulty in obtaining reliable data.
- The importance of the size of the shareholding and distribution of shares.
- The relationship between the parties.
- The protection provided to minority shareholders in the relevant jurisdiction.
- The prospects and timing of a potential liquidity event.

Lack of Control Discounts

A **discount for lack of control (DLOC)** is “an amount or percentage deducted from the pro rata share of 100% of the value of an equity interest in a business to reflect the absence of some or all of the powers of control.”⁴

Lack of control discounts are applied if the value of total equity was determined from the perspective of a controlling interest. They are important because minority shareholders do not have a say in important operating and investment decisions of the company (including dividend policy). Further, controlling shareholders can allow themselves above-market compensation and significant perquisites that reduce returns available to minority shareholders. Note that if a company plans to eventually offer its shares to the public, it is less likely to pursue actions that hurt minority shareholders.

Factors that determine the appropriate discount for lack of control are the same as the ones (discussed earlier) considered in the determination of the control premium. Due to

⁴ Defined in International Glossary of Business Valuation Terms.

the relative lack of data required to estimate a discount for lack of control, the DLOC is computed based on the control premium as follows:

$$\text{DLOC} = 1 - \left[\frac{1}{1 + \text{Control Premium}} \right]$$

For example, if the control premium equals 20%, the discount for lack of control would equal 16.67% [calculated as $= 1 - (1/1.20)$].

The application of DLOC varies with the method and basis used to value the equity interest:

- The guideline public company method values a company from a non-controlling perspective, and therefore, a DLOC must not be applied.
- The guideline transaction method values a company from a control perspective, and therefore, a DLOC should be applied.
- The application of DLOC in the capitalized cash flow or the free cash flow method depends on the type of cash flows used.
 - Generally speaking, the CCM and FCF models use cash flows and discount rates that are estimated on a controlling interest basis, so a DLOC is applied to the results of the model.
 - However, if control cash flows are not used and/or the discount rate does not reflect an optimal capital structure, a DLOC must not be applied.

Lack of Marketability Discounts

A **discount for lack of marketability (DLOM)** is “an amount or percentage deducted from the value of an ownership interest to reflect the relative absence of marketability.”⁵

While a DLOM is different from a DLOC, the two are linked. If the valuation is performed from a non-controlling interest perspective, a lack of marketability discount is typically applied because a minority interest in the company cannot compel liquidation to convert its equity interest into cash, and no established market exists where such an interest could be sold. The discount for lack of marketability varies with prospects for liquidity, contracts that affect marketability, restrictions on transfers, size and timing of distributions, uncertainty of value, and concentration of ownership.⁶

There are three types of data that are typically used to quantify lack of marketability discounts:

1. **Restricted stock transactions:** SEC Rule 144 provides certain restrictions on the resale of unregistered shares of a company for a defined period. The price of these restricted shares is compared to the price of the publicly traded shares to determine the size of the DLOM. However, when applying this method, one should bear in mind that restricted stock transactions involve shares that will enjoy ready marketability in the near future (when restrictions are removed), but there is no such guarantee regarding near term marketability for private company shares.
2. **IPOs:** The price of pre-IPO shares is compared to the price of post-IPO shares to determine the size of the DLOM. However, analysts should bear in mind that

⁵Defined in International Glossary of Business Valuation Terms.

⁶As reported in paragraph 57 (page 24) of AICPA “Stock Practice Aid.”

post-IPO prices tend to be higher not only because of greater marketability, but also because of lower risk and greater certainty regarding future cash flows.

3. **Put options:** If an investor owns restricted stock and purchases an at-the-money put option (that expires when the restriction on sale ends) to sell the stock, the investor has effectively purchased marketability for the shares. The price paid for the put is effectively the marketability discount (in dollar terms). The marketability discount is generally expressed as a percentage by dividing the price of the put option by the market price of the stock. The advantage of this approach is that it directly addresses the perceived risk in the private company through the volatility estimate (used in determining the price of the put). Bear in mind, however, that one problem with this approach is that attributing the entire cost of the option to marketability would be misleading as the put premium primarily reflects the cost of downside protection.

The relationship between DLOC and DLOM is not additive, so you should compound when both exist. For example, if the DLOC is 5% and the DLOM is 3%, the total discount is not 8%, but:

$$1 - [(1 - 0.05)(1 - 0.03)] = 7.85\%$$

Finally, note that in addition to discounts for lack of control and/or lack of marketability, the application of other discounts may also be considered when valuing an equity interest in a private company. Examples of such discounts include key person discounts, portfolio discounts, and discounts for nonvoting shares.

Example 5-1: Applying Valuation Discounts

Olivia Martin is the CEO of Luxury Travels and holds 80% stake in the company, while the remaining 20% is held by Roy Anderson. Martin is interested in selling the company to a third party, which leads to the possibility of the following two scenarios:

Scenario 1: Martin will likely sell the firm very soon.

- Under this scenario, since the company is likely to be sold by the controlling shareholder, the lack of marketability discount applicable on Anderson's minority equity interest will be modest. Assume that the lack of marketability discount (DLOM) equals 5%.
- A lack of control discount (DLOC) will not be applicable under this scenario as both shareholders will receive the same price per share.
- Further, the company should be valued based on normalized earnings (as opposed to reported earnings), and the discount rate applied to future earnings should be based on an optimal capital structure (as opposed to the actual current capital structure).
- Suppose the value of the company's equity in this scenario is estimated as \$75 million.

Scenario 2: Martin has no plans to sell the firm.

- Under this scenario, since the company is not likely to be sold, a higher DLOM will be applicable on Anderson's non-controlling equity interest in the company. Assume the DLOM equals 30%.

- Further, the company will be valued on the basis of reported earnings (as opposed to normalized earnings) that are not adjusted for any above-market compensation and perquisites that Martin may be charging the company. Use of reported earnings captures the adverse impact associated with lack of control, so there is no need to apply DLOC separately.
- The discount rate applied to future earnings should be based on the actual capital structure (as opposed to the optimal capital structure).
- Suppose the value of firm's equity in this scenario is estimated as \$60 million.

Calculate the value of Anderson's equity interest in both scenarios.

Solution:

Scenario 1:

$$\begin{aligned}\text{Value of Anderson's 20\% equity interest} &= \text{Pro rata value of 20\% equity interest} - \text{DLOC} \\ &\quad - \text{DLOM} \\ &= (\$75m \times 20\%) - 0\% - (\$75m \times 20\% \times 5\%) \\ &= \$14.25m\end{aligned}$$

Scenario 2:

$$\begin{aligned}\text{Value of Anderson's 20\% equity interest} &= \text{Pro rata value of 20\% equity interest} - \text{DLOC} \\ &\quad - \text{DLOM} \\ &= (\$60m \times 20\%) - 0\% - (\$60m \times 20\% \times 30\%) \\ &= \$8.4m\end{aligned}$$

Note that the value of the firm is greater in Scenario 1 because:

- Normalized earnings are greater than reported earnings (e.g., due to above-market compensation for the owner).
- The WACC based on the optimal capital structure is lower than the WACC based on the current capital structure.

LOS 31l: Describe the role of valuation standards in valuing private companies. Vol 4, pp 595–596

Before the 1980s business appraisers primarily focused on tax, divorce, and commercial litigation-related valuations where (1) the impact on third parties was limited, (2) appraisers were viewed as advocates of their clients, and (3) not much attention was given to the quality of appraisals. Since then, the increasing potential impact of valuation estimates on third parties (which was highlighted by the contribution of overvalued properties to the U.S. savings and loan crisis, and the increasing role of fair value estimates in financial reporting) resulted in a drive toward establishing some valuation standards.

In the U.S., Congress created the Appraisal Foundation which in turn developed the Uniform Standards of Professional Appraisal Practice (USPAP). This quasi-governmental agency's goal is to provide an environment in which valuation standards, estimates, and practices are followed by all third parties. USPAP has a model to value real estate, businesses, and fixed assets.

The problem is that following these standards is optional for appraisers as the standards are not laws. The mortgage lending industry does require USPAP compliant appraisals, but business valuations, including those for public companies do not.

Other groups have also begun the process of developing standards for their particular industries. For example, the American Institute of Certified Public Accountants, the International Private Equity and Venture Capital Valuation Board, and the American Society of Appraisers have all created some standards in which their members are required or encouraged to comply. These and other groups realize the importance of creating a system in which valuations are performed consistently and without bias or influence.

For financial reporting, fair value estimates made by management are first reviewed by auditors and (in the case of companies registered with the SEC) are subject to comment by SEC staff.

Generally speaking, valuation standards that have been developed suffer from the following drawbacks:

- Compliance with these standards is at the discretion of the appraisers since most users and buyers of valuations are not aware of these standards.
- Due to the confidentiality of valuation reports, it is not possible for appraisal organizations to ensure that compliance requirements are being adhered to.
- Due to the significant heterogeneity of valuations, the application of technical guidance offered by valuation standards is limited.
- Differing definitions of value result in materially different conclusions of value.