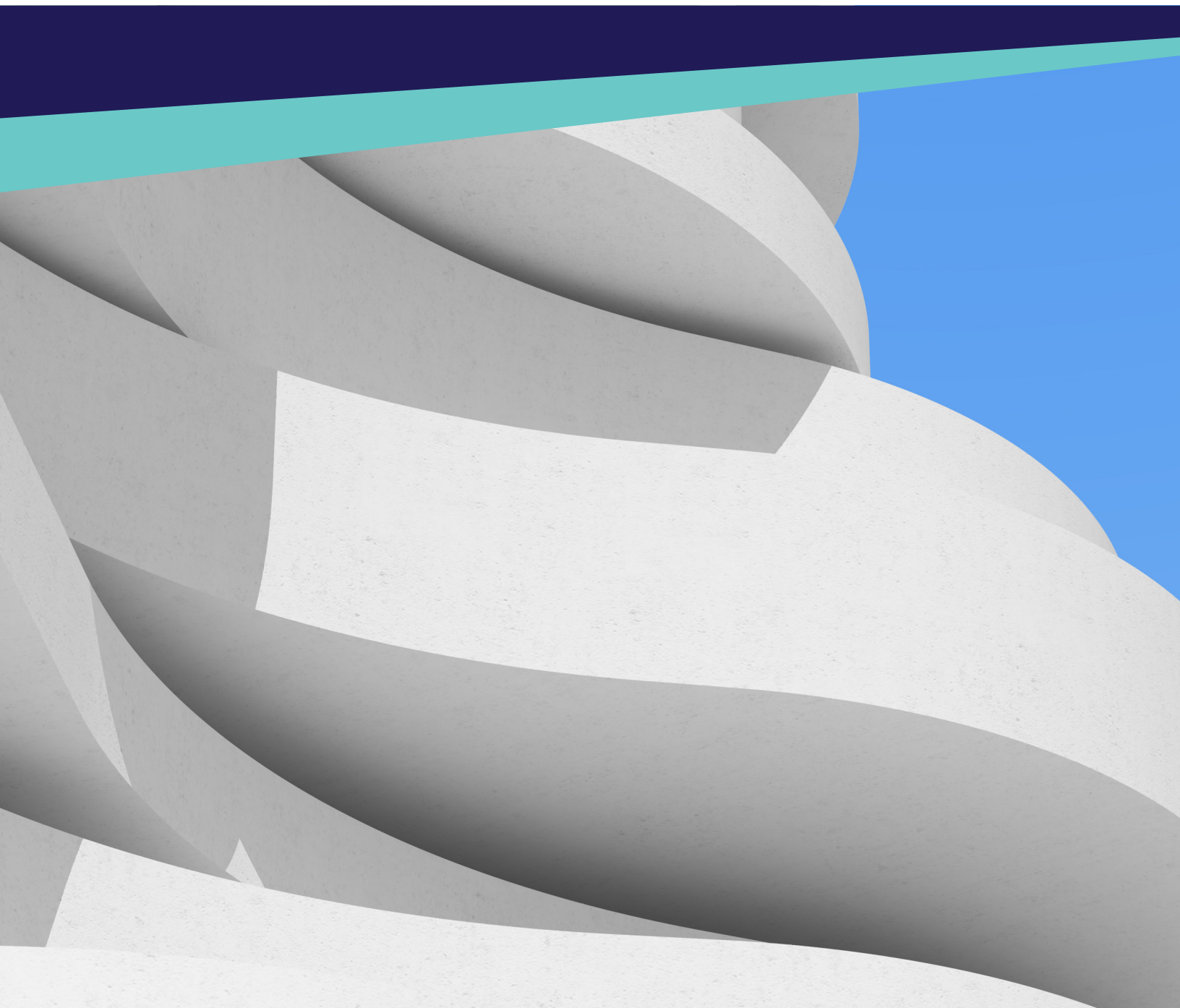


LEVEL III – ADVANCED BUSINESS VALUATION

2023 EDITION



LEVEL III – ADVANCED BUSINESS VALUATION



2023 EDITION



LEVEL III — ADVANCED BUSINESS VALUATION 2023 edition

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COURSE INTRODUCTION AND LEARNING OBJECTIVES

Welcome to the **Level III — Advanced Business Valuation** (Level III) course of the CBV Institute's Program of Studies.

Course objectives — Level III:

In this level, you will learn about valuation mechanics for specific types of assets, liabilities, financial instruments, and non-cash consideration. By the end of **Level III**, you will be able to allocate the en bloc value of a business to specific classes of shares in order to arrive at a value conclusion for a particular shareholding. You will also be able to apply core valuation knowledge learned in **Level I** and **Level II** in conjunction with new concepts introduced in this level in the form of a comprehensive (i.e., MQE-style) question.

Module 1: Valuation of Specific Assets — Part 1 — Intangible Assets and Tax Assets

Module 1 explores issues encountered in the valuation of specific assets owned by a business, such as identifiable intangible assets, equipment, and certain tax assets. Such assets may or may not exist on the balance sheet of a business being valued, and where they are reported, their fair market value (or fair value) may differ from the book value indicated on a balance sheet.

This section is divided into three parts: part 1 on intangible assets and tax assets (Module 1), part 2 on real estate (Module 2), and part 3 on blockchain and cryptoassets (Module 3). By the end of **Module 1**, you will be able to:

- Identify examples of intangible assets;
- Explain common methodologies to value intangible assets and the rationale behind an appropriate methodology for a particular asset, given the circumstances;
- Perform technically correct calculations using the multi-period excess earnings method, the relief from royalty method, and the depreciated replacement cost method; and
- Explain how the inclusion of tax loss carryforwards, undeducted scientific research and experimental development (SR&ED) expenditures, and investment tax credits can be reflected in a valuation.

Module 2: Valuation of Specific Assets — Part 2 — Real Estate

Module 2 covers the valuation of real estate. Since real estate is not the primary focus of a CBV's training and experience, CBVs are not qualified to issue real estate appraisals. Therefore, CBVs should seek a qualified appraiser to determine real estate market values when they do not have the appropriate real estate experience and knowledge or when real estate forms a substantial part of the valuation. However, regardless of whether a separate expert is engaged, CBVs should have the foundational knowledge to interpret real estate appraisals and use them appropriately in the context of a business valuation. By the end of **Module 2**, you will be able to:

- Explain the basics of real estate appraisals; and
- Identify when real estate appraisers should be engaged.

Module 3: Valuation of Specific Assets — Part 3 — Blockchain and Cryptoassets

Module 3 serves as a primer to provide a foundational understanding of blockchain, cryptoassets, and factors to consider when encountering cryptoassets in the context of a valuation. This module is not a prescriptive valuation manual, and valuers should remember that the market for cryptoassets is still in its infancy and continues to evolve swiftly. By the end of **Module 3**, you will be able to:

- Explain the basic concepts of blockchain technology;
- Explain the basics of cryptoassets; and
- Describe the factors to consider when encountering cryptoassets in the context of a valuation.

Module 4: Valuation of Financial Instruments – Part 1 – Debt Instruments

Module 4 provides an overview of financial instruments and discusses the valuation approaches commonly used. Financial instruments encompass a wide range of instruments, each with its own characteristics as well as valuation approaches and considerations. As such, this section is divided into three parts: part 1 on debt instruments (**Module 4**), part 2 on derivative instruments (**Module 5**), and part 3 on contingent consideration and other financial instruments (**Module 6**). By the end of **Module 4**, you will be able to:

- Describe common situations giving rise to the need for the valuation of financial instruments;
- Describe the broad categories of financial instruments that a valuator commonly encounters;
- Explain the characteristics of debt instruments;
- Explain and apply the concept of an issuer credit rating methodology;
- Explain and apply the concept of an issue-specific credit rating methodology; and
- Describe and apply common valuation methodologies for debt instruments.

Module 5: Valuation of Financial Instruments – Part 2 – Derivative Instruments

Module 5 provides an overview of derivative instruments and their common characteristics. It then elaborates on the main types of derivative instruments as well as the valuation methods and considerations for each type. By the end of **Module 5**, you will be able to:

- Describe the characteristics of derivative instruments;
- Describe the main types of derivative instruments;
- Explain and apply valuation methodologies for each type of derivative instrument; and
- Explain considerations for credit valuation adjustments and debit valuation adjustments.

Module 6: Valuation of Financial Instruments – Part 3 – Contingent Consideration and Real Options

Module 6 provides an overview of contingent consideration, which is a customized financial instrument commonly seen in business combinations. The valuation methods available for contingent consideration and the application of each method is then discussed.

The module then discusses real options, which are economically valuable rights but not obligations to a company regarding business projects and investment opportunities. The module elaborates on evaluating real options using the option pricing methods developed for financial instruments as discussed in **Module 5**. The evaluation of real options is also known as real options thinking, which presents an alternative tool for management in assessing business projects. By the end of **Module 6**, you will be able to:

- Describe the characteristics of contingent consideration;
- Identify approaches to value determination for contingent consideration;

- Explain fair value considerations that are unique to contingent consideration;
- Apply the scenario-based method and the option pricing method in valuing contingent consideration;
- Describe characteristics of real options;
- Explain how real options thinking can be used as a strategic tool for managerial decisions on business projects; and
- Apply the Black-Scholes-Merton formula and the Monte Carlo simulation method to evaluate real options.

Module 7: Valuation of Specific Share Classes

Module 7 explores issues encountered by valuers in the allocation of the total value of a firm's equity to specific share classes or shareholdings. By the end of **Module 7**, you will be able to:

- Perform professional and technically correct calculations with respect to the allocation of value, under both a direct and indirect approach, and assess the reasonability of such calculations; and
- Discuss the differences between different classes of common and preferred shares, including rights and characteristics, and approaches to value.

MODULE 01

**VALUATION OF
SPECIFIC ASSETS
— PART 1 —
INTANGIBLE ASSETS
AND TAX ASSETS**

Module Overview

Welcome to Module 1. This module explores issues encountered in the valuation of specific assets owned by a business, such as identifiable intangible assets, equipment, and certain tax assets. Such assets may or may not exist on the balance sheet of a business being valued, and where they are reported, their fair market value (or fair value) may differ from the book value indicated on a balance sheet.

This section is divided into three parts: part 1 on intangible assets and tax assets (**Module 1**), part 2 on real estate (**Module 2**), and part 3 on blockchain and cryptoassets (**Module 3**).

By the end of this module, you will be able to:

- Identify examples of intangible assets;
- Explain common methodologies to value intangible assets and the rationale behind an appropriate methodology for a particular asset, given the circumstances;
- Perform technically correct calculations using the multi-period excess earnings method, the relief from royalty method, and the depreciated replacement cost method; and
- Explain how the inclusion of tax loss carryforwards, undeducted scientific research and experimental development (SR&ED) expenditures, and investment tax credits can be reflected in a valuation.

The acronyms used throughout this module are:

ABIL	Allowable business investment loss
ASPE	Accounting Standards for Private Enterprises
CCA	Capital cost allowance
EBITDA	Earnings before interest, taxes, depreciation, and amortization
GAAP	Generally Accepted Accounting Principles
IFRS	International Financial Reporting Standards
MEEM	Multi-period excess earnings method
NOI	Net operating income
NVT	Network value to transactions
RFR	Relief from royalty
SR&ED	Scientific research and experimental development
TAB	Tax amortization benefit

Recommended Readings

Johnson, Howard E. *Business Valuation in Canada*. Toronto: CPA Canada, 2021.

- Chapter 3 — Asset Valuation Methodologies — Intangible Asset Valuation
- Chapter 3 — Asset Valuation Methodologies — Equipment Valuation

Optional Readings

Nobes, Christopher, Howard E. Johnson, and Ian R. Campbell. *Canada Valuation Service 2018 Student Edition*. Vancouver: Carswell, 2017.

- Chapter 9 — Losses, Undeducted Scientific Research Expenditures and Investment Tax Credits (pp. 9-77 to 9-81)

1.1 Valuing Individual Intangible Assets

CBVs are often tasked with valuing individual intangible assets — such as trademarks, trade names, customer relationships, technology or other intellectual property, and non-competition or management agreements — on a stand-alone basis. The need to value such identifiable intangible assets¹ on an individual basis is driven by the constantly evolving Canadian, U.S., and international financial accounting standards. Specifically, in the context of a business combination, valuers are often engaged to measure the fair value² of the identifiable intangible assets acquired in order to allocate the purchase price paid by the acquiring entity to these assets in accordance with the relevant financial reporting standard (i.e., IFRS, U.S. GAAP, or ASPE). The topic of purchase price allocations is explored in more depth in **Level IV** and in the **Valuation for Financial Reporting** course.

Valuers are also called on to perform stand-alone valuations of intangible assets for tax and litigation purposes. This section will examine some of the approaches commonly used to value intangible assets.

*Note: The purpose of the information in the following section is to introduce you to the basic approaches used to value intangible assets. A detailed examination of the valuation of intangible assets in the context of purchase price allocations and impairment analyses is included in the **Valuation for Financial Reporting** course. Further, specific methodologies to value certain intangible assets such as intellectual property are addressed in the **Litigation** course.*

1.1.1 Valuation of a Business vs. the Valuation of Stand-Alone Intangible Assets

To gain a better understanding of how intangible assets are valued, it is important to appreciate some of the differences between valuing a business enterprise and valuing a single intangible asset. These differences can include many of the key assumptions underlying the valuation analysis:

- Income or cash flows included in a valuation;
- Term or time period of projected cash flows;
- Discount or capitalization rate used;
- Highest and best use; and
- Effects of obsolescence.

These assumptions are outlined in more depth in **Exhibit 1.1**.

Exhibit 1.1: Valuation Differences (Enterprise vs. Individual Intangible Asset)

Income or cash flows included in valuation

Enterprise — All income or cash flows

Intangible asset — Can either be all income or cash flows or a portion of total income or cash flows

Term or time period of projected cash flows

Enterprise — Usually includes an assumption that the business will continue indefinitely (terminal value)

Intangible asset — Often limited to a finite time period, based on the asset's expected economic life (which may differ from its useful life for accounting or tax purposes)

Discount or capitalization rate

Enterprise — Reflects risks associated with, and returns required on, all the enterprise's assets

Intangible asset — Reflects the risk associated with, and return required on, a single asset on a stand-alone basis

¹ *Identifiable* as defined by IAS 38 *Intangible Assets* is an asset that is separable or arises from contractual or other legal rights.

² *Fair value* as defined by IFRS 13 *Fair Value Measurement* is 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.

Highest and best use

Enterprise — Highest and best use is usually to continue operating as a business

Intangible asset — Highest and best use may not be that for which the subject intangible asset is currently being used

Obsolescence

Enterprise — Usually assumed the enterprise will adapt to changing business conditions or operating environments

Intangible asset — In the valuation of a single intangible asset on a stand-alone basis, various elements of obsolescence (functional, technological, or economic) should be considered

1.2 Primary Approaches for Valuing Intangible Assets

Theoretically, individual intangible assets can be valued using one of the three primary approaches used for business or enterprise valuations:

- Income approach;
- Cost approach; or
- Market approach.

Practically speaking, the use of the market approach is extremely limited when valuing individual intangible assets, because it is difficult, if not impossible, to identify reliable data on intangible assets that are sufficiently comparable to the asset being valued, and because intangible assets are rarely bought and sold on a stand-alone basis. In valuing intangible assets, the market approach is most commonly used in relation to rights to operate, such as taxi medallions and broadcasting rights, but usually only when a sufficient volume of recent trading data is available.

Accordingly, in the majority of cases, an income approach or cost approach is used to value individual intangible assets on a stand-alone basis (with the income approach being the most common).

When using an income approach to value individual intangible assets, the following are commonly used valuation methods:

- The with and without method;
- The multi-period excess earnings method; and
- The relief from royalty method.

The following sections introduce the application of each of these three methods.

1.3 The With and Without Method

The with and without method is a form of the income approach. This method determines the value of a subject intangible asset by comparing the value of a business *with* the subject intangible asset in place to the hypothetical value of the same business *without* the subject intangible asset in place.

The with and without method is frequently used to value non-competition agreements, franchises, and processes, although it can be used for other types of intangible assets in certain circumstances.

To effectively use the with and without method, a valuator must be able to:

- Identify and segregate incremental cash flows attributable to the subject asset; and
- Understand the risks, if any, associated with the absence of the subject intangible asset.

1.3.1 Steps in Applying the With and Without Method

Exhibit 1.2: Steps in the With and Without Method to Value an Individual Asset

1. Determine the value of the business *with* the subject asset in place.
2. Determine the hypothetical value of the business *without* the subject asset in place.
3. Subtract the value determined in Step 2 from the value determined in Step 1.
4. Determine the fair value of the subject asset by adding the related tax amortization benefit to the value derived in Step 3.

1.3.2 Tax Amortization Benefit (TAB)

1.3.2.1 TAB When Valuing Intangible Assets Using the Income Approach

When valuing intangible assets on a stand-alone basis using an income approach, it is common to include a TAB associated with the future tax savings resulting from the depreciation of the subject intangible asset.

Note: Take care not to confuse the TAB referred to in the context of financial reporting calculations with the tangible asset backing referred to when performing notional business valuations.

The mechanics of calculating a tax amortization benefit in Canada should be familiar, as the following formula was introduced and explored in both **Level I** and **Level II**:

$$\text{TAB} = (\text{Tax cost} \times \text{Inclusion rate} \times \text{CCA rate} \times \text{Tax rate}) / (\text{CCA rate} + \text{Discount rate})$$

Exhibit 1.3 shows the calculation of a tax amortization benefit for an intangible asset falling under CCA Class 14.1 in Canada.

Exhibit 1.3: Tax Amortization Benefit

Value prior to tax amortization benefit	A	10.0
Tax amortization benefit	{[A] - [B]}	1.0
Value of intangible asset = {[A] / (1 - TAB factor)}	B	11.0

$$\text{TAB factor} = \frac{\text{TC} \times \text{IR} \times \text{CCA} \times \text{T}}{\text{CCA} + \text{D}} = 8.8\%$$

Inputs:

CCA rate (CCA)	5.0%
Tax rate (T)	30.0%
Discount rate (D)	12.0%
Tax cost (TC)	1.0
Inclusion rate (IR)	100%

In this example, the value of the intangible asset under an income-based approach (before the addition of the TAB) is assumed to be \$10.0.

- The total value of the intangible asset — including the TAB — is calculated to be $[10 / (1 - 8.8\%)] = 11.0$; and
- The TAB is imputed to be $[11.0 - 10.0] = 1.0$.

In addition to examples such as the above, valuers are often required to value intangible assets that may be subject to non-Canadian tax regimes. In such cases, valuers generally apply a TAB calculated in a manner consistent with the tax benefits that would be expected for a market participant owning the subject intangible asset. For example, if a market participant acquired a brand relating to cash flows derived in the United States, it would generally be appropriate to calculate a TAB in accordance with tax amortization rules for intangible assets in the United States.

Note: A detailed exploration of tax amortization rules in different jurisdictions is beyond the scope of this course.

1.3.2.2 TAB When Valuing Intangible Assets Using the Cost or Market Approach

Some difference of opinion exists as to whether a TAB should be included when valuing intangible assets using the cost approach. *Note: For the purpose of this course, assume that no TAB is applicable for intangible assets valued under the cost approach.*

Under the market approach, it is generally assumed that comparable metrics for the subject intangible asset already include all ownership features associated with the asset, including the ability to deduct CCA for tax purposes, if applicable. Therefore, no TAB is added under the market approach to avoid double counting.

1.3.3 Valuation of Intangible Assets Using the With and Without Method

Example 1.1: Valuation of Intangible Asset Using the With and Without Method

Step 1 — Determine the value of the business *with* the subject intangible asset in place:

Business Enterprise Value — WITH Intangible Asset in Place					Example 1.1A	
(CAD in '000s)						
		Year				
		Year 1	Year 2	Year 3	Year 4	Terminal
Revenue		500.0	525.0	556.5	589.9	
<i>% growth</i>		13.6%	5.0%	6.0%	6.0%	
Cost of goods sold		(300.0)	(315.0)	(333.9)	(353.9)	
<i>Cost of goods sold (%)</i>		60.0%	60.0%	60.0%	60.0%	
Gross margin		200.0	210.0	222.6	236.0	
<i>Gross margin (%)</i>		40.0%	40.0%	40.0%	40.0%	
Operating, general, and administration		(165.0)	(173.3)	(183.6)	(194.7)	
EBITDA		35.0	36.8	39.0	41.3	
<i>EBITDA margin (%)</i>		7.0%	7.0%	7.0%	7.0%	
Less: Income taxes	30.0%	(10.5)	(11.0)	(11.7)	(12.4)	
<i>Income tax rate</i>		30.0%	30.0%	30.0%	30.0%	
After-tax operating earnings		24.5	25.7	27.3	28.9	
<i>% of revenue</i>		4.9%	4.9%	4.9%	4.9%	
Less: Changes in working capital		(3.0)	(0.8)	(0.9)	(1.0)	
Less: Capital expenditures, net of tax shield		(10.0)	(10.5)	(11.1)	(11.8)	
Unlevered after-tax free cash flows		11.5	14.5	15.2	16.1	
Long-term growth	2.0%					
Terminal value						205.3
Discount period		0.5	1.5	2.5	3.5	
Discount rate	10.0%	0.9535	0.8668	0.7880	0.7164	0.7164
Discounted net cash flow		11.0	12.5	12.0	11.5	147.1
Business enterprise value		194.1				

It is important to note that the discount rate referred to in Example 1.1A is that of a notional market participant and not necessarily the subject company.

Step 2 – Determine the value of the business *without* the subject intangible asset in place:

Business Enterprise Value – WITHOUT Intangible Asset In Place					Example 1.1B	
(CAD in '000s)						
		Year				
		Year 1	Year 2	Year 3	Year 4	Terminal
Revenue		450.0	472.5	500.9	530.9	
<i>% growth</i>		2.3%	5.0%	6.0%	6.0%	
Cost of goods sold		(270.0)	(283.5)	(300.5)	(318.5)	
<i>Cost of goods sold (%)</i>		60.0%	60.0%	60.0%	60.0%	
Gross margin		180.0	189.0	200.3	212.4	
<i>Gross margin (%)</i>		40.0%	40.0%	40.0%	40.0%	
Operating, general, and administration		(148.5)	(155.9)	(165.3)	(175.2)	
EBITDA		31.5	33.1	35.1	37.2	
<i>EBITDA margin (%)</i>		7.0%	7.0%	7.0%	7.0%	
Less: Income taxes	30.0%	(9.5)	(9.9)	(10.5)	(11.1)	
<i>Income tax rate</i>		30.0%	30.0%	30.0%	30.0%	
After-tax operating earnings		22.1	23.2	24.5	26.0	
<i>% of revenue</i>		4.9%	4.9%	4.9%	4.9%	
Less: Changes in working capital		(1.5)	(0.7)	(0.9)	(0.9)	
Less: Capital expenditures, net of tax shield		(9.0)	(9.5)	(10.0)	(10.6)	
Unlevered after-tax free cash flows		11.6	13.0	13.7	14.5	
Long-term growth	2.0%					
Terminal value						147.8
Discount period		0.5	1.5	2.5	3.5	
Discount rate	12.0%	0.9449	0.8437	0.7533	0.6726	0.6726
Discounted net cash flow		10.9	11.0	10.3	9.7	99.4
Business enterprise value		141.4				

Note that a higher discount rate was used to reflect the incremental risk associated with the absence of the intangible asset.

Step 3 – Subtract the value determined in Step 1 from the value determined in Step 2:

Value of Intangible Asset, Prior to Tax Amortization Benefit		Example 1.1C
(CAD in '000s)		
Business enterprise value WITH intangible asset		194.1
Business enterprise value WITHOUT intangible asset		141.4
Indicated value of intangible asset, before tax amortization benefit		52.7

Step 4 – Determine the fair value of the subject asset by adding the related TAB to the value derived in Step 3:

Value of Intangible Asset		Example 1.1D
(CAD in '000s)		
Tax amortization benefit (TAB)		
(CCA rate = 5%; Discount rate = 12%; Tax rate = 30%)		5.1
Value of intangible asset		57.8

1.3.4 Advantages and Disadvantages of Using the With and Without Method

Advantages:

- Sound theoretical model that can be used when the incremental benefit of using the subject intangible asset can be determined; and
- Widely accepted methodology.

Disadvantages:

- Quantifying the incremental benefit can be difficult and subjective; and
- Supporting an appropriate discount rate to reflect the impact of the absence of the subject intangible asset on the enterprise can be difficult.

1.4 The Multi-Period Excess Earnings Method (MEEM)

The MEEM is a variation of the discounted cash flow method commonly used to value intangible assets that are key drivers of a business's cash flows. Examples of intangible assets that often act as such primary drivers are customer relationships, order backlogs, technology, and licences, among others. The MEEM is also used when it is difficult to obtain a direct measure of the future economic benefits associated with a particular intangible asset.

The distinguishing characteristic of the MEEM is its use of contributory asset charges to isolate and quantify the residual cash flow stream that the subject intangible asset is expected to generate over the course of its economic life. It is premised on the idea that the subject intangible asset requires contributory (complementary) assets to support its income generation, such as working capital, capital assets, employee workforce, and in some cases other intangible assets being used together. Contributory asset charges reflect a notional economic rent that would be incurred to use these contributory assets.

The MEEM takes a residual approach to estimating the economic benefit that the subject intangible asset is expected to generate. It starts with the expected after-tax cash flows directly attributable to the intangible asset (which depending on the use of the asset, may be the full business enterprise's cash flows or a portion thereof) and deducts contributory asset charges for relevant contributory assets required to generate that cash flow stream. Said differently, the MEEM attempts to isolate residual cash flows attributable to a single intangible asset, in excess of the fair returns on all the contributory assets that contribute to that cash flow.

The residual — or excess — cash flow stream attributable to the individual intangible asset is then discounted using a rate that reflects the risk associated with the subject intangible asset. Given that the MEEM is a variant of the income approach, a TAB is added to arrive at the value of the subject asset.

1.4.1 Contributory Asset Charges

Contributory asset charges consist of: (1) a return *of* investment; and (2) a return *on* investment.

The *return of* investment reflects the economic depreciation of the contributory asset that a third party would expect as reimbursement to recover its initial investment in the asset.

The *return on* investment is the charge a third party would expect as a profit in addition to the return of investment. For example, if a company had to lease a widget making machine (that it owns) to generate income from the technology it has developed, the arm's length lease payment would include a charge related to the depreciation of the machine (the *return of*) as well as an additional charge to reflect the required return on the lessor's investment in the machine (the *return on*).

1.4.2 Steps in Applying the MEEM

Exhibit 1.4: Application of the MEEM

1. Calculate the after-tax cash flows attributable to the subject intangible asset.
2. Estimate and subtract after-tax contributory asset charges.
3. Select and apply an appropriate discount rate to the after-tax discretionary cash flows.
4. Calculate the net present value of the after-tax discretionary cash flows.
5. Determine the fair value of the subject intangible asset by adding the related TAB to the value derived in Step 4.

Example 1.2: Valuation of Intangible Asset Using the MEEM

The following example reflects the valuation mechanics when using the MEEM to value an intangible asset. Considerations used by the valuator include the following:

- The subject intangible asset has an economic life of eight years;
- Revenues for the subject intangible asset account for approximately 35.0% of the total revenues of the business enterprise. *Note: This is a simplistic assumption for this illustrative example. In many cases, the relative proportion of an enterprise's revenues relating to an intangible asset will vary, and often decrease, over time as the intangible asset may experience various elements of obsolescence as described in **Exhibit 1.1**;*
- EBITDA margins for the intangible asset are as shown below;
- Contributory asset charges — for assets including working capital, fixed assets, and one other intangible asset — approximate 4.0% of total revenues. *Note: This is a simplistic assumption for this illustrative example. The mechanics of calculating contributory asset charges are covered in detail in the **Valuation for Financial Reporting** course; and*
- The TAB factor was calculated to be 8.3%.

Valuation of Intangible Asset — MEEM	Year							
	1	2	3	4	5	6	7	8
Projected revenue — business enterprise	500.0	525.0	550.0	575.0	600.0	625.0	650.0	675.0
Revenue attributable to intangible asset (35.0% of total revenue)	175.0	183.8	192.5	201.3	210.0	218.8	227.5	236.3
EBITDA	21.0	25.7	27.4	28.7	29.9	31.2	32.4	33.7
as a % of revenue	12.0%	14.0%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%
Less: Cash taxes	(5.3)	(6.4)	(6.9)	(7.2)	(7.5)	(7.8)	(8.1)	(8.4)
After-tax cash flows prior to contributory asset charges	15.8	19.3	20.6	21.5	22.4	23.4	24.3	25.2
Less: Contributory asset charges	(7.0)	(7.4)	(7.7)	(8.1)	(8.4)	(8.8)	(9.1)	(9.5)
% of revenue	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Excess cash flows	8.8	11.9	12.9	13.5	14.0	14.6	15.2	15.8
Partial period	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Discount period	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5
Present value factor	0.9494	0.8477	0.7568	0.6758	0.6034	0.5387	0.4810	0.4295
Present value of excess cash flows	7.6	10.1	9.7	9.1	8.5	7.9	7.3	6.8
Sum of present value of excess cash flows	67.0							
Add: Tax amortization benefit	6.1							
Indicated value of intangible asset	73.1							

1.4.3 Advantages and Disadvantages of Using the MEEM

Advantages:

- Sound theoretical model based on risk associated with the subject intangible asset;
- Value is based on expected cash flow specifically attributable to the subject intangible asset; and
- Widely accepted methodology.

Disadvantages:

- The subject intangible asset may not have observable discrete cash flow;
- Estimating future expenses specifically associated with the subject intangible asset may be difficult;
- It may be difficult to quantify contributory asset charges when contributory assets include other intangible assets;
- Deriving an appropriate discount rate to apply to the subject intangible asset is subjective; and
- Since the MEEM takes a residual approach (by starting with a cash flow stream for an entire enterprise and deducting contributory asset charges), the methodology can theoretically overvalue the subject intangible asset by including a portion of the enterprise value (versus value relating solely to the subject intangible asset) or undervalue the intangible asset if excessive expenses or contributory asset charges are allocated against cash flows.

1.5 Relief from Royalty (RFR) Method

The RFR method is a common form of the income approach used to value intangible assets such as trade names/trademarks, patents, licences, and technology.

Under this method, the value of the subject intangible asset is determined based on the royalty income that could be earned by the owner of the asset if the asset was licensed or, conversely, the royalty the subject company is “relieved” from having to pay a hypothetical licensor as a result of owning the subject intangible asset.

The key factors for consideration when using the RFR method include:

- The projected revenue (or other royalty base such as units) associated with the subject intangible asset over its expected economic life;
- The notional royalty rate applicable to the subject intangible asset; and
- An appropriate after-tax discount rate that reflects the risk associated with the cash flows to be generated from the subject intangible asset.

One of the main challenges in using the RFR method is determining an appropriate royalty rate, particularly when valuing an intangible asset using the RFR method for financial reporting purposes. (For financial reporting purposes, the royalty rate assumption used in the RFR method is often subject to audit.)

The difficulty in determining an appropriate royalty rate (specifically for specialized technologies) stems from the lack of publicly available information on royalty rates for comparable intangible assets.

In selecting a reasonable and supportable royalty rate assumption, valuers must assess the similarities and differences between the intangible assets driving the observed royalty rates and the subject intangible asset, which can be a subjective exercise in itself.

1.5.1 Factors to Consider When Selecting Market Royalty Rates

When royalty rates are estimated from observable licensing transactions, the valuator should pay particular attention to differences between the intangible asset(s) in the market transaction and the subject intangible asset, as most licensing agreements include various terms and conditions that can have an impact on the resulting royalty rate.

Particular attention should be paid to the following factors:

1.5.1.1 Non-Arm's Length Parties

Many multinational businesses transfer intellectual properties or rights thereto to foreign subsidiaries. Such transactions may not be relevant in determining a reasonable royalty rate as they may or may not reflect the royalty rate that would otherwise be charged between two unrelated parties.

1.5.1.2 Date of Licensing Transaction vs. Valuation Date

Valuators should consider the date of an observable licensing transaction relative to the valuation date for the subject intangible asset. All other things being equal, a royalty rate derived from a transaction concluded 10 years ago may be less relevant in assessing the royalty rate of an equivalent licensing transaction occurring today.

1.5.1.3 Financial Condition of Parties to the Observed Licensing Agreement

When the parties to a licensing agreement are not in the same or equivalent financial condition, the rate agreed on by the parties may be distorted.

1.5.1.4 Industry

Although a licensing transaction may involve a similar intellectual property to the subject intangible asset, the observed intellectual property may be used in a different industry than that of the subject intangible asset. As such, the observed royalty rate may be influenced by factors such as competition, government subsidies, pricing policies, or other such influences.

1.5.1.5 International Transactions

The absence of legal protection of intellectual property in developing countries may have a significant impact on the observed royalty rates associated with licensing in those countries. Care should be exercised when considering the use of some international licensing agreements.

1.5.1.6 Economic Life of Intellectual Property

Generally speaking, the longer the term of the licensing agreement, the higher the royalty rate.

As such, if using the RFR method to value an intangible asset with a useful life of three years, it may not be appropriate to use an observed royalty rate associated with an intangible asset having a 10-year economic life.

1.5.1.7 Required Investments in Complementary Assets or Expenditures

The royalty rate associated with intellectual property requiring a substantial capital investment to support the given intellectual property will likely be lower than the royalty rate associated with intellectual property requiring only a modest capital investment.

1.5.1.8 Other Forms of Compensation

Valuators should consider the existence of other forms of compensation (in addition to the stated royalty rate) in observed licensing transactions. For example, if an observed licensing agreement requires the licensee to pay

the licensor 5% of gross sales plus an upfront payment of \$250,000, the equivalent effective royalty rate would theoretically be greater than 5% of gross sales. Another common form of compensation is an annual maintenance or advertising payment in addition to the stated royalty rate.

1.5.1.9 Exclusivity

Generally, the more exclusive the licensing agreement is, the higher the observed rate is likely to be.

1.5.1.10 Collecting, Interpreting, and Documenting Royalty Rate Data

Given the challenges with selecting a reasonable and supportable royalty rate assumption when using the RFR method, valuers often encounter situations where limited transaction data exists for the subject intangible asset. In these instances, valuers may need to broaden their transaction search and use professional judgement to support a reasonable royalty rate assumption under the RFR method. In doing so, valuers should document: (1) search parameters used to identify comparable licensing transactions; (2) reasons why observed transactions are included or excluded; and (3) any qualitative considerations made.

1.5.2 Steps in Applying the RFR Method

Exhibit 1.5: Application of the RFR Method

1. Identify the revenue stream (or other royalty base) associated with the subject asset over its expected life or term.
2. Select an appropriate supportable notional arm's length royalty rate.
3. Apply the selected royalty rate to the above-noted revenue (or royalty base).
4. Subtract the associated tax deduction from the royalty payments to derive the after-tax royalties saved as a result of owning the subject intangible asset.
5. Select an appropriate discount rate to apply to the after-tax royalty savings.
6. Calculate the net present value of after-tax royalty savings and add a TAB.

Example 1.3: Valuation of Intangible Asset Using the RFR Method

This example illustrates the application of the RFR method for a subject intangible asset with:

- An economic life of four years;
- A supportable market royalty rate of 2.0% of revenues (based on research of comparable licensing transactions);
- A tax rate of 25.0%;
- An appropriate discount rate of 12.0% on after-tax royalties saved; and
- A TAB factor of 8.3%.

Relief from Royalty Approach				
(CAD '000s)				
	Year			
	Year 1	Year 2	Year 3	Year 4
Revenue base (4-year term)	80.0	100.0	120.0	140.0
Royalty rate	2.0%	2.0%	2.0%	2.0%
Royalty payments	1.6	2.0	2.4	2.8
Less: Tax deduction	(0.4)	(0.5)	(0.6)	(0.7)
Tax rate	25.0%	25.0%	25.0%	25.0%
After-tax royalty savings	1.2	1.5	1.8	2.1
Discount period	0.5	1.5	2.5	3.5
Discount rate	12.0%	0.9449	0.8437	0.7533
Present value	1.1	1.3	1.4	1.4
Sum of present value of royalties saved	5.2			
Add: Tax amortization benefit	0.5			
Indicated value of intangible asset	5.6			

1.5.3 Advantages and Disadvantages of Using the RFR Method

Advantages:

- Sound theoretical model for asset types that are commonly licensed; and
- Easy to use and widely accepted.

Disadvantages:

- Only applicable to intangible assets that are theoretically capable of being licensed;
- Forecasting future royalty base is subjective;
- Can be difficult to obtain comparable royalty rates from open market licensing transactions; and
- Model can be extremely sensitive to changes in the royalty rate assumption.

1.6 Cost Approach

The cost approach derives the value of an intangible asset by determining the cost that would be required to reproduce or replace the service capacity of the subject asset. It is based on the premise that a prudent third-party purchaser would pay no more for an asset than its replacement cost.

The cost approach may be appropriate in situations where highly substitutable assets can be developed in-house or purchased from a third party, and/or when future expected cash flows from the subject asset have not been developed.

Intangible assets that are commonly valued using the cost approach include licences and permits, certifications, internally generated software, assembled workforces,³ and technology assets that demonstrate substance but are not far enough along the development path for expected future cash flow projections to exist.

In valuing intangible assets under the cost approach, an obsolescence adjustment must be considered. Assets are subject to physical, functional, technological, and economic obsolescence:

- Physical obsolescence is generally not applicable to intangible assets;

³ An assembled workforce reflects the value associated with having a trained and productive workforce established within a business in the form of costs saved. If a business had to replace an existing workforce, there would be costs associated with recruiting, hiring, and training new employees or contractors. In most instances, the assembled workforce is not an identifiable intangible asset under business combination standards under IFRS, U.S. GAAP, or ASPE but is treated as part of goodwill. The assembled workforce is also commonly separately valued to be used as a contributory asset in a MEEM analysis.

- Functional obsolescence occurs when there is a loss of utility from the subject asset compared to its replacement asset, such as the design or technology being outdated, whereby the replacement asset has a lower capital cost to construct or operational costs to maintain (resulting in a higher selling price) than the subject asset;
- Technological obsolescence occurs when there is loss of utility from technological improvements; and
- Economic obsolescence occurs when there are external factors impacting the asset, such as adverse changes in consumer demand, changes in legislation or the operating environment, oversupply in the market, increased competition, disruption in the supply chain, and so on.

1.6.1 Steps in Applying the Cost Approach (Depreciated Replacement Cost)

Exhibit 1.6: Application of the Cost Approach

1. Identify and estimate all cost components that are needed to reproduce or replace an asset of similar utility.
2. Estimate adjustments to reflect functional, economic, and technological obsolescence as appropriate to derive depreciated replacement cost new.
3. Subtract the depreciation calculated in Step 2 from reproduction/ replacement cost determined in Step 1.

1.6.2 Advantages and Disadvantages of Using the Cost Approach

Advantages:

- Easy to understand;
- Historical costs to develop an intangible asset are often available;
- Costs to re-create/reproduce an intangible asset can often be estimated; and
- “Build versus buy” analyses are often used by companies when considering developing technology or other intangible assets.

Disadvantages:

- For pre-revenue assets, may not adequately capture future revenue-generating potential, thereby potentially undervaluing subject asset;
- Historical costs incurred to create a technology might differ from current costs to re-create or reproduce an asset (using current technologies and information available in the public domain);
- Quantifying functional, technological, and economic obsolescence can be highly subjective;
- Re-creating an intangible asset may not be a viable alternative due to legal protection in place; and
- Determination of appropriate costs to be included (variable, fixed, overhead, etc.) can be challenging and uncertainty regarding the types of costs to be considered can lead to an erroneous conclusion.

1.7 Tax Loss Carryforwards

When valuing a business on a going concern basis, valuers may need to consider the value of tax loss carryforwards. Often, the present value of the tax benefits associated with loss carryforwards are not captured on a company’s balance sheet; moreover, if a future tax asset is recognized on a company’s balance sheet, it may differ from its fair market value at the valuation date.

Much of the discussion in this section has been summarized from information in *Canada Valuation Service 2018 Student Edition* and *Business Valuation*. You are encouraged to refer to these texts to read the authors’ full comments.

1.7.1 Overview

The existence of income tax loss carryforwards can be an important consideration in the determination of a purchase price that can be offered by a purchaser of shares. For a comprehensive review of tax rules surrounding losses in Canada, refer to **Level II, Module 2**.

1.7.2 Net Capital Losses

A corporation that has incurred a net capital loss is entitled to carryforward and deduct that loss against taxable capital gains realized in any subsequent taxation year and carry the loss back and deduct it against taxable capital gains realized in the three preceding taxation years.

Net capital losses include allowable business investment losses (ABILs), which cannot be claimed by the taxpayer because of the expiry of the 10-year carryforward period for such losses. However, net capital losses realized in previous taxation years, up to and including the taxation year deemed to end immediately before an acquisition of control, are not deductible in computing taxable income of subsequent taxation years, and net capital losses realized after the change of control cannot be carried back to taxation years before the change of control.

1.7.3 Non-Capital Losses⁴

Generally, non-capital losses or business losses incurred subsequent to 2005 (excluding ABILs) can be carried forward and deducted in the computation of a corporation's taxable income for 20 taxation years immediately following the year in which the loss is incurred and carried back and deducted in computing taxable income in the three preceding taxation years. In the case of business losses resulting from allowable investment business losses, the non-capital losses convert to capital losses after 10 years. There are, however, certain restrictions on the deductibility of loss carryforwards where there has been an acquisition (change) in control of a corporation.

Acquisition of control rules exist to prevent profitable companies from acquiring a corporation with a history of losses solely for the loss carryovers without intending to operate the acquiree on an ongoing basis. Acquisition of control takes place when a person, group of persons, or corporation takes de jure (i.e., legal) control of the company in which the tax losses exist.

For the acquired non-capital losses to be deductible, the Income Tax Act requires that the acquired business must be carried on with a reasonable expectation of profit. In the absence of an expectation of profit, the subject losses cease to be deductible.

Furthermore, for the subject losses to be deductible in future years, there are specific rules in place requiring that future taxable income be derived from similar businesses. There are also numerous provisions under the general anti-avoidance rule that prevent or limit the use of loss carryforwards.

Assuming for the moment that a pool of non-capital losses can be used, the value of the pool is a function of:

- The size of the pool;
- The expected tax rate of the taxable entity; and
- The expectation of future taxable income.

If LossCo amalgamated with AcquirorCo, the expected tax rate and taxable income of the combined entity would determine the value of the pool of tax losses. If, however, LossCo remained autonomous, its own expected tax rate and taxable income would determine the value of any tax losses.

As illustrated in **Example 1.4**, to quantify the value of a pool of non-capital losses, consideration is given to:

- The acquisition and expiry date of the non-capital losses;
- The expected taxable income of the entity that will be using the losses; and
- The present value of the implied cash tax shield associated with the losses.

⁴ The information in this section has been based, in part, on *Valuing Non-Capital Tax Losses in Business Acquisitions*, by Richard R. Conn, CMA, MBA, CPA, with the author's permission.

Example 1.4: Implied Value of Non-Capital Losses

(\$) Year	Expected Taxable Income	Non-Capital Losses	Implied Tax Shield @ 30.0%	PV of Tax Savings @ 10.0%
1	-	2,000,000	-	-
2	500,000	1,500,000	150,000	130,018
3	600,000	900,000	180,000	141,837
4	750,000	150,000	225,000	161,179
5	1,000,000	-	45,000	29,305
				462,339

Example 1.4 illustrates the non-capital loss effects on taxable income in Canada. The valuator should be mindful that different jurisdictions may have different tax legislations, which could result in different tax treatments related to utilization of tax losses (i.e., in the United States, there may be an annual cap on the amount of non-capital losses that can be deducted each year). Such differences in tax legislation affect the tax saving/tax shield associated with non-capital losses.

1.7.4 Other Methods of Valuing Non-Capital Losses

There is also some academic literature about the valuation of non-capital loss carryforwards. The approaches considered include a contingent claim model⁵ and a Monte Carlo simulation-based approach,⁶ which considers the future tax savings from a tax loss carryforward to be similar in nature to a portfolio of options based on the company's taxable base.

Although there may be some basis for these academic approaches, their use in daily practice remains limited due to the high cost and complexity associated with creating the models, and the inherent uncertainty associated with models that incorporate multiple assumptions.

Tax losses may also be valued with reference to observed transactions involving the sale of a company containing loss carryforwards. However, as with any market-based approach, it is often difficult to obtain sufficient information to assess the extent to which the characteristics of the observed transaction mirror those of the subject tax losses at hand.

1.8 Non-Competition Agreements

Non-competition agreements arise in a number of circumstances; however, they are most frequently found in the purchase and sale of a business and in employment. This discussion focuses on the impact in a sale environment, where these agreements are typically required when a selling shareholder (that is active in the business) is believed to be in a position to negatively affect the business and its value after the transaction. These agreements tend to specify the “types” of business in which the selling shareholder may not compete, directly or indirectly; the geographic region in which the selling shareholder may not compete; and the length of time over which a selling shareholder cannot compete.

It is important to understand the value of a non-competition agreement in a notional market context as well as in an open market transaction. In a notional market, it is generally assumed that a non-competition agreement is required to consummate a transaction. Accordingly, its value is rarely separated from the value attributed to the business; it generally represents a component of goodwill based on the price paid by a buyer. Historically in Canada, the same approach has been taken in an open market purchase, with no value attributed to the non-competition agreement. This may not be the case in relation to allocating a purchase price for accounting and income tax purposes, where a non-competition agreement may be treated as a separately identifiable intangible asset.

5 Sarkar, Sudipto. “Valuation of Tax Loss Carry-forwards.” *CAAA Annual Conference*, 12 January 2012.

6 Streitferdt, Felix Georg. “The Valuation of Tax Loss Carry-forwards.” *NACVA Annual Conference*, 2 June 2010.

The obvious difficulty for the valuator is attempting to determine what someone would be prepared to pay for a business without the non-competition agreement, when traditionally it has been included as a component of the transaction. This is an extremely subjective process.

Some key elements in determining the allocation of value to a non-competition agreement include:

- Whether an earnout exists, which would likely place a lesser value on the non-competition agreement (in a notional market context, as notional market valuations tend to be based on a cash or cash-equivalent offer);
- The vendor's ability to compete after the transaction, given factors such as financial means, age, health, and so forth;
- The legal enforceability of the non-competition agreement;
- The vendor's level of interest in continuing the business;
- The vendor's level of involvement with the business, pre-transaction;
- The capital intensity (indicating a barrier to entry) of the business;
- The nature of existing competition;
- The size of the business and nature of its products; and
- Whether the shareholder is asked to remain for a period under management contract.

If the vendor in a transaction is approaching retirement and has demonstrated that they have been stepping back from daily operational involvement in the subject business, the non-competition agreement would arguably be less valuable (or have a nil value) than in the case of a younger, hands-on vendor with a greater interest in remaining involved in the industry. Similarly, a non-competition agreement involving a vendor with significant financial means — in an industry with low financial barriers to entry — would be more valuable than an agreement where the vendor would not have the financial ability to establish a competing business.

1.9 Management Agreements

Management agreements can be discussed in two contexts:

- Those in place with current management when valuing a business; and
- Those entered into with the vendor on the purchase of a business.

1.9.1 Purchase of a Business

Like non-competition agreements discussed in the previous section, management contracts come into existence when an open market transaction closes. They are generally offered to selling shareholders during the transition to new management in an effort to retain their services and transfer knowledge, relationships, and key operating fundamentals.

Often, management contracts can be used to close the gap on price between a vendor and a purchaser. As such, the price paid may be inflated over normal market rates. From a vendor's perspective, however, these amounts are not guarantees in the event of death or if termination occurs for just cause, in the course of their duties.

Management contracts are rarely considered in a notional market context as they are assumed to be a pre-condition to the transaction occurring and because fair market value is defined in terms of cash and cash equivalents.

1.9.2 Existing Contracts on Valuation

Management contracts are also important from the perspective of the valuation of a business because they may:

- Provide security that key employees will be retained post-closing; and
- Be put in place or exist as a form of protection for key employees in contemplation of a sale.

The latter aspect is important from a due diligence perspective because such agreements will often specify the severance available to an employee and the triggering events that would enable the employee to exercise these rights, such as a change in control of the business or a change in function. In either case, the impact of paying severance on the financial assumptions may be significant.

1.10 Leases — Favourable and Unfavourable

When a business is being valued at a specific valuation date, it may have lease agreements in place for its operating premises. Market rent rates for the facilities leased by the subject business may have increased or decreased relative to the actual rate in the lease; this can be common when the business is operating under a long-term lease that was signed years before the valuation date.

If market lease rates for the subject property have increased relative to the actual lease rate being paid by the business, a favourable lease asset can arise at the valuation date. This is because a market participant would enjoy a lower rate of rent compared to what would be required if the lease was signed on the valuation date.

Similarly, if market lease rates for the subject property have decreased relative to the actual lease rate being paid by the business, an unfavourable lease liability can arise at the valuation date. This is because a market participant would be locked into paying a higher rate of rent compared to what would be charged if the lease was signed on the valuation date.

Favourable or unfavourable leases may be recognized as assets or liabilities in the context of a purchase price allocation for a business combination. However, in a notional valuation context unrelated to a business combination, a valuator can qualitatively consider whether a business is paying above- or below-market lease rates when assessing the overall reasonability of the goodwill and intangible value implied by the valuation.

To obtain an accurate measure of a true market rate of rent, a CBV may need to retain a real estate appraiser. The valuation of real estate is discussed in more detail in **Module 2**.

1.10.1 Leases Accounted for Under IFRS

Under IFRS 16, lease assets and liabilities may appear on a company's balance sheet for the duration of the lease term. However, the duration of these lease assets and liabilities may be different than the duration of a company's cash flow stream as a going concern. This issue, and leases in a financial reporting context, are covered in greater detail in **Level IV**.

1.11 Undeducted Scientific Research and Experimental Development (SR&ED) Expenditures

Certain provisions of the Income Tax Act effectively reduce a corporation's pool of undeducted SR&ED expenditures to nil on a change of control.

The pre-change of control pool is deductible only in taxation years after the change of control, where the business to which the expenditures related was carried on continuously since the change of control for profit, or with a reasonable expectation of profit.

In addition, such expenditures are deductible only to the extent that the corporation's income for the year from that business or from other businesses was from the sale or lease of similar products or the rendering of similar services. The rule thus parallels the rule for deducting non-capital losses under the Income Tax Act.

1.12 Undeducted Investment Tax Credits

In general terms, undeducted investment tax credits of a corporation may only be carried forward after a change of control.

In computing such notional tax liability, taxable income is reduced by any investment tax credits deducted by the corporation in the year in respect of the business, or the similar business, and is calculated without taking into account capital gains from disposition of property used in such businesses before the change of control.

This rule, therefore, parallels the restriction on the deduction of non-capital losses.

1.13 Equipment

When valuing business interests in a notional context, valuers frequently incorporate assumptions regarding machinery and equipment values. These assumptions typically underlie calculations of tangible asset backing and going concern asset value.

When tangible asset backing is being determined, “value in use” is generally the most applicable. Value in use in the context of equipment valuation generally is defined as the value in place of equipment assets, installed in the company’s location, with consideration being given to age, condition, and obsolescence. This is the value the equipment contributes to the going concern value of a business.

Where the modified tangible asset backing or the liquidation value of a business is being determined, the orderly liquidation value and the forced liquidation value methods are generally most applicable. Liquidation value in the context of equipment appraisal is generally defined as realizable prices other than in a going concern context.

Although in many cases valuers make, or are requested to make, the assumption that the carrying value of the equipment approximates its fair market value, there are instances where the services of a qualified appraiser are required, particularly in situations where:

- The valuator has cause to believe that the carrying value of a group of assets does not approximate its fair market value; or
- Where liquidation or so called “scrap” values are required.

Valuations of machinery and equipment prepared by appraisers are:

- Typically notional, in that they are prepared in the absence of specific, identified purchasers for either the assets viewed separately or the business that owns the assets; and
- May result in the determination of a number of different measures of value such as replacement cost new, depreciated replacement cost, and value in use.

Replacement cost new is generally the cost of an equivalent new asset of similar capacity, utility, and current technology as available from manufacturers, suppliers, and distributors, on a lowest available price basis, plus installation costs. Depreciated replacement cost is defined as replacement cost new, less an allowance for accumulated depreciation. The depreciation allowance takes into account physical deterioration, functional obsolescence, and economic obsolescence, based on a comparison of the asset with new units. As in the case of real estate valuation, the estimate of depreciation is subjective.

An estimate of value in use is normally restricted to special-use equipment essential to the ongoing business operations. Value in use is usually determined as the present value of discretionary cash flows expected to accrue from use of the equipment.

When liquidation value is being developed, the equipment is valued based on its “value in exchange,” based on the estimated proceeds that could be expected from the sale of the assets at auction, either on an individual basis or as a group of related assets.

In developing liquidation value, it is assumed that:

- The assets are sold on an assembled “as is, where is” basis;
- The assets are removed for offsite use;

- Sales are completed within a short time period (normally 3 to 12 months) from the valuation date; and
- Market conditions will remain relatively constant during the liquidation period.

Where the assets are not in working order, they may have to be sold at their salvage value (where certain parts can be salvaged) and/or at scrap value, based on their material components.

Liquidation value can be further categorized as either an orderly liquidation or a forced liquidation. A forced liquidation generally occurs pursuant to a court order (or some other order) issued on the insolvency of a business and is overseen by a trustee. An orderly liquidation normally is presumed to take place under more favourable circumstances, such as the voluntary windup and dissolution of a business.

The two premises of liquidation value — gross orderly liquidation value and gross forced liquidation value — are distinguished by the amount of gross proceeds expected from the sale of the equipment assets. Gross orderly liquidation value assumes equipment assets are offered for sale in a way that will realize the greatest aggregate gross sale proceeds. Typically, it is assumed that an orderly liquidation process occurs over a 6- to 18-month period, depending on economic and industry conditions.

When reviewing an appraiser's liquidation value calculation for equipment, it is important to ensure that all costs related to the liquidation and windup, and all applicable taxes, have been adequately accounted for. Typically, a forced liquidation yields a lower value than an orderly liquidation, given the time constraint in completing the sale.

MODULE 02

**VALUATION OF
SPECIFIC ASSETS
— PART 2 — REAL
ESTATE**

Module Overview

Welcome to Module 2. This module covers the valuation of real estate. Since real estate is not the primary focus of a CBV's training and experience, CBVs are not qualified to issue real estate appraisals. Therefore, CBVs should seek a qualified appraiser to determine real estate market values when they do not have the appropriate real estate experience and knowledge or when real estate forms a substantial part of the valuation. However, regardless of whether a separate expert is engaged, CBVs should have the foundational knowledge to interpret real estate appraisals and use them appropriately in the context of a business valuation.

By the end of this module, you will be able to:

- Explain the basics of real estate appraisals; and
- Identify when real estate appraisers should be engaged.

The acronyms used throughout this module are:

DCF Discounted cash flow

LEED Leadership in Energy and Environmental Design

NOI Net operating income

PGI Potential gross income

REIT Real estate investment trusts

Recommended Readings

Johnson, Howard E. *Business Valuation in Canada*. Toronto: CPA Canada, 2021.

- Chapter 3 — Asset Valuation Methodologies — Real Estate Valuation

Note: There is a glossary with key terms at the end of the module.

2.1 Real Estate Appraisals

CBVs may need to rely on real estate appraisers when their business valuation engagements involve one or more ownership interests in real property. From a business valuation context, real estate is normally treated as a redundant asset; however, in some cases, the real estate and business are intrinsically linked (e.g., hotels, seniors' housing, self-storage facilities, carwashes, gas stations, etc.). Valuers should ensure that any property valuations relied on are appropriate given the purpose and intended use of their business valuation engagement.

CBVs retaining a real estate appraiser or reviewing a real estate appraisal report must be able to accurately interpret the appraiser's analysis and conclusions. Accordingly, a valuator should have a basic understanding of property valuation theories and methodologies, including knowledge of any professional licensing requirements applicable to the property's jurisdiction. Further, the professional designation held by the appraiser should be appropriate for the type of property, as separate designations exist for residential and commercial properties:

- Residential appraisers are qualified to value single-detached houses, semi-detached houses, townhouses of four units or less, individual residential condominiums, residential acreages, and vacant residential lots capable of development of four units or less; and
- Commercial appraisers are qualified to value any commercial or residential buildings, land, and agricultural properties. Commercial appraisers generally specialize by geographical markets and property types, suggesting that valuers should assess the appraiser's competency based on the nature of the property, particularly in the case of unique or special-use properties.

Professional reporting standards for real estate appraisers can vary from country to country. Some of the professional reporting standards applicable to real estate appraisal are the Canadian Uniform Standards of Professional Appraisal Practice, Uniform Standards of Professional Appraisal Practice, International Valuation Standards, and the Red Book Global Standards.

Valuers should ensure that the purpose and intended use of a real estate appraisal in a business valuation engagement is appropriate and not taken from an appraisal prepared for a different purpose. For example, an appraisal prepared for expropriation purposes must follow the relevant legislative framework for that jurisdiction, but this may result in a valuation that would not be suitable in a valuation for financial reporting purposes. A valuator should obtain written authorization from the appraiser in cases where the real estate appraisal was not prepared specifically for their business valuation.

2.2 Real Estate Ownership Interests

The terms *real estate* and *real property* are often used interchangeably; however, their distinction is fundamental to appraisal theory. While the term real estate refers to the dirt, concrete, wood, and other tangible components of a property, real property encompasses the rights to a property. Central to real estate appraisal theory is the "bundle of rights" concept, which compares real property ownership to a bundle of sticks. Each stick in the bundle represents a distinct and separate right, including:

- The right to occupy;
- The right to sell;
- The right to lease;
- The right to mortgage;
- The right to gift; and
- The right to exercise all or none of these rights.

The owner of a property's fee simple estate possesses the entire bundle of rights, subject only to limitations imposed by the government, such as expropriation and escheat. The owner of a property's fee simple estate may choose to transfer one or more rights in the property to another party, such as transferring the right of occupancy to a tenant by executing a lease agreement. When this occurs, the landlord (lessor) retains a leased fee interest while the tenant (lessee) holds a leasehold interest in the property. The rights or claims in a property can also include non-possessory interests, such as easements, restrictive covenants, liens, and mortgages.

A business valuator relying on a real estate appraisal report should ensure the ownership interest specified in the appraisal aligns with the facts and circumstances specific to the valuator's engagement. For example, the contract rent specified in a long-term land lease (also known as a ground lease) may vary significantly from prevailing market rent. When this occurs, the valuation of the property's fee simple estate may be materially different from its leasehold interest. A properly prepared real estate appraisal will include commentary on these types of differences and an analysis of their impact on market value.

2.3 Market Value

The definition of value in a real estate appraisal will, like in a business valuation, depend on the intended use and context for which the opinion of value is sought. Most real estate appraisals are prepared for the purpose of estimating market value, which is generally similar to the term fair market value. That is, a value estimate based on the most probable price expressed in cash, exchanged between willing and able arm's length parties, each of whom acts prudently, in their own best interest, based on reasonable knowledge of relevant facts without compulsion or duress.

Market value is defined in numerous sources, including textbooks published by professional bodies and industry organizations and legislation drafted by various levels of government. Valuators must ensure that the definition of value used in a real estate appraisal aligns with the purpose and intended use of their business valuation engagement. For example, the definition of market value and the parameters surrounding how that estimate is derived in a certain context (e.g., expropriation) may not be compatible with a market value opinion required in another context (e.g., financial reporting).

2.4 Highest and Best Use

Researching and analyzing a property's highest and best use represents a crucial step in the appraisal process because the appraiser's determination of a property's highest and best use:

- Influences the valuation methodologies selected by the appraiser; and
- Determines the appraiser's selection of comparable market transactions.

An appraiser's opinion on a property's highest and best use can be considered similar to a valuator's assessment of a business's ability to continue as a going concern. That is, errors at this point in the valuation process will likely result in a false or misleading opinion of value.

While an in-depth review of highest and best use theory and its practical application in real estate appraisal is beyond the scope of this course, valuators should note that:

- When the purpose of an appraisal is to provide an opinion of market value, the appraiser must consider:
 - The highest and best use of the property "as if vacant"; and
 - The highest and best use of the property "as improved" or "as proposed";
- A property's highest and best use may be a continuation of its existing use or a change of use;

- Realizing a property’s highest and best use may require assemblage with adjacent parcels, although the appraiser would need to consider the timing and likelihood of successfully executing an assemblage when making this determination;
- Researching a property’s legally permissible uses requires the appraiser to consider the property’s land use designation (i.e., zoning) within the context of the entire planning hierarchy (e.g., area structure or redevelopment plans, municipal development plans, transportation plans). In other words, appraisers consider a property’s current and anticipated land use controls when analyzing a property’s legally permissible uses;
- A legally nonconforming use may or may not represent a property’s highest and best use, depending on the facts and circumstances surrounding the valuation engagement; and

Increasing awareness of environmental, social, and governance considerations will influence highest and best use analyses, particularly property performance from an environmental and sustainability perspective. For example, a building satisfying the requirements for LEED certification may attract capital at a lower cost than an otherwise similar property without LEED certification.

2.5 Special-Purpose Properties

Special-purpose properties are generally described as properties with designs, construction materials, and layouts specific to the needs of a certain use or user (e.g., hotels, nursing homes, theatres, arenas, etc.). In some cases, the functional utility of these properties in their continued use does not represent the property’s highest and best use, with some properties so specialized that their improvements cannot be readily adapted to any viable alternative use.

Further, special-purpose properties often include personal property, fixtures, and trade fixtures, sometimes described more generally as furniture, fixtures, and equipment. A real estate appraiser may estimate the market value of the going concern or the property’s value in use¹ in these circumstances.

Valuators must understand whether or not any non-realty components of value are included in a real estate appraiser’s opinion of value, particularly when the subject property is appraised on a value in use or going concern basis. In other words, valuers should ensure that personal property or intangible assets have not been omitted or double counted when their business valuation uses an opinion of value from a real estate appraisal.

2.6 Valuation Approaches

A distinctive feature of real estate includes its physical immobility and heterogeneity, resulting in localized markets that are often fragmented, illiquid, and characterized by high transaction costs. The imperfect nature of real estate markets and the diverse objectives of the many participants active in these markets can sometimes lead to widely diverging perspectives on the value of a particular property or particular use.

Real estate appraisal, like business valuation, is premised on three primary approaches to value:

- The direct comparison approach (market approach);
- The income approach (income approach); and
- The cost approach (asset approach).

The type of property and the availability of reliable market evidence will ultimately determine the valuation approaches used by a real estate appraiser. In some cases, an appraiser may use all three approaches, while in others, the appraiser may be limited to applying a single approach. When more than one approach is used, the appraiser may select a final estimate of value based more heavily on one approach over another.

¹ Note that the definition of “value in use” in the context of a real estate appraisal differs from the definition of “value in use” for financial reporting purposes under IFRS, U.S. GAAP, or ASPE.

2.6.1 Direct Comparison Approach

Many market participants consider the direct comparison approach the most straightforward valuation approach, making its use commonplace when valuing various property types, particularly land, single-family dwellings, and owner-occupied commercial properties. The relative simplicity of the direct comparison approach also makes it useful as a secondary valuation approach or as a test of reasonableness when used alongside the income approach and/or cost approach.

Per the economic principle of substitution, the direct comparison approach is predicated on the view that market participants base their pricing decisions on their ability to acquire a substitute property of similar quality, utility, and desirability, without undue delay. In theory, comparable properties considered identical to the subject property require no adjustment as purchasers would be willing to pay the exact price to acquire these perfectly substitute properties. In practice, however, comparable properties share varying degrees of similarity to the subject property. Accordingly, the sale price or the unit price indicated by these comparable transactions often requires adjustments to reflect inferior and superior characteristics relative to the subject property, including adjustments for different terms of sale, atypical motivations of either buyers or sellers, and changing market conditions.

Appraisers can use quantitative and/or qualitative techniques to estimate adjustments, with these adjustments applied as either percentage or absolute dollar amounts, or, in the case of qualitative adjustments, by noting that the comparable property is superior or inferior to the subject in a particular attribute. In theory, paired sales analyses (i.e., the sale and resale of the same property) offer the best quantitative support for adjustments; however, paired sales are difficult to find in practice and, when found, are limited in number. Accordingly, adjustments are generally based on a combination of quantitative and qualitative analyses and professional judgement. In the end, the appraiser attempts to adjust the unadjusted sale price per unit for each comparable so that the adjusted sale price per unit provides a closer approximation of the probable value of the subject property. Indications from comparable properties considered superior to the subject property have their sale prices adjusted downward, whereas indications from comparables with inferior characteristics are adjusted upward.

Not all real estate transactions meet the conditions required for their sale price to be considered representative of market value. For instance, a transaction may represent a forced sale or purchase where one of the parties is compelled or under duress to transact. Similarly, a sale price may reflect non-cash consideration, such as a vendor take-back mortgage at an interest rate significantly below market. Appraisers generally disqualify comparable transactions from further analysis when they occur between non-arm's length parties or where atypical or "non-market" terms and conditions influence the transaction price in an unknown or unobservable manner. In other cases, sufficient market evidence combined with the appraiser's professional judgement may provide adequate support to apply transactional adjustments aimed at recognizing the nature and terms of the transaction, including:

- Property rights conveyed;
- Financing terms;
- Conditions of sale;
- Expenditures made immediately after purchase; and
- Market conditions (time).

After applying the preceding transactional adjustments sequentially, the appraiser considers the need to apply one or more of the following property adjustments, which are calculated on a cumulative basis:

- Location;
- Physical characteristics;
- Economic characteristics; and
- Non-realty items.

Every property has a distinct location and other unique features, such as the size, topography, and configuration of the land parcel and the size, age, orientation, and quality of its building improvements. A comparable property is considered one that the typical buyer could reasonably consider as an alternative to the subject property; however, the availability, quantity, and quality of comparable market transactions vary by property type and market conditions. In practice, a lack of comparable market evidence may force the appraiser to extend their search parameters to include transactions that may otherwise be considered dated or too dissimilar to the subject property, applying appropriate adjustments as necessary.

Valuators should keep the following considerations regarding the application of the direct comparison approach in mind:

- Details concerning most real estate transactions (e.g., transfer date, transfer price, identification of the vendor and purchaser) are publicly available through provincial/state land registry offices (except for share transactions involving real property interests, in which case the property's title does not transfer);
- Even if physically similar, a comparable transaction should likely be avoided if its legal interest is different from the legal interest appraised for the subject property;
- Transactions involving vendor take-back loans or assumable debt at non-market rates should be adjusted appropriately, or the weight applied to these indications of value should be limited or eliminated;
- Foreclosures and related forced-sale transactions should be used with caution;
- Whether a market transaction is too dated to use as a comparable is a function of changing market conditions and not necessarily the mere passage of time;
- A property's location may be more or less suitable for certain uses based on its linkages and proximity to:
 - Employment;
 - Employees;
 - Customers;
 - Suppliers;
 - Public transportation;
 - Transportation routes;
 - Recreational amenities;
 - Emergency and protective services;
 - Professional services and retail amenities;
 - Natural amenities;
 - Potable water; and
 - Utilities.
- Physical characteristics with the greatest significance on value vary by property type (e.g., retail vs. industrial), thus the research and analysis undertaken to quantify dissimilar physical characteristics must be property-specific;
- Economic characteristics (e.g., occupancy and lease details) for comparable transactions are seldom available in the public domain, meaning appraisers generally rely on other methods (e.g., subscription resources, professional networks, company files) to obtain relevant details; and

- The identification and analyses of any non-realty components of value must be noted within the appraisal report and be consistent with the valuator’s intended use to ensure no double counting or omission within the context of the valuator’s business valuation engagement. For example, machinery and equipment included in a real estate appraiser’s valuation may be double counted if the valuator’s adjusted net book value calculation fails to consider if the machinery and equipment is recorded on the company’s balance sheet under the building line item or as a separate line item under machinery and equipment.

2.6.2 Income Approach

The income approach represents the preferred approach for valuing income-producing properties, such as multi-family apartments, offices, shopping malls, and industrial properties that are leased (rather than owner-occupied). Per the economic principle of anticipation, the income approach establishes that a property’s market value is based on its anticipated income stream considering the inherent risks and opportunities therein.

The income approach involves two related yet distinct techniques:

- Direct capitalization, most frequently used to value income-producing assets that reflect stabilized occupancy and stabilized income; and
- DCF analysis, most frequently used to value more complex income-producing assets or those income-producing assets not performing at levels considered representative of their stabilized occupancy or stabilized income.

Valuators are well versed in converting anticipated economic benefits into a current value estimate; however, it is important to note that:

- The economic benefits and return requirements in real estate appraisal are calculated on a pre-tax basis (i.e., using pre-tax income streams and pre-tax discount rates and capitalization rates). The market for real estate is made up of purchasers subject to varying and often unknown income tax rates and/or tax structures. As such, explicit income tax rate assumptions are not made when calculating income streams and rates of return in real estate appraisals (although purchasers in the marketplace may calculate after-tax metrics based on their individual tax circumstances); and
- Market value in real estate appraisal reflects a property’s unlevered value, akin to enterprise value in business valuation. The market for real estate includes purchasers who use varying amounts of financial leverage (debt capital), with the cost and repayment terms of this debt capital varying from borrower to borrower. With this in mind, and similar to business valuation, the discount rate and capitalization rate estimates in real estate appraisal reflect a weighted average cost of capital based on an “optimal” capital structure aimed at minimizing the overall cost of capital.

Sale prices for most real estate transactions are available in the public domain through land title registries. However, for investment transactions, confirming the in-place and prospective income streams for comparable transactions can be challenging because stakeholders involved in these transactions may not disclose this confidential information. Real estate appraisers rely on various sources to research details concerning investment transactions, including industry contacts, company files, interviews with market participants, publicly available documentation, and real estate database subscriptions. This data is generally adjusted and supplemented by the appraiser to ensure a consistent methodology is used when extracting information from comparable transactions and applying it to the subject property.

The legal interest (property rights) appraised determines whether an appraiser uses a property’s contract rent or an estimate of prevailing market rent when the purpose of an appraisal is to estimate market value. This distinction is critical when contract rent differ materially from market rent, particularly when this variance is expected over a longer duration (i.e., a longer remaining lease term). In short, valuers should recognize that an appraiser preparing an opinion of market value will:

- Use market rent when the purpose is estimating the value of a property’s fee simple estate;

- Use arm's length contract rent when the purpose is estimating the value of a property's leased fee interest; and
- When applicable, make appropriate calculations to account for the anticipated time and cost of a property achieving market rent where circumstances indicate that contract rent varies from market rent.

A leased fee interest represents a lessor's (landlord's) ownership interest, while a leasehold interest reflects a lessee's (tenant's) beneficial interest. Depending on the relationship between contract rent and market rent and other factors like a tenant's investments in leasehold improvements, a leasehold interest can be a positive leasehold or negative leasehold. That is to say, the existence of excess rent or deficit rent may provide incremental value to the owner of the leased fee interest or leasehold interest, respectively, depending on the remaining duration of the lease and other lease-specific considerations. Real estate appraisers also analyze the effects of rent concessions offered by property owners, calculating the property's imputed effective rent and comparing this against its contract rent or "face rent." Similarly, the appraiser will research if expense recoveries from tenants allow the property owner to pass along any or all of the operating cost increases to the tenant rather than assuming this risk. All else being equal, a property owner will prefer a net lease over a gross lease.

Although market conventions vary slightly by asset class, the following is a general overview of how to apply the income approach, specifically the direct capitalization technique:

1. Review the subject property's historical operating performance, including the subject's leases and/or rent rolls as at the valuation date, if applicable.
2. Conduct a market rent survey and estimate the subject property's potential gross income (PGI) assuming 100% occupancy.
3. Prepare a stabilized operating statement (i.e., income and expense estimate).
4. Select a market-derived overall capitalization rate.
5. Capitalize the subject property's stabilized net operating income (NOI) estimate into an indication of value.
6. If necessary, apply post-capitalization adjustments to reflect one-time or lump-sum adjustments not captured in the subject property's estimated income stream and capitalization rate selection.

Example 2.1: Sample Calculations – Direct Capitalization

Assumptions

Total rentable area	25,000 square feet
Market rental rate (net)	\$30.00 per square foot
Additional rent (operating costs)	\$15.00 per square foot
Stabilized vacancy and collection loss allowance	3.0% of PGI
Stabilized replacement allowance	2.0% of Effective gross income
Overall capitalization rate	5.0%

Calculations

Base rent	\$750,000
Additional rent (operating cost recoveries)	\$375,000
PGI	\$1,125,000
Minus: Vacancy and collection loss allowance	\$33,750
Equals: Effective gross income	\$1,091,250
Minus: Operating costs	\$375,000
Minus: Stabilized replacement allowance	\$21,825
Equals: Stabilized NOI	\$694,425
Stabilized NOI	\$694,425
Divided by: Overall capitalization rate	5.0%
Capitalized value	\$13,888,500
Plus (Minus): Lump-sum adjustment(s), if applicable	\$0
Equals: Estimated market value	\$13,888,500
<i>Rounded</i>	<i>\$13,900,000</i>

In this example, the stabilized replacement allowance reflects an above-the-line expense, meaning the deduction is calculated before “the line” (represented by the property’s stabilized NOI estimate). When applying the DCF technique, capital costs such as tenant improvement allowances and leasing commissions are often considered below-the-line expenses. In the end, real estate appraisers must ensure their income stream calculations are completed in a manner consistent with their analysis of comparable transactions.

The interconnected relationship between estimated income streams and capitalization rates cannot be overstated. When selecting the overall capitalization rate to apply in their analyses, real estate appraisers consider numerous elements, including:

- The property’s asset class, location, size, age, quality, condition, and use;
- The size, age, and quality of improvements, including their estimated depreciated replacement cost compared to their implied market value, and the cost and timing of anticipated capital repairs;
- The risks and opportunities underlying the property’s anticipated income stream (e.g., net vs. gross lease, below-market or above-market contract rent, duration of remaining lease term, quality of tenant covenant, renewal provisions, options, and other pre-emptive rights);
- Capitalization rates extracted from comparable arm’s length transactions, preferably on a stabilized or normalized basis to provide consistent calculations concerning stabilized vacancy allowances, stabilized replacement allowances, and other market assumptions;
- Public restrictions (e.g., land use designation, utility rights-of-way) and private claims (e.g., restrictive covenants, caveats, liens, options, rights of first offer or refusal) registered on the property’s title, including enforceable off-title or unregistered claims;
- Risk-free rates and prospective return metrics from alternative investments (e.g., publicly traded REITs, private REITs or mortgage investment corporations, stocks, bonds, mortgages);
- The availability and cost of mortgage financing, while considering conventional underwriting metrics (e.g., loan-to-value, debt service coverage, capital reserve requirements) used by lenders when evaluating loan opportunities; and
- The property’s underlying land value, including the timing and scope of the property’s redevelopment potential, if any.

2.6.3 Cost Approach

The cost approach is typically applied in market value appraisals when the subject is a special-use property whose income-generating potential is not the primary value driver (e.g., place of worship, public recreation centre, etc.) The cost approach is also helpful as a secondary valuation approach or a test of reasonableness when used alongside the income approach and/or direct comparison approach, particularly in cases involving newly constructed properties.

In short, the cost approach arrives at an estimate of market value by taking the sum of a property's vacant land value and the depreciated value of its improvements. An appraiser estimates the value of improvements using one of two techniques, replacement cost or reproduction cost, while also considering depreciation arising from physical deterioration, functional obsolescence, and external obsolescence at the valuation date. Difficulties obtaining reliable vacant land values and replacement costs, compounded by challenges in estimating all forms of depreciation, make the cost approach difficult to apply in practice. Further, this approach rarely reflects the thought process of market participants. Despite these challenges, the cost approach provides market evidence that may help form market value opinions when the availability or reliability of other data sources is inadequate or questionable.

Valuators should keep the following considerations regarding the application of the cost approach in mind:

- Comparable vacant land transactions rarely exist in fully built-out areas, which causes the appraiser to estimate the market value of the subject's land (as vacant) using other techniques, such as market extraction or allocation;
- Replacement cost or reproduction cost estimates and any amounts included for contractor's profit and entrepreneurial profit must be market-based and applied consistently when estimating costs for the subject property and all comparable transactions; and
- An appraiser's opinion on a property's curable depreciation, curable functional obsolescence, incurable physical deterioration, and incurable functional obsolescence requires sufficient research and analyses and the application of professional judgement.

2.7 Assessment vs. Appraisal

Valuators often receive municipal property assessment notices instead of independent property appraisals when a property's market value is required as part of their business valuation engagement. Although the terms assessment and appraisal are often used interchangeably, they are distinct opinions of value. Valuators considering the suitability or appropriateness of relying on a property assessment instead of a property appraisal prepared specifically for their purpose and intended use should note that:

- Property assessments are prepared on a mass appraisal basis, with cost and timing constraints, legislative requirements (e.g., appraisal ratio studies), and assessment policies influencing the determination of market value assessments. In some cases, a property's market value assessment may be materially higher or lower than what the property's market value estimate would be if it were appraised;
- Property assessments have valuation dates established by legislation, whereas appraisals can have one or more valuation dates based on the purpose and intended use of the valuation;
- Property assessments are prepared for the sole purpose of fairly and equitably distributing municipal property taxes among property owners, whereas appraisals are prepared for various intended uses; and
- Property assessments relate to fee simple property rights, although legislation and assessment policies typically exclude personal property (e.g., furniture, fixtures, and equipment) and intangible assets from assessment. Conversely, property appraisals can involve any ownership interest in the real property, which may include the value of personal property and intangible assets.

2.8 Additional Considerations

Valuators encounter various scenarios where the estimated value of real property materially impacts their opinion of value, whether this pertains to an operating business or a holding company. Valuators should keep the following additional considerations regarding property valuations in mind:

- A partial interest discount may or may not apply in an appraisal depending on its purpose and intended use, which may or may not align with the requirements of a specific business valuation engagement. Partial interest discounts may or may not be apparent in the market. Accordingly, valuators should ensure there is no omission or double counting regarding discounts for control or marketability whenever these circumstances arise (i.e., minority ownership interests);
- Real estate agents and brokers often provide a comparative market analysis to solicit listings for sale on the open market; however, regulatory bodies generally limit the use of these comparative market analyses to complete a sale transaction. In other words, regulators ordinarily prohibit real estate agents and brokers from issuing comparative market analyses for any other use (e.g., dispute resolution, financial reporting, financing, etc.). Conversely, real estate appraisers must be independent and free of conflicts that may impair their objectivity, in addition to satisfying their professional obligations based on the professional reporting standard selected for their valuation;
- Real estate appraisals may require the use of hypothetical conditions and extraordinary assumptions when the purpose and intended use of the valuation reflect circumstances that do not exist on the valuation date (e.g., the property is appraised “as-complete,” meaning the improvements are valued as though complete as of the date of valuation). Valuators should ensure these critical assumptions align with the purpose and intended use of their business valuation engagement;
- Real estate appraisers rarely segregate the contributory value of land and building improvements when estimating a property’s market value. Rather, a property’s market value is ordinarily presented as a single value without allocation among land and building/site improvements. If a valuator requires an opinion of market value on only the land component of a property, the valuator should specifically instruct the appraiser to provide this market value opinion at the outset of the engagement;
- A portfolio discount or portfolio premium may apply in circumstances where a business owns interests in a portfolio of properties. Properties appraised on a portfolio basis may be valued after considering the impact, if any, these types of premiums/discounts may have; however, valuators should ensure no omissions or double counting occurs concerning any premiums/discounts in a real estate appraisal when these opinions are used in their business valuation report;
- Valuators applying the liquidation approach to value should confirm that any opinion of value relied on reflects the appropriate definition of value, including adequate consideration of the proposed terms of sale under the forced or orderly liquidation process;
- Land registry systems allow real estate appraisers to research past transactions involving properties, with professional reporting standards mandating appraisers disclose current or pending transactions and prior transactions involving the subject property three years preceding the valuation date. Valuators concerned about the potential for fraud can review these appraisal reporting disclosures to uncover past transaction activity that may warrant further research; and
- A property’s highest and best use determines whether a residential or commercial appraiser should appraise it. For example, a residential appraiser may value an acreage or small farm if future development of the land is unlikely; however, acreages and farms located along a municipality’s outskirts and within the path of urban development should be valued by a commercial appraiser when the highest and best use of these properties is future urban development.

Glossary

The source for each of the following definitions is:

Appraisal Institute, *The Dictionary of Real Estate Appraisal*, 6th ed. Chicago: Appraisal Institute, 2015.

Above-the-line expense	An expense that is recorded “above” the net operating income line in a reconstructed operating statement typically developed for valuation purposes and therefore is considered part of the total operating expenses for the property.
Appraisal ratio study	A comparison of the ratio of an assessor’s market value estimates to actual sale prices; used to investigate the extent to which the assessor’s market value estimates conform to statutory requirements and assessment policy.
Assemblage	The combining of two or more parcels, usually but not necessarily contiguous, into one ownership or use; the process that may create plottage value.
Below-the-line expense	An expense that is recorded “below” the net operating income line in a reconstructed operating statement typically developed for valuation purposes and therefore is not considered part of the total operating expenses for the property.
Contractor’s profit	The amount by which the fee received by a contractor for work performed exceeds the total direct costs of materials, labour, and overhead.
Contract rent	The actual rental income specified in a lease.
Curable depreciation	Items of physical deterioration or functional obsolescence that are economically feasible to cure. Curing an item of depreciation is economically feasible if the cost to cure is equal to or less than the anticipated increase in the value of the property that would result after curing the depreciation.
Curable functional obsolescence	An element of depreciation; a curable defect caused by a flaw in the structure, materials, or design, which can be practically and economically corrected.
Deficit rent	The amount by which market rent exceeds contract rent at the time of the appraisal; created by a lease favourable to the tenant, resulting in a positive leasehold, and may reflect uninformed or unusually motivated parties, special relationships, inferior management, a lease executed in a weaker rental market, or concessions agreed to by the parties.
Effective rent	Total base rent, or minimum rent stipulated in a lease, over the specified lease term minus rent concessions; the rent that is effectively paid by a tenant net of financial concessions provided by a landlord.
Entrepreneurial profit	A market-derived figure that represents the amount an entrepreneur receives for their contribution to a project and risk; the difference between the total cost of property (cost of development) and its market value (property value after completion), which represents the entrepreneur’s compensation for the risk and expertise associated with development. An entrepreneur is motivated by the prospect of future value enhancement (i.e., the entrepreneurial incentive). An entrepreneur who successfully creates value through new development, expansion, renovation, or an innovative change of use is rewarded by entrepreneurial profit. Entrepreneurs may also fail and suffer losses.
Excess rent	The amount by which contract rent exceeds market rent at the time of the appraisal; created by a lease favourable to the landlord (lessor) and may reflect unusual management, unknowledgeable or unusually motivated parties, a lease execution in an earlier, stronger rental market, or an agreement of the parties.

External obsolescence	A type of depreciation; a diminution in value caused by negative external influences and generally incurable on the part of the owner, landlord, or tenant. The external influence may be either temporary or permanent.
Fee simple estate	Absolute ownership unencumbered by any other interest or estate, subject only to the limitations imposed by the governmental powers of taxation, eminent domain, police power, and escheat.
Fixture	An article that was once personal property but has since been installed or attached to the land or building in a rather permanent manner so that it is regarded in law as part of the real estate.
Functional obsolescence	The impairment of functional capacity of improvements according to market tastes and standards.
Furniture, fixtures, and equipment	Business trade fixtures and personal property, exclusive of inventory.
Gross lease	A lease in which the landlord receives stipulated rent and is obligated to pay all of the property's operating and fixed expenses; also called full-service lease.
Highest and best use	The use of an asset that maximizes its potential and that is possible, legally permissible, and financially feasible. The highest and best use may be for continuation of an asset's existing use or for some alternative use. This is determined by the use that a market participant would have in mind for the asset when formulating the price that it would be willing to bid.
Incurable functional obsolescence	An element of depreciation; a defect caused by a deficiency or superadequacy in the structure, materials, or design that cannot be practically or economically corrected as of the effective date of the appraisal.
Incurable physical deterioration	A form of physical deterioration that cannot be practically or economically corrected as of the effective date of appraisal.
Land use	The designation by a governing authority of the use to which land may be put to promote the most advantageous development of the community, e.g., designation of industrial, residential, commercial, recreational, and other uses under a master plan.
Leased fee interest	The ownership interest held by the lessor, which includes the right to receive the contract rent specified in the lease plus the reversionary rights when the lease expires.
Leasehold improvements	Improvements or additions to leased property that have been made by the lessee.
Leasehold interest	The right held by the lessee to use and occupy real estate for a stated term and under the conditions specified in the lease.
Legally nonconforming use	A use that was lawfully established and maintained, but no longer conforms to the use regulations of its current zoning; also known as a grandfathered use.
Mass appraisal	The process of valuing a universe of properties as of a given date using standard methodology, employing common data, and allowing for statistical testing. Often associated with real property tax assessment valuation.

Market rent	The most probable rent that a property should bring in a competitive and open market reflecting the conditions and restrictions of a specified lease agreement, including the rental adjustment and revaluation, permitted uses, use restrictions, expense obligations, term, concessions, renewal and purchase options, and tenant improvements.
Market value	The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress. (Note: This definition includes the most widely accepted components of market value; however, numerous sources of market value exist, and the correct definition must reflect the context and circumstances surrounding the intended use of the valuation.)
Market value of the going concern	The market value of an established and operating business including the real property, personal property, financial assets, and the intangible assets of the business.
Mortgage	A pledge of a described property interest as collateral or security for the repayment of a loan under certain terms and conditions.
Negative leasehold	A lease situation in which the market rent is less than the contract rent.
Net lease	A lease in which the landlord passes on all expenses to the tenant.
Net operating income (NOI)	The actual or anticipated net income that remains after all operating expenses are deducted from effective gross income but before mortgage debt service and book depreciation are deducted. (Note: This definition mirrors the convention used in corporate finance and business valuation for EBITDA; however, appraisers may or may not deduct a replacement allowance when calculating NOI.)
Partial interest discount	A discount to the value of a full ownership interest in property often applicable to ownership of a partial interest resulting from the diminished marketability of a less than full interest, lack of control, or both.
Personal property	The interests, benefits, and rights inherent in the ownership of tangible objects that are considered by the public as being personal; also called tangible personal property.
Positive leasehold	A lease situation in which the market rent is greater than the contract rent.
Real estate	An identified parcel or tract of land, including improvements, if any.
Real property	The interests, benefits, and rights inherent in the ownership of real estate.
Reimbursements	Operating expenses that are paid by the tenant, often on the basis of the proportion of space the tenant occupies compared to the total.
Rent concession	An inducement for a tenant to lease space, sometimes, but not always, observed in overbuilt markets, which can include above-standard tenant improvements, free rent, moving cost reimbursement or credit, and buyout of the tenant's existing lease. Concessions are an integral part of the definition of market rent.
Replacement allowance	An allowance that provides for the periodic replacement of building components that wear out more rapidly than the building itself and must be replaced during the building's economic life; sometimes referred to as reserves or reserves for replacement.

Replacement cost	The estimated cost to construct, at current prices as of a specific date, a substitute for a building or other improvements, using modern materials and current standards, design, and layout.
Reproduction cost	The estimated cost to construct, at current prices as of the effective date of the appraisal, an exact duplicate or replica of the building being appraised, using the same materials, construction standards, design, layout, and quality of workmanship and embodying all the deficiencies, superadequacies, and obsolescence of the subject building.
Stabilized income	(1) An estimate of income, either current or forecasted, that presumes the property is at stabilized occupancy. (2) The forecast of the subject property's yearly average income (or average-equivalent income) expected for the economic life of the subject property. (3) Projected income that is subject to change but has been adjusted to reflect an equivalent, stable annual income.
Stabilized occupancy	The occupancy of a property that would be expected at a particular point in time, considering its relative competitive strength and supply and demand conditions at the time, and presuming it is priced at market rent and has had reasonable market exposure. A property is at stabilized occupancy when it is capturing its appropriate share of market demand.
Tenant improvement allowance	A dollar amount (usually expressed as an amount per square foot) provided to the tenant by the landlord for the construction of tenant improvements, which may or may not equal the cost of remodelling.
Tenant improvements	Fixed improvements to the land or structures installed for use by a lessee.
Trade fixtures	Articles placed in or attached to rented buildings by a tenant to help carry out the trade or business of the tenant. For example, a tenant's shelves used to display merchandise are trade fixtures and retain the character of personal property, as opposed to all other fixtures that were, but are no longer, personal property when they are attached to and become part of the real estate.
Value in use	The value of a property assuming a specific use, which may or may not be the property's highest and best use on the effective date of the appraisal.

MODULE 03

**VALUATION OF
SPECIFIC ASSETS
— PART 3 —
BLOCKCHAIN AND
CRYPTOASSETS**

Module Overview

Welcome to Module 3. Blockchain and cryptoassets are rapidly becoming part of mainstream business. This module serves as a primer to provide a foundational understanding of blockchain, cryptoassets, and factors to consider when encountering cryptoassets in the context of a valuation. This module is not a prescriptive valuation manual, and valuers should remember that the market for cryptoassets is still in its infancy and continues to evolve swiftly.

By the end of this module, you will be able to:

- Explain the basic concepts of blockchain technology;
- Explain the basics of cryptoassets; and
- Describe the factors to consider when encountering cryptoassets in the context of a valuation.

The acronyms used throughout this module are:

BTC Bitcoin

CRA Canada Revenue Agency

CSA Canadian Securities Administrators

DLT Distributed ledger technology

NVT Network value to transactions

PoW Proof of work

PoS Proof of stake

Optional Readings

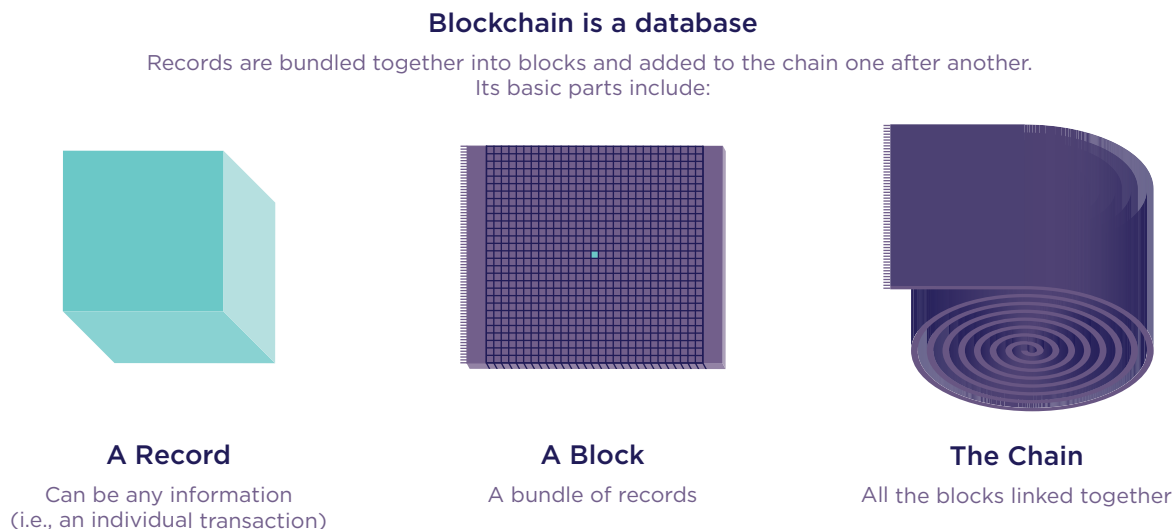
Singh, Tara K., and Tylar St. John. "Decrypting Crypto: An Introduction to Cryptoassets and a Study of Select Valuation Approaches." *Journal of Business Valuation — Sponsored Research Supplement*, 2019, <https://cbvinstitute.com/wp-content/uploads/2019/12/DecryptingCrypto-Final-DIGITAL-VERSION.pdf>.

- Section 6.3
- Appendix D

3.1 Introduction to Blockchain Technology

In technical terms, a blockchain is a distributed digital ledger that uses cryptography to securely and permanently record transactions without the involvement of trusted third-party facilitators or intermediaries. In lay terms, a blockchain is simply a database. Each new block contains records or transactions along with a unique link to the previous block. Once newly proposed records or transactions are verified by network participants, the block is cryptographically “chained” to its predecessor, effectively creating an immutable ledger shared by the entire network.

Exhibit 3.1: Basic Components of a Blockchain



Source: Adapted from Reuters Graphics

While blockchains can be public (analogous to the internet) or private (analogous to an intranet), the focus of this section is on public blockchains. Three principal technologies fuse together to facilitate blockchain technology. Each of these is discussed in more detail below.

3.1.1 Distributed Ledger Technology (DLT)

DLT is a public database of records simultaneously maintained by all network participants. Corporate and financial record-keeping has traditionally been maintained by institutions and governments in centralized computer databases, making it inherently susceptible to hacking and misuse. Blockchain uses DLT to decentralize record-keeping by ensuring that every participant maintains an identical copy of the blockchain’s complete ledger, which is publicly accessible by anyone at any time. This ensures transparency while eliminating the need for a central authority to process transactions and maintain records.

3.1.2 Cryptography

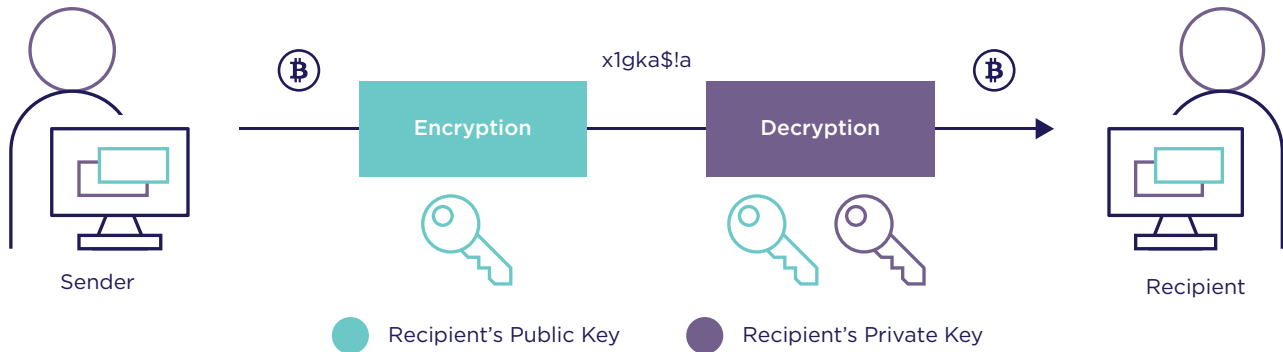
Cryptography, the science of secure communication, is used to protect the identity of blockchain participants while still allowing a public record of transactions on the blockchain. Most blockchains require that each participant have two different keys, a public key and a private key, which are linked via mathematical algorithms.

A hypothetical example (illustrated in **Exhibit 3.2**) of the transmission process using public and private keys is as follows:

1. Sender initiates a transfer of bitcoin to Recipient. The transfer is encrypted and transmitted using the Recipient’s public key (akin to sending an email to an email address).

- Recipient decrypts the transmission using their private key (akin to entering the password to an email inbox to access messages received). The private key used for decryption must correspond to the Recipient's public key; otherwise, the transmission will fail.

Exhibit 3.2: Illustration of Asymmetric Cryptography



3.1.3 Consensus Mechanisms

Consensus mechanisms provide a means for dispersed network participants to agree on the transactions to be included in the public ledger, without an administering body to oversee the process. The two common consensus models used in the cryptoasset space today are proof of work and proof of stake.

3.1.3.1 Proof of Work (PoW)

Under a PoW model, computers perform “work” by attempting to solve complex mathematical puzzles. The first computer to solve the puzzle must provide the answer (or the “proof of work”) to other network participants for verification. Once verified, a new block can be added to the blockchain and the digital ledgers of all participants. Bitcoin is an example of a blockchain governed by the PoW protocol.

3.1.3.2 Proof of Stake (PoS)

Under a PoS model, the validator of a transaction and creator of a new block is chosen deterministically depending on its investment or stake in the particular cryptoasset’s network. For example, some blockchains choose a validator randomly, whereas for others the choice is based on the quantity and age of the validator’s investment in the network. Under the latter method, “older” vintages are increasingly likely to forge upcoming blocks. Tezos is an example of blockchain governed by the PoS protocol.

The foundational technologies underlying blockchain — DLT, cryptography, and consensus mechanisms — each allow for the displacement of trusted third parties and the construction of a shared ledger that becomes self-audited and nearly impossible to unwind.

3.2 Business Use Cases of Blockchain

According to a report by PwC, blockchain has the potential to add US\$1.76 trillion to the global economy and enhance 40 million jobs globally by 2030.¹ The potential applications of blockchain’s sequencing technology are innumerable. Blockchain is expected to impact many sectors, including manufacturing, logistics, fashion, finance, health care, technology, and government services.

¹ PwC. “Time for trust: Time for trust: How blockchain will transform business and the economy.” October 2020, <https://www.pwc.com/gx/en/industries/technology/publications/blockchain-report-transform-business-economy.html>.

The following sections discuss several of blockchain’s use cases, illustrating how the technology has already improved the offerings of many businesses simply by streamlining the creation, storage, and dissemination of potentially sensitive information over a decentralized network.

3.2.1 Payments and Financial Institutions

The payments and finance industries have the potential to be fundamentally revolutionized by blockchain. For example, in perhaps the most familiar application of blockchain and cryptoassets, cryptocurrencies like Bitcoin are essentially being used as a digital currency for payments (as an alternative to fiat currencies issued by governments and central banks). However, despite their increased adoption in recent years,² the use of cryptocurrencies as a payment mechanism is still largely unregulated in many jurisdictions, and in others it is illegal.

To provide some legitimacy to digital currencies, many central banks around the world have been exploring how state-issued digital currencies can contemporize the national payments infrastructure. The Bank of Canada, for example, is exploring whether and to what extent central bank digital currency can replace or supplement physical cash while optimizing clearing operations between the central and commercial banking system and improving speed and reliability to end users.³

The financial sector is also investigating how stable coins (i.e., cryptoassets backed by fiat currency or some other real-world asset) can be used to modernize cross-border payment infrastructure, which has historically been plagued by high remittance fees and long delays.

3.2.2 Supply Chain Management

Blockchain technology is currently being used by many businesses to improve supply chain management. It has been used very effectively to prove the origin of goods such as fresh produce, pharmaceuticals, raw manufacturing materials, and gemstones. As goods move through the supply chain, blockchain can be used as a tracking mechanism by creating a unique and irreversible identifier for each item or batch that includes details of the batch’s attributes (e.g., origin, inspections, environmental compliance, deliveries, etc.). The unique identifier generated can then be used to identify counterfeit or non-compliant products or automatically generate and disseminate warnings of product quality deficiencies, thereby potentially mitigating a company’s risk of losses.

Exhibit 3.3: Use of Blockchain in Supply Chain Management



Source: Adapted from www.systra-tech.com⁴

2 Pirus, Benjamin. “Crypto Has Entered Its Fourth Stage Of Adoption, Industry Exec Say.” *Forbes*, 29 January 2021, <https://www.forbes.com/sites/benjaminpirus/2021/01/29/crypto-has-entered-its-fourth-stage-of-adoption-industry-exec-says/?sh=1ac945ad2053>.

3 Bank of Canada. “Contingency Planning for a Central Bank Digital Currency.” 25 February 2020, <https://www.bankofcanada.ca/2020/02/contingency-planning-central-bank-digital-currency/>.

4 Miller, Ron. “Walmart is betting on the blockchain to improve food safety.” *TechCrunch*, 24 September 2018, <https://techcrunch.com/2018/09/24/walmart-is-betting-on-the-blockchain-to-improve-food-safety/>.

For example, Walmart has partnered with IBM to create a “food safety” blockchain in which each participant that handles food on its journey from farm to table must digitally sign the blockchain. In the event of food recall, the identification, tracing, and quarantine of affected batches is quick and precise.⁵

3.2.3 Smart Contracts

A smart contract is a computer protocol intended to facilitate, verify, or enforce a contract on the blockchain without third-party intervention.⁶ Effectively, many of the terms and conditions typically included in a legally enforceable contract can be programmed into a smart contract, making it possible to automatically trigger payment if certain conditions are met or, alternatively, halt payment if conditions are not satisfied or a dispute arises.

Some benefits of smart contracts include the streamlining of the contracting and dispute resolution processes, which can save time and lower costs for transacting parties:

- It is not necessary to execute a smart contract in person (i.e., encrypted digital signatures required to participate on most blockchains replace the need for in-person execution); and
- When a smart contract self-executes, an audit trail is automatically generated, removing the need for ongoing third-party monitoring and reporting. This may potentially reduce additional costs, such as the cost of litigation.

YellowHeart is a real-world example of the use of smart contracts in the entertainment industry. It is a blockchain-based ticketing and blockchain collectibles platform, which harnesses the power of smart contracts in an attempt to reduce improprieties in the secondary sale of concert and event tickets.⁷ The smart contract can specify the exact number and location of seats available, the minimum age requirement for entry, the original ticket price of each seat, the maximum price, and the number of times a ticket may be resold,⁸ thereby regulating the exorbitant pricing and scalping activities that normally take place in this market.

Blockchain and smart contracts may also make it possible for artists and entertainers to be immediately compensated for use of their innovative works without having to navigate through a labyrinth of contracts and reporting.

Valuators involved in contract disputes may increasingly see reference to smart contracts in their work.

3.3 Introduction to Cryptoassets

Cryptoassets are the native digital assets used or transacted on a blockchain, “which utilize cryptography, peer-to-peer networking, and a public ledger to regulate the creation of new units, verify transactions, and secure the transactions without the intervention of any middleman.”⁹

Cryptoassets can initially be classified based on their designation as either digital coins or digital tokens, based on where they reside — coins reside on their own, independent blockchain, whereas tokens reside on top of another blockchain. For example, a bitcoin is a “coin” that resides on the Bitcoin network.¹⁰ A filecoin is a “token” that functions on the Ethereum blockchain¹¹ along with hundreds of other tokens.

5 Hyperledger Foundation. “Case Study: How Walmart brought unprecedented transparency to the food supply chain with Hyperledger Fabric.” <https://www.hyperledger.org/learn/publications/walmart-case-study>.

6 Zapotochnyi, Andrew. “What Are Smart Contracts?” *Blockgeeks*, 11 April 2022, <https://blockgeeks.com/guides/smart-contracts/>.

7 YellowHeart. “What is YellowHeart?” <https://helpcenter.yh.io/kb/en/article/what-is-yellowheart>.

8 Hissong, Samantha. “A Field Guide to Music’s Potential Crypto Boom.” *Rolling Stone*, 4 February 2021, <https://www.rollingstone.com/pro/features/music-crypto-blockchain-nfts-guide-1116327/>.

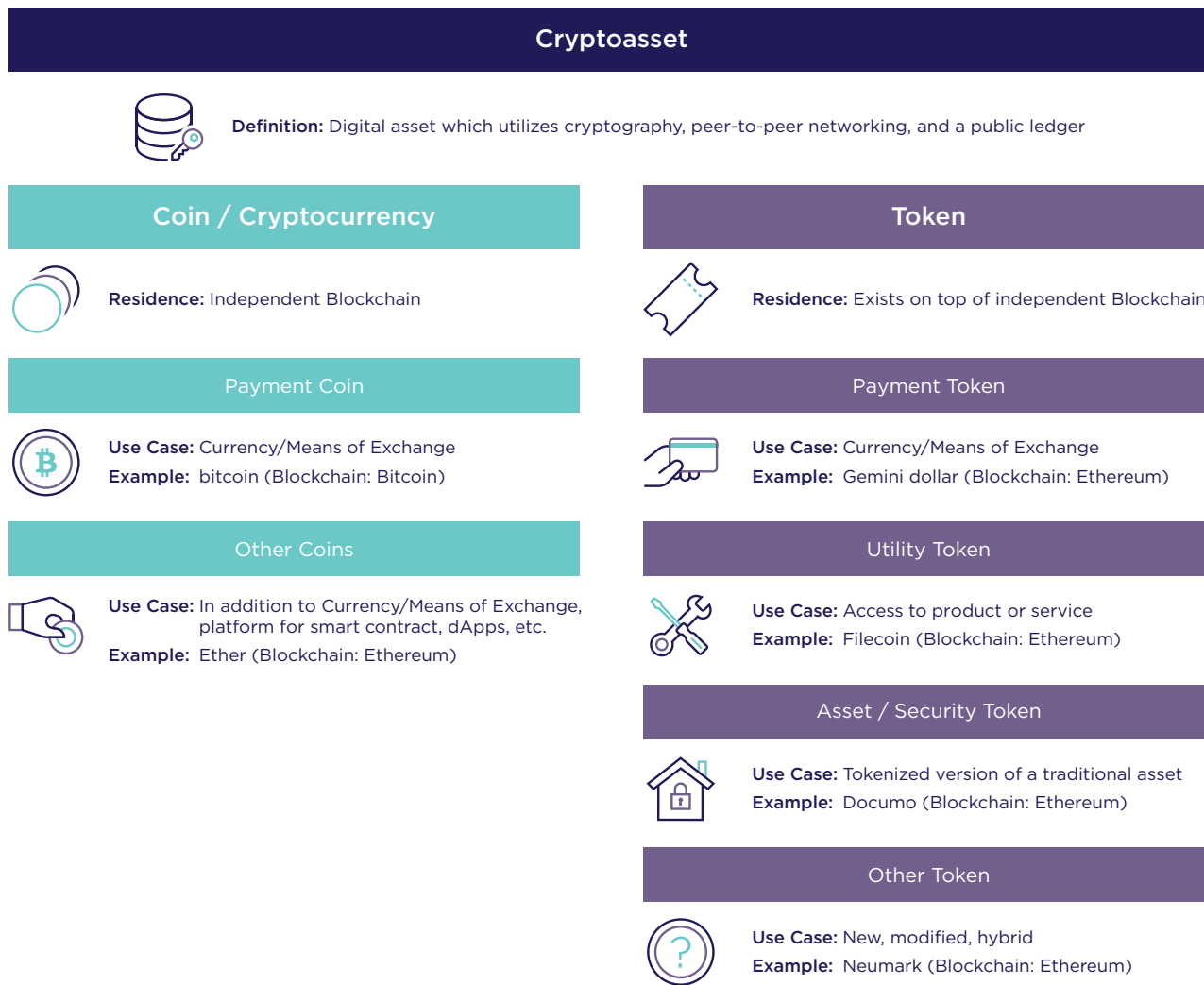
9 Haeems, Adam. “What is a crypto-asset?” *Medium.com*, April 2018.

10 The Blockchain Team, “Drawing the distinction between the uppercase “B” and lowercase “b” in Bitcoin.” *Blockchain.com*, 29 December 2014, <https://blockchain.medium.com/drawing-the-distinction-between-the-uppercase-b-and-lowercase-b-in-bitcoin-c37ae4464c22>.

11 Filecoin, <https://filecoin.io>.

Coins and tokens have many different functions. They can be used as a means of digital payment (i.e., payment coins/tokens), a digital ticket or “grant of access” to a particular product or service (i.e., utility tokens), or a digital representation of a traditional asset (i.e., asset/security token). An overview of the broad cryptoasset taxonomy is set out in **Exhibit 3.4**.

Exhibit 3.4: Taxonomy of Cryptoassets



To recap, one of the fundamental differences between coins and tokens is that a coin resides on its own native blockchain, whereas a token resides on another blockchain. The type of cryptoasset may influence the applicable valuation approach, as discussed in further detail in **Section 3.6**.

3.4 Taxation — Canada Revenue Agency (CRA) Perspective

In 2019, the CRA published the “Guide for Cryptocurrency Users and Tax Professionals,” which consolidated the CRA’s views on the Canadian taxation of cryptocurrency. The CRA adopts the position that a cryptocurrency (sometimes also referred to as a cryptoasset or altcoin) is a digital asset that “works as a medium of exchange for goods and services between the parties who agree to use it.”¹²

12 Canada Revenue Agency. “Guide for cryptocurrency users and tax professionals.” Government of Canada, 26 June 2021, <https://www.canada.ca/en/revenue-agency/programs/about-canada-revenue-agency-cra/compliance/digital-currency/cryptocurrency-guide.html>.

The guide explicitly states that despite its nomenclature, cryptocurrency is not considered legal tender in Canada and therefore is not afforded the same protections as fiat currency. For example, cryptocurrency held in a digital wallet is not protected in the same way as a bank account at a Canadian bank is. Similarly, Canadian businesses are not required to accept cryptocurrency as a form of payment in the same way they are with legal tender.

In general, the CRA treats a cryptocurrency as a commodity in the hands of a Canadian taxpayer for purposes of the Income Tax Act. This means that any income (or loss) from cryptocurrency transactions is treated as business income or a capital gain (or a business loss/capital loss), depending on the taxpayer’s circumstances. (Types of income and their tax consequences were introduced in **Level II, Module 2.**)

If a cryptocurrency is used to pay for goods or services, the CRA treats this as a barter transaction (i.e., two parties exchanging goods or services and carrying out that exchange without using legal currency). **Example 3.4** illustrates the tax implications that typically arise in this situation.

3.4.1 Acquisitions of Cryptocurrency

The acquisition of cryptocurrency from a cryptoasset trading platform (also called CTP or cryptoasset exchange) using fiat currency is generally not a taxable event until the cryptocurrency is exchanged or otherwise disposed of by the taxpayer. However, the initial acquisition sets the cost base of the cryptocurrency, which is a factor in determining the ultimate tax liability. If a taxpayer holds more than one type of cryptocurrency in a digital wallet, each type of cryptocurrency is considered to be a separate digital asset and must be valued separately for tax purposes (similar to individual stocks or bonds held in a brokerage account).

In the event that a cryptocurrency is acquired through mining activities, the tax treatment will depend on whether the taxpayer is mining as a business activity or as a personal hobby (which is decided on a case-by-case basis by the CRA). If the taxpayer is mining as a business activity, the CRA adopts the position that the miner is subject to business income tax at the time the cryptocurrency is earned. The CRA considers mining to be a “service” provided and views the mined cryptocurrency earned as the compensation for the provision of services. In these cases, the CRA applies its position regarding barter transactions in determining the amount that is required to be included in income at the time the cryptocurrency is earned.

Similarly, the acquisition of a cryptocurrency as consideration for the provision of any other goods or services, or as compensation for some other right of payment, is governed by the CRA’s position regarding barter transactions.

Example 3.1: Tax Implications of Bitcoin (BTC) Mining – Business Activity vs. Hobby

Josée is a computer science teacher who has mined one BTC as a hobby. On the day she mines her BTC, it is trading at a price of \$40,000. On the same day, Raul, who has hundreds of mining rigs set up in an operation deemed to be a business, mines a BTC (which also trades at \$40,000 at the time of mining). Both parties later sell their BTC at \$60,000. The following table illustrates the difference in tax treatment, assuming a marginal business income tax rate of 35% for individuals and businesses:

	Josée	Raul
Tax payable on day of mining	\$nil	\$14,000 (35% × \$40,000)
Adjusted cost base of single BTC at time of acquisition	\$nil	\$40,000

3.4.2 Dispositions of Cryptocurrency

The guide states that any time a disposition occurs, the taxpayer will realize taxable income (or a loss). The CRA considers the following events to give rise to tax consequences:

- Sale or gift of a cryptocurrency;
- Trading or exchanging cryptocurrency, including disposing of one cryptocurrency to get another cryptocurrency;
- Conversion of cryptocurrency to government-issued currency, such as Canadian dollars; or
- Use of cryptocurrency to buy goods or services.

The buying and selling of cryptocurrencies can generally be regarded as being on capital account unless, as mentioned above, it is carried out in the context of a business buying and selling such cryptocurrencies.

Example 3.2: Tax Implications of Sale of Bitcoin

From **Example 3.1**, assume that both Josée and Raul sell their single BTC at \$60,000, earning a \$20,000 pre-tax profit relative to the price at which it was mined.

	Josée	Raul
Taxable capital gain on sale of BTC	\$30,000 [(\$60,000 - \$nil) × 50%]	n/a
Business income on sale of BTC	n/a	\$20,000
Tax owing on sale of BTC	\$10,500 (\$30,000 × 35%)	\$7,000 (\$20,000 × 35%)

Example 3.3: Trading One Cryptoasset for Another Cryptoasset

Abe holds 2.5 BTC (originally purchased for C\$30,700, with a fair market value today of C\$116,000) in his digital wallet and converts it to 30.3 ether (fair market value of C\$116,000).

Required:

How is this transaction treated for tax purposes?

Solution:

- The transaction is considered disposition and the CRA categorizes this as a barter transaction because no legal currency is being used in the transaction.
- Proceeds: Value of cryptocurrency given up, converted into CAD (exchange rate at time of trade).
- Cost base: Cost of cryptocurrency given up converted into CAD (exchange rate at time of initial acquisition).
- Tax liability: Proceeds of \$116,000 less cost base of \$30,700 = \$85,300 capital gain taxed at 50%.

3.4.3 Accepting Currency as a Form of Payment

If a business accepts cryptocurrency as a form of payment (i.e., cryptocurrency received by vendor is recognized as business income), there is potential for any increase in the fair market value of the cryptocurrency held by the business to be taxed as full business income rather than on account of capital when the business eventually disposes of the cryptocurrency.

Example 3.4: Accepting Currency as a Form of Payment

Ballmark Games is a digital gaming company providing peer-to-peer combat games. On Monday, when BTC is trading at \$40,000, the company receives one BTC as a form of payment for game access. By Friday, the price of BTC has increased to \$50,000, and the company decides to sell the BTC for cash. The company is thus taxed for the increase in the value of the BTC that it held from Monday to Friday (\$10,000) at its ordinary business income tax rate.

The onus is on the taxpayer to maintain all the necessary documents for reporting their tax liability related to cryptocurrencies, including receipts of purchase or transfer of cryptocurrency, the value of the cryptocurrency in Canadian dollars at the time of the transaction, the digital wallet records and cryptocurrency addresses, exchange records, and records of accounting and legal costs. If the taxpayer is involved in business activities relating to cryptoassets, there will likely be greater reporting requirements. For example, miners are required to maintain receipts for their equipment and electricity costs for tax purposes.

3.5 Investment Purposes – Canadian Securities Administrators (CSA) Perspective

In Canada, cryptoassets are primarily regulated under securities law. Since 2017, the CSA and the Investment Industry Regulatory Organization of Canada have released various publications providing guidance on topics such as cryptoasset offerings (i.e., initial coin offerings and initial token offerings), trading platforms and exchanges as related to securities legislation, and disclosure requirements applicable to reporting issuers dealing in cryptoassets.

In Canada, securities legislation requires reporting issuers to disclose the material risks affecting their business and, where practicable, the financial impacts of such risks. For cryptoasset reporting issuers, the CSA highlighted the ongoing risk of loss and/or theft related to these cryptoassets and the importance of custody controls adopted by these issuers to safeguard against this risk. When valuing businesses that hold cryptoassets, valuers should be aware of these risks and their potential impact on a conclusion of value. Other risks that valuers should be aware of in a valuation setting include the availability and/or cost of electricity, potential declines in the price of cryptoassets, and decreased rewards for mining a particular cryptoasset.

3.6 Valuation

3.6.1 Valuation Framework

Parallels have been drawn between some of the cryptoasset valuation theory that has emerged and existing valuation theory, particularly in relation to the valuation of intellectual property:¹³

- There is a pronounced similarity between certain characteristics of cryptoassets and intellectual property – both are non-monetary assets that lack physical substance but grant rights and economic benefits to their owners; and¹⁴
- Certain cryptoasset valuation approaches are analogous to the three approaches commonly used in traditional valuation – the cost, income, and market approaches.¹⁵ See **Exhibit 3.5** below.

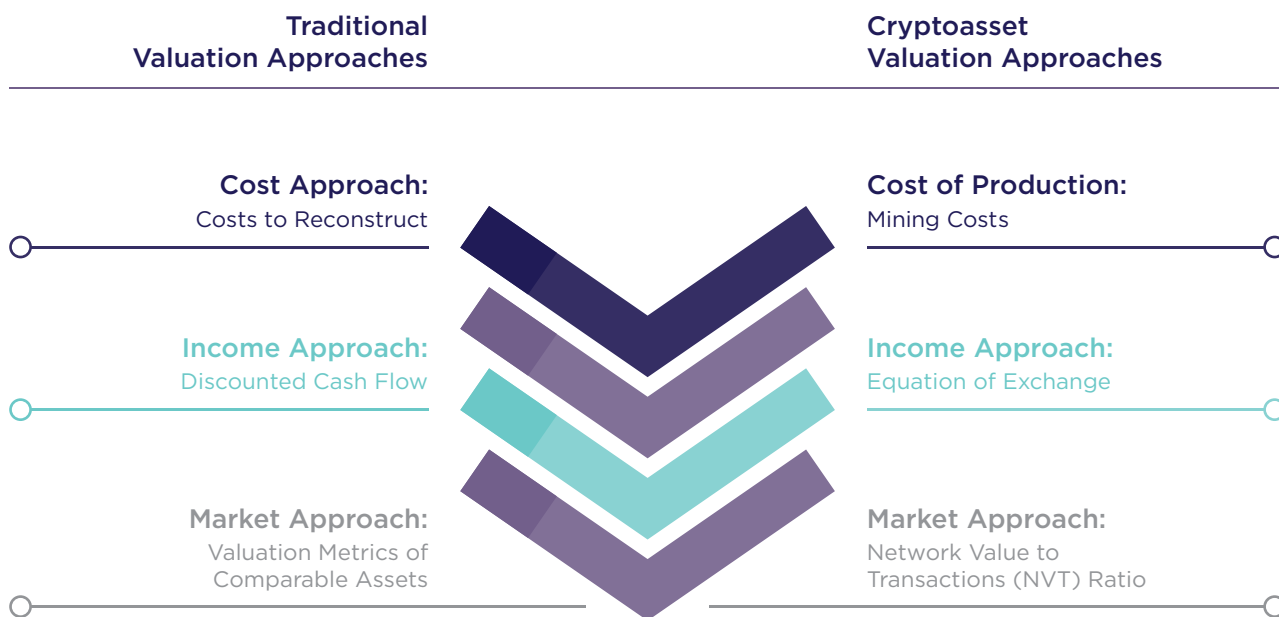
Given the advanced status of intellectual property valuation approaches, these identified parallels may help alleviate some apprehension when embarking on cryptoasset valuation.

13 Singh, Tara K., and Tylar St. John. “Decrypting Crypto: An Introduction to Cryptoassets and a Study of Select Valuation Approaches.” *Journal of Business Valuation – Sponsored Research Supplement*, 2019, <https://cbvinstitute.com/wp-content/uploads/2019/12/DecryptingCrypto-Final-DIGITAL-VERSION.pdf>.

14 Chartered Professional Accountants of Canada and International Valuation Standards Council, “International Valuation Standards 2013, Framework and Requirements.” 2013.

15 Loomer, Suzanne C. *Managing Intellectual Property Value*. Carswell, 2015, p. 31.

Exhibit 3.5: Comparison of Traditional Valuation Approaches and Cryptoasset Valuation Approaches



3.6.2 Cost of Production Approach

The cost of production approach suggests that the cost of producing or mining a cryptoasset may provide an indicator of its value. It postulates that those responsible for the generation of digital assets are incented by the expectation of profits and will continue to produce (or mine) only as long as the variable cost of production is less than or equal to the market price of the mined coin.¹⁶

This approach aligns with the cost approach from intellectual property valuation, under which a valuator estimates the cost to reconstruct the subject asset assuming that “no prudent buyer would pay more for intellectual property rights than the cost to construct a substitute of equal desirability and utility.”¹⁷

While the cost of production approach is, perhaps, one of the most straightforward cryptoasset valuation methodologies, valuers should be aware of certain limitations:

- Not all cryptoassets are “produced” or “mined” and, therefore, measuring the costs of production is not always possible;¹⁸
- The proposed model focuses on the costs of electricity (the primary cost incurred in digital asset mining) but does not consider transaction fees, another important component of miners’ total compensation;¹⁹ and
- The proposed model does not consider the non-monetary incentives of miners. For example, some miners may be willing to operate at a loss to develop and maintain the network because of their philosophical belief in an unregulated, transparent financial system.²⁰

16 Hayes, Adam. “A Cost of Production Model for Bitcoin.” *The New School for Social Research*, March 2015, http://www.economicpolicyresearch.org/econ/2015/NSSR_WP_052015.pdf.

17 Loomer, Suzanne C. *Managing Intellectual Property Value*. Carswell, 2015, p. 31.

18 Specifically, there is limited applicability of the cost of production approach to tokens and coins that adopt the proof of stake consensus mechanism.

19 This model considers the marginal cost of production and does not include consideration for fixed cost for start-up, such as hardware.

20 Ige, Lanre. “Cryptoasset Valuation Techniques.” *Medium*, March 2018, <https://medium.com/mosaic-network-blog/cryptoasset-valuation-techniques-part-1-23f3188c7d96>.

3.6.3 Equation of Exchange Approach

The equation of exchange approach,²¹ frequently applied in valuing utility tokens,²² resembles the classic discounted cash flow method. Under this approach, a utility token is considered to be the currency of the micro-economy it supports and its value is estimated using an identity from monetary economics (i.e., Money × Velocity = Price × Quantity).

The approach requires the valuator to estimate, among other things, the total size of the market and the subject cryptoasset's share of the market, prices for the provisioned good or service, and a discount rate to convert future value to present value.

The equation of exchange approach shares many characteristics with traditional cash flow valuation approaches, which may help ease the transition to cryptoassets. However, valuers should be aware of certain critical nuances in its application:

- Under this approach, there is a fundamental shift away from an analysis of future expected cash flows and toward an analysis of future expected network value;²³ and
- Selection of valuation model inputs such as the discount rate may be especially difficult because of the limited empirical evidence available. The risk, of course, is that a valuation model built on a multitude of unverified assumptions may result in “garbage” output.²⁴

3.7 Network Value to Transactions (NVT) Ratio

In the context of cryptoassets, a relative or market-based valuation approach requires the valuator to “identify a value metric from one [asset], and then use it to value another [asset].”²⁵

The NVT ratio, a market-based approach, relies on a new cryptoasset-specific metric, daily transaction volume. The intention of this approach is to use the daily transaction volume of one cryptoasset to impute the network value of another “comparable” cryptoasset. This method relies on the publicly available market pricing and volume information derived from cryptoasset trading platforms and other data aggregators.

The components of the NVT ratio are as follows:

- The numerator, the cryptoasset's network value, is akin to a public company's market capitalization (i.e., the total market value of all coins or tokens in circulation for the specific cryptoasset); and
- The denominator, daily transaction volume, measures the cryptoasset's on-chain transaction volumes.²⁶

The NVT ratio, a popular cryptoasset market-based valuation approach, may provide a methodology to evaluate or test the fundamental value of cryptoassets. However, at present, there are a number of limitations of which valuers should be mindful:

21 Burniske, Chris. “Cryptoasset Valuations.” *Medium*, September 2017.

22 Dowlat, Sherwin, and Michael Hodapp. *Cryptoasset Market Coverage Initiation: Valuation*. Satis Group, 2018.

23 If a utility token is “a scarce asset that serves as a gateway for cash flows that come in and out of a network,” it follows that “as long as the network requires all or some internal transactions to be conducted in its native token, the token can be designed in such a way as to tie its value to the growth of the network.” Anisimov, Andrei. “Utility Token: a new value-capture mechanism.” *Medium*, April 2018.

24 The application of the equation of exchange approach is beyond the scope of this course. If you are interested in learning more about this approach can, see Section 6.3 and Appendix D of “Decrypting Crypto: An Introduction to Cryptoassets and a Study of Select Valuation Approaches” by Tara K. Singh and Tylar St. John.

25 Ige, Lanre. “Cryptoasset Valuation Techniques.” *Medium*, March 2018, <https://medium.com/mosaic-network-blog/cryptoasset-valuation-techniques-part-1-23f3188c7d96>.

26 In contrast to the price/earnings ratio where the denominator represents a company's earnings, many cryptoassets do not generate cash flows. Therefore, the daily transaction volume is used as a proxy for earnings and represents the value flowing through the network on a given day. Ige, Lanre. “Cryptoasset Valuation Techniques.” *Medium*, March 2018, <https://medium.com/mosaic-network-blog/cryptoasset-valuation-techniques-part-1-23f3188c7d96>.

- The usefulness of market-based cryptoasset valuation analysis may be limited since drawing meaningful inferences hinges on having access to reliable empirical data, which, given the relative immaturity of the cryptoasset industry, may not yet be available; and
- When using traditional market-based valuation approaches to value a business, it is often challenging to identify companies, transactions, or assets that are reasonably comparable to the subject. The same challenge exists with cryptoassets. There are many dimensions of comparability between different cryptoassets, which may render one cryptoasset difficult to compare to another. Examples of differences between cryptoassets include differences in the maturity of a cryptoasset, the intended use of the asset (i.e., whether it is broadly accepted as a method of exchange), liquidity of the asset, and other technical nuances among assets. Such differences may render a relative valuation metric unsuitable for application to the subject cryptoasset being valued. This challenge is similar to a traditional business valuation where guideline public companies are used and where a relatively illiquid public company may imply a valuation metric (i.e., enterprise value/revenue) that is much less meaningful when compared against more actively traded comparables.

3.8 Applicability to CBVs Now and in the Future

The three valuation approaches examined in this module are still in development and, given the various noted limitations, are likely to continue to undergo significant refinement as the cryptoasset market matures. Nevertheless, their respective contributions to the cryptoasset valuation discourse has been significant. Specifically, they highlight a set of new and important factors that valuers should consider:

- As with traditional valuation, there is no universal cryptoasset valuation methodology; and
- The applicability of a valuation methodology will depend on the features of a particular cryptoasset and other case-specific factors.

MODULE 04

**VALUATION
OF FINANCIAL
INSTRUMENTS
— PART 1 — DEBT
INSTRUMENTS**

Module Overview

Welcome to Module 4. This module provides an overview of financial instruments and discusses the valuation approaches commonly used. Financial instruments encompass a wide range of instruments, each with its own characteristics as well as valuation approaches and considerations. As such, this section is divided into three parts: part 1 on debt instruments (**Module 4**), part 2 on derivative instruments (**Module 5**), and part 3 on contingent consideration and other financial instruments (**Module 6**).

By the end of this module, you will be able to:

- Describe common situations giving rise to the need for the valuation of financial instruments;
- Describe the broad categories of financial instruments that a valuator commonly encounters;
- Explain the characteristics of debt instruments;
- Explain and apply the concept of an issuer credit rating methodology;
- Explain and apply the concept of an issue-specific credit rating methodology; and
- Describe and apply common valuation methodologies for debt instruments.

The acronyms used throughout this module are:

bps	Basis points
CDOR	Canadian Dealer Offered Rate
CFO	Cash flow from operation
CICRA	Corporate industry and country risk assessment
DCF	Discounted cash flow
EAD	Exposure at default
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, taxes, depreciation, and amortization
EV	Enterprise value
FFO	Funds from operations
FOCF	Free operating cash flow
LIBOR	London Interbank Offered Rate
PIK	Payment in kind

Note: There is a glossary with key terms at the end of the module.

Optional Readings

This module references the S&P credit methodology for corporate issuers. You can read more about S&P's ratings methodologies for different types of debt issuers by visiting <https://disclosure.spglobal.com/ratings/en/regulatory/ratings-criteria>. You will be required to create a free online account in order to access this content.

4.1 Overview of Financial Instruments

A financial instrument is a contract involving any kind of monetary value between two parties. Typically, it gives rise to a financial asset of one party and a financial liability or equity instrument of another party. Generally, a financial instrument can be traded, and there are established markets to facilitate trades (such as the bond market).

Financial instruments can be loosely divided into two broad categories:

- **Debt instruments**, whereby the value of the instrument is defined in terms of cash. An example is a promissory note, in which the contract defines the monetary value one party owes to the other. A debt instrument is also known as a fixed-income security, terminology commonly used in the capital market.
- **Derivative instruments**, whereby the value of the instrument is derived from and dependent on the value of an underlying asset. The underlying asset can be a stock, a commodity, an interest rate, or an index. A derivative instrument can be structured as a right but not the obligation to execute the contract. Derivative instruments will be discussed in more detail in **Module 5**.

Debt and derivative instruments are common categories of traded financial instruments, in which the terms of each contract are somewhat standardized to facilitate trades. Financial instruments can also be highly customized to suit the needs of the transacting parties, such as contingent consideration. This category of customized financial instruments will be explored in **Module 6**.

4.1.1 Common Situations Giving Rise to a Valuation of Financial Instruments

Valuation of financial instruments may be required for financial reporting, tax planning or structuring, litigation support, and transaction purposes. Below are some of the common situations that give rise to a valuation of financial instruments:

- In estimating the equity value of a business under the income approach or market approach,¹ where the stated interest rate of a debt instrument does not reflect the prevailing market rates, either due to a change in the company's creditworthiness or a change in market conditions, and as such the face value of the debt instrument is not an acceptable approximation of its fair market value.
- In adopting the adjusted net book value method, where an adjustment to fair market value is necessary for all assets and liabilities (including financial instruments such as debt and derivative instruments).
- In business combinations for accounting purposes, where the purchase price consists of contingent consideration.
- In a purchase price allocation for accounting purposes, where individual assets and liabilities (including financial instruments such as debt and derivative instruments) are measured at the estimated fair value at the date of acquisition.
- For financial reporting purposes, where the company owns financial instruments (such as debt and derivative instruments) that are required to be measured at fair value on each reporting date, in accordance with the accounting standards. Some examples of financial instruments that are commonly valued for financial reporting purposes are as follows:
 - Debt instruments that are required or elected to be measured at fair value;
 - Debt instruments with optionality whereby the option(s) is classified as equity and is required to be valued and reported separately (also known as the debt-equity-split); and
 - Stock option or equity compensation for employees and non-employees.

¹ For clarity, this refers to estimating an enterprise value using the income approach or market approach, then deducting the value of net debt to arrive at the equity value of a business.

4.2 Characteristics of Debt Instruments

A debt instrument allows companies to borrow money from lenders and investors under defined terms. For companies, debt instruments differ from common shares in a few ways:

- Debt instruments do not have ownership rights; and
- Payments of debt instruments, commonly in the form of interest and principal, are priority claims on the company's earnings and assets, rather than the claim on residual cash flows of common shareholders.

Various other entities, such as government and infrastructure projects, may issue debt instruments to fund their operation or development plans.

This section discusses the characteristics of debt instruments. The first part follows the journey of issuing a debt instrument, which covers the difference between a primary and secondary market, as well as the difference between a public and private debt. Next, the common characteristics of debt instruments are discussed: seniority, credit rating, interest and principal payment structure, yield, optionality, and other salient terms. At last, securitized debt instruments — which are a pool of debt instruments instead of a single instrument — are then briefly discussed.

4.2.1 Primary vs. Secondary Market

Similar to equity, there is a primary and secondary market for debt instruments for both public and private debts. The primary market is where debt instruments are first issued or sold to debtholders, and the issuer receives the net proceeds. The secondary market is where debt instruments are traded among the debtholders, and the instrument's issuer doesn't take any part and doesn't share in the proceeds.

Typically, when a corporate entity (or “corporate”) issues a public debt instrument, it's called a bond. To issue a bond, the corporate approaches an underwriting bank to indicate its interest in raising capital. It then typically engages a credit rating agency to perform an issuer credit rating and an issue-specific credit rating for the contemplated bond (refer to **Section 4.2.5** for details on credit ratings). In the meantime, the underwriting bank prepares the required legal documentation (along with the audited financial statements) for registration. The corporate then goes on a “roadshow” and presents to potential investors. The purpose of the roadshow is twofold: first to market the bond, and second to gauge interest and determine the price and maturity. Once sufficient interests are gathered, the underwriting bank announces the issuance on the market and opens a “book” to record orders from the investors.

During the announcement day, the issuer may adjust the interest rate on the bond depending on the orders received from the investors. By the end of the announcement day, the book is closed and an allocation to each investor is determined. The underwriting bank then informs the market of the closing of the bond issuance with the instrument's finalized interest rate and maturity. Concurrently, the bond is listed on the secondary market, where details of the transactions and quotes are tracked by data vendors such as Bloomberg.

Typically, when a corporate borrows in private, most commonly from a bank, the instrument is called a loan. To obtain a loan, the corporate approaches a lending bank with a business plan to indicate the uses of the borrowing and historical financial statements to demonstrate its ability to repay the loan. The lending bank assesses the creditworthiness of the corporate and provides an indicative term sheet detailing the terms of the loan, including the interest rate and principal amount. Once the corporate accepts the term sheet, the lending bank performs due diligence on the borrower and engages attorneys to draft the credit agreement. Sometimes, when the loan exceeds a certain size, the lending bank seeks a consortium to fund the loan and share the risk.

4.2.2 Public Debt vs. Private Debt

Public debt refers to a debt instrument that is issued or sold to a large number of institutional and retail investors in a public auction or a dealer market. Common issuers of public debts are governments and their agencies (in the form of treasury bills and bonds), provinces and municipalities (in the form of bonds), large corporates (in the form of bonds), and financial institutions (in the form of bonds and securitized debts (refer to **Section 4.2.10** for details on securitization). For simplicity, this module refers to public debts as bonds.

Prevailing market rates for bonds can be observed in the primary and secondary markets. Since issuances in the primary market can be sporadic, and the issuance date may not align with the intended valuation date, secondary market data are more commonly used as a benchmark. Generally, there are two types of secondary market data: (1) traded prices of individual bonds, and (2) a bond index that is an aggregate of selected bonds with certain characteristics (for example, the Canadian Investment-Grade Bond Index).

Given the limited size of the Canadian bond market, analysts often look to the U.S. bond market for market data. **Exhibit 4.1** illustrates the composition of the Canadian and the U.S. bond markets, respectively, as well as the market size and market share for each of the major issuers.

Exhibit 4.1: Composition of the Canadian and the U.S. Bond Market

Market Issuer	Canadian Bond Market (Note 1)		U.S. Bond Market (Note 2)	
	Principal (\$B) (Note 3)	Market Share	Principal (\$B) (Note 3)	Market Share
Government and agencies	\$535	34%	\$22,667	45%
Provinces and municipalities	629	40%	3,950	8%
Corporates (Note 3)	421	27%	24,299	48%
Total (Note 4)	\$1,585	100%	\$50,916	100%

Notes:

(1) Source: FTSE, as of June 2021, converted to USD equivalent using the Bank of Canada CAD/USD exchange rate.

(2) Source: SIFMA – U.S. Fixed Income Securities Statistics, as of Q4 2020.

(3) Based on the outstanding principal as of the measurement dates.

(4) Includes issuances from financial institutions such as securitization bonds and money market instruments.

Private debt refers to a debt instrument issued or sold to a limited number of pre-qualified investors in private, typically banks or non-bank institutional investors. Common issuers of private debts are mid-size companies and corporates (in the form of loans) as well as individuals (in the form of consumer loans). For simplicity, this module refers to private debts as loans.

Similar to bonds, prevailing market rates for loans can be observed in the primary and secondary markets, mainly in the United States, although they are not as liquid and transparent as bonds.

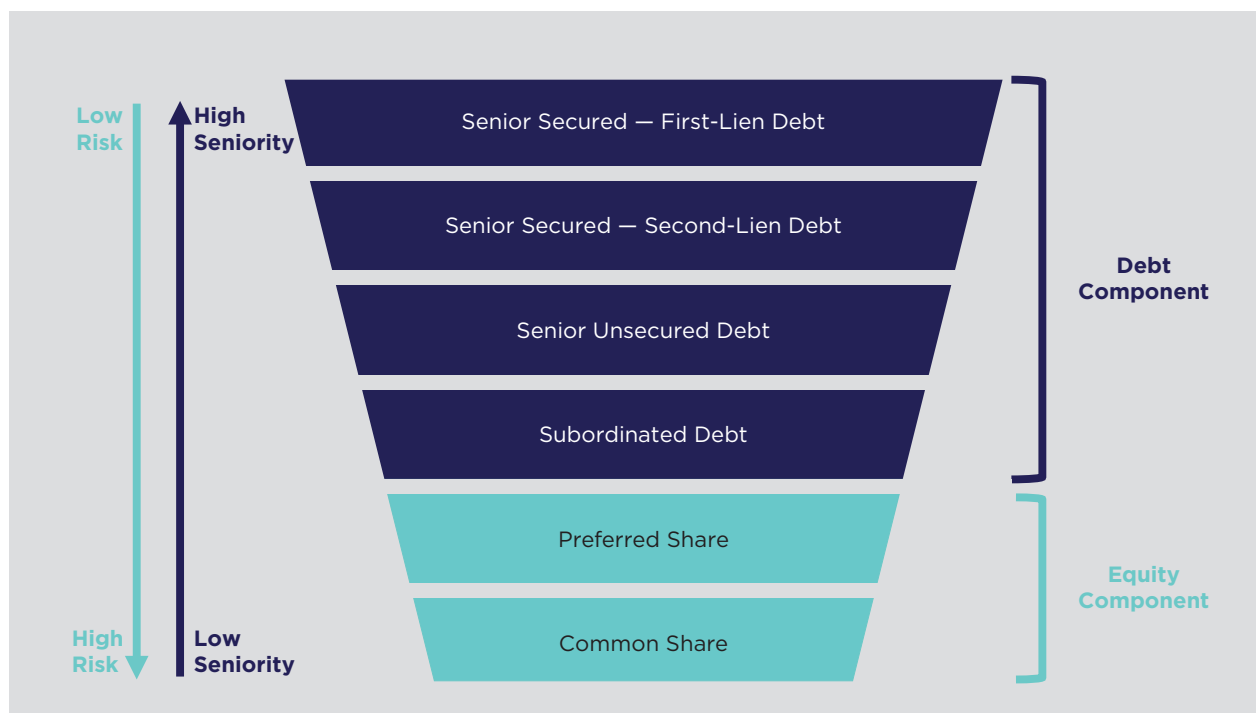
The selection of applicable market benchmarks are discussed further in **Section 4.3.1.3**.

4.2.3 Seniority

A company's capital structure refers to the composition of its debt and equity financing. In terms of the priority of payment, debt ranks ahead of equity. Within the debt component, there can be varying levels of seniority, depending on the terms of the debt instrument.

Exhibit 4.2 presents an illustrative capital structure showing the ranking of various debt and equity instruments in order of the priority of payment.

Exhibit 4.2: Illustrative Capital Structure



A secured debt has a direct claim on certain assets pledged by the issuer. Within secured debt, there is first-lien debt, which is the highest-ranking debt. There could be a second-lien debt on the same assets, which ranks behind the first-lien debt in the event of bankruptcy or liquidation.

On the other hand, unsecured debt only has a general (residual) claim on the issuer's assets. Within unsecured debt, senior debt ranks ahead of subordinated debt. Subordinated debt refers to a class of obligations that are contractually subordinated in ranking to all of the senior debts of the company, whether they are secured or unsecured.

Generally, an inter-creditor agreement will be put in place between multiple classes of debtholders to govern the specific liquidation preferences and procedures for each class of holders in the event of bankruptcy or liquidation.

4.2.4 Other Salient Terms

A **default** occurs when a defined event of default occurs, typically giving the debtholders the right to demand immediate repayment prior to the maturity date. Common events of default include:

- Non-payment of interest or principal;
- Breach of any covenants;
- Liquidation or bankruptcy of the issuer; or
- Change of control of the issuer.

Covenants are legally enforceable rules that the issuer and the debtholders agree on when issuing a debt instrument. Affirmative covenants enumerate what the issuer is required to do. Generally, affirmative covenants relate to the financial performance of the issuer. For example, an issuer may be required to maintain a minimum debt servicing ratio as measured in the EBIT to interest ratio and a maximum leverage ratio as measured in the debt to EBITDA ratio. Negative covenants, on the other hand, enumerate what the issuer is prohibited from doing. For example, an issuer may be prohibited from pledging its assets as security for additional borrowing.

Representations and warranties are statements made by the issuer as formal confirmation that certain assumptions or facts are accurate. For example, the issuer may make a representation that the projections provided have been prepared in accordance with the accounting principles it uses in preparing its audited financial statements.

A **sinking fund** provision is a requirement for the issuer to set aside cash in a custodial account each year to fund the repayment of the debt by maturity. The sinking fund provision is a credit enhancement as it lowers the default risk of the debt instrument. Sometimes, the issuer may use the sinking fund to repay parts of the debt prior to maturity, called an accelerated sinking fund provision, as stipulated in the credit agreement with a prescribed repayment schedule. The accelerated sinking fund provision is an embedded call option as it allows the issuer to repay the debt earlier than the scheduled maturity.

4.2.5 Credit Rating

4.2.5.1 Credit Risk

Credit risk refers to the risk of an issuer failing to make full and timely interest and principal payments. Credit risk can be further bifurcated into two components: (1) the probability of default, and (2) the loss given default, which measures the severity of loss in the event of default. The product of the two is expected loss, which in theory equals credit risk.

Expected loss = Probability of default × Loss given default

Loss given default = 1 - Recovery rate

Recovery rates can vary significantly by issuer and industry. They are influenced by the composition of an issuer's capital structure, the economic and credit cycle when the default occurred, and the market's view of the prospects for the issuer and its industry.

4.2.5.2 Types of Credit Rating

Credit rating is an opinion on credit risk at a point in time. Generally, there are two types of credit rating:

- An issuer credit rating is a rating assigned to an issuer, which expresses an opinion about the ability and willingness of the issuer to meet its financial obligations in full and on time; and
- An issue-specific credit rating is a rating assigned to a debt instrument, which expresses an opinion on the likelihood of a default on the contractual payments and the loss severity in the event of default. An issue-specific credit rating is derived from the issuer credit rating, a process known as notching. It considers the ranking of the debt instrument in the overall capital structure along with other factors that may impact loss severity.

4.2.5.3 Credit Rating Agencies

Credit ratings are typically performed by an independent agency, such as S&P Global Ratings, Moody's, Fitch Ratings, or DBRS Morningstar. Each agency develops and applies its methodology in measuring creditworthiness and uses a specific rating scale to publish its ratings opinions. **Exhibit 4.3** shows the S&P rating scale and the definition for each letter grade.

Exhibit 4.3: S&P Rating Scale and Rating Definition

Investment Grade	AAA+ / AAA / AAA-	Extremely strong capacity to meet financial commitments
	AA+ / AA / AA-	Very strong capacity to meet financial commitments
	A+ / A / A-	Strong capacity to meet financial commitments, but somewhat susceptible to adverse economic conditions and changes in circumstances
	BBB+ / BBB / BBB- (Note 1)	Adequate capacity to meet financial commitments, but more subject to adverse economic conditions
Speculative Grade / High Yield	BB+ (Note 2) / BB / BB-	Less vulnerable in the near term but faces major ongoing uncertainties to adverse business, financial, and economic conditions
	B+ / B / B-	More vulnerable to adverse business, financial, and economic conditions but currently has the capacity to meet financial commitments
	CCC+ / CCC / CCC-	Currently vulnerable and dependent on favourable business, financial, and economic conditions to meet financial commitments
	CC	Highly vulnerable; default has not yet occurred, but is expected to be a virtual certainty
	C	Currently highly vulnerable to non-payment, and ultimate recovery is expected to be lower than that of higher-rated obligations
	D	Payment default on a financial commitment or breach of an imputed promise; also used when a bankruptcy petition has been filed or similar action taken

Notes:

- (1) BBB - is considered the lowest investment grade by market participants.
 (2) BB+ is considered the highest speculative grade by market participants.

Credit rating is an efficient, widely recognized, and long-standing measure of credit risk, which facilitates the process of issuing the transacting debt instruments. Credit rating is prevalent among public debts and optional among private debts — this partially explains the liquidity difference between the bond and the loan markets. Typically, investors in private debts perform credit ratings in-house using their own methodology.

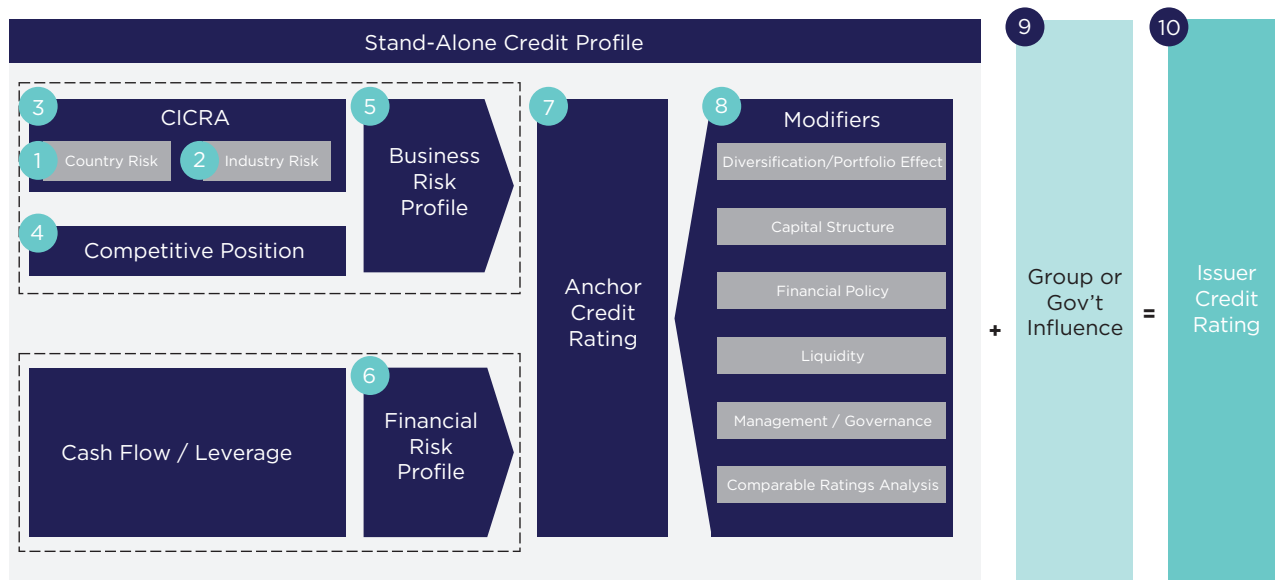
4.2.5.4 Issuer Credit Rating Methodology

With respect to an issuer's rating methodology, there are different frameworks to account for the vast differences in the nature of the issuers. Examples of frameworks include corporate, financial institution, sovereign, public finance, infrastructure, project finance, and so on. This discussion focuses on the corporate framework, which is most relevant for a business valuator.

Within the corporate framework, there are sector- and industry-specific methodologies, either as a supplemental methodology to a general corporate framework (as in S&P) or as a stand-alone methodology (as in Moody's). Industry-specific considerations capture the credit risk differences resulting from industry growth trends, cyclicity, market structure, and competition.

Exhibit 4.4 demonstrates each component of the S&P corporate rating methodology and outlines the steps to perform an issuer credit rating.

Exhibit 4.4: S&P Corporate Credit Rating Methodology



Overall, the methodology consists of a qualitative assessment of the business risk profile and a quantitative assessment of the financial risk profile of the issuer.

Three factors are considered in assessing the business risk profile of an issuer: (1) country risk, (2) industry risk, and (3) competitive position. Country risk refers to the economic risk, institutional and governance effectiveness risk, financial system risk, and payment culture risk in the countries in which a company operates. Industry risk refers to the relative health and stability of the markets in which a company operates. Country risk and industry risk are considered collectively in performing the issuer's corporate industry and country risk assessment. Competitive position refers to the issuer's readiness to take advantage of key industry drivers or mitigate associated risks compared to its peer group.

Cash flow and leverage analysis are performed to assess the financial risk profile of an issuer. Examples of ratios considered are funds from operations² to debt and debt to EBITDA. Other supplementary ratios are considered to address the differences in financial results due to industry and sector. For example, an issuer operating in a capital-intensive industry will have a higher EBITDA and FFO measure in comparison to other industry groups. Therefore, a measure such as free operating cash flow³ may be more reflective of its cash flow.

The combined assessment of an issuer's business risk profile and financial risk profile leads to an anchor credit rating. Various modifiers, such as capital structure, financial policy, management, and governance, may strengthen or weaken the anchor credit rating. Once the stand-alone credit profile of the issuer is established, its relationship with other entities such as a corporate group and government needs to be assessed.

If the issuer is a corporate group member, an assessment is performed on the likelihood of receiving extraordinary group support, either positive or negative, that may strengthen or weaken the issuer's creditworthiness.

Suppose the issuer could, if under stress, benefit from extraordinary government support. In this case, an assessment is made to determine the likelihood of receiving extraordinary government support that may strengthen the issuer's creditworthiness.

A comparison to other issuers in the same industry group may also be performed before finalizing the issuer credit rating.

² Funds from operations (FFO) is an S&P metric that is beyond the scope of this module. Refer to S&P's corporate rating methodology for details on the calculation of the metric.

³ Free operating cash flow (FOCF) is an S&P metric that is beyond the scope of this module. Refer to S&P's corporate rating methodology for details on the calculation of the metric.

Generally, most rating agencies' methodologies share similar considerations of risks. The details as to how each component is factored into the overall issuer credit rating differ. The mechanics of how a credit rating is performed also differ.

Refer to **Example 4.2** for an illustrative analysis of the issuer credit rating using the S&P corporate rating methodology.

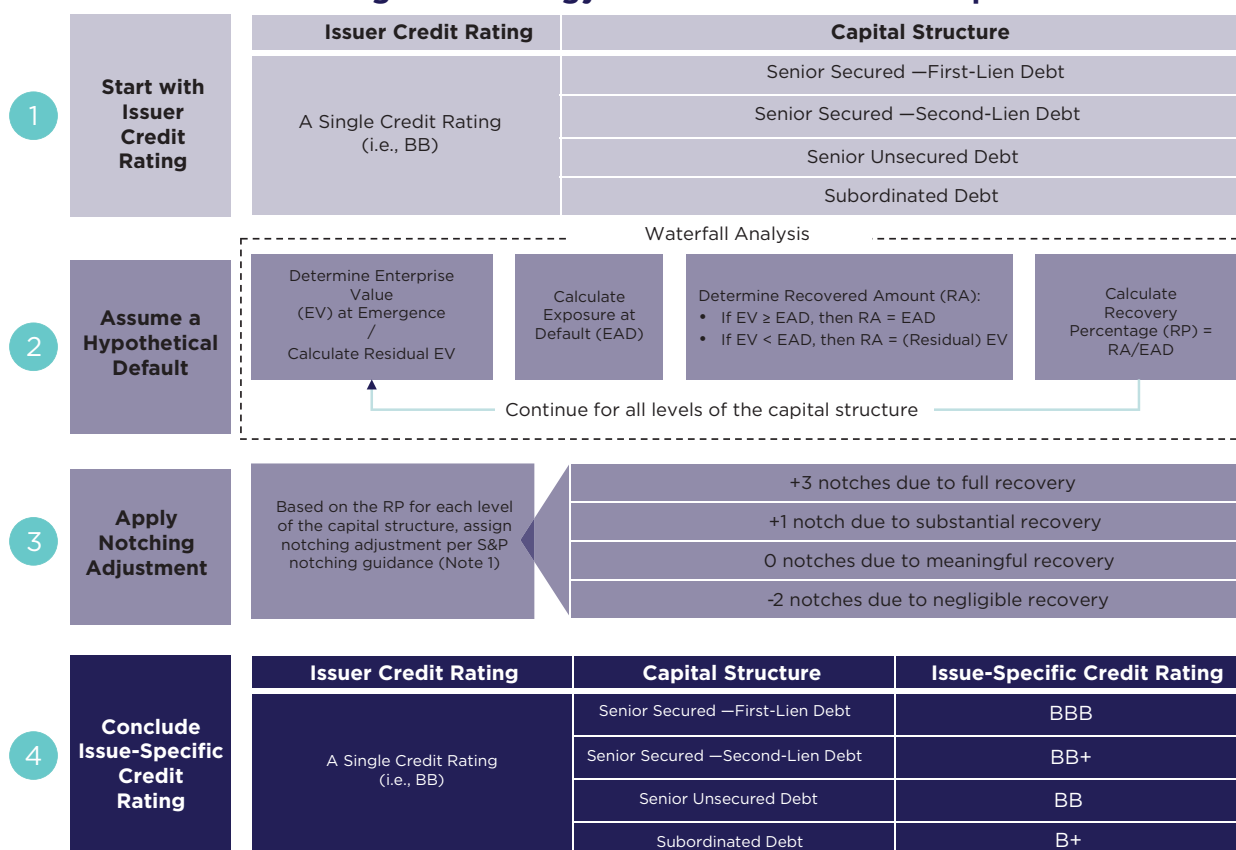
4.2.5.5 Issue-Specific Credit Rating Methodology – Notching

Based on the issuer credit rating, an issue-specific credit rating can be assigned to each debt instrument based on its priority of claim in the overall capital structure, which results in varying degrees of loss severity in the event of default. The process of going from an issuer credit rating to an issue-specific credit rating is known as notching. At each level of the capital structure, all the debt instruments will receive the same issue-specific credit rating since they share the same priority of claims.

Exhibit 4.5 uses S&P's notching methodology for speculative-grade issuers as an example to explain the notching process and how to go from an issuer credit rating to an issue-specific credit rating for each debt instrument. It demonstrates each component of the S&P notching methodology and outlines the steps to perform an issue-specific credit rating.

Overall, the methodology assumes a hypothetical default by the issuer at some point in time. It estimates the loss severity for each level of the capital structure owing by the issuer.

Exhibit 4.5: S&P Notching Methodology – From Issuer to Issue-Specific Credit Rating



Note:

(1) Refer to Exhibit 4.6

Particularly, an enterprise value is estimated at the point of hypothetical default, either as a going concern or liquidated, known as the EV at emergence. The EV at emergence is then distributed to each level of the capital structure in the order of priority of claim, a process known as the waterfall analysis. EV at emergence is the EV available for distribution at the beginning of the waterfall analysis.

At each level of the capital structure, four metrics are calculated:

- The exposure at default,⁴ which is the sum of debt claims outstanding at the point of hypothetical default;
- The recovered amount, which is the lesser of EAD or EV available for distribution;
- The recovery percentage, which is the percentage of recovered amount over exposure at default (Recovery percentage = Recovered amount / EAD); and
- The residual EV, which is the beginning EV available for distribution minus the EAD.

The process repeats for the next level of the capital structure, starting with residual EV as the EV available for distribution.

Once the waterfall analysis is completed, the recovery percentage for each level of the capital structure is then translated into a recovery rating that corresponds to a number of upward or downward “notches” relative to the issuer credit rating, also known as the notching adjustment. Based on the issuer credit rating, the notching adjustment is applied to arrive at the issue-specific credit rating for each level of the capital structure.

A high recovery percentage implies a low loss severity, and this typically leads to an upward adjustment for the issue-specific credit rating relative to the issuer credit rating. Conversely, a low recovery percentage implies a high loss severity, and this typically leads to a downward adjustment for the issue-specific credit rating relative to the issuer credit rating.

In general, S&P’s notching methodology indicates a maximum upward adjustment of three notches for an issue-specific credit rating relative to the issuer credit rating and a maximum downward adjustment of two notches. For example, an issuer with a credit rating of BB issues a subordinated debt instrument, and a downward adjustment of two notches is appropriate. Two notches goes from BB to B+ (BB → BB- → B+). Therefore, the issue-specific credit rating for the subordinated debt instrument is B+.

In addition, caps are placed on upward adjustments for unsecured debt instruments, debts issued in certain jurisdictions, and issuers rated BB+ or BB.

Exhibit 4.6 demonstrates the S&P notching scale for speculative-grade issuers.

Exhibit 4.6: S&P Notching Guidance for Issuers with a Speculative-Grade Issuer Credit Rating⁵

Recovery Rating	Recovery Description	Recovery Percentage ≥	Recovery Percentage <	Notching Adjustments (Note 1)
1+	Highest expectation, full recovery	100%	n/a	+3 notches
1	Very high recovery	90%	100%	+2 notches
2	Substantial recovery	70%	90%	+1 notch
3	Meaningful recovery	50%	70%	0 notches
4	Average recovery	30%	50%	0 notches
5	Modest recovery	10%	30%	-1 notch
6	Negligible recovery	0%	10%	-2 notches

Note:

(1) Relative to the issuer credit rating, subject to other adjustments and caps.

4 EAD equals the sum of accrued and unpaid interest plus principal outstanding of all the debt instruments at each level of the capital structure. EAD is an S&P term that is outside the scope of this module.

5 Based on issuers located in the Group A jurisdiction, as determined by S&P.

Refer to **Example 4.2** for an illustrative analysis of an issue-specific credit rating using the S&P notching methodology.

Other rating agencies' notching methodologies share similar attributes in assessing the loss severity of a debt instrument in the event of default. The range of upward and downward adjustments relative to the issuer credit rating is also comparable. While similar, Moody's methodology offers streamlined guidance that prescribes a notching recommendation for each class of debt instrument, depending on its seniority in the overall capital structure, without the requirement to perform a thorough waterfall analysis.

4.2.6 Interest Payment Structure

The interest rate of a debt instrument can be structured in various ways, such as fixed rate, floating rate, step up, payment in kind, and zero coupon.

A fixed-rate instrument is a debt in which the interest payment is static or fixed for the term of the instrument.

A floating-rate instrument is a debt in which the interest payment is set based on some reference rate plus a spread. A floating-rate note can be floored, capped, or collared⁶ to limit the variability in interest payments. Since the reference rate changes periodically, the interest payment varies over the term of the instrument. The spread that is quoted on top of the reference rate typically stays unchanged over the term of the instrument, unless there is a change in risk for the business, in which case it would be renegotiated. The commonly used reference rate is LIBOR, a benchmark interest rate intended to represent the level at which major banks estimate to borrow from and lend to one another in the international interbank market for short-term loans on an unsecured basis. In Canada, the LIBOR equivalent is CDOR. Refer to **Module 5, Appendix 5B** for current developments relating to LIBOR.

A step-up instrument is a debt in which the interest payment increases to prescribed rates at the specified times or when defined metrics (usually a leverage ratio) are triggered during the term of the instrument.

A payment-in-kind (PIK) instrument is a debt that accrues interest in additional principal rather than cash for a partial period or the full term. Where debt is owed in the form of a PIK, the balance owing by the debtor increases over time as interest is accrued rather than paid. Financially distressed companies usually issue PIK instruments to reduce the cash flow pressure on the issuer.

The stated interest rate is also called the coupon — this term is commonly used in describing bonds. A zero-coupon bond is a debt instrument that does not accrue or pay interest but instead issues and trades at a discount to the principal value. Zero-coupon bonds are most prevalent for treasury bonds and uncommon for corporate bonds.

The frequency of interest payments can be monthly (common for loans), quarterly (common for bonds), or semi-annually (common for treasury bills, which are bonds issued by a government agency).

4.2.7 Interest Rate vs. Yield

The interest rate of a debt instrument is stated on the credit agreement, and it's a contractual rate. The yield of a debt instrument is calculated as the discount rate that equates the future cash flows until maturity to its price. There is an inverse relationship between price and yield. The higher the price of a bond, the lower the yield, and vice versa. Yield is a measure of return on a debt instrument, whereas price is the unit for quotes and trades. The risk exposure on the changing yield of a debt instrument that results in changes in the value of the debt is known as the interest rate risk.

Typically, the yield equals the interest rate on the issuance date, when the issuance price equals the principal value, also known as issued at par. As the debt instrument trades on the secondary market, the transacted price varies, and the yield changes.

An original issue discount is the discount in price from the debt instrument's principal value at the time of issuance. The original issue discount results from supply and demand for similar loans offered in the market around the same time. A debt instrument issued with an original issue discount, also known as issued below par, will have a yield higher than the interest rate on the issuance date.

6 "Collared" is defined as a floating-rate note that is floored and capped.

4.2.8 Principal Repayment Structure

A debt instrument's principal is the amount the issuer agrees to pay the debtholders when the instrument matures. Principal repayment can be structured as a bullet payment at maturity or can be amortized over the life of the instrument. Amortization can be structured as a fully amortized debt instrument such that the outstanding principal amount is reduced to zero by the maturity date or as a partially amortized debt whereby a balloon payment is required at maturity to pay down the remaining principal outstanding.

Debt instruments with maturity of less than three years are generally referred to as short-term debts. Debt maturing in 3 to 10 years is usually considered medium term. Debt maturing in 10 or more years is generally regarded as long term.

4.2.9 Optionality

Debt instruments can be structured with optionality, which gives either the issuer or the holders the right, but not the obligation, to act. Common features of optionality include call, put, and conversion to equity. These options are embedded in the sense that they are not separable from the debt instrument and cannot be traded separately.

A callable debt gives the issuer the right to call or buy back the debt prior to maturity. The issuer generally calls a debt instrument at a time of falling interest, when it is beneficial to cancel the existing debt instrument and replace it with one with a lower interest rate. A callable debt has more than one possible maturity date. The range of possible dates includes all the call dates (or any date during a continuous call period) and the final maturity date. Therefore, the cash flows associated with the instrument are not explicit.

A puttable debt gives the holders the right to put or sell back the debt to the issuer prior to maturity. The effect of the put option is the opposite of that of a callable debt. That is, the holders generally put a debt instrument back to the issuer at a time of rising interest. As such, it's beneficial to recoup and reinvest at a higher interest rate. Similarly, a puttable debt has more than one possible maturity date. The range of possible dates includes all the put dates (or any date during a continuous put period) and the final maturity date. Therefore, the cash flows associated with the instrument are not explicit.

A convertible debt gives the holders the right to convert the debt into common shares of the issuer. A conversion ratio, that is, how many shares can the debt instrument be converted into, is agreed on in the credit agreement at the time of issuance. The holders generally convert the debt into shares when the conversion value⁷ exceeds that of the convertible debt. Similarly, convertible debt has more than one possible maturity date. The range of possible dates includes all the conversion dates (or any date during a continuous put period) and the final maturity date. Therefore, the cash flows associated with the instrument are not explicit.

Sometimes, a debt instrument is issued concurrently with warrants. A warrant is a security giving the holders the right to purchase common shares of the issuer at a prescribed price within a specified time frame. A warrant is separate from the debt instrument and can be traded separately.

Optionality, either embedded or separate, impacts the yield of the debt instrument, both at issuance and at subsequent valuation dates. The valuation of debt instruments with optionality is discussed in **Section 4.3.2**.

4.2.10 Securitization

Securitization is a process that involves issuing debt instruments that are backed by a pool of assets, commonly mortgages and consumer loans. The assets are typically held by a special-purpose vehicle, which collects income from the underlying assets and makes payments to the holders of the debt instruments. Often, the special-purpose vehicle issues various classes of debt instruments, and each class differs in seniority and yield. A higher seniority usually implies lower loss severity and as such offers a lower yield, and vice versa. Most commonly, banks issue securitized debt instruments as a way of funding, such as mortgage-backed securities and asset-backed securities.

⁷ Conversion value = Prevailing market price of share × Conversion ratio

A mortgage-backed security is a marketable security that is created through securitizing pools of mortgage loans. The underlying pools of mortgage loans provide the collateral and the cash flows used to service a mortgage-backed security. The cash flow streams associated with a mortgage-backed security include net interest from the mortgage loans, scheduled principal payments of mortgage loans, and prepayments of mortgage loans.

Similar to a mortgage-backed security, an asset-backed security is the product of a securitization process. Various debt-linked assets such as auto loans and credit card balance receivables are pooled together to form the underlying assets that provide the collateral and cash flows to service the asset-backed security.

Valuation of a securitized debt instrument is a quantitative intensive process beyond the scope of this module.

4.3 Valuation of Debt Instruments

A debt instrument can be valued using an asset-based, market-based, or income-based approach, similar to a business valuation discussed in **Level I**.

The first step in selecting an appropriate approach is determining whether the debt instrument is a going concern. The focus of this module is on the valuation of a going concern debt instrument.

A debt instrument is considered a going concern if it's expected that the interest and principal owing on the instrument will be paid in full and on time, and there is no indication of default. If a debt instrument is a going concern, a market-based or income-based approach is appropriate to estimate its fair market value, with an income-based approach being most appropriate. Specifically, a discounted cash flow method is commonly used. The application of a discounted cash flow method in valuing a straight debt instrument, that is, a debt instrument without optionality, is described in detail in **Section 4.3.1**. Valuation of a debt instrument with optionality is discussed in **Section 4.3.2**.

If a debt instrument is not a going concern, that is, either there is an indication of default (such as the issuer losing a substantial revenue source) or an occurrence of an event of default (such as missing an interest or principal payment and/or breaching certain covenants), an asset-based approach (specifically the liquidation value) is most appropriate to estimate its fair market value.

4.3.1 The Discounted Cash Flow (DCF) Method

In this section, the term debt instrument is used interchangeably with straight debt instrument.

Put simply, the valuation of a debt instrument consists of estimating the cash flows associated with the debt instrument and discounting all the cash flows at a discount rate reflective of the underlying risk of the debt instrument.

The application of the DCF method in valuing a debt instrument follows these six steps, described in more detail in the sections below:

1. Estimate the cash flows associated with the debt instrument.
2. Calibrate the issuance yield to the issuance price.
3. Bifurcate the issuance yield into components.
4. Determine the appropriate discount rate as at the subsequent valuation date.
5. Consider adjustments to the discount rate.
6. Discount all the cash flows to present value as at the subsequent valuation date.

4.3.1.1 Estimate the Cash Flows Associated with the Debt Instrument

There are generally two types of cash flows associated with a debt instrument: (1) cash flows relating to the periodic interest payment over the term of the debt instrument, and (2) cash flows relating to the principal repayment on maturity.

For debt instruments with fixed-rate interest and bullet principal repayment, the cash flows are straightforward to estimate as there is certainty on the timing and amount of the cash flows associated with the instrument.

Complicating factors may arise depending on the interest payment structures of a debt instrument, for example:

- For a debt instrument with floating-rate interest, the amount of future interest payments is uncertain, as the reference rate is subject to changes over the term of the instrument. In this case, a valuator will need to estimate the cash flows associated with the interest payment based on an assumption of the forward reference rates, that is, what the reference rate will be at each future payment date. Forward reference rates are calculated by data providers such as Bloomberg for all major reference rates in each major currency. *Note: For the **Level III** course assignments and exam, you will be provided with the appropriate forward reference rates in questions.*
- For a debt instrument with step-up interest, the amount of future interest payments is also uncertain. The applicable interest rate may change depending on the company's future performance on the prescribed metrics. In this case, a valuator will need to consider the plausible future metrics based on management's forecast for the applicable period and whether the results will impact the cash flows associated with the instrument.

A debt instrument's principal repayment structure, either bullet or amortizing, is usually certain and contractual. There may be complications with the amortization calculation, typically depicted in a cash flow schedule as part of the credit agreement.

4.3.1.2 Calibrate the Issuance Yield to the Issuance Price

Once the cash flows associated with the debt instrument have been determined, the issuance yield can be calibrated to the issuance price of the instrument, similar to a goal-seek calculation. The known factors or inputs are the cash flows and the issuance price, and the issuance yield needs to be solved for using numerical iteration. The issuance yield serves as an anchor in determining the discount rates used in the subsequent valuations, as discussed in **Section 4.3.1.4**.

If the debt instrument was issued at par, the issuance yield equals the stated interest rate on the issuance date. If the debt instrument was issued at a discount, the issuance yield is greater than the interest rate. Conversely, if the debt instrument was issued at a premium, the issuance yield is less than the interest rate.

The one difference in applying the DCF method in valuing a debt instrument, contrary to valuing a business, is that the initial issuance yield can typically be used as an anchor for determining the discount rate used in subsequent valuations, for the following two reasons:

- Initial issuance of a debt instrument represents a fair market transaction whereby the parties transacted at the highest price and acted at arm's length in an open and unrestricted market. Neither was under compulsion to transact; and
- The term of a debt instrument is typically short or medium term (i.e., less than 10 years). As such, the issuance price is still relevant for future date valuations.

The assumption of a fair market transaction is not valid for intercompany loans and distressed debt issuances. As such, the issuance yield cannot be used as an anchor for determining the discount rate for subsequent valuations.

4.3.1.3 Bifurcate the Issuance Yield into Components

Once the issuance yield of the debt instrument has been determined, the issuance yield can be bifurcated into three components: (1) the risk-free rate, (2) the credit benchmark, and (3) the company-specific risk.

The Risk-Free Rate Component

The risk-free rate component captures macroeconomic factors that affect all debt instruments, such as inflation, economic growth, and monetary and fiscal policy.

For the risk-free rate component, the treasury bond yield corresponding to the term to maturity of the debt instrument is typically used as a proxy.

The Credit Benchmark Component

The credit benchmark component is meant to capture the prevailing market rates for debt instruments with similar creditworthiness. In theory, this component consists of the credit risk premium and liquidity premium.

The credit risk premium can vary significantly depending on the issuer and the industry it operates in, the issuer's financial health, the seniority of the debt instrument relative to the overall capital structure, the market the debt instrument trades in, and so on. The credit risk can typically be captured by a credit benchmark.

The liquidity premium, on the other hand, is generally difficult to measure. The general consensus is that the bond market is more liquid than the loan market. Therefore, a bond requires a lower liquidity premium in comparison to a loan.

Generally, there are two approaches to selecting a credit benchmark: customize a benchmark by identifying comparable debt instruments with similar creditworthiness, or use an index published by a data provider.

Under the customized approach, a valuator needs to consider the nature of the business for each issuer and the credit rating of each debt instrument. This approach is most suitable for a pure-play issuer operating in an established industry where its competitors have issued similarly rated bonds⁸ actively trading in the market. The customized benchmark is most comparable to the subject debt instrument and most reflective of the prevailing market rates.

The index approach is commonly used for convenience. Bond indexes and loan indexes are published by data providers and are expressed in terms of spread over the risk-free rate and prices. There is a long list of indexes, and each is intended to reflect various characteristics, for example:

- Currency, such as USD, CAD, or EUR;
- Credit rating, either expressed in terms of letter grade credit rating (such as BBB+, BB+) or broad categories (such as investment grade vs. high yield); and
- Industry, such as utility, industrial, financial, and so on.

Each data provider develops its own methodology that details the selection criteria, the computation method, and the publication frequency for each index.

Generally, the bond indexes capture instruments with an investment-grade credit rating (from AAA to BBB). The loan indexes capture instruments with a speculative-grade credit rating (from BB+ to B-).

Commonly used bond indexes at the time of writing include the ICE Bank of America Merrill Lynch bond indexes and the Bloomberg bond indexes. Commonly used loan indexes include the S&P Leveraged Commentary & Data (LCD) loan index.

The Company-Specific Risk Component

The company-specific risk component is intended to capture additional risk associated with a subject debt instrument that has not been quantified in the credit benchmark. This component reflects the additional risk specific to the issuer and the subject debt instrument. It also captures any differences between the subject debt instrument and the selected credit benchmark. The company-specific risk component is meant to be a catch-all and is calculated as the residual by deducting the risk-free rate and credit benchmark from the issuance yield. Formula 1 below shows the mathematical calculation:

Formula 1:

Company-specific risk = Issuance yield – Risk-free rate – Credit benchmark

It's important to understand and document what the company-specific risk component captures as of the issuance date. This understanding serves as the baseline to track subsequent changes in the company-specific risk at each of the subsequent valuation dates.

8 Bonds denominated in the same currency.

4.3.1.4 Determine the Appropriate Discount Rate as at the Subsequent Valuation Date

Fast forward to a subsequent valuation date, and the build-up method would be used in determining the appropriate discount rate. That is, the discount rate is built up by first rolling forward the risk-free rate and credit benchmark to the subsequent valuation date, then adding the company-specific risk premium as depicted in Formula 2:

Formula 2:

Discount rate = Risk-free rate + Credit benchmark + Company-specific risk

The roll-forward process is intended to capture the prevailing market rates reflective of the macroeconomic factors and debt market conditions at the subsequent valuation date. Adjustments to the company-specific risk component should also be considered by assessing the change of creditworthiness of the underlying issuer as well as any change in instrument-specific risk as at the valuation date.

4.3.1.5 Consider Adjustments to the Discount Rate as at the Subsequent Valuation Date

A valuator must consider whether there are changes to the creditworthiness of the subject debt instrument since the issuance date. The most common change is a credit migration, a change in the credit rating of the debt instrument. In this case, the discount rate must be adjusted to reflect the difference in the credit rating of the debt instrument as at the subsequent valuation date. Often, the credit rating of a debt instrument is not updated. Therefore, a valuator would need to consider applying metrics that can monitor the creditworthiness of the issuer and the subject debt instrument between the issuance date and the valuation date. The risk exposure associated with the rating assigned to a bond being downgraded is known as the downgrade risk. Various factors can impact a debt instrument's downgrade risk, such as changing market conditions, the ability of the issuer to make good on its promise, and so on.

A valuator should also consider whether there are changes to the company-specific risk component compared to what was understood at the time of issuance.

4.3.1.6 Discount All the Cash Flows to Present Value as at the Subsequent Valuation Date

The last step in valuing a debt instrument is to discount all the cash flows to present value using Formula 3:

Formula 3:

$$\text{Present Value} = \sum_{t=1}^n \frac{\text{Cash flow}_t}{(1 + \text{Discount rate})^t}$$

Where:

Cash flow_t = the cash flow in payment period t

t = the payment period

n = the remaining term to maturity

Example 4.1: Valuation of a Straight Debt — Application of the DCF Method

Required:

You have been asked to value a straight debt with terms as follows:

- Principal amount: \$100 million;
- Interest rate: 8%;
- Interest payment frequency: annually; and
- Remaining term to maturity: 5 years.

Solution:

You have determined the appropriate discount rate for the straight debt to be 6% as of the valuation date, which is two years from initial issuance. The present value of the straight debt is estimated to be \$108 million as of the valuation date and is summarized in the following table.

As at the Valuation Date (in millions)						
Period	0	1	2	3	4	5
Expected cash flows		\$8	\$8	\$8	\$8	\$108
Discount rate	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
Discounting factor		0.9434	0.8900	0.8396	0.7921	0.7473
Discounted cash flows		\$8	\$7	\$7	\$6	\$81
Present value	\$108					

4.3.2 Valuation of Debt Instruments with Optionality

4.3.2.1 Valuation of Debt Instruments with Embedded Options

A debt instrument with embedded options is subject to various uncertainties that would change the expected cash flows associated with the instrument. For example, a callable debt or a puttable debt is subject to uncertainties about future interest rates. A convertible debt is subject to uncertainties about the future share prices of the issuer.

The valuation of a debt instrument with optionality is often mathematically advanced. It also involves making assumptions about the uncertainties that would change the value of the optionality. The application of valuation methods is beyond the scope of this module. Instead, this section focuses on the concepts behind the valuation and the directions of value changes.

Callable Debt

A callable debt is used as an example. A callable debt can be thought of as two parts: (1) a straight debt that makes interest payments and principal repayments, and (2) a call option that allows the issuer to call or buy back the debt. Focusing on the call option, at each eligible call date, the issuer has two choices: call the debt or do nothing. The issuer's decision is dependent on the prevailing market rate. If the prevailing market rate is lower than the stated interest rate, the issuer will call the debt and issue new debt at a lower rate. If the prevailing market rate is higher than the stated interest rate, the issuer will do nothing and keep the existing debt. As such, the call option is advantageous to the issuer but disadvantageous to the debtholders. Therefore, the value of a callable debt can be depicted by Formula 4:

Formula 4:

$$\text{Value of callable debt}_t = \text{Value of straight debt}_t - \text{Value of call option}_t$$

Holders of callable debt are subject to reinvestment risk, a situation whereby the callable debt is repaid in a low interest rate environment, and the holders will have to reinvest the cash proceeds at a lower rate than the promised yield on the original instrument.

Puttable Debt

Similarly, a puttable debt can be thought of as two parts: (1) a straight debt that makes interest payments and principal repayments, and (2) a put option that allows the debtholders to put or sell the debt. Focusing on the put option, the debtholders have two options at each eligible put date: put the debt or do nothing. Again, the debtholders' decision is dependent on the prevailing market rate. If the prevailing market rate is lower than the stated interest rate on the debt, the debtholders will do nothing and keep the existing debt. If the prevailing market rate is higher than the stated interest rate, the debtholders will put the debt and reinvest in higher yield instruments. The effect of the put option is the opposite of that of a call option. That is, the put option is disadvantageous to the issuer but advantageous to the debtholders. Therefore, the value of a puttable debt can be depicted by Formula 5:

Formula 5:

Value of puttable debt_t = Value of straight debt_t + Value of put option_t

In combination, the value of a debt instrument with embedded options can be depicted by Formula 6:

Formula 6:

Value of debt with embedded options_t = Value of straight debt_t
- Value of options granted to the issuer_t
+ Value of options granted to debtholders_t

Convertible Debt

Similarly, a convertible debt can be thought of as two parts: (1) a straight debt that makes interest payments and principal repayments, and (2) a conversion option that allows the debtholders to convert the debt instrument into the issuer's shares. Since a conversion option is not a typical option traded on the market, it will be translated into a market convention. That is, a conversion option can be thought of as a call option on the issuer's shares.

For the call option, the debtholders have two options at each eligible exercise date: exercise the call and convert the debt into shares, or do nothing. The debtholders' decision is dependent on the prevailing share prices of the issuer. If the conversion value is greater than the straight debt value, the debtholders will exercise the call. If the conversion value is less than the straight debt value, the debtholders will do nothing. As such, the call option is advantageous to the debtholders. Applying Formula 6, the value of a convertible debt can be depicted by Formula 7 and Formula 8:

Formula 7:

Value of convertible debt_t = Value of straight debt_t + Value of option granted to debtholder_t

Formula 8:

Value of convertible debt_t = Value of straight debt_t + Value of call option on the issuer's shares_t

In summary, valuation of a debt instrument with embedded options can be thought of as two parts: (1) valuation of the straight debt portion using the DCF method discussed in **Section 4.3.1**, and (2) valuation of the options using the methods discussed in **Module 5, Section 5.5.3**.

4.3.2.2 Valuation of Debt Instruments Issued with Warrants

Recall that sometimes a debt instrument is issued concurrently with warrants. At the time of issuance, the transaction can be thought of as two parts: (1) a straight debt that makes interest payments and principal repayments, and (2) warrants that can be exercised to buy the issuer's shares. The value of the issuance can be depicted by Formula 9:

Formula 9:

Value of issuance (debt instrument issued with warrants)_(t=0)
= Value of straight debt_(t=0) + Value of warrants_(t=0)

Where:

(t=0) = the time of issuance

Note that the warrants are separated from the debt instrument. As such, the value of the warrants does not impact the value of the debt instrument in subsequent valuations.

Therefore, the valuation of the debt instrument follows the same steps as discussed in **Section 4.3.1**, except for the calibration of issuance yield to the issuance price shown in **Section 4.3.1.2**. Specifically, the issuance price needs to be adjusted for the value of the warrants as of the issuance date, as the debtholders "paid" for two components: the straight debt and the warrants. Deducting the value of the warrants from the issuance price gets to the true "price" the debtholders paid for the straight debt.

Example 4.2: Issuer and Issue-Specific Credit Rating Analysis

Background

Founded in 2010, EarthMama is an online grocer that delivers local organic produce and meat right to customers' doors. It offers a subscription-based service where the customers can either choose from a curated selection of grocery baskets or customize their order.

With overwhelming success on the East Coast, EarthMama decided to expand to the West Coast in 2015. To fund its expansion, EarthMama issued a private debt to WhitePoint Capital, a private debt fund specializing in lending to the Canadian mid-market. **Table 1** summarizes the salient terms of the debt instrument.

Issuance date	December 31, 2015
Principal amount	\$100M, bullet repayment on maturity
Interest rate	10%, payable semi-annually
Term	5 years — maturing on December 31, 2020
Seniority	Senior secured first lien on all assets
Optionality	None
Credit rating	Not rated

Required:

On December 31, 2018, EarthMama received an offer from a national grocer to acquire 100% of its outstanding common shares. As part of the acquisition, you are asked to perform an issuer credit rating for EarthMama and an issue-specific credit rating for the private debt as of December 31, 2018 (the valuation date). Your conclusion on the issue-specific credit rating will then be used in the valuation of the private debt, as shown in **Example 4.3**.

Summary of Key Financial Metrics

Table 2 summarizes key financial metrics for EarthMama for the two most recent historical years and forecasts for the current year and the next two years.

	2020 (Note 1) (Forecast)	2019 (Note 1) (Forecast)	2018 (Note 1) (Current)	2017 (Note 1) (Historical)	2016 (Note 1) (Historical)	5-Year-Average
Return on capital (%) (Note 2)	12%	11%	12%	9%	7%	10%
EBITDA margin (%)	8%	4%	6%	8%	4%	6%
FFO/Debt (%) (Note 3)	24%	23%	25%	22%	21%	23%
Debt/EBITDA (x)	3.2x	3.2x	3.2x	3.5x	3.7x	3.4x
FFO/Cash interest (x)	4.6x	4.3x	4.1x	4.0x	3.9x	4.2x
EBITDA/Interest (x)	4.0x	3.6x	3.4x	3.0x	2.8x	3.4x
CFO/Debt (%) (Note 4)	20%	18%	16%	14%	12%	16%
FOCF/Debt (%) (Note 5)	15%	13%	12%	10%	8%	12%
Discretionary CF/Debt (%) (Note 6)	8%	8%	7%	5%	3%	6%

Notes:

(1) EarthMama's fiscal year-end is December 31

(2) Calculated as: Net income / (Book value of debt + Book value of equity)

(3) Funds from operations to debt ratio, calculated as: (EBITDA - Cash interest - Cash tax) / Total debt

(4) Cash flow from operations to debt ratio, calculated as: Cash flow from operations / Total debt

(5) Free operating cash flow to debt ratio, calculated as: (Cash flow from operations - Capital expenditures) / Total debt

(6) Discretionary cash flow to debt ratio, calculated as: (FOCF - Cash dividend - Share buybacks) / Total debt

Solution:**Issuer Credit Rating Analysis**

The S&P corporate rating methodology is used as a reference to perform a credit rating on EarthMama.

Step 1 – Perform country risk assessment:

EarthMama operates solely in Canada, a jurisdiction rated by S&P as very low risk considering its robust economy, the effectiveness of institutions and governance, the health of the financial system, and the rule of law that governs the payment culture in the country.

Step 2 – Perform industry risk assessment:

EarthMama operates in the retail and restaurant industry that is rated by S&P as intermediate risk in the global industry risk assessment.

Step 3 – Perform corporate industry and country risk assessment (CICRA):

Based on the country risk and industry risk assessment, EarthMama's CICRA is a score of 3. Refer to **Table 3** for the S&P rating scale on CICRA.

	Country Risk Assessment					
Industry Risk Assessment	1	2	3	4	5	6
1	1	1	1	2	4	5
2	2	2	2	3	4	5
3	3	3	3	3	4	6
4	4	4	4	4	5	6
5	5	5	5	5	5	6
6	6	6	6	6	6	6

Risk scale: 1 - very low risk; 2 - low risk; 3 - intermediate risk; 4 - moderately high risk; 5 - high risk; 6 - very high risk.

Step 4 – Perform competitive position assessment:

Competitive position is assessed based on four components: (1) competitive advantage, (2) scale, scope, and diversity, (3) operating efficiency, and (4) profitability.

First, separately assess competitive advantage; scale, scope, and diversity; and operating efficiency. Second, apply weighting factors to these three components to derive a weighted average assessment that translates into a preliminary competitive position assessment. Third, assess profitability. Finally, combine the preliminary competitive position assessment and the profitability assessment to determine the final competitive position assessment. Profitability can confirm or influence, positively or negatively, the competitive position assessment.

Based on your analysis, you have determined that:

- Competitive advantage is adequate. EarthMama’s online and delivery model is well adapted to market conditions as customer behaviours are trending toward online shopping. However, given its size and regional focus, it’s not necessarily a leader in setting industry trends. EarthMama’s products are superior since they are locally sourced and organic. However, the stability of supply and quality of products are uncertain as it doesn’t own or operate any part of the supply chain. Its products are priced at a premium for the quality and services provided. While the subscription-based model enhances customer stickiness, the subscription can be cancelled any time at no charge; this option to cancel increases the risk of customer attrition. There are some barriers to entry, as the supply of genuinely local and organic produce and meat is limited, and it has established relationships with a few key suppliers.
- Scale, scope, and diversity are adequate/weak as it offers a limited selection of seasonal produce and meat. EarthMama is a niche player offering premium products and services. However, its market share accounts for less than 5% of the local market. EarthMama’s operating model has proven successful in a metropolitan setting where customers are clustered and within certain serviceable boundaries. However, the trend of permanent remote work triggered more families to move away from a metropolitan centre, and this trend adds uncertainty to EarthMama’s operating model.
- Operating efficiency is adequate/weak. EarthMama has demonstrated the ability to manage most fixed costs as it has no brick-and-mortar presence. However, managing variable costs has proven challenging as fresh produce and meat have a limited shelf life. Its cost structure is in line with its peers — cost savings on a physical presence is offset by higher operating costs on packaging and delivery.
- Based on the above, you determined a score of 3.6 for the preliminary competitive assessment. Refer to **Table 4** for a summary of the assessment.

Table 4: Preliminary Competitive Assessment				
Component	Assessment	Score (Note 1)	Weighting (Note 2)	Weighted Score
Competitive advantage	Adequate	3	45%	1.35
Scale, scope, and diversity	Adequate/Weak	4	30%	1.2
Operating efficiency	Adequate/Weak	4	25%	1.0
Total			100%	3.6

Notes:

(1) Based on the S&P corporate rating methodology — competitive position assessment — definition of qualifier for competitive advantage assessment; scale, scope, and diversity assessment; and operating efficiency assessment.

(2) Based on the S&P corporate rating methodology — competitive position assessment — classification of competitive position group profile, and competitive position group profiles and category weightings.

- Profitability is measured by return on capital and EBITDA margin. To assess the level of profitability measured by return on capital, you calculated a five-year average, consisting of the two-year historical figures and three-year forecast. EarthMama’s return on capital was calculated to be 10%, which is considered average based on S&P’s methodology.⁹ In assessing volatility of profitability measured by the EBITDA margin, you looked at the historical EBITDA margin since inception. You concluded that the volatility of the EBITDA margin is somewhat higher than the industry average based on S&P’s guidance. There were significant dips in the margin at times of modest swing in customer demand and downturns in the economic cycle. As such, you determined a score

⁹ Refer to S&P methodology - SER Calibration by Industry Based on Return on Capital for details on rating definitions and scores.

of 4 for the volatility of profitability, based on S&P's rating scale for this subfactor. Refer to **Table 5** for the S&P rating scale on profitability assessment.

Table 5: Profitability Assessment						
	Volatility of Profitability Assessment					
Level of Profitability Assessment	1	2	3	4	5	6
Above average	1	1	2	3	4	5
Average	1	2	3	4	5	6
Below average	2	3	4	5	6	6

- Combining the preliminary competitive position assessment and profitability assessment, which received scores of 3.6 and 4.0, respectively, you determined a score of 4.0 for its overall competitive position assessment. Refer to **Table 6** for the S&P rating scale on combining the two assessments.

Table 6: Combining the Preliminary Competitive Position Assessment and Profitability Assessment						
	Preliminary Competitive Position Assessment					
Profitability Assessment	1	2	3	4	5	6
1	1	2	2	3	4	5
2	1	2	3	3	4	5
3	2	2	3	4	4	5
4	2	3	3	4	5	5
5	2	3	4	4	5	6
6	2	3	4	5	5	6

Step 5 – Determine the business risk profile:

Based on the CICRA score of 3 (refer to Step 3) and a competitive position score of 4 (refer to Step 4), you determined a score of 4 for EarthMama's business risk profile. Refer to **Table 7** for the S&P rating scale on determining the business risk profile assessment.

Table 7: Determining the Business Risk Profile Assessment						
	CICRA					
Competitive Position Assessment	1	2	3	4	5	6
1 (excellent)	1	1	1	2	3	5
2 (strong)	1	2	2	3	4	5
3 (satisfactory)	2	3	3	3	4	6
4 (fair)	3	4	4	4	5	6
5 (weak)	4	5	5	5	5	6
6 (vulnerable)	5	6	6	6	6	6

Step 6 – Determine the financial risk profile:

You focus on two core ratios and five supplementary ratios for your analysis of the financial risk profile. Specifically, you have calculated each ratio based on a five-year average, consisting of the two-year historical figures and three-year forecast. Based on your calculation, you determined EarthMama's financial risk profile to be significant. Refer to **Table 2** for a detailed calculation of each financial metric and **Table 8** for the S&P rating scale on the financial risk profile.

	Core Ratios		Supplementary Coverage Ratio		Supplementary Payback Ratios		
Description	FFO/ Debt (%)	Debt/ EBITDA (x)	FFO/Interest (x)	EBITDA/ Interest (x)	CFO/ Debt (%)	FOCF/ Debt (%)	DCF/ Debt (%)
Minimal	>60	<1.5	>13	>15	>50	>40	>25
Modest	45-60	1.5-2	9-13	10-15	35-50	25-40	15-25
Intermediate	30-45	2-3	6-9	6-10	25-35	15-25	10-15
Significant	20-30	3-4	4-6	3-6	15-25	10-15	5-10
Aggressive	12-20	4-5	2-4	2-3	10-15	5-10	2-5
Highly leveraged	<12	>5	<2	<2	<10	<5	<2

Note:

(1) Based on the standard volatility chart for CICRA score 2-6 as determined by S&P.

Step 7 – Determine the anchor credit rating:

Based on the business risk profile score of 4 (refer to Step 5) and the financial risk profile score of significant (refer to Step 6), you determined an anchor credit rating of BB for EarthMama. Refer to **Table 9** for the S&P rating scale on combining the business and financial risk profile to determine the anchor credit rating.

	Financial Risk Profile (Note 1)					
Business Risk Profile	1	2	3	4	5	6
1 (excellent)	AAA/AA+	AA	A+/A	A-	BBB	BBB-/BB+
2 (strong)	AA/AA-	A+/A	A-/BBB+	BBB	BB+	BB
3 (satisfactory)	A/A-	BBB+	BBB/BBB-	BBB-/BB+	BB	B+
4 (fair)	BBB/BBB-	BBB-	BB+	BB	BB-	B
5 (weak)	BB+	BB+	BB	BB-	B+	B/B-
6 (vulnerable)	BB-	BB-	BB-/B+	B+	B	B-

Note:

(1) Financial risk profile scale description: 1 - minimal; 2 - modest; 3 - intermediate; 4 - significant; 5 - aggressive; 6 - highly leveraged.

Step 8 – Consider the modifier adjustments and perform comparable ratings analysis:

Five modifiers are considered in adjusting the anchor credit rating: (1) diversification/portfolio effect, (2) capital structure, (3) financial policy, (4) liquidity, and (5) management and governance. Based on your analysis, you determined a neutral rating for each modifier; therefore, there was no impact on the anchor rating.

You then performed a comparable ratings analysis and determined a neutral assessment based on a holistic review of EarthMama's stand-alone credit risk profile; therefore, there was no impact on the anchor rating.

Step 9 – Consider group or government influence:

Based on your assessment, you determined that EarthMama is not subject to any group or government influence.

Step 10 – Conclude on the issuer credit rating:

Based on the credit rating analysis outlined in steps 1 to 9, you concluded an issuer credit rating of BB for EarthMama.

Issue-Specific Credit Rating Analysis

Step 1 – Estimate enterprise value at the time of hypothetical default:

Assuming a hypothetical default, you determined that EarthMama is likely to be restructured as a going concern. As such, you estimated the EV at emergence to be \$30 million.

Step 2 – Estimate EAD at the time of hypothetical default:

You determined that the private debt issued to WhitePoint Capital is the only debt instrument outstanding. EAD is estimated to be \$103 million, which equates to the accrued and unpaid interest for the recent quarter plus principal outstanding.

Step 3 – Perform the waterfall analysis:

According to a waterfall reflective of the relative seniority within EarthMama's capital structure, you allocated the EV to the outstanding debt claim. Refer to **Table 10** for the waterfall analysis and recovery percentage calculation.

Table 10: Waterfall Analysis and Recovery Percentage Calculation				
Waterfall Analysis	Amount	EAD	Recovered Amount	Recovery Percentage
Enterprise value at the time of hypothetical default	\$30M	n/a	n/a	n/a
Less: Allocation to senior secured first-lien debt	(\$30M)	\$103M	\$30M	29%
Residual: Allocation to common shares	n/a	n/a	n/a	n/a

Based on the S&P notching scale as presented in **Exhibit 4.6**, the recovery percentage of 100% implies a recovery rating of 5, which translates into a downward adjustment of one notch relative to the issuer credit rating.

Step 4 – Conclude on the issue-specific credit rating:

Based on your analysis outlined in steps 1 to 3, you concluded an issue-specific credit rating of BB- for the private debt issued to WhitePoint Capital.

Credit Rating Conclusions

Based on your analysis, you conclude the following as of the valuation date:

- A hypothetical issuer-specific credit rating of BB for EarthMama; and
- A hypothetical issue-specific credit rating of BB- for the private debt issued to WhitePoint Capital.

Example 4.3: Valuation of a Straight Debt – Detailed Analysis

Background

This continues from **Example 4.2** on the EarthMama engagement. To recap, you have determined the issue-specific credit rating for EarthMama's private debt to be BB- as of the valuation date. The salient terms of the private debt are summarized in **Table 11**.

Table 11: Salient Terms of the Private Debt	
Issuance date	December 31, 2015
Principal amount	\$100M, bullet repayment on maturity
Issuance price	\$100M
Interest rate	10%, payable semi-annually
Term	5 years — maturing on December 31, 2020
Seniority	Senior secured first lien on all assets
Optionality	None
Credit rating	BB- (issue-specific credit rating as at the valuation date)
Valuation date	December 31, 2018

Required:

The second part of the engagement is to determine the fair market value of the private debt as at the valuation date.

Solution:

You reviewed EarthMama's forecasted financial metrics (refer to **Example 4.2, Table 2**). You noted a healthy cash flow forecast of FFO¹⁰/cash interest ratios above 3.0x and leverage ratio of debt/EBITDA ratios less than 3.5x for the remaining term to maturity. As such, you conclude that EarthMama's private debt is a going concern as the company is expected to have the financial strength to make full and timely payments on the private debt. Per discussion with management, EarthMama is also up to date on all payments associated with the private debt. There is no indication of default as of the valuation date. As such, you determined that the income approach is appropriate in valuing the private debt. Specifically, you will apply the DCF method. The analysis is detailed in each of the steps below.

Step 1 – Estimate the cash flows associated with the private debt:

The private debt bears a fixed interest rate of 10% payable semi-annually and matures in a bullet payment. As such, the expected cash flows associated with the private debt can be estimated with certainty and as detailed in **Table 12**.

¹⁰ Refer to **Example 4.2, Table 2** footnote for detailed calculation.

Table 12: Expected Cash Flows Associated with the Private Debt (in CAD millions)

As at the Issuance Date (December 31, 2015)

Time period	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Payment date	31/12/2015	30/06/2016	31/12/2016	30/06/2017	31/12/2017	30/06/2018	31/12/2018	30/06/2019	31/12/2019	30/06/2020	31/12/2020
Expected cash flows	n/a	5	5	5	5	5	5	5	5	5	105

As at the Issuance Date (December 31, 2015)

Period	0	0.5	1	1.5	2
Payment date	31/12/2018	30/06/2019	31/12/2019	30/06/2020	31/12/2020
Expected cash flows	n/a	5	5	5	105

Step 2 — Calibrate the issuance yield to the issuance price:

Since the private debt was issued at par (that is, the issuance price equals the principal amount), the issuance yield equals the stated interest rate as at the issuance date. To prove this mathematically, **Table 13** shows the calculations.

Table 13: Calibrate Issuance Yield to the Issuance Price

As at the Issuance Date (December 31, 2015)

Time period	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Payment date	31/12/2015	30/06/2016	31/12/2016	30/06/2017	31/12/2017	30/06/2018	31/12/2018	30/06/2019	31/12/2019	30/06/2020	31/12/2020
Expected cash flows	5	5	5	5	5	5	5	5	5	5	105
Issuance yield	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Discounting factor		0.9524	0.9070	0.8638	0.8227	0.7835	0.7462	0.7107	0.6768	0.6446	0.6139
Discounted cash flows		5	5	4	4	4	4	4	3	3	64
Present value											100

Goal Seek

Step 3 — Bifurcate the issuance yield into components:

You bifurcate the issuance yield into three components. Consideration for each is as follows:

- Risk-free rate:
 - You used the five-year Bank of Canada Treasury bond yield of 0.73% (given) as a proxy.
- Credit benchmark:
 - You determined the search criteria for similar debt instruments as follows:
 - Credit rating: BB-;
 - Industry: retail and restaurant;
 - Geography: Canada or North America; and
 - Currency: CAD or USD.
 - First, you searched the Canadian bond market for issuers operating in the retail and restaurant industry and identified one issuer, Weston. Weston is a national grocer with mega-size brick-and-mortar supermarkets across Canada. Weston owns the majority of its operating locations and is the market leader in the retail grocery space. However, it has no e-commerce channels. Given the difference in operating models and asset mixes, you concluded that Weston is not comparable to EarthMama.
 - You then searched for a Canadian BB- bond index. This was unsuccessful since most of the bonds traded in the Canadian market are rated as investment grade (contrary to the private debt, which is rated as speculative grade).
 - You then looked to the U.S. bond market for issuers operating in the retail and restaurant industry, focusing on e-commerce. You identified one issuer, WholesomeFood. Similar to EarthMama, WholesomeFood focuses solely on e-commerce and has no brick-and-mortar locations. It offers online grocery delivery services across the United States. In 2014, WholesomeFood issued a \$250 million bond at 6% maturing in March 2019. The WholesomeFood bond was rated as BBB as of the issuance date. Given the difference in credit rating, you concluded that WholesomeFood's bond is comparable from an industry standpoint but not from a credit rating perspective, which you view as more critical.
 - You then searched for a U.S. BB- bond index and identified one broad industry index. You then looked at the industry composition of the index. You noted that 50% of the bonds were issued by companies operating in the oil and gas industry and 30% in the technology sector. You believe that both industries are subject to considerably higher risk compared to the retail and restaurant industry. As such, the debtholders would typically require a higher yield for bonds with similar credit ratings. In short, the U.S. BB- Broad Industry Bond Index is comparable from a credit rating standpoint but is not reflective of the industry risk of the subject instrument.
 - You continued your search in the U.S. loan market and identified a retail and restaurant BB- loan index. You concluded that this is the most appropriate credit benchmark as it reflects both the credit rating and industry group of the subject instrument. The U.S. BB- retail and restaurant loan index was observed to be 6.95% (given) as of the issuance date.
- Company-specific risk:
 - This component is calculated as the residual from the bifurcation process.

Table 14 summarizes the bifurcation analysis. Note that the common unit of measure for spread, the interest rate over the risk-free rate, is in basis points (bps). One basis point is equal to 1/100th of 1%, or 0.01%, or 0.0001.

(bps)	Issuance Date	
Issuance yield	1000	A
Risk-free rate	73	B
Credit benchmark	695	C
Company-specific risk	232	D=A-B-C

Step 4 – Determine the appropriate discount rate as at the valuation date:

To determine the appropriate discount rate at the valuation date, first roll forward the risk-free rate and the credit benchmark to the valuation date and then add the company-specific risk premium. The risk-free rate was observed to be 1.86% (given) as of the valuation date. The U.S. BB- retail and restaurant loan index was observed to be 7.90% (given) as of the valuation date. **Table 15** summarizes the calculation.

(bps)	Valuation Date		Issuance Date		Change	
Issuance yield			1000	A		
Risk-free rate	186	E	73	B	113	E-B
Credit benchmark	790	F	695	C	95	F-C
Company-specific risk	232	G	232	D=A-B-C	0	G-D
Discount rate	1208	H=E+F+G			208	H-A

Overall, while keeping the company-specific risk unchanged from the issuance date, the discount rate is 208 bps higher than the issuance yield, mainly driven by an increase in both the risk-free rate and the credit benchmark as a result of rate increases in the debt market.

Note that the risk-free rate used at the valuation date corresponds to the remaining term to maturity of two years. Therefore, the increase in the risk-free rate is attributable to an overall increase in the treasury yield curve.

Step 5 – Consider adjustments to the discount rate:

You then assessed any adjustments required to reflect changes in the creditworthiness of the private debt. Since the private debt was not rated as at the issuance date, you applied the key financial metrics used in the issuer credit rating analysis (refer to **Example 4.2, Table 2**) as a framework to monitor any indications of credit migration. You calculated the same metrics as of the issuance date then compared them to the valuation date. **Table 16** summarizes the calculation of each key financial metric (given) as of the issuance date.

Table 16: Summary of Key Financial Metrics

	2018 (Note 1) (Forecast)	2017 (Note 1) (Forecast)	2016 (Note 1) (Current)	2015 (Note 1) (Historical)	2014 (Note 1) (Historical)	5-Year Average
Return on capital (%) (Note 2)	12%	9%	7%	8%	7%	9%
EBITDA margin (%)	6%	8%	4%	8%	6%	6%
FFO/Debt (%) (Note 3)	25%	22%	21%	22%	21%	22%
Debt/EBITDA (x)	3.2	3.5	3.7	3.6	3.7	3.5
FFO/Cash interest (x)	4.1	4.0	3.9	3.9	4.0	4.0
EBITDA/Interest (x)	3.4	3.0	2.8	3.0	2.8	3.0
CFO/Debt (%) (Note 4)	16%	16%	14%	15%	13%	15%
FOCF/Debt (%) (Note 5)	12%	10%	8%	9%	8%	9%
Discretionary CF/ Debt (%) (Note 6)	7%	5%	3%	4%	3%	4%

Notes:

(1) EarthMama's fiscal year-end is December 31 for each year

(2) Calculated as Net income / (Book value of debt + Book value of equity)

(3) Funds from operations (FFO) to debt ratio, which is calculated as (EBITDA - Cash interest - Cash tax) / Total debt

(4) Cash flow from operation (CFO) to debt ratio, which is calculated as Cash flow from operation / Total debt

(5) Free operating cash flow (FOCF) to debt ratio, which is calculated as (CFO - Capital expenditures) / Total debt

(6) Discretionary cash flow to debt ratio, which is calculated as (FOCF - Cash dividend - Share buybacks) / Total debt

Although the metrics changed slightly between the two dates, you determined that they point to the same level of financial risk profile (refer to **Example 4.2, Table 2**). Therefore, you concluded that the creditworthiness of the private debt remained the same between the issuance date and the valuation date. Hence no adjustment to the discount rate is required.

Step 6 – Calculate the present value of the estimated cash flows:

The last step is to calculate the present value of the estimated cash flow determined in Step 1 using the discount rate determined in Step 5. **Table 17** summarizes the calculation.

Table 17: Calculate the Present Value of the Estimated Cash Flows

As at the Valuation Date (December 31, 2018)					
Time period	0	0.5	1	1.5	2
Payment date	31/12/2018	30/06/2019	31/12/2019	30/06/2020	31/12/2020
Expected cash flows		\$5	\$5	\$5	\$105
Discount rate	12.08%	12.08%	12.08%	12.08%	12.08%
Discounting factor		0.9430	0.8893	0.8387	0.7909
Discounted cash flows		\$5	\$4	\$4	\$83
Present value	\$96				

Valuation Conclusion

Based on your analysis, you conclude that the fair market value of EarthMama's private debt is \$96 million as of the valuation date.

Glossary

Bond	A type of public debt instrument commonly issued by governments and their agencies, provinces and municipalities, large corporates, and financial institutions.
Debt instruments	A financial instrument where the value of the instrument is defined in terms of cash.
Derivative instruments	A financial instrument where the value of the instrument is derived from and dependent on the value of an underlying asset.
Investment grade	Credit ratings ranging from AAA+ to BBB- (S&P nomenclature).
Issuer credit rating	A rating assigned to an issuer, which expresses an opinion about the ability and willingness of the issuer to meet its financial obligations in full and on time.
Issue-specific credit rating	A rating assigned to a debt instrument, which expresses an opinion on the likelihood of a default on the contractual payments and the loss severity in the event of default.
Loan	A type of private debt instrument commonly issued by mid-size companies and corporates, as well as individuals.
Notching	The process of going from an issuer credit rating to an issue-specific credit rating.
Private debt	A debt instrument issued or sold to a limited number of pre-qualified investors in private, typically banks or non-bank institutional investors.
Public debt	A debt instrument that is issued or sold to a large number of institutional and retail investors in the public auction or dealer market.
Speculative grade or high yield	Credit ratings ranging from BB+ to D (S&P nomenclature).

MODULE 05

**VALUATION
OF FINANCIAL
INSTRUMENTS —
PART 2 — DERIVATIVE
INSTRUMENTS**

Module Overview

Welcome to Module 5. This module provides an overview of derivative instruments and their common characteristics. It then elaborates on the main types of derivative instruments as well as the valuation methods and considerations for each type.

By the end of this module, you will be able to:

- Describe the characteristics of derivative instruments;
- Describe the main types of derivative instruments;
- Explain and apply valuation methodologies for each type of derivative instrument; and
- Explain considerations for credit valuation adjustments and debit valuation adjustments.

The acronyms used throughout this module are:

CAPM Capital asset pricing model

CDOR Canadian Dollar Offer Rate

CORRA Canadian Overnight Repo Rate Average

CVA Credit valuation adjustment

DVA Debit valuation adjustment

ESOP Employee stock option plan

LIBOR London Interbank Offered Rate

SOFR Secured Overnight Financing Rate

Note: There is a glossary with key terms at the end of the module.

Optional Readings

Black, Fischer, and Myron Scholes. "The Pricing of Options and Corporate Liabilities." *The Journal of Political Economy*, Vol. 81, No. 3 (May–June 1973). <https://www.jstor.org/stable/1831029?origin=JSTOR-pdf>.

Merton, Robert C. "Theory of Rational Option Pricing." *The Bell Journal of Economics and Management Science*, Vol. 4, No. 1 (Spring 1973). <https://www.jstor.org/stable/3003143?origin=JSTOR-pdf>.

Cox, John C., Stephen A. Ross, and Mark Rubinstein. "Option Pricing: A Simplified Approach." *The Journal of Financial Economics*, Vol. 7 (1979).

Glasserman, Paul. *Monte Carlo Methods in Financial Engineering: Stochastic Modelling and Applied Probability*. Springer Science + Business Media, Inc. 2003 (pp. 93 to 94).

5.1 Overview of Derivative Instruments

A derivative instrument is an instrument that derives its value from and is dependent on the value of an underlying asset. In this module, the word *derivative* is used interchangeably with *derivative instrument* and *derivative contract*.

5.1.1 Types of Derivative Instruments

There are three main types of derivative contracts: (1) forward contracts (forwards) and futures contracts (futures), (2) swap contracts (swaps), and (3) option contracts (options). The following example explains each type of derivative contract.

Suppose that you work at a gold mining company, and the price of gold has been volatile in the last 12 months. You anticipate that 300,000 ounces (oz) of gold will be available for sale over the next 12 months. Gold is currently trading in the market at \$950/oz, which is the spot price. You have no way of knowing what the market price of gold will be in the next 12 months.

Say you want to presell a portion of the gold at a fixed price. You found a wholesaler who is willing to buy 100,000 oz of gold at a price of \$1,000/oz in 12 months. That is, the wholesaler is obligated to purchase the gold at the agreed-on price in 12 months regardless of the prevailing market price. An agreement to transact at a fixed price at a future point in time is called a forward or a future. The differences between forwards and futures are explained in **Section 5.3**.

You also found a bank that is willing to buy 8,000 oz of gold each month for the next 12 months at a price of \$1,025/oz. Similarly, the bank is obligated to buy the gold at the agreed-on price. Unlike a single purchase, as in a forward or future contract, the bank will buy gold in a series of 12 purchases. This contract is called a swap. Swaps are explained in detail in **Section 5.4**.

At the same time, you found a dealer interested in having the right (but not the obligation) to buy 100,000 oz of gold at a price of \$1,050/oz in 12 months, at the expiration of the option. The option holder may choose not to exercise the option in 12 months. Their decision is dependent on the prevailing market price of gold on the last day of the contract. This contract is called an option. There are various styles and types of options, which are explained in detail in **Section 5.5**.

5.1.2 Characteristics of Derivative Instruments

There are four key terms to all derivative contracts: (1) the underlying, (2) size and exercise price, (3) expiration date, and (4) settlement.

5.1.2.1 Underlying

Derivatives can be created on any asset, event, or outcome, which is called the underlying. The underlying can be a real asset such as gold (as was the case in the introductory example) or a financial asset such as a company's shares. The underlying can be an event such as bankruptcy or default. The underlying can also be the outcome of a broad market index, such as the S&P 500 Index.

5.1.2.2 Size and Exercise Price

The derivative contract (i.e., forward, future, swap, or option contract) must also specify size and exercise price. The size is the amount of the underlying to be exchanged. The exercise price is what the underlying will be purchased or sold for under the contract terms. The exercise price can also be called the strike price. Note that the exercise price specified in the contract is not the current or spot price for the underlying but a price for future delivery.

5.1.2.3 Expiration Date

All derivatives have a finite life. Each derivative contract specifies a date on which the contract ends, called the expiration date.

5.1.2.4 Settlement

Settlement defines how a derivative contract is satisfied at expiration. Some contracts require settlement by physical delivery of the underlying, and other contracts allow for — or even require — cash settlement. Cash settlement requires less time and cost to deliver on expiry. In practice, most derivatives contracts are settled in cash.

5.1.3 Benefits and Costs of Holding the Underlying

Some commodities generate a benefit that is somewhat opaque and difficult to measure. This benefit is called the convenience yield. It represents a non-monetary advantage of holding the asset. Convenience yields are primarily associated with commodities and generally exist due to either difficulty in shorting¹ the commodity or unusually tight supplies. For example, suppose a commodity cannot be sold short without great difficulty or cost. This constraint limits the amount of market participants who can trade the commodity in a timely manner. As a result, a commodity holder has an advantage in selling and extracting a price premium when the demand is rising and the supply of the commodity falls short. This temporary disequilibrium in supply and demand is uncommon in a well-functioning market where shorting is inexpensive and supply is abundant (such as financial assets). Convenience yields tend to exist when the costs associated with physical storage are relatively low.

Holding physical commodities usually requires a cost of storage. One cannot own gold, oil, or wheat without incurring some cost for storing these assets. There are also costs incurred in protecting and insuring some commodities against theft or destruction. Depending on the commodity, these costs can be quite significant.

The term *carry* often refers to the net of the costs and benefits. Carry is sometimes known as the cost of carry. The holding, storing, or carrying of an asset is said to incur a net cost that is essentially what it takes to “carry” an asset.

One example is when the price of oil futures dropped to $-\$30/\text{barrel}$ (negative) in March 2020. That is, a seller would need to pay the buyer \$30. This example magnifies the cost of carry (where cost exceeded benefit) when demand for oil dried up due to the pandemic (commodity value was viewed as nil) and the cost of storage skyrocketed as supply was used up.

For financial assets, convenience yields are either non-existent or extremely limited; the same logic applies to storage costs, which are generally sufficiently low that they can be ignored in financial analysis.

5.2 Valuation of Derivative Instruments

5.2.1 Valuation Approaches

Recall from **Level I** and **Level II** that there are generally three valuation approaches: the asset-based, market-based, and income-based approaches. This section discusses the consideration for each approach in the context of derivative valuation.

A derivative instrument derives its value from the underlying asset, yet it has no ownership of any asset. As such, the asset-based approach is not applicable for derivative valuation.

A derivative instrument could be valued under the market-based approach if a comparable instrument with identical terms (underlying, size, exercise price, expiration date, and settlement method) can be identified with

¹ Shorting means borrowing an asset and agreeing to return it at a later date, while paying an upfront fee to get into the short position. It is an investment strategy that speculates on the decline of the asset price.

active and reliable trading prices. In practice, a market-based approach is challenging to apply given the difficulties in identifying perfectly comparable derivative instruments.

Therefore, an income-based approach is most applicable in estimating the fair market value of a derivative instrument. **Section 5.2.2** dives into the fundamentals of derivative valuation, followed by applying valuation methods for each type of derivative instrument in **Section 5.3**, **Section 5.4**, and **Section 5.5**.

5.2.2 Fundamentals of Derivative Valuation

5.2.2.1 Arbitrage and Law of One Price

Arbitrage arises in a situation where two identical assets trade at different prices. Consider the gold example. Through the grapevine, you found a seller in Toronto who is willing to sell at \$1,000/oz, and you also found a buyer in Mississauga who is willing to buy at \$1,200/oz. The market is opaque, and the two parties are unaware of each other's bid and ask prices. Given the size of the transaction, assume that the cost of travelling between Toronto and Mississauga is minimal as you drive an electric car, and the cost of carry is ignorable. You will make \$200/oz of profit if you buy gold from the Toronto seller and sell it to the Mississauga buyer. Sound like free money? Yes, but it's also too good to be true.

In well-functioning markets with low transaction costs and a free flow of information, traders quickly exploit arbitrage opportunities when they exist. The combined actions of many traders engaging in the same transaction of buying the low-priced asset and selling the high-priced asset results in increased demand and an increasing price for the former and decreased demand and a decreasing price for the latter. This market activity will continue until the prices converge.

Therefore, identical assets can have only one true market price in theory. This rule is called the *law of one price*. With virtually all market participants alert for the possibility of earning such profits at no risk, arbitrage opportunities are rare.

5.2.2.2 Risk-Neutrality vs. Risk-Aversion Framework

Now let's apply the concept of arbitrage to derivatives. Say you own one ounce of gold — this is also known as having a long position on the gold. You want to sell this gold in six months and have found a counterparty willing to buy at an agreed-on price. You seal the deal with a future contract. This is also known as having a short position (to sell) on the future, in which the underlying is one ounce of gold. Now you have a perfect hedge, which has a long position in the underlying combined with a short position in the derivative.

In a perfect hedge, all market risks are eliminated. That is, your market risk exposure on the long position is entirely offset by the short position, and as such, your return is locked in. In this situation, your position should earn a risk-free rate. That is, the risk-free rate represents the time value of money a perfect hedge yields, reflecting the price of giving up your money today in return for receiving more money later. If not, arbitrageurs begin to trade until the derivative price reaches equilibrium and returns a risk-free rate on the perfect hedge position. In other words, the price of the derivative will converge to the law of one price.

This is the first important assumption in all derivative valuations. That is, there are **no arbitrage opportunities** for the derivative, and there is only one price for the derivative that produces a risk-free return for a perfect hedge position.

The second important assumption is that the valuations for derivatives assume a **risk-neutrality framework** among investors. Since the arbitrage mechanism means that any investor is expecting a risk-free rate of return on a perfect hedge, the discount rate used to discount future payoffs is equivalent to the risk-free rate.

The risk-neutrality assumption in derivative valuations is a significant divergence from debt valuations, which assume a risk-aversion framework. Under the risk-aversion framework, investors require a risk premium over the

risk-free rate to compensate for the additional credit risk the debt instruments are subject to. Business valuations also assume a risk-aversion framework, whereby the cost of equity is estimated based on the risk-free rate plus a risk premium that captures the additional equity risk — equity risk premium, size premium, and company-specific risk — under the CAPM, as discussed in **Level II**.

5.2.2.3 Intrinsic Value and Time Value

Conceptually, a derivative instrument's value consists of two components: intrinsic value and time value.

Intrinsic value is the value any derivative would have if it was exercised today. Intrinsic value is calculated as the difference between the spot price and the present value of the exercise price. The present value is calculated by discounting the exercise price at the risk-free rate under the risk-neutrality framework.

Time value is the value associated with the derivative between the current date and the expiration date. Time value is calculated as the difference between the derivative value and the intrinsic value. In other words, the time value represents the price an investor is willing to pay for the upside. Time value is impacted by two factors: the remaining term to the expiration date and the volatility of the underlying.

Typically, the time value is higher for derivatives with a highly volatile underlying. Time value also declines for all derivatives as the expiration date approaches. At expiration, no time value remains, and the derivative is worth only its intrinsic value.

5.3 Forwards and Futures

5.3.1 Attributes of Forwards and Futures

Forwards and futures involve obligations in the future for both parties to the contract. That is, one party has to deliver the underlying, and the other has to make full and timely payments. This arrangement is also known as a bilateral contract.

Bilateral contracts are typically set up such that the two parties' positions are equal at inception. That is, the terms of the forward or future contract represent the most amount of underlying one party is willing to give up in exchange for the highest payment the other party is willing to make. Therefore, the contract's net initial value should be zero. As time goes on and as the market value of the underlying changes, one party would gain at the other's loss.

Bilateral contracts expose each party to the risk that the other party will not fulfill the contractual agreement, called counterparty risk.

5.3.2 Differences Between Forwards and Futures

A forward contract is a customized agreement made over the counter between two counterparties that negotiate and arrive on the contract's exact terms. Prior to delivery and including the time of initiation, no payment is required on the contract by either party. At settlement, one party will lose and the other party will gain relative to the spot price of the underlying on the expiration date.

A future contract is a standardized contract with a fixed maturity date and uniform underlying. Futures are traded on exchanges and are marked-to-market daily, which means that daily changes are settled day by day until the end of the contract. For clarity, the daily change is calculated as the difference between the current day settlement price and the previous day settlement price. The daily settlement price is set by the exchange and typically calculated as the average price of similar contracts traded during the day. The same settlement price applies to all parties. The presence of an exchange as an intermediary has two advantages: (1) it helps reduce counterparty risk as each party transacting on the exchange is required to deposit funds as collateral, and (2) it provides liquidity to investors who can enter and exit whenever they choose.

Despite the settlement differences, it is important to note that the final outcome is the same if a forward and a future contract with identical terms are held to maturity.

5.3.3 Common Types of Forwards and Futures

There are two main types of underlying for forwards and futures:

- Financial assets, such as stocks, bonds, market indexes, interest rates, and currencies; and
- Commodities, such as natural gas, gold, copper, silver, oil, electricity, coffee beans, and sugar.

5.3.4 Valuation of Forwards and Futures

This section will demonstrate the valuation of a forward contract. All the concepts and formulas discussed below also apply to future contracts as the fundamentals are the same.

Assume that today, at time 0, a forward contract is created that expires at time T. The value of the underlying today is S_0 . At expiration, the underlying value is S_T , which is unknown at the contract's inception.

The (forward) exercise price established at the inception date is $F_0(T)$. The value at the expiration of the forward contract is denoted as $V_T(T)$ and is stated in Formula 1:

Formula 1: Value of Forward Contract at Given Point in Time

$$V_T(T) = S_T - F_0(T)$$

Where:

$V_T(T)$ = the value of the forward at expiration

S_T = the spot price of the underlying at expiration

$F_0(T)$ = the (forward) exercise price established at inception

That is, the value of a forward contract at expiration is the spot price of the underlying minus the (forward) exercise price agreed to in the contract.

Generally, value is defined as the value to the long position. A long position on the forward contract is the party paying the exercise price to acquire the underlying.

Looking at the transaction from the point of view of the short party, Formula 1 would need to be adjusted by multiplying by -1 to calculate the short position, as the short position takes the exact opposite payoff compared to the long position.

Recall that at the inception of the contract, the initial value is equal to zero. This value is stated in Formula 2:

Formula 2: Value of Forward Contract at Inception

$$V_0(T) = 0$$

Where:

$V_0(T)$ = the value of the forward at inception

Applying the logic in Formula 1, the initial value of the contract is equal to the spot price of the underlying minus the present value of the (forward) exercise price. This relationship is stated in Formula 3:

Formula 3: Value of Forward Contract at Inception (Rearranged)

$$V_0(T) = S_0 - \frac{F_0(T)}{(1+r)^T} = 0$$

Where:

$F_0(T)$ = the (forward) exercise price established at inception

S_0 = the spot price of the underlying at inception

r = the risk-free rate at inception

Formula 3 can be rearranged to solve for the (forward) exercise price at inception, as stated in Formula 4.

Formula 4: Value of Forward Contract at Inception (Rearranged)

$$F_0(T) = S_0(1 + r)^T$$

Where:

$F_0(T)$ = the (forward) exercise price established at inception

S_0 = the spot price of the underlying at inception

r = the risk-free rate at inception

That is, the (forward) exercise price is the spot price compounded at the risk-free rate over the life of the contract.

Applying the logic in Formula 1, during the life of the forward, the value of the forward contract equals the spot price of the underlying minus the present value of the forward price. The relationship is denoted in Formula 5:

Formula 5: Value of Forward Contract at a Given Point in Time (Rearranged)

$$V_t(T) = S_t - \frac{F_0(T)}{(1 + r)^{(T-t)}}$$

Where:

$V_t(T)$ = the value of the forward at time t

t = a point in time after the inception date and before the expiration date

S_t = the spot price of the underlying at time t

$F_0(T)$ = the (forward) exercise price established at inception

r = the risk-free rate at time t

If the asset has a cost of carry, an adjustment can be made, as stated in Formula 6:

Formula 6: Value of Forward Contract at a Given Point in Time (With Costs of Carry Considered)

$$V_t(T) = S_t - \frac{F_0(T)}{(1 + r)^{(T-t)}} - (\gamma - \theta)(1 + r)^t$$

Where:

γ = the present value of the benefit of carry

θ = the present value of the cost of carry

The (forward) exercise price denoted as $F_0(T)$ is fixed when the contract was initiated; as such, $F_0(T)$ remains unchanged in formulas 1 to 6. The remaining variables need to be updated to reflect the market value at the measurement or valuation date (time t).

Example 5.1: Valuation of a Forward Contract

At time 0, you entered into a short position to sell 100,000 oz of gold at a (forward) exercise price $F_0(T)$ of \$1,000/oz in 12 months ($T=12$). The spot price of gold (S_0) is \$950/oz (given).

Six months after inception ($t=6$), the spot price of gold (S_t) is \$900/oz (given). Assume that the present value of the benefit (γ) is \$50/oz (given) and the present value of the cost (θ) is \$45/oz (given). The risk-free rate (r) at the time is 5% (given).

The value of the short position of the forward contract can be calculated using Formula 6, as follows:

$$V_t(T) = \left[S_t - \frac{F_0(T)}{(1+r)^{(T-t)}} - (\gamma - \theta)(1+r)^t \right] \times -1 \times 100,000$$

$$V_t(T) = \left[900 - \frac{1000}{(1+5\%)^{(12-6)/12}} - (50 - 45)(1+5\%)^{6/12} \right] \times -1 \times 100,000$$

$$V_t(T) = [900 - 976 - 5] \times -1 \times 100,000$$

$$V_t(T) = [-81] \times -1 \times 100,000$$

$$V_t(T) = 8,100,000$$

Conclusion: Your short position in the forward contract is \$8,100,000 six months after inception ($t=6$). It is logical for the value of the short position to be positive since the price of gold has fallen from T_0 (\$950/oz) to a price of \$900/oz six months later.

5.4 Swaps

5.4.1 Attributes of Swaps

Swaps are derivative contracts in which two parties exchange (or swap) cash flows and the underlying over multiple periods. Swaps can be thought of as a series of forwards or futures. Swaps involve obligations in the future for both parties to the contract. As such, swaps are bilateral contracts.

Similar to forwards and futures, a swap contract's initial value should be zero, and as one side of the swap contract gains, the other side loses by the same amount.

5.4.2 Common Types of Swaps

There are two common types of swaps:

- An interest rate swap that allows a company to swap its interest rate obligation (usually a fixed rate for a floating rate) to manage interest rate risk; and
- A currency swap that allows a company to swap its debt service obligation from one currency to another currency (usually from the debt instrument's denomination currency to its operating currency) to manage currency risk.

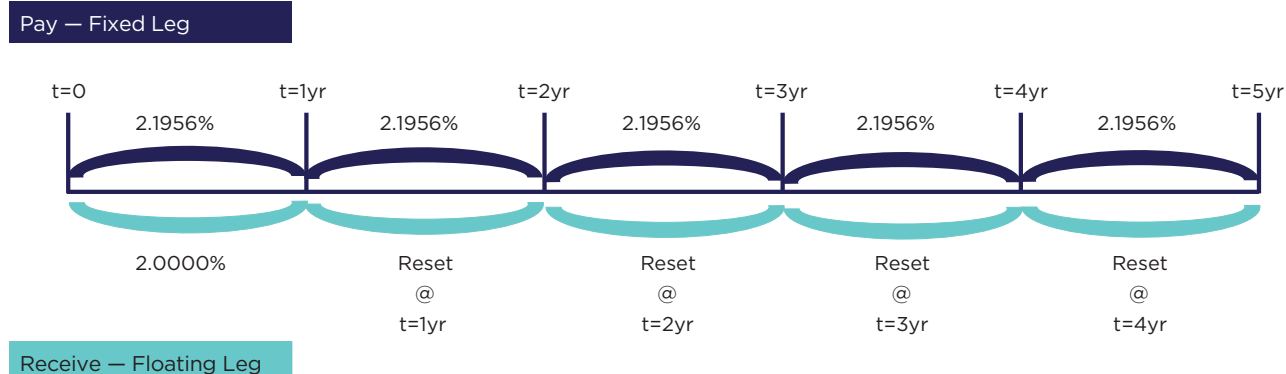
5.4.2.1 Interest Rate Swaps

An interest rate swap is an agreement to exchange one stream of interest payments for another, based on a specified principal amount (also known as the notional amount), over a specified period and at specified intervals (also known as reset dates).

When one stream of the swap pays a fixed-rate interest payment and the other stream receives a floating-rate interest payment, this is called a pay fixed, receive floating interest rate swap, also known as a plain vanilla swap.

Exhibit 5.1 presents the interest payment structure of a plain vanilla swap with a five-year term and an annual reset date.

Exhibit 5.1: Plain Vanilla Swap



The fixed-rate stream in the swap is also known as the fixed leg. The fixed rate stays the same throughout the life of the swap.

The floating-rate stream in the swap is also known as the floating leg. The floating rate is reset on each reset date, which becomes the interest rate the floating leg is subject to until the next reset date. The floating leg payment is calculated based on a reference rate. The most commonly used reference rate is LIBOR. Refer to **Appendix 5B** for more details on recent developments in LIBOR.

One party pays the fixed-rate interest payment on each reset date and receives a floating-rate interest payment. The floating rate for the next period is reset to the prevailing market rate.

Notional amounts are not exchanged in interest rate swaps because these amounts are equal — there is no need to exchange the notional principal amounts.

5.4.2.2 Currency Swaps

A currency swap is a contract in which two counterparties agree to exchange payments in different currencies, based on a specified notional amount, over a specified period and at specified intervals.

There are two notable differences between a currency swap and an interest rate swap:

- Each leg of the currency swap, which is denominated in two different currencies, can be either fixed or floating; and
- The notional amounts of a currency swap, denominated in two different currencies, are typically exchanged.

5.4.3 Valuation of Swaps

Interest rate swaps are most commonly encountered by valuers, so this section will use interest rate swaps as an example. All the concepts and formulas discussed below also apply to currency swaps, as the fundamentals are the same, but some modifications may be required.

Recall that swaps can be thought of as a series of forward contracts. An interest rate swap can be thought of as a series of forward (interest rate) contracts whereby the exercise price is the fixed rate (also known as the swap rate), and the underlying is the floating rate. One forward contract expires on a corresponding reset date of the swap contract. All forward contracts have the same exercise price.

Recall that swap contracts, similar to forward and future contracts, have an initial value of zero. The exercise price or swap rate of an interest rate swap can be solved by equating the value of the fixed leg to the floating leg. This relationship is denoted in Formula 7:

Formula 7: Value of Swap Contract at Inception

$$V_0 = 0 = V_{\text{float}} - V_{\text{fixed}}$$

Rearranging Formula 7:

$$V_{\text{float}} = V_{\text{fixed}}$$

Where:

V_0 = the value of the swap at inception

V_{float} = the value of the floating leg

V_{fixed} = the value of the fixed leg

The value of the floating leg at inception is par because the interest payment is set to match the discount rate.² Par is denoted as 1. In fact, at each of the reset dates, the value of the floating leg equals par for the same reason. This relationship is denoted in Formula 8:

Formula 8: Value of Floating Leg of Swap Contract

$$V_{\text{float}} = 1$$

Where:

V_{float} = the value of the floating leg

Combining Formula 7 and Formula 8, the value of the fixed leg at inception is denoted in Formula 9:³

Formula 9: Value of Fixed Leg of Swap Contract at Inception

$$V_{\text{fixed}} = r_{\text{fixed}} \times \sum_{t=1}^n PV_t(1) + PV_n(1) = 1$$

-
- For clarity, the discount rate is calculated based on the prevailing interest rate, which is the floating rate.
 - The step-by-step mathematical induction is illustrated below. For **Level III** course assignments and exams, you will be provided with Formula 9 and Formula 10.

The fixed leg can be thought of as a fixed-rate bond. Recall from **Module 4** that the formula to calculate the value of a debt instrument is as follows:

$$\text{Present value} = \sum_{t=1}^n \frac{\text{Cash flow}_t}{(1 + \text{Discount rate})^t}$$

The value of the fixed leg can be denoted as:

$$V_{\text{fixed}} = \sum_{t=1}^n \frac{\text{Cash flow}_t}{(1 + \text{Discount rate})^t}$$

Then the cash flows can be separated into coupons (C) and the notional amount. The notional amount is not exchanged in a swap; therefore, the notional amount is denoted simply as 1.

$$V_{\text{fixed}} = \sum_{t=1}^n \frac{C_t \times 1}{(1 + \text{Discount rate})^t} + \sum_{t=1}^n \frac{1}{(1 + \text{Discount rate})^t}$$

Since the coupon payments are fixed, C_t remains the unchanged throughout the life of the swap. As such, C_t can be simplified as C. It is also known that $1 / (1 + \text{Discount rate})^t$ is a calculation for present value factor at time t, which is denoted as PV_t . Therefore, the formula can be simplified as follows:

$$V_{\text{fixed}} = C \times \sum_{t=1}^n PV_t(1) + PV_n(1)$$

Since the coupon (C) is just the fixed interest rate multiplied by par (or 1), $r_{\text{fixed}} = C$, so that:

$$V_{\text{fixed}} = r_{\text{fixed}} \times \sum_{t=1}^n PV_t(1) + PV_n(1)$$

Where:

V_{fixed} = the value of the fixed leg

r_{fixed} = the fixed rate on the fixed leg (also known as the swap rate)

n = the number of remaining reset dates

Rearranging Formula 9 leads to the swap pricing equation in Formula 10:

Formula 10: Swap Rate at Inception

$$r_{\text{fixed}} = \frac{1 - PV_n(1)}{\sum_{t=1}^n PV_t(1)}$$

Where:

r_{fixed} = the fixed rate on the fixed leg (also known as the swap rate)

PV_t = the present value factor at time t

n = the number of remaining reset dates

Applying the logic in Formula 7, during the life of the swap, the value of the swap contract equals the value of the floating leg minus the value of the fixed leg. For simplicity, the value of the swap is calculated at each reset date. Recall that the value of the floating leg equals par at each reset date. The value of the swap at each reset date (t) is denoted in Formula 11:

Formula 11: Value of Swap Contract at a Given Point in Time

$$V_t = 1 - V_{\text{fixed},t}$$

Where:

V_t = the value of the swap at time t

$V_{\text{fixed},t}$ = the value of the fixed leg at time t

During the life of the swap and at each reset date, the value of the fixed leg equals the present value of the difference between the new fixed rate ($r_{\text{fixed},t}$) to be received and the fixed rate ($r_{\text{fixed},0}$) the contract is bound to pay. The value of the swap contract (V_t) is denoted in Formula 12:

Formula 12: Value of Swap Contract at a Given Point in Time (Rearranged)

$$V_t = V_{\text{fixed},t} = (r_{\text{fixed},t} - r_{\text{fixed},0}) \times \sum_{t=1}^n PV_t(1)$$

Where:

V_t = the value of the swap at time t

$V_{\text{fixed},t}$ = the value of the fixed leg at time t

$r_{\text{fixed},0}$ = the contractual fixed rate or swap rate

$r_{\text{fixed},t}$ = the fixed rate or swap rate at time t

PV_t = the present value factor at time t

n = the number of remaining reset dates

Note that the new fixed rate is calculated to match the remaining term on the subject swap contract. Refer to **Example 5.3** for an illustration of the valuation of a swap contract at a subsequent valuation date.

Example 5.2: Calculation of the Swap Rate at Inception

At time 0, you entered into a vanilla swap with a notional amount of \$100 million and an expiration date in five years. The swap floating leg references LIBOR and resets every year.

Since you have a long position on the vanilla swap, that means you will pay a fixed rate and receive a floating rate. The current LIBOR rate is as follows:

LIBOR Term (t=0)	LIBOR Rate (t=0)	Present Value Factor (t=0)
1 yr LIBOR	2.0000%	0.9804
2 yr LIBOR	2.0500%	0.9602
3 yr LIBOR	2.1000%	0.9396
4 yr LIBOR	2.1500%	0.9184
5 yr LIBOR	2.2000%	0.8969

You want to find out what the swap rate is at time 0, which is calculated using Formula 10, as follows:

$$r_{\text{fixed},0} = \frac{1 - PV_n(1)}{\sum_{t=1}^n PV_t(1)}$$

$$r_{\text{fixed},0} = \frac{1 - 0.8969}{(0.9804 + 0.9602 + 0.9396 + 0.9184 + 0.8969)}$$

$$r_{\text{fixed},0} = \frac{0.1031}{4.6955}$$

$$r_{\text{fixed},0} = 2.1956\%$$

Conclusion: The swap rate is 2.1956% for the five-year vanilla swap at time 0.

Example 5.3: Valuation of an Interest Rate Swap at a Subsequent Valuation Date

This continues from **Example 5.2**. After two periods and on the last day of period 2 (t=2), the LIBOR rate is as follows (note that this rate has changed from the value at t=0):

LIBOR Term (t=2)	LIBOR Rate (t=2)	Present Value Factor (t=2)
1 yr LIBOR	2.0800%	0.9796
2 yr LIBOR	2.1300%	0.9587
3 yr LIBOR	2.1800%	0.9374

Since there are only three years left on the swap contract, you calculated the new fixed rate using Formula 10 as follows:

$$r_{\text{fixed},t} = \frac{1 - PV_n(1)}{\sum_{t=1}^n PV_t(1)}$$

$$r_{\text{fixed},t} = \frac{1 - 0.9374}{(0.9796 + 0.9587 + 0.9374)}$$

$$r_{\text{fixed},t} = \frac{0.0626}{2.8757}$$

$$r_{\text{fixed},t} = 2.1786\%$$

The value of the swap contract is calculated using Formula 12, as follows:

$$V_t = (r_{\text{fixed},t} - r_{\text{fixed},0}) \times \sum_{t=1}^n PV_t(1) \times \text{Notional amount}$$

$$V_t = (2.1786\% - 2.1956\%) \times (0.9796 + 0.9587 + 0.9374) \times 100,000,000$$

$$V_t = (-0.0171\%) \times (2.8757) \times 100,000,000$$

$$V_t = -0.00049137 \times 100,000,000$$

$$V_t = -49,137$$

Conclusion: Your vanilla swap position is at a loss of \$49,137 at time 2. If you want to sell your position, you need to pay the counterparty \$49,137.

5.5 Options

5.5.1 Attributes of Options

Options give one party (the buyer) the right, but not the obligation, to buy or sell the underlying. Options are unilateral contracts because only one party (the seller) to the contract has a future commitment that, if broken, represents a breach of contract. Unilateral contracts expose only the buyer to the risk that the seller will not fulfill the contractual agreement.

Because of its unilateral nature, options have positive values for the buyer at the contract's inception. That is, the option buyer pays this value, or the option premium, to the option seller at the time of the initial contract. The option premium represents the maximum profit that the option seller can make.

Options may trade in the over-the-counter market, but they trade predominantly on an exchange. Options in the over-the-counter market are customizable contracts, whereas options on an exchange are standardized contracts.

Generally, there are three exercise styles of options, which differ by the timing of exercise:

- A European option — the option can only be exercised on the expiration date;
- An American option — the option can be exercised at any time up to the expiration date; and
- A Bermudan option — a restricted form of an American option that can be exercised prior to the expiration date but only at specific set dates.

5.5.2 Common Types of Options

There are two basic types of options: (1) options to buy the underlying, known as call options, and (2) options to sell the underlying, known as put options.

In other words, an option buyer who buys a call option has the right, but not the obligation, to buy or call the underlying from the option seller at the exercise price until the option expires. Conversely, the option buyer who buys a put option has the right, but not the obligation, to sell or put the underlying to the option seller at the exercise price until the option expires.

5.5.2.1 Call Options

Recall that a call option allows the holder to buy the underlying by paying the exercise price. Therefore, exercise is justified only if the value of the underlying exceeds the exercise price. Otherwise, the holder would simply let the call expire.

As such, a call option's value is dependent on the spot price of the underlying. The direction between the spot price of the underlying and the exercise price is known as the option's moneyness. A call option can be in one of three states of moneyness:

- A call option is *in the money* if the spot price is greater than the exercise price. In this case, the option would be exercised;
- A call option is *out of the money* if the spot price is less than the exercise price. In this case, the option would not be exercised; and
- A call option is *at the money* if the spot price and the exercise price are the same. In this case, the option may be exercised.

The payoff of a call option (C_t) is denoted as in Formula 13:

Formula 13: Payoff Calculation for Call Options

$$C_t = \text{Max}(S_t - X, 0)$$

Where:

C_t = the value of the call option at time t

S_t = the spot price of the underlying at time t

X = the exercise price established at inception

5.5.2.2 Put Options

Recall that a put option allows the holder to sell the underlying at the exercise price. Therefore, exercise is justified only if the value of the underlying is below the exercise price. Otherwise, the holder would simply let the put expire.

As such, a put option can be in one of three states of moneyness:

- A put option is *in the money* if the spot price is less than the exercise price. In this case, the option would be exercised;
- A put option is *out of the money* if the spot price is greater than the exercise price. In this case, the option would not be exercised; and
- A put option is *at the money* if the spot price and the exercise price are the same. In this case, the option may be exercised.

The value of a put option (P_t) is denoted in Formula 14:

Formula 14: Payoff Calculation for Put Options

$$P_t = \text{Max}(X - S_t, 0)$$

Where:

P_t = the value of the put option at time t

S_t = the spot price of the underlying at time t

X = the exercise price established at inception

5.5.2.3 Put-Call Parity

Before diving into the details of valuing options, an important concept needs to be established: put-call parity, which is the relationship between the price of a call option and the price of its corresponding put option.

For clarity, this refers to call and put options with identical underlyings, exercise prices, and expiration dates.

The put-call parity is denoted in Formula 15:

Formula 15: Put-Call Parity

$$S_0 + P_0 = C_0 + \frac{X}{(1+r)^T}$$

Where:

S_0 = the spot price of the underlying at inception

P_0 = the value of the put option at inception

C_0 = the value of the call option at inception

X = the exercise price established at inception

T = the time to the expiration date

r = the risk-free rate

That is, the underlying price plus the put price equals the call price plus the present value of the exercise price.

The put-call parity is an important concept under the no-arbitrage assumption. If the value of a call option is known, the value of a corresponding put option can be solved for, and vice versa. The put-call parity indicates the difference in values for the corresponding call and put options.

A detailed explanation of the put-call parity is presented in **Appendix 5A**.

5.5.3 Valuation of Options

The valuation of options can be thought of as two parts: (1) modelling the price of the underlying, and (2) calculating the option payoff based on the price of the underlying.

Generally, there are three methods to value options: (1) the closed-form method, (2) the lattice method, and (3) the Monte Carlo simulation method.

With respect to modelling the price of the underlying, all three methods share similar assumptions as to how the price of the underlying behaves. However, each method differs in the techniques in modelling.

With respect to the calculation of the option payoff, the closed-form method is generally suitable for simple exercise styles such as European options and a constant exercise price. In comparison, the lattice method and the Monte Carlo simulation method are more suitable for complex exercise styles such as American and Bermudan options and variable exercise prices. Both methods allow more customization in the calculation of the option payoff.

It's important to note that all three methods should yield the same results if valuing a simple European option. This point is demonstrated through **Examples 5.4, 5.5, 5.6, and 5.7**, which value the same European call option under each method. For simplicity, the discussion focuses on stock options on non-dividend-paying stocks.

5.5.3.1 Closed-Form Method (the Black-Scholes Formula)

The most commonly used closed-form method is the Black-Scholes formula, which is the focus of this section.

The Black-Scholes formula is widely used by market participants to estimate the theoretical value of European options. It's also simple to use once a valuator understands the concept behind the formula — simply plug in the variables.

Overall, the Black-Scholes formula estimates the value of an option based on the probability that the option will be in the money at the expiration date, assuming the price of the underlying is random and follows a normal distribution during the life of the option. The mathematical induction and explanations⁴ are beyond the scope of this module.

4 Refer to the optional reading “The Pricing of Options and Corporate Liabilities” for full details on arriving at the Black-Scholes formula.

The Black-Scholes formula operates under six major assumptions:

- A European style exercising (on the expiration date);
- The price of the underlying follows a normal distribution;
- The stock does not pay a dividend;
- The volatility of the underlying is constant;
- The risk-free rate is constant; and
- The market is efficient, and there are no transaction costs or taxes.

The Black-Scholes formula uses the put-call parity as discussed in **Section 5.5.2.3** to derive the value of a call option and a put option, as denoted in Formula 16 and Formula 17, respectively. Formula 18 and Formula 19 show the two inputs into the Black-Scholes formula.

Formula 16: The Black-Scholes Formula for Call Options

$$C_t = S_t \times N(d_1) - X e^{-rt} \times N(d_2)$$

Formula 17: The Black-Scholes Formula for Put Options

$$P_t = X \times e^{-rt} \times N(-d_2) - S_t \times N(-d_1) \quad \text{***see footnote}$$

Formula 18: Calculation of d_1 in the Black-Scholes Formula

$$d_1 = \frac{\ln\left(\frac{S_t}{X}\right) + t \times \left(r + \frac{\sigma^2}{2}\right)}{\sigma \sqrt{t}}$$

Formula 19: Calculation of d_2 in the Black-Scholes Formula

$$d_2 = d_1 - \sigma \times \sqrt{t}$$

Where:

C_t = the value of a call option at time t

P_t = the value of a put option at time t

S_t = the value of the underlying at time t

$N(x)$ = the standard normal cumulative distribution function

X = the exercise price

r = the risk-free rate

t = the remaining term to maturity (in years)

σ = the annualized volatility of the underlying

Notably, the option value calculated using the Black-Scholes formula is most sensitive to the assumed volatility and remaining term to maturity. The higher the volatility, the higher the option value as there is more variability in the underlying share price, such that the probability of the option being in the money is higher. Likewise, the longer the remaining term to maturity, the higher the option value as there is a higher chance of the option being in the money for a longer time frame.

Most of the inputs to the Black-Scholes formula are directly observable, except for volatility. Volatility is a measure of the degree of variation of the trading prices of the underlying over time, usually calculated as the standard

*** $P_t = X \times e^{-rt} \times N(-d_2) - S_t \times e^{-qt} \times N(-d_1)$ **NOTE:** The "q" in the equation is for cumulative dividends that are beyond the scope of the module. Please assume that the "q" term will be 0 for the purposes of this Level.

deviation of logarithmic returns. In simple terms, volatility indicates how high and how low the prices of the underlying can go. Often, the historical trading prices of the underlying are used as a proxy, also known as the historical volatility. Historical volatility can be inferred using Formula 20:

Formula 20: Volatility

$$\sigma = \sqrt{252 \times \frac{\sum (P_{avg} - P_i)^2}{n}}$$

Where:

σ = the annualized volatility of the underlying

252 = the number of trading days in a year

p_{avg} = the average price of the underlying in the year

p_i = the daily price of the underlying in the year

n = the number of daily prices of the underlying

*Note: For **Level III** course assignments and exams, you will be provided with values of $N(d_1)$, $N(d_2)$, and volatility (σ).*

There are modifications to the Black-Scholes formula, which incorporate dividend yield⁵ and dilution impacts. These expansions of the Black-Scholes formula are beyond the scope of this module.

Example 5.4: Valuation of a European Call Option Using the Black-Scholes Formula

At time 0, you are looking to buy a European call option on a stock and would like to know the theoretical value of the call option. Salient terms of the European call option are as follows:

- Share price at time 0 (S_t): \$100;
- Exercise price (X): \$110;
- Term to maturity in years (t): 1;
- Risk-free rate (r): 5%; and
- Volatility (σ): 20%.

Solution:

Step 1 — Using Formula 18, calculate the value of d_1 as follows:

$$d_1 = \frac{\ln\left(\frac{S_t}{X}\right) + t \times \left(r + \frac{\sigma^2}{2}\right)}{\sigma \sqrt{t}}$$

$$d_1 = \frac{\ln\left(\frac{100}{110}\right) + 1 \times \left(5\% + \frac{(20\%)^2}{2}\right)}{20\sqrt{1}}$$

$$d_1 = -0.126551$$

Step 2 — Using Formula 19, calculate the value of d_2 as follows:

$$d_2 = d_1 - \sigma \times \sqrt{t}$$

5 Refer to the optional reading “Theory of Rational Option Pricing” for more details on the Black-Scholes-Merton formula, which incorporates constant dividend yield in option valuation.

$$d_2 = -0.126551 - 20\% \times \sqrt{1}$$

$$d_2 = -0.326551$$

Step 3 — To calculate the standard normal cumulative distribution function $N(X)$ in Formula 16, use the following Excel formula to calculate $N(d_1)$ and $N(d_2)$:

$$N(d_1) = \text{Norm.S.Dist}(-0.126551, \text{True}) = 0.449647$$

$$N(d_2) = \text{Norm.S.Dist}(-0.326551, \text{True}) = 0.372004$$

Step 4 — Using Formula 16, calculate the value of the European call option as follows:

$$C_t = S_t \times N(d_1) - Xe^{-rt} \times N(d_2)$$

$$C_t = 100 \times 0.449647 - 110 \times e^{-5\% \times 1} \times 0.372004$$

$$C_t = 6.04$$

Conclusion: Based on the Black-Scholes formula, the European call option value is estimated to be \$6.04 at time 0.

Valuation of an Employee Stock Option Plan (ESOP) Using the Black-Scholes Formula

Often, a valuator is asked to estimate the value of an ESOP for financial reporting purposes. An ESOP typically has the following unique aspects that a valuator would need to account for in its valuation:

- There is usually a vesting period attached to an ESOP during which the option cannot be exercised;
- There is a probability that the employee will leave the company during the vesting period — this will typically trigger a forfeiture of the option granted;
- There is a probability that the employee will leave the company after the vesting date and prior to the maturity of the option — this will trigger a forfeiture of the option if not exercised;
- There can be restrictions on transfer of the ESOP after the vesting date; and
- There can be a dilutive effect on the share price when an ESOP is exercised.

In estimating the expected life of the ESOP, a valuator would need to account for the vesting period as well as forfeiture (the first three points above) by looking at historical behaviours. A discount for lack of marketability may be applied (on top of the option value calculated using the Black-Scholes formula) to account for any restrictions on transfer of the ESOP. In most cases, the dilution effect does not need to be taken into account as the traded share price should reflect the effect of dilution once the announcement of the ESOP grant is made. However, entities planning major unanticipated ESOP grants should consider the application of the dilution effect if it is unreasonable to assume that the share price already reflects the market's assessment of the effect of the grant on the value of the shares.

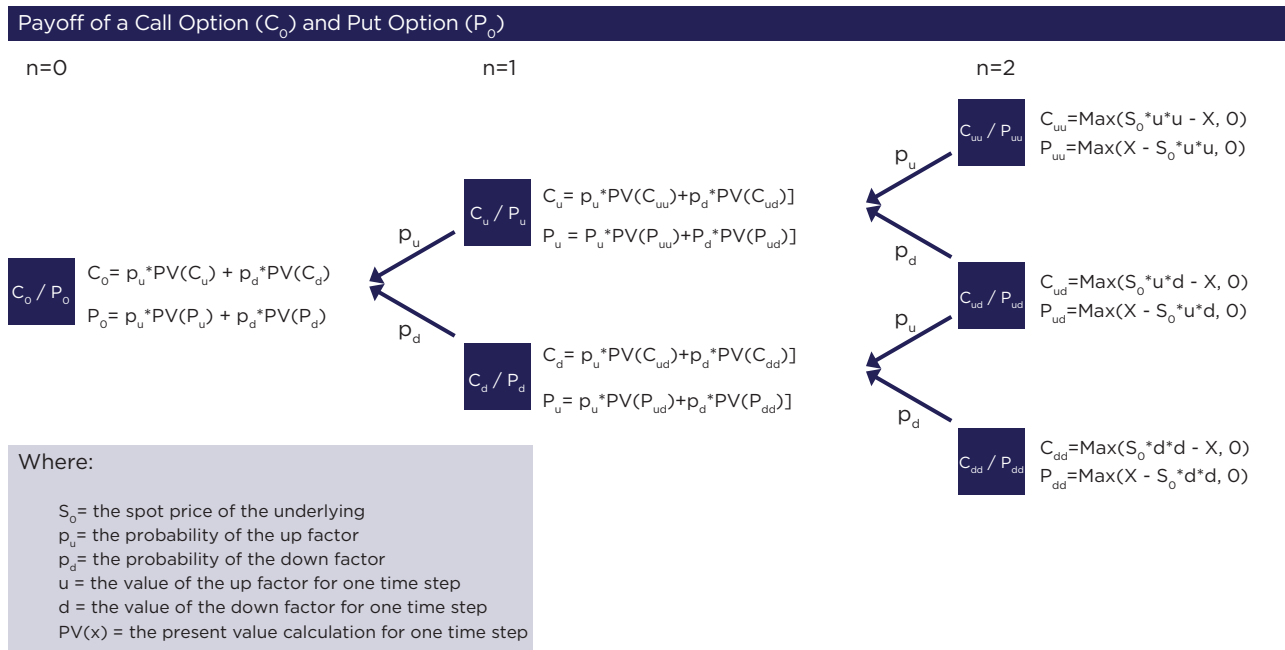
Note: Although you should be able to demonstrate an understanding of the unique aspects of an ESOP, you will not be asked to calculate an ESOP's value.

5.5.3.2 The Lattice Method (the Binomial Tree Method)

While the Black-Scholes formula is suitable for simple exercise styles such as European options, the lattice method is more suitable for complex exercise styles such as American and Bermudan options to take into account the varying exercise dates that are inherent in the option.

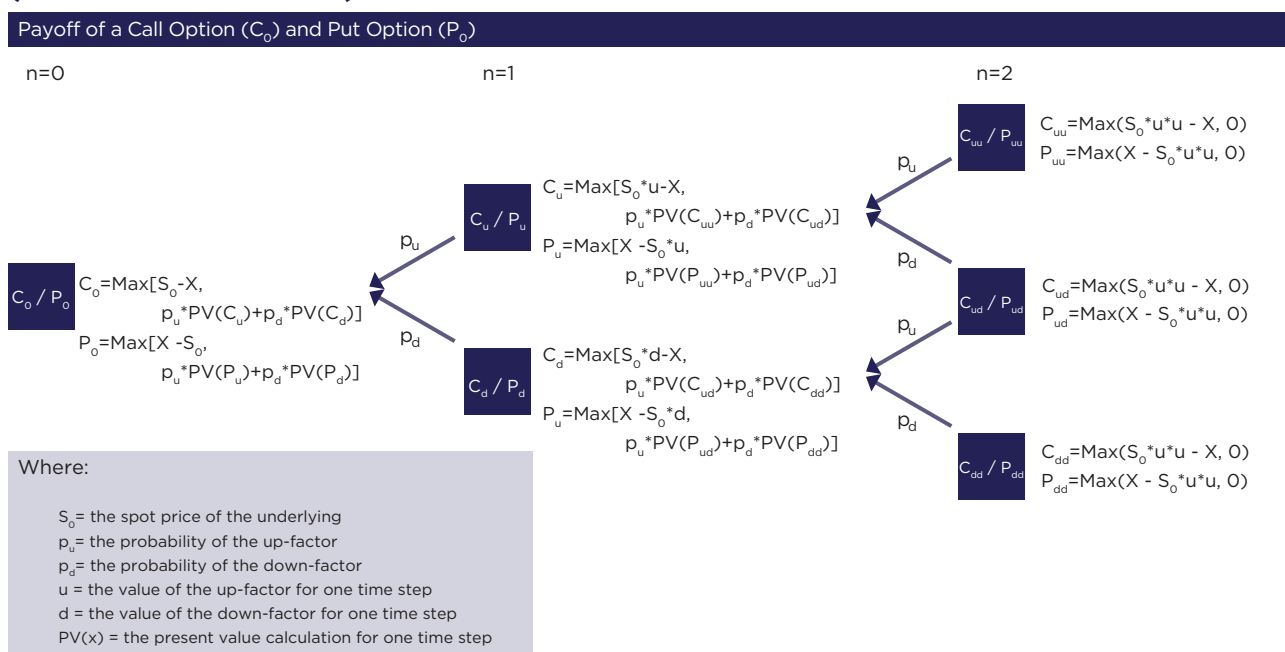
In simple terms, the lattice method to value options involves building a “tree” consisting of two components: (1) the nodes, which represent the value of the underlying at a discrete point in time, and (2) the branches, which represent the directions of the value of the underlying for the next time period.

Exhibit 5.3: The Binomial Tree — European Options — Calculation of the Option Payoff (Backward Calculation)



For American options, since the payoff can be exercised at any time prior to the expiration date, it is calculated at each time step. To determine whether the option will be exercised at each time step, compare the exercise price to the price of the underlying. Starting from the expiration date ($n=2^8$), calculate the payoff at each of the nodes. These values are discounted back one period and compared to the payoff at the time step before ($n=1$). Repeat this process at each time step until time 0. **Exhibit 5.4** presents the binomial tree method to calculate the option payoff for American options.

Exhibit 5.4: The Binomial Tree — American Option — Calculation of the Option Payoff (Backward Calculation)



8 Assuming a two-step binomial tree calculation.

Formulas Used in the Binomial Tree Method

There are five computed inputs into the binomial tree method: (1) the up factor as denoted in Formula 21, (2) the down factor as denoted in Formula 22, (3) the probability of the up factor as denoted in Formula 23, (4) the probability of the down factor as denoted in Formula 24, and (5) the present value factor for each time step as denoted in Formula 25.

Formula 21: Calculation of the Up Factor in the Binomial Tree Method

$$u = e^{\sigma \times \sqrt{t/n}}$$

Formula 22: Calculation of the Down Factor in the Binomial Tree Method

$$d = \frac{1}{u}$$

Where:

u = the up factor

d = the down factor

σ = the annualized volatility of the underlying

t = the remaining term to maturity

n = the number of nodes or time steps

Formula 23: Calculation of the Probability of the Up Factor in the Binomial Tree Method

$$p_u = \frac{e^{r \times t/n} - d}{u - d}$$

Formula 24: Calculation of the Probability of the Down Factor in the Binomial Tree Method

$$p_d = 1 - p_u$$

Formula 25: Calculation of the Present Value Factor for One Time Step in the Binomial Tree Method

$$PV(t) = e^{-r \times t/n}$$

Where:

p_u = the probability of the up factor

p_d = the probability of the down factor

r = the risk-free rate

t = the remaining term to maturity in years

n = the number of nodes or time steps

Example 5.5: Valuation of a European Call Option Using a Two-Step Binomial Tree Method

Recall from **Example 5.4** that you are looking to buy a European call option on a stock and would like to know the theoretical value of the call option (or the premium) you need to pay at time 0. Salient terms of the European call option are as follows:

- Share price at time 0 (S_t): \$100;
- Exercise price (X): \$110;
- Term to maturity in years (t): 1;

- Risk-free rate (r): 5%;
- Volatility (σ): 20%; and
- Time step (n): 2.

Solution:

This example uses the binomial tree method. For simplicity, it uses a two-step binomial tree to value the European call option.

Step 1 – Calculate the up factor using Formula 21:

$$u = e^{\sigma \times \sqrt{1/n}} = e^{20\% \times \sqrt{1/2}} = 1.151910$$

Step 2 – Calculate the down factor using Formula 22:

$$d = \frac{1}{u} = \frac{1}{1.151910} = 0.868123$$

Step 3 – Calculate the probability of the up factor using Formula 23:

$$p_u = \frac{e^{r \times 1/n} - d}{u - d} = \frac{1.025315 - 0.868123}{1.151910 - 0.868123} = 0.553908$$

Step 4 – Calculate the probability of the down factor using Formula 24:

$$p_d = 1 - p_u = 1 - 0.553908 = 0.446092$$

Step 5 – Model the price of the underlying according to **Exhibit 5.2:**

$$S_u = S_0 \times u = 100 \times 1.151910 = 115.190991$$

$$S_d = S_0 \times d = 100 \times 0.868123 = 86.812345$$

$$S_{uu} = S_0 \times u \times u = 100 \times 1.151910 \times 1.151910 = 132.689644$$

$$S_{ud} = S_0 \times u \times d = 100 \times 1.151910 \times 0.868123 = 100.000000$$

$$S_{dd} = S_0 \times d \times d = 100 \times 0.868123 \times 0.868123 = 75.363832$$

Step 6 – Calculate the option payoff at the expiration date (n=2) using Formula 13 and according to **Exhibit 5.2:**

$$C_{uu} = \text{Max}(S_{uu} - X, 0) = \text{Max}(132.689644 - 110, 0) = \text{Max}(22.689644, 0) = 22.689644$$

$$C_{ud} = \text{Max}(S_{ud} - X, 0) = \text{Max}(100.000000 - 100, 0) = \text{Max}(0, 0) = 0$$

$$C_{dd} = \text{Max}(S_{dd} - X, 0) = \text{Max}(75.363832 - 100, 0) = \text{Max}(-24.636168, 0) = 0$$

Step 6 – Calculate the option value at n=1 according to **Exhibit 5.2:**

$$C_u = p_u \times \text{PV}(C_{uu}) + p_d \times \text{PV}(C_{ud})$$

$$C_u = 0.553908 \times 22.689644 \times e^{-5\% \times 1/2} + 0.446092 \times 0 \times e^{-5\% \times 1/2}$$

$$C_u = 12.257677$$

$$C_d = p_u \times \text{PV}(C_{ud}) + p_d \times \text{PV}(C_{dd})$$

$$C_d = 0.553908 \times 0 \times e^{-5\% \times 1/2} + 0.446092 \times 0 \times e^{-5\% \times 1/2}$$

$$C_d = 0$$

Step 7 – Calculate the option value at n=0 according to **Exhibit 5.2:**

$$C_0 = p_u \times PV(C_u) + p_d \times PV(C_d)$$

$$C_0 = 0.553908 \times 12.257677 \times e^{-5\% \times \frac{1}{2}} + 0.446092 \times 0 \times e^{-5\% \times \frac{1}{2}}$$

$$C_0 = 6.621993$$

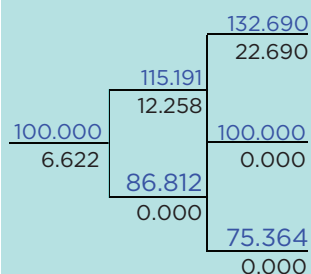
The graph below summarizes the calculation from steps 1 to 7.

Strike price:	110.00	Volatility:	20.0 %
Underlying asset price:	100.00	Interest rate:	5.00 %
Days to expiration:	365	Days to ex-dividend: Enter days for discrete dividend; leave blank or zero for yield	0
Dividend: Enter an amount (\$.cc) for discrete dividend, or an annual yield (eg 3.5 = 3.5% pa)	0.00	Exercise style:	<input type="radio"/> American <input checked="" type="radio"/> European
Option type:	<input checked="" type="radio"/> Call <input type="radio"/> Put	Calculate	
No. Tree Steps (1- 150): (max. 10 displayed)	2		

Cox, Ross & Rubinstein Binomial Tree for European Call (price: 6.6220)

Values at each node:

Above line: underlying asset price
 Below line: option price
 Bold: Amended price from early exercise



Days from time now:
 0.00 182.50 365.00

Conclusion: Based on the two-step binomial tree method, the European call option value is estimated to be \$6.62 at time 0.

The Binomial Tree Method and Black-Scholes Formula Convergence

In **Example 5.4**, the output from the Black-Scholes formula is \$6.04, and in **Example 5.5**, the output from the two-step binomial tree method is \$6.62 at time 0, a 10% difference in value. This section looks at what causes this difference and how the two methods can converge.

Starting with the binomial tree method, recall **Example 5.5**, which set up a two-step binomial tree. That is, it is assumed the underlying stock price only moved twice in a year (or during the life of the option), once at the six-month point and the other at the 12-month point. At each node, the underlying stock price will either go up or down once. As such, the two-step binomial tree yielded three prices of the underlying at the expiration date. Simply put, there isn't enough movement in the underlying stock price. As such, the basis of the option valuation (the possible stock prices) is not sufficient.

The general rule of thumb is, the more time steps a binomial tree has, the more underlying stock prices will be calculated, and the more accurate the option valuation is.

In addition, as more underlying stock prices are calculated, the totality of the stock prices will resemble a normal distribution. Most of the stock prices will be around the average, with a limited number of extremes on the high end and low end of the value spectrum. This pattern is similar to the Black-Scholes formula assumption that the underlying stock prices follow a normal distribution.

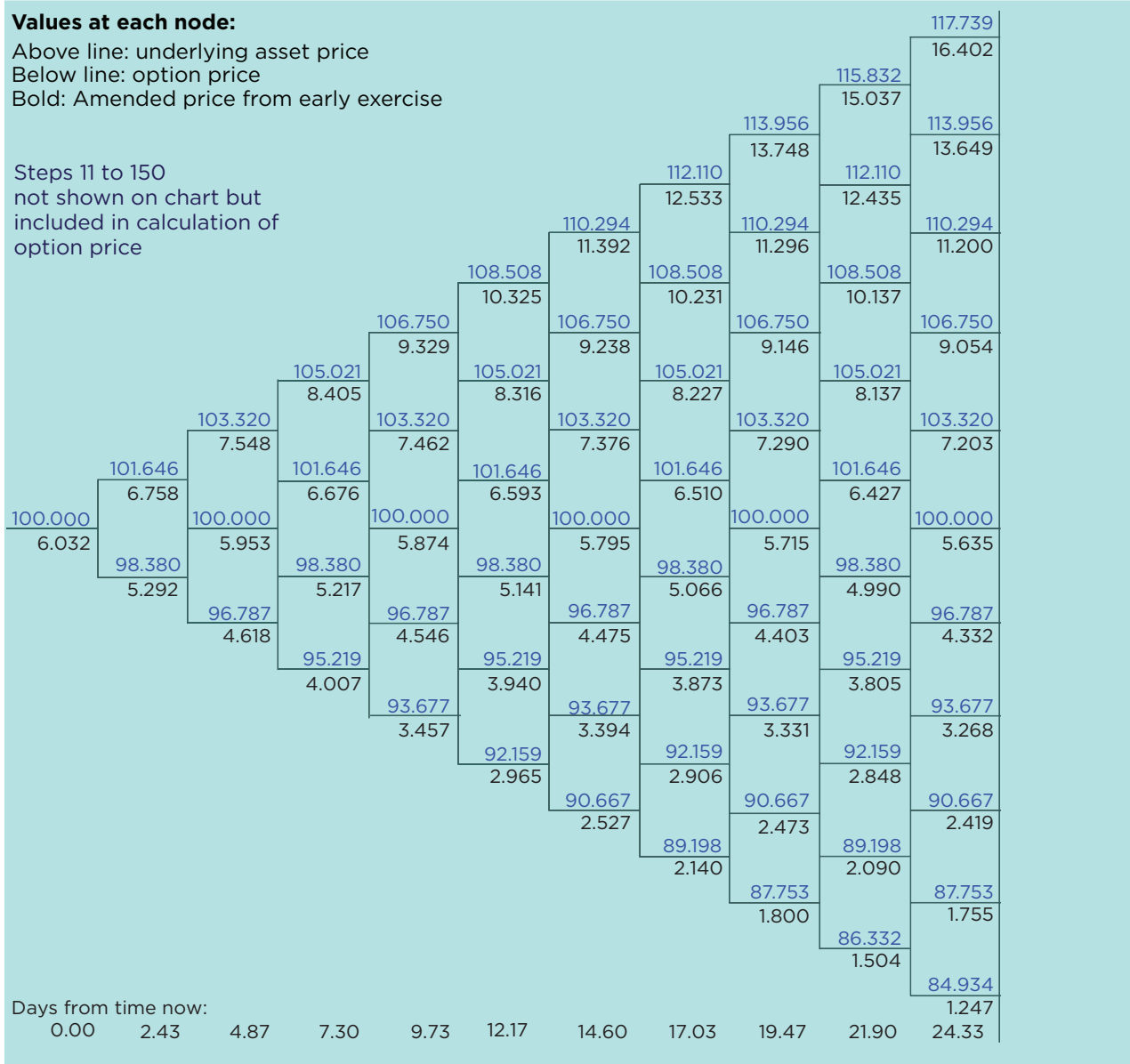
Example 5.6 demonstrates the convergence between the binomial tree method and the Black-Scholes formula.

Example 5.6: Valuation of a European Call Option Using a Multiple-Step Binomial Tree Method

Similar to **Example 5.5**, this example uses the binomial tree method to estimate the value of the European call option at time 0. This time, the number of steps is expanded to 150 (from two steps used in the previous example). That is, the underlying stock price moves every 2.5 days. The graph below summarizes the calculation.

Strike price:	110.00	Volatility:	20.0 %
Underlying asset price:	100.00	Interest rate:	5.00 %
Days to expiration:	365	Days to ex-dividend: Enter days for discrete dividend; leave blank or zero for yield	0
Dividend: Enter an amount (\$.cc) for discrete dividend, or an annual yield (eg 3.5 = 3.5% pa)	0.00	Exercise style:	<input type="radio"/> American <input checked="" type="radio"/> European
Option type:	<input checked="" type="radio"/> Call <input type="radio"/> Put	Calculate	
No. Tree Steps (1- 150): (max. 10 displayed)	150		

Cox, Ross & Rubinstein Binomial Tree for European Call (price: 6.0320)



Conclusion: Based on the 150-step binomial tree method, the European call option value is estimated to be \$6.03 at time 0. Compared to the Black-Scholes formula's output of \$6.04, the difference in value is 0.2%, which is insignificant.

5.5.3.3 Monte Carlo Simulation Method

While the Black-Scholes formula is suitable for simple exercise styles such as European options, and the lattice method is suitable for American and Bermudan options to address features such as varying exercise dates, the Monte Carlo simulation method is most suitable for customized options with both varying exercise prices and varying exercise dates. For example, if the exercise price changes depending on certain metrics or the timing of the exercise, the Monte Carlo simulation method is equipped with the flexibility to customize the calculation of exercise prices and payoffs at each period and scenario.

The Monte Carlo simulation method is a broad class of computational algorithms that rely on repeated random sampling to obtain numerical results. In simple terms, it is a random number simulator with capabilities to compute user-defined calculations. The user can also define how the end result of the simulation looks — for example, whether it follows a normal distribution.⁹

For simplicity, the discussion focuses on applying the Monte Carlo simulation method to value a European option on non-dividend-paying stocks. Assume the price of the underlying follows a normal distribution, similar to that of the Black-Scholes formula.

Overall, the Monte Carlo simulation method in option pricing consists of three steps:

1. Calculate (or simulate) the potential future prices of the underlying at the expiration date.
2. Calculate the payoff of the option for each of the potential underlying prices.
3. Discount the payoffs back to time 0 and average them to determine the option value.

The Monte Carlo simulation method, in essence, is similar to the lattice method (binomial tree method), whereby the future prices of the underlying are modelled out, then the corresponding option payoff is calculated. The difference lies in the technique in modelling the prices of the underlying.

Note: Although you should demonstrate an understanding of the characteristics of a Monte Carlo simulation method, you will not be asked to perform a calculation using this approach. Therefore, no formula is provided.

Example 5.7 demonstrates the application of the Monte Carlo simulation method in calculating the option value of a European call option. The purpose is to show a convergence between the three methods — that is, in valuing a simple European option, with the same assumptions, the Black-Scholes formula, the binomial tree method, and the Monte Carlo simulation method yield similar outputs.

Example 5.7: Valuation of a European Call Option Using the Monte Carlo Simulation Method

Recall from **Example 5.4** that you are looking to buy a European call option on a stock and would like to know the theoretical value of the call option (or the premium) you need to pay at time 0. Salient terms of the European call option are as follows:

- Share price at time 0 (S_t): \$100;
- Exercise price (X): \$110;
- Term to maturity in years (t): 1;
- Risk-free rate (r): 5%;
- Volatility (σ): 20%; and
- Time step (n): 2.

⁹ Other common distribution patterns that can be defined in a Monte Carlo simulation include: (1) lognormal distribution (positively skewed and asymmetrical), (2) uniform distribution (user defines a range of possible values and all values have an equal chance of occurring within the range), (3) triangular distribution (user defines minimum, most likely, and maximum values), (4) discrete distribution (user defines specific values and the likelihood of occurrence).

Solution:

This example uses the Monte Carlo simulation method performed in Excel.

Step 1 – Calculate (or simulate) the potential future prices of the underlying using the geometric Brownian motion¹⁰ 25,000 times, which gives 25,000 different future prices of the underlying at the expiration date.

Step 2 – Calculate the option payoff for each of the 25,000 prices of the underlying calculated in Step 1.

Step 3 – Calculate the option value by taking the average of the present value¹¹ of all the option payoffs.

Below is an extract of the first 20 simulations as well as a summary statistic of the simulated prices of the underlying and the corresponding option payoffs.

Outputs (Future Value):			Summary (Future Value):		Option Value (Present Value):	
Trial	Simulated Share Price	Call Option Expiry Value			Call Value	6.05
1	90.79	-	Mean Option Payoff	6.36		
2	62.71	-	Min Option Payoff	-		
3	111.93	1.93	Max Option Payoff	138.54		
4	87.07	-				
5	56.16	-				
6	88.85	-	Mean Share Value	105.24		
7	88.99	-	Min Share Value	42.80		
8	84.16	-	Max Share Value	248.54		
9	132.69	22.69				
10	132.59	22.59				
11	68.51	-				
12	115.05	5.05				

10 This means the price of the underlying is random and follows a normal distribution pattern. Specifically, the following formula is used:

$$S_t = S_0 \times e^{\left(\frac{r - \frac{\sigma^2}{2}}{t} + \sigma \times \sqrt{t} \times \text{IN}(\text{Rand})\right)}$$

Where:

S_t = the value of the underlying at time t

S_0 = the value of the underlying at time 0

r = the risk-free rate

σ = the annualized volatility of the underlying

t = the remaining term to maturity (in years)

$\text{IN}(x)$ = the inverse of the standard normal cumulative distribution in Excel

Rand = a random number in Excel

11 Present value calculation as follows: $\$6.36 \times \exp(-5\% \times 1) = \6.05 .

Outputs (Future Value):			Summary (Future Value):		Option Value (Present Value):	
Trial	Simulated Share Price	Call Option Expiry Value			Call Value	6.05
13	96.40	-				
14	90.71	-				
15	102.84	-				
16	72.65	-				
17	92.75	-				
18	87.89	-				
19	76.62	-				
20	96.49	-				

That is, based on 25,000 simulations, the average (mean) share price at the expiration date is \$105.24, with a maximum of \$248.54 and a minimum of \$42.80. The corresponding option payoff in future value averaged \$6.36 with a maximum of \$138.54 and a minimum of \$0. The average option payoff of \$6.36 is then discounted back to time 0 using the risk-free rate — this gives the option value of \$6.05 at time 0.

Conclusion: Based on the Monte Carlo simulation method, the European call option value is estimated to be \$6.05 at time 0. Comparing to the output from the Black-Scholes formula of \$6.04, the difference is 0.2% in value, which is insignificant.

5.6 Credit Valuation Adjustment (CVA) and Debit Valuation Adjustment (DVA)

For financial reporting purposes, IFRS 13 *Fair Value Measurement* provides a framework for determining fair value. This framework lays out the factors to be considered and the key principles to be applied in measuring all assets and liabilities, including financial instruments.

Specifically, IFRS 13 requires the credit risk of a counterparty and the entity's own credit risk to be taken into account in valuing financial instruments.

The valuation of debt instruments as discussed in **Module 4** considers an entity's own credit risk in selecting an appropriate discount rate. There is no counterparty risk as debt instruments are unilateral contracts in which only the debtholders are exposed to credit risk. Therefore, no further adjustment is required.

Derivative instruments, on the other hand, are valued under a risk-neutral framework, and the valuation excludes consideration of credit risks. Therefore, an adjustment is required to consider the counterparty credit risk, also known as the CVA, and the entity's own credit risk, also known as the DVA. CVA and DVA are, in essence, the expected credit loss valuation adjustments to the risk-neutral value of the derivatives, as discussed in this module.

CVA and DVA are relatively new requirements under the accounting standards. As such, there is no standardized approach to estimating CVA and DVA among market participants. Large financial institutions (like banks) that are exposed to significant CVA and DVA adjustments typically use sophisticated methods that simulate different scenarios of defaults and the expected credit losses associated with each scenario. Refer to **Module 6, Example 6.1** for an example of application of CVA.

For banks who are market makers of derivative instruments, the consideration for pricing adjustments also includes the funding valuation adjustment, the margin valuation adjustment, and the capital valuation adjustment. Collectively with CVA and DVA, the various components of pricing adjustments are known as XVAs.

The funding valuation adjustment refers to the cost associated with funding an uncollateralized derivative position. It can be thought of as two components: (1) a funding cost adjustment that reflects the cost of funding derivatives when they have a positive value, and (2) a funding benefit adjustment that reflects the benefit of holding derivatives that have a negative value. The funding valuation adjustment is the net cost combining the funding cost adjustment and funding benefit adjustment.

Margin valuation adjustment refers to the cost associated with the initial margin posted with a clearing house, in the case where a derivative is cleared through a central clearing party (which is a common practice these days).

Capital valuation adjustment refers to the cost to the bank associated with capital requirements for having the derivative exposure throughout the life of the contract. This concept is rooted in the capital adequacy requirements imposed on a bank's operations, whereby each product offering has a funding requirement, and as such, by offering derivative instruments to clients, the bank incurs capital requirement costs.

Note: Although you should demonstrate an understanding of the concepts of CVA and DVA, you will not be asked to perform a calculation.

Appendix 5A: The Put-Call Parity

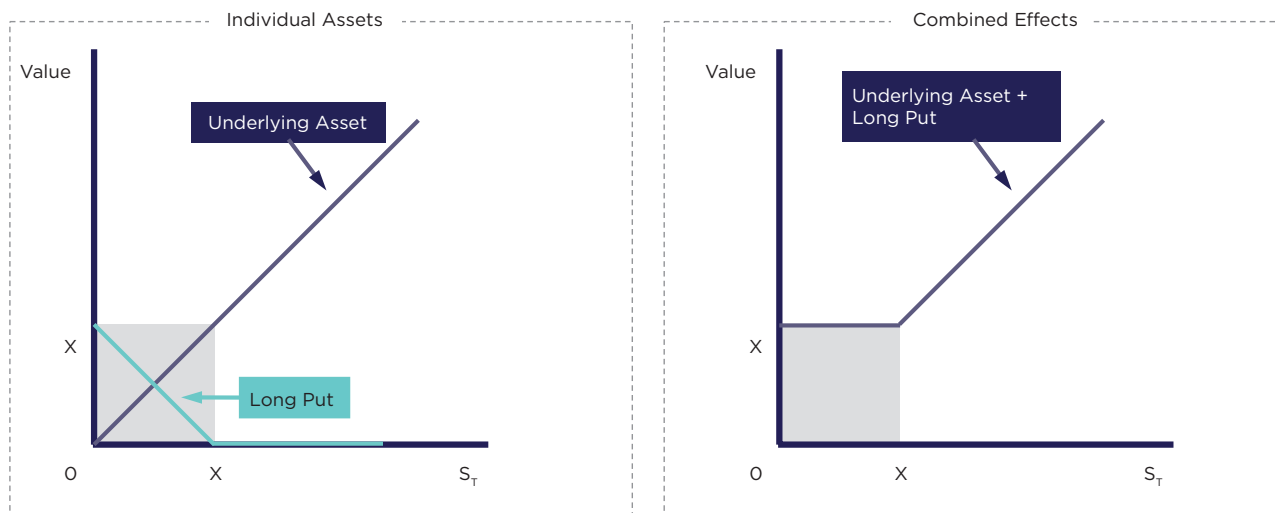
Recall that put-call parity is the relationship between the price of a call option and the price of its corresponding put option. This appendix provides examples to explain this concept. For simplicity, this appendix uses European style options. That is, the call and put option can only be exercised on the expiration date.

Suppose Investor A owns an asset that has a current price of S_0 . The asset makes no cash payments and has no carrying costs. The end of the holding period is time T , at which point the asset will be worth S_T . Concerned by the possibility that S_T will decline, Investor A buys a put option with an exercise price of X , which can be used to sell the asset for X at time T . This put option is worth P_0 at time 0 . Combined with the value of the asset, the investor's current position is worth $S_0 + P_0$, which is the investor's money at risk. This position of holding the asset and a put is called a protective put.

At expiration, the value of the asset is S_T . The value of the put will be either zero or $X - S_T$. If the asset increases in value such that $S_T \geq X$, then the overall position is worth S_T . The asset has appreciated in value, and the investor will let the put expire. If the asset value declines to the point at which $S_T < X$, the asset is worth S_T , and the put is worth $X - S_T$, for a total of X . In other words, the investor would exercise the put, selling the asset for X , which exceeds the asset's value at time t (S_T).

In summary, Investor A benefits from unlimited upside potential, with the downside value protected at X . **Exhibit 5A.1** presents the payoff of a protective put. The graph on the left illustrates the underlying asset and the put. The graph on the right shows their combined effects.

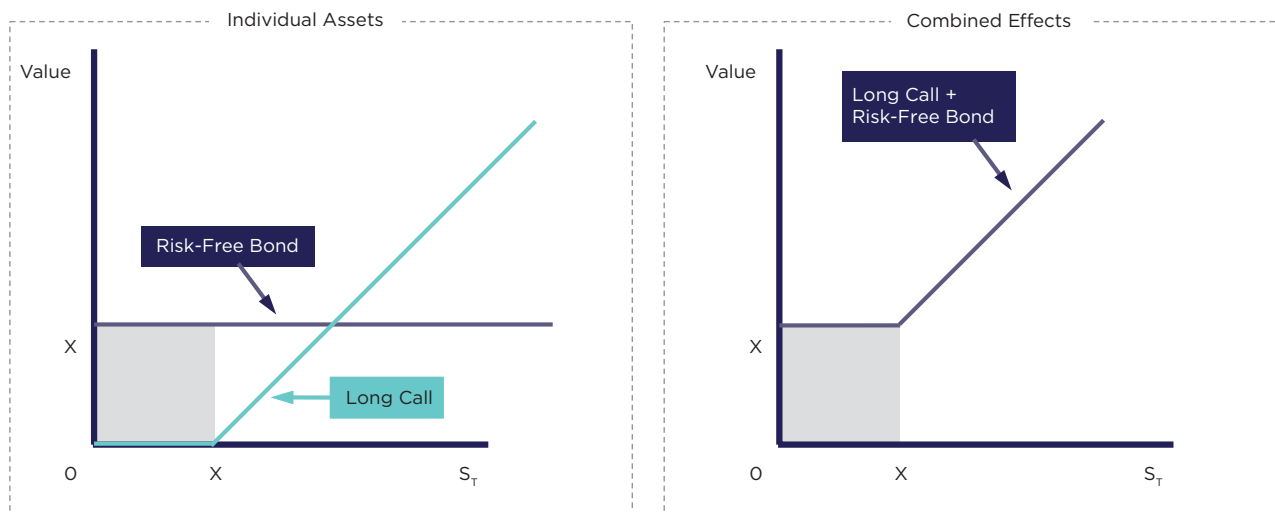
Exhibit 5A.1: Protective Put (Long Asset Plus Long Put)



Consider Investor B. At time 0 , this investor buys a call option on this asset with an exercise price of X that expires at T and a risk-free zero-coupon bond with a face value of X that matures at T . The call costs C_0 , and the bond costs the present value of X , which is $X/(1+r)^T$. Thus, Investor B invested a total of $C_0 + X/(1+r)^T$. This position is known as a fiduciary call.

If the underlying price exceeds the exercise price at expiration, the call will be worth $S_T - X$, and the bond will mature and pay a value of X . These values combine to equal S_T . Suppose the underlying price does not exceed the exercise price at expiration. In that case, the call expires worthless, and the bond is worth X for a combined value of X . **Exhibit 5A.2** shows the performance of the fiduciary call. The graph on the left shows the call and bond, and the graph on the right shows the combined effects of the two strategies.

Exhibit 5A.2: Fiduciary Call (Long Call Plus Risk-Free Bond)



Comparing **Exhibit 5A.1** with **Exhibit 5A.2** shows that a protective put and a fiduciary call produce the same result. Recall that Investor A committed funds of $S_0 + P_0$, while Investor B committed funds of $C_0 + X/(1+r)^T$. If both investors receive the same payoffs at time T regardless of the asset price at T, the amounts they invest at time 0 have to be the same. Therefore, the put-call parity is arrived at, as stated in Formula 15 and restated below:

Formula 15:

$$S_0 + P_0 = C_0 + \frac{X}{(1+r)^T}$$

Where:

S_0 = the spot price of the underlying at inception

P_0 = the value of the put option at inception

C_0 = the value of the call option at inception

X = the exercise price established at inception

T = the time to the expiration date

r = the risk-free rate

Appendix 5B: LIBOR Reform

What Is the London Interbank Offered Rate (LIBOR)?

LIBOR is a set of benchmark interest rates intended to represent the level at which major global banks estimate to borrow from and lend to one another in the international interbank market for short-term loans on an unsecured basis. LIBOR is calculated and published daily across five currencies (USD, GBP, EUR, CHF, and JPY) and seven tenors (overnight, 1-week, 1-month, 2-month, 3-month, 6-month, and 12-month). LIBOR is used as a rate index in a wide range of products globally, most notably derivative products as well as corporate loans and bonds.

Why Is LIBOR Going Away?

Despite its status as the global benchmark for interest rates, the market that LIBOR seeks to measure is no longer active. Therefore, LIBOR sometimes behaved in unpredictable and volatile ways, such as during the financial crisis in 2007–2008. Moreover, LIBOR is a survey-based rate calculated based on submissions from participating banks, which is subject to manipulation. Most notable was the LIBOR-manipulation scandal in September 2012, which triggered the global LIBOR reform to use a transaction-based risk-free rate as the replacement benchmark.

When Is LIBOR Going Away?

The discontinuation dates for LIBOR are as follows:

- December 31, 2021, for 1-week and 2-month USD LIBOR;
- December 31, 2021, for GBP, EUR, CHF, and JPY LIBOR; and
- June 30, 2023, for overnight, 1-month, 3-month, 6-month, and 12-month USD LIBOR.

What Alternative Rates Will Replace LIBOR?

The alternative rates, which are fully transaction-based, represent rates in each major currency where the credit, liquidity, and other risks are minimal (and therefore nearly risk free). Specifically, the alternative rates are calculated based on the cost of overnight repurchase transactions (repos) using treasury bills and bonds as collateral.

Table 1 summarizes the alternative rate in each of the major currencies that replaces the LIBOR.

Currency LIBOR	Alternative Rate	Administrator	Key Features
USD	SOFR (Secured Overnight Financing Rate)	Federal Reserve Bank of New York	Secured
GBP	SONIA (Sterling Overnight Index Average)	Bank of England	Unsecured
EUR	ESTR (Euro Short-Term Rate)	European Central Bank	Unsecured
CHF	SARON (Swiss Average Rate Overnight)	SIX Swiss Exchange	Secured
JPY	TONAR (Tokyo Overnight Average Rate)	Bank of Japan	Unsecured

How Are the Alternative Rates Different from LIBOR?

For simplicity, **Table 2** shows SOFR compared to USD LIBOR, as an example.

Table 2: SOFR vs. USD LIBOR	
SOFR	USD LIBOR
Rely entirely on transaction data	Survey-based
Overnight rates	Forward-looking rates with seven tenors ranging from 1-day to 1-year
Excludes credit and term risk	Includes credit and term risk
Considered a secured rate	Considered an unsecured rate

In short, SOFR and USD LIBOR measure different rates, and as such, there is a spread difference between SOFR and USD LIBOR. Generally, SOFR is a lower rate in comparison to USD LIBOR, as it excludes credit and term risk.

What Are the Implications?

To understand the implication of LIBOR reform, first the asset classes that reference LIBOR as the benchmark rate must be explained. Using USD LIBOR as an example and based on the volume traded in March 2018,¹² derivative products represent the largest asset class that reference USD LIBOR (approximately 96% of total volume), followed by business loans (2%), bonds (1%), securitization (1%), and consumer loans (1%).

In the U.S. market, the transition to SOFR is well underway.

For derivatives that are governed by the International Swaps and Derivatives Association Master Agreement, a standard document regularly used to govern over-the-counter derivatives transactions, the association has implemented a fallback provision to incorporate the mechanics of reference rate adjustments that came into effect in January 2021. Specifically, once USD LIBOR is discontinued, a fixed spread will be added to the alternative rate (risk-free rate), which is calculated based on the median of the spreads observed between SOFR and the USD LIBOR using a look-back period of five years. The intent is to make both parties “whole.” Most new issuances of derivatives (particularly swaps and futures) now reference SOFR as the benchmark.

For debt instruments, a fallback protocol similar to the International Swaps and Derivatives Association reference rate adjustment has been incorporated in new issuances since 2018. The debt market is also moving toward using SOFR as the benchmark rate for floating-rate note issuances from an adoption standpoint. Fannie Mae issued the first SOFR-linked floating-rate note in July 2018 with a notional amount of \$6 billion. As of January 2021, more than 60%¹³ of the private sector’s new issuances of floating-rate notes adopted SOFR as the reference rate.

The Canadian Dollar Offer Rate (CDOR) and the Canadian Overnight Repo Rate Average (CORRA)

The LIBOR equivalent in Canada is the CDOR. While CDOR is also survey-based, CDOR represents a committed bank lending rate, where the banks are willing to extend credit to existing corporate borrowers referencing CDOR plus a spread.

As part of the global LIBOR reform, the Bank of Canada adopts an alternative interest rate benchmark, CORRA, as a key risk-free interest rate benchmark in Canada.

CORRA is calculated based on actual transactions observed in the overnight repo market using the Government of Canada Treasury bills and bonds as collateral, like other alternative rates.

While currently there are no plans to discontinue CDOR, it is expected that its relevance will decline as markets globally move to adopt a transition-based risk-free rate as the benchmark. In February 2021, the Royal Bank of Canada issued the first floating-rate note referencing CORRA with a notional amount of \$500 million.

¹² Source: Federal Reserve Bank of New York, March 2018.

¹³ Source: Bloomberg.

Key Takeaway

For legacy instruments issued before January 2022 and referencing LIBOR as the benchmark, the fallback provision needs to be applied in computing the expected cash flows for the instrument. With respect to discount rate selection, since January 2022, the alternative rates have started being used as the basis for risk-free rates. An adjustment to the risk-free rate will be required in building up the discount rate used, particularly for debt instruments.

Glossary

American option	An option that can be exercised at any time up to the expiration date.
Bermudan option	An option that can be exercised prior to the expiration date but only at specific set dates.
Bilateral contract	A contract in which one party has to deliver the underlying and the other has to make full and timely payments. Examples of bilateral contracts include forwards, futures, and swaps.
Call option	An option to buy the underlying.
Carry or cost of carry	The net of the benefits and costs associated with holding a commodity.
Convenience yield	The benefit associated with holding a commodity.
Counterparty risk	The risk that the other party to a contract does not fulfill the contractual agreement.
Derivative instruments	A financial instrument in which the value of the instrument is derived from and dependent on the value of an underlying asset.
European option	An option that can only be exercised on the expiration date.
Intrinsic value	The value any derivative would have if it were exercised today.
Perfect hedge	Having a long position in the underlying and combining it with a short position in the derivative.
Put option	An option to sell the underlying.
Spot price	The current trading price of an asset in the market.
Swap rate	The fixed rate on an interest rate swap.
Time value	The value associated with the derivative between the current date and the expiration date.
Unilateral contract	A contract in which only one party (the seller) to the contract has a future commitment that, if broken, represents a breach of contract.
Underlying	The reference that the derivative contract was created on; an underlying can be an asset, event, or outcome.

MODULE 06

**VALUATION
OF FINANCIAL
INSTRUMENTS
— PART 3 —
CONTINGENT
CONSIDERATION
AND REAL OPTIONS**

Module Overview

Welcome to Module 6. This module provides an overview of contingent consideration, which is a customized financial instrument commonly seen in business combinations. The valuation methods available for contingent consideration and the application of each method is then discussed.

The module then discusses real options, which are economically valuable rights but not obligations to a company regarding business projects and investment opportunities. The module elaborates on evaluating real options using the option pricing methods developed for financial instruments as discussed in **Module 5**. The evaluation of real options is also known as real options thinking, which presents an alternative tool for management in assessing business projects.

By the end of this module, you will be able to:

- Describe the characteristics of contingent consideration;
- Identify approaches to value determination for contingent consideration;
- Explain fair value considerations that are unique to contingent consideration;
- Apply the scenario-based method and the option pricing method in valuing contingent consideration;
- Describe characteristics of real options;
- Explain how real options thinking can be used as a strategic tool for managerial decisions on business projects; and
- Apply the Black-Scholes-Merton formula and the Monte Carlo simulation method to evaluate real options.

The acronyms used throughout the module are:

CAPM Capital asset pricing model

EBIT Earnings before interest and taxes

EBITDA Earnings before interest, taxes, depreciation, and amortization

FY Fiscal year

LTFCF Long-term free cash flows

NPV Net present value

RMRP Required metric risk premium

WACC Weighted average cost of capital

Note: There is a glossary with key terms at the end of the module.

Optional Readings

The Appraisal Foundation. "Valuations in Financial Reporting Valuation Advisory 4: Valuation of Contingent Consideration," February 2019. <https://appraisalfoundation.sharefile.com/share/view/s89a36f672e344eeb>.

Leslie, Keith J., and Max P. Michaels. "The Real Power of Real Options." *The McKinsey Quarterly*, 1 June 2000. <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-real-power-of-real-options>.

6.1 Contingent Consideration

6.1.1 Overview of Contingent Consideration

Contingent consideration is the obligation of an acquirer to transfer additional assets or equity interests to the vendors of the acquired entity on meeting certain specified future events or conditions. Contingent consideration is usually negotiated as part of a business combination in which control of the acquiree is transferred. Contingent consideration is also known as an earnout. In this module, the term earnout is used interchangeably with contingent consideration.

Contingent consideration is typically included in the purchase consideration for one of the following purposes:

- To bridge a valuation gap — The buyer and seller in a transaction may have different views on the value of the acquiree, often due to different opinions regarding the outlook and risks for the acquired business or the likelihood of certain post-acquisition events. This gap can be bridged by agreeing on an upfront price consistent with the buyer's perception while providing for a contingent payment in the future if the seller's more optimistic outlook is achieved;
- To provide alternative financing — The buyer and seller can use contingent consideration to defer a portion of the purchase consideration to a later date;
- To retain a seller post-transaction — If the buyer wishes to retain a vendor after the transaction (e.g., to continue as an employee or consultant of the acquiree), contingent consideration can be used to engage and incentivize the seller for their continuous involvement and contribution; or
- To share risk and reward — The buyer may want to share the risk and reward relating to the business's future performance with the sellers.

Sometimes, contingent consideration is structured with a clawback clause that gives the acquirer the right to claw back previously transferred consideration if certain specified conditions are met.

In a financial reporting context, contingent consideration is required to be measured at fair value as of the acquisition date, under ASC 805, IFRS 3, and ASPE 1582.¹

6.1.2 Characteristics of Contingent Consideration

6.1.2.1 Underlying Metrics

Underlying metrics (or just metrics) refer to the criteria whose value or occurrence will determine the amount of contingent consideration to be paid. Typically, they are quantifiable measures the parties can use to track, monitor, and assess the success or failure of the acquired business post-acquisition.

The underlying metrics can be categorized into the following two types:

- **Financial metrics**, which are commonly reported financial performance figures (such as revenue, EBITDA, net income, etc.) or certain management metrics that are closely related to financial performance (such as the number of units sold, rental occupancy rates, etc.); and
- **Non-financial metrics** or milestone events such as regulatory approvals, resolution of legal disputes, execution of certain commercial contracts or retention of customers, the closing of a future transaction, achievement of technical milestones (such as completion of a product launch or a stage of product development or a construction project), and so on.

There could be one metric or multiple metrics dictating the payoff of contingent consideration.

¹ Financial Accounting Standards Board Accounting Standards Codification Topic 805 *Business Combinations*; IFRS 3 *Business Combinations*; ASPE Section 1582 *Business Combinations*

6.1.2.2 Payoff Structure

There is a broad spectrum of payoff structures for contingent consideration. On one end, the payoff may be structured simply as a fixed percentage of an underlying metric, also known as a linear payoff structure. For example, an earnout structure where a vendor receives 50% of the acquiree's EBITDA over a specified period of time is a linear payoff structure.

On the other end, payoff structures may be complex and include a minimum threshold in which no payment is made, a cap limiting the maximum payoff, a tiered structure in which different rates are assigned to each tier of performance, or carryforward provisions that link payment in one period to the performance in subsequent periods. This structure is also known as a non-linear payoff structure.

6.1.2.3 Settlement

The settlement method of contingent consideration can be cash; transfer of assets, liabilities, or equities; or a combination of various forms.

6.1.3 Valuation Approaches for Contingent Consideration

Recall from **Level I** that there are generally three valuation approaches: the asset-based, market-based, and income-based approaches. This section discusses each approach in the context of valuing contingent consideration.

Contingent consideration, similar to a derivative contract, derives its value from the underlying business. Yet, it has no ownership of the underlying. As such, the asset-based approach is not appropriate for valuing contingent consideration.

Contingent consideration is not a standardized financial instrument and has no active trading market. As such, the market approach is generally not applicable for valuing contingent consideration.

Therefore, an income-based approach is most applicable in estimating the fair value of contingent consideration. **Section 6.1.4** elaborates on certain fair value considerations that are unique to valuing contingent consideration; the following sections then discuss the application of valuation methods commonly used by valuers.

6.1.4 Fair Value Considerations Unique to Contingent Consideration

Contingent consideration is similar to a derivative instrument in that its value is derived from the underlying metric. There could be a wide range of possible outcomes associated with the underlying metric. Each outcome leads to a different future cash flow profile and payoff. Therefore, valuers need to consider a wide range of possible outcomes in valuing contingent consideration, instead of a single most likely measure.

One method is to develop future scenarios relevant to the underlying metric and estimate the likelihood of each scenario. This method is known as the scenario-based method and is explained in **Section 6.1.5**.

An alternative method is to estimate a range of possible outcomes based on the most likely case, such as management's best estimate. This method uses some option pricing models developed for valuing financial options, known as the option pricing method, which is explained in **Section 6.1.6**.

6.1.5 Income Approach — The Scenario-Based Method

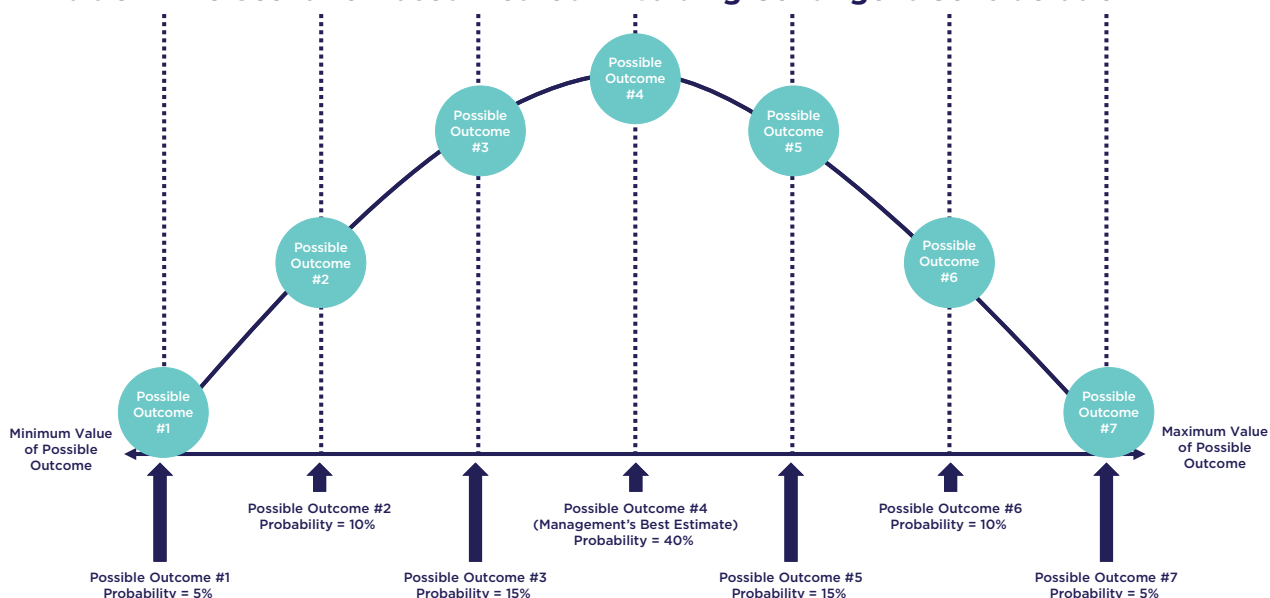
In simple terms, the scenario-based method consists of:

1. Identifying the possible outcomes associated with the underlying metric;
2. Assigning a probability of occurrence to each outcome;
3. Calculating the weighted average of all outcomes; and
4. Discounting the result at an appropriate discount rate to arrive at the present value of the contingent consideration.

6.1.5.1 Develop Scenarios

The primary goal when developing scenarios is to adequately represent the full range of probable outcomes associated with the underlying metrics over the relevant periods. From a statistical standpoint, the more granular the scenarios, the higher the accuracy of the outcomes. However, a valuator needs to balance the need for statistical accuracy with the additional subjectivity introduced in developing many scenarios and probabilities. A valuator should also examine management's assessments meticulously, challenge whether management has adequately considered both the probability of various scenarios and a wide enough range of potential outcomes, and challenge the consistency of these scenarios and probabilities with other assumptions in the analysis. **Exhibit 6.1** demonstrates the concept of identifying a full range of possible outcomes and assigning a probability of occurrence to each outcome.

Exhibit 6.1: The Scenario-Based Method in Valuing Contingent Consideration



6.1.5.2 Select the Appropriate Discount Rate

A valuator needs to select an appropriate discount rate reflecting the risks associated with the contingent consideration payments, similar to a business valuation. For clarity, this module assumes a risk-adjusted framework in which market participants require a risk premium over the risk-free rate to compensate for any additional risks that the contingent consideration payments are subject to. Since the payments are dependent on achieving the underlying metrics, considerations for any additional risks are tied to the risk exposures of the underlying metrics.

In selecting the appropriate discount rate, a valuator needs to consider the following three components:

- The time value of money;
- A risk premium associated with the underlying metric; and
- Counterparty credit risk.

The time value of money and the counterparty credit risk components are applicable from the valuation date to the expected payment dates.

However, the risk premium associated with the underlying metric component is applicable only from the valuation date until the uncertainty related to the metric is fully resolved. This component is the critical factor in selecting the appropriate discount rate for contingent consideration; hence, it is the focus of this section.

Estimate Time Value of Money

This component is captured by the risk-free rate commensurate with the expected timing of the contingent consideration payments.

Estimate Risk Premium Associated with the Underlying Metric — Capital Asset Pricing Model (CAPM) Framework

Level I and **Level II** introduced two key concepts associated with the CAPM framework: (1) the types of risks that investors face, and (2) the CAPM formula for estimating the cost of equity. The CAPM framework can be used as a guide for estimating the risk premium associated with the underlying metric.

Under the CAPM framework, investors face two kinds of risks:

- **Systematic risk** is meant to capture the uncertainties associated with future cash flows resulting from market-wide events that threaten the broad market, such as wars, recession, inflation, and so on. Systematic risk affects all asset classes in the broad market and cannot be diversified; and
- **Unsystematic risk** is meant to capture the uncertainties particular to the asset and is not associated with the broad market. In theory, unsystematic risk can be diversified.

The concept of systematic versus unsystematic risk can be applied to decipher the type of underlying metric, which then affects the inclusion of the risk premium associated with the metric. Note that depending on the type of risk, the risk premium is either reflected in the discount rate or in the cash flows.

- Contingent consideration tied to a non-financial metric is exposed to unsystematic risk since the non-financial metric is typically unique to the underlying business (such as achieving a product development) and largely unaffected by the broader market. In this case, a market participant would not require a risk premium for the contingent consideration payments. As such, the appropriate discount rate for the non-financial metric is the risk-free rate of return, and the risk premium is reflected in the cash flows.²
- Contingent consideration tied to a financial metric may be exposed to systematic risk since the financial metric is usually dependent on the broader market; for example, achieving certain revenue figures is negatively affected by recession yet positively impacted by inflation. In this case, a market participant would typically require a risk premium, as reflected in the discount rate, over the risk-free rate to compensate for the additional risk exposures.

CAPM Formula — Application in Estimating the Required Metric Risk Premium (RMRP)

The RMRP measures the risk premium that the investors demand to bear the systematic risk associated with an earnout metric. The CAPM formula can be used to estimate a company's return on equity, which can then lead to the determination of the RMRP. The CAPM formula is presented below:

$$r_{\text{equity}} = r_{\text{risk-free}} + \beta \times r_{\text{market risk premium}} + r_{\text{size}} + r_{\text{company specific}}$$

Where:

r_{equity} = the estimated return on equity

$r_{\text{risk-free}}$ = the risk-free rate

β = the correlated volatility of the company's stock price with the volatility of the market benchmark

$r_{\text{market risk premium}}$ = the market risk premium

r_{size} = the size premium

$r_{\text{company specific}}$ = the company-specific risk premium

2 For clarity, the risks associated with the metric (such as the execution risk of meeting a product development milestone) are reflected in the development of cash flow scenarios discussed in **Section 6.1.5.1**. As such, no adjustment for non-financial metric risk is required in the discount rate build-up.

Note that a company's return on equity is a levered measure. In contrast, the financial metric used as the earnout metric is usually unlevered³ (for example, revenue or EBITDA). When a company is valued using a WACC, the valuator will need to adjust and arrive at an unlevered discount rate when valuing contingent consideration based on unlevered financial metrics.

Two methods are commonly used to estimate the RMRP associated with a financial metric: the top-down method and the bottom-up method.

The **top-down method** starts with the discount rate for the company's long-term free cash flows (LTFCF) for the overall business enterprise — such as the estimated WACC — and deducts the risk-free rate to arrive at a benchmark risk premium. The benchmark risk premium reflects the total risk premium between the LTFCF and a risk-free rate (i.e., if the WACC of a business is 12% and the appropriate risk-free rate 2%, then the benchmark risk premium would be 10%). The benchmark risk premium is then adjusted for the differences between the LTFCF and the earnout metric, such as:

- The short-term nature of the earnout metric;
- Differences in operational leverage between the LTFCF and the earnout metric, for example:
 - Operational leverage refers to the operating cost structure of the business and is calculated as the ratio of fixed cost over revenue. It measures how well a company uses its fixed-cost items such as machinery and equipment to generate revenue. The more revenue a company can earn on the same amount of fixed assets, the higher its operating leverage;
 - If the earnout metric is based on revenue, a valuator will need to de-lever the benchmark risk premium⁴ since revenue is not subject to operational leverage, which is implicit in the LTFCF; or
 - If the earnout metric is based on earnings figures (such as EBIT and EBITDA), no adjustment is required as the earnout metric is subject to the same operational leverage as the LTFCF;
- Differences attributable to which synergies are included or excluded by the definition of the earnout metric (refer to **Appendix 6A** for further discussion on synergies); and
- Other differences between the LTFCF and the earnout metric with respect to a size premium and a company-specific premium.

The internal rate of return on the transaction is also commonly used as the starting point for the top-down method. The internal rate of return of a transaction is the discount rate that causes the sum of the present value of future cash flows of a target business to be equal to the total value of the purchase price paid. The mechanics of calculating an internal rate of return are discussed further in **Level IV** and the **Valuation for Financial Reporting** courses.

The **bottom-up method** starts with estimating the beta of an earnout metric and multiplying this beta by the market risk premium to arrive at a benchmark risk premium. (The beta of an earnout metric can be theoretically different than the beta of the overall operations of a business.) The benchmark risk premium is adjusted to incorporate additional risk premiums applicable to the earnout metric regarding size and company-specific risk premiums.

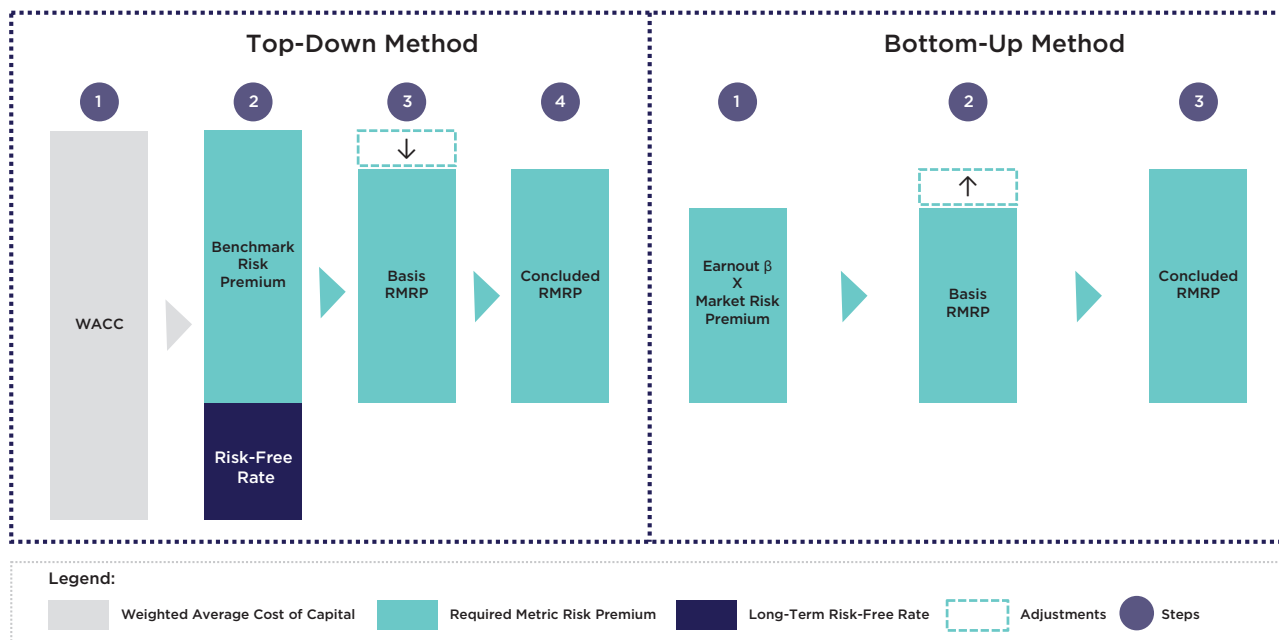
*Note: For **Level III** course assignments and exam, you will be provided with the earnout metric's beta (no calculation of the earnout metric's beta is required).*

Exhibit 6.2 presents the two methods for estimating the RMRP under the CAPM framework.

³ This refers to financial leverage.

⁴ Though beyond this course, conceptually, this de-levering would consider the amount of fixed costs relative to variable costs for the business.

Exhibit 6.2: The Top-Down and Bottom-Up Methods in Estimating the RMRP



In determining the portion of the additional risk premium that applies to the earnout metric under both methods, a valuator needs to consider the portion of the risk exposure that the earnout metric is subject to relative to the underlying business. The following are examples of such considerations:

- In assessing the size premium — The extent to which the business relevant to the earnout is anticipated to be integrated with the acquirer. The more integrated the business, the more the size premium resembles that of the acquirer's business (vs. that of the acquiree); and
- In assessing the company-specific risk premium — The extent of the riskiness of the business. If the premium included in the WACC reflects the higher risk of aggressive projections solely for LTFCF, but not higher risk throughout the earnout period, then a lower company-specific risk premium may be appropriate for the earnout metric. Similarly, if the rationale for the company-specific risk premium is to address significant near-term risk or aggressive projections relevant to the earnout metric, then including the full company-specific risk premium may be appropriate.

Estimate Counterparty Credit Risk

Recall from **Module 5** that IFRS 13 explicitly requires the credit risk of a counterparty and the entity's own credit risk to be taken into account in valuing financial instruments. This requirement is also applicable to contingent consideration. As such, the discount rate used in valuing contingent consideration must consider the obligator's credit risk (or counterparty risk).

6.1.5.3 Decide on In-Period Discounting Convention

The practice of discounting cash flows using a mid-period convention is widely used as a practical approximation to allow for the time value and risk of financial metrics that are earned over a period, as opposed to at a single point in time. Predicting the timing of when the underlying metric will be met can be difficult. Therefore, a valuator often assumes that the financial metric is earned at the midpoint of the period to which it applies.

Example 6.1: Valuation of Contingent Consideration Using the Scenario-Based Approach

Founded in 2018, Aura Cannabis is a medical and recreational cannabis producer with 100 retail stores across Canada. Aura Cannabis has four growing facilities for cultivation and one processing facility to convert grown flower into various products ready for sale. The growing facilities are reaching maturity and are expected to produce peak volumes of flower for the next five years. However, the processing facility is currently at capacity and can only process approximately 50% of the grown flower into consumer products. The remaining flower is sold as raw products at a lower margin. The processing capacity is currently the bottleneck limiting the future growth of the company.

On December 31, 2021, the sole owner of Aura Cannabis, Whitney, agreed to sell 80% of the outstanding shares of Aura Cannabis to Capital Partners for total consideration of \$150 million in cash. As part of the transaction, Whitney is entitled to a contingent consideration payment of 30% of the cumulative revenue earned between FY2022 and FY2024.

Required:

Whitney has engaged you to estimate the fair value of the contingent consideration as of December 31, 2021 (the valuation date).

Solution:

Based on discussion with management, you have developed three scenarios and identified the probability of each occurrence as follows:

- Scenario 1: The company plans to open a new processing plant that will reach full capacity in FY2022 to double the existing processing capacity. The company is planning to retain its existing retail footprint. Under this scenario, the expected revenue for each of FY2022, FY2023, and FY2024 is \$28.2 million, \$42.3 million, and \$42.3 million, respectively. The probability of this scenario is 40%.
- Scenario 2: The company plans to open a new processing plant and to concurrently double its retail locations to 200 stores by FY2022. Each retail store is assumed to reach peak sales by FY2023. Under this scenario, the revenue for each of FY2022, FY2023, and FY2024 is expected to be \$28.2 million, \$56.4 million, and \$56.4 million, respectively. The probability of this scenario is 30%.
- Scenario 3: The company plans to open a new processing plant and to concurrently double its retail locations by FY2022. However, under this scenario, due to increasing competition, all retail locations suffer from a remarkable decline in sales in FY2022. All stores only reach 50% of the targeted peak sales in FY2023 and FY2024. Under this scenario, the revenue for each of FY2022, FY2023, and FY2024 is expected to be \$14.1 million, \$28.2 million, and \$28.2 million, respectively. The probability of this scenario is 30%.

Table 1 summarizes each of these scenarios, as well as the probability of occurrence. The probability-weighted average of the contingent consideration payment is calculated to be \$32.6 million.

(\$thousands)	Revenue			Cumulative	Contingent Consideration		Probability
	FY2022	FY2023	FY2024		Contingent Consideration Ratio	Contingent Consideration Payment	
Scenario 1	28,200	42,300	42,300	112,800	30%	33,840	40%
Scenario 2	28,200	56,400	56,400	141,000	30%	42,300	30%
Scenario 3	14,100	28,200	28,200	70,500	30%	21,150	30%
Probability weighted average	23,970	42,300	42,300	108,570		32,571	

Based on discussion with management as well as your independent industry and company research, you arrived at the following market data:

- Long-term risk-free rate: 4.0%;
- Three-year risk-free rate: 3.0%;
- Market risk premium: 5.0%;
- Beta for the company's equity: 1.0;
- Beta for the earnout metric: 0.3;
- Size premium for the company: 3.5%;
- The company-specific risk premium: 6.5%;
- Debt to equity ratio: 0%;
- Credit spread for the obligator (i.e., appropriate spread for credit valuation adjustment): 2.0%; and
- Operational leverage: 50%.

You have decided to use both the top-down and bottom-up methods to estimate the RMRP associated with the earnout metric. Details of your analysis are as follows:

The Top-Down Method

1. Estimate the WACC for the business based on the CAPM formula to be 19.0% as the company has no debt.
2. Estimate the benchmark risk premium to be 15.0% by subtracting the long-term risk-free rate from the WACC for the business.
3. Consider the following differences between the LTFCF and the earnout metric (revenue):
 - The duration difference is determined to be 1.0% based on the term difference observed in the risk-free rates (4.0% – 3.0%);
 - The financial leverage difference is determined to be nil as the company has no debt;
 - The operational leverage difference is determined to be 50.0% based on an analysis of the historical operating leverage;
 - The difference attributable to synergies is determined to be nil as the acquirer has no prior history operating in the cannabis industry; and
 - The difference with respect to size premium and company-specific premium is determined to be nil as the acquired business continues to operate as a stand-alone entity, and the earnout metric is tied to the entirety of the operation.

The RMRP for the earnout metric is estimated to be 6.5% under the top-down method, as summarized in Table 2.

Table 2: Estimate the RMRP Using the Top-Down Method

	Rate	
Step 1: Estimate the weighted average cost of capital for the company		
Long-term risk-free rate	4.0%	A
Beta for the company's equity	1.00	B
Market risk premium	5.0%	C
Size premium	3.5%	D
Company-specific risk premium	6.5%	E
Weighted average cost of capital	19.0%	F=A+BxC+D+E
Step 2: Estimate the benchmark risk premium		
WACC	19.0%	G
Long-term risk-free rate	4.0%	H
Benchmark risk premium	15.0%	I=G-H
Step 3: Consider adjustments to the benchmark risk premium		
Benchmark risk premium	15.0%	J
Duration difference	1.0%	K
Financial leverage difference	0.0%	L
Operating leverage difference	50.0%	M
Synergy difference	0.0%	N
Size premium difference	0.0%	O
Company-specific risk premium difference	0.0%	P
RMRP	6.5%	Q=JxM-K

The Bottom-Up Method

1. Estimate the benchmark risk premium to be 1.5% by multiplying the earnout metric's beta by the market risk premium.
2. Estimate the portion of size and company-specific risk premium applicable to the earnout metric to be approximately 50.0% of the business's overall size and company-specific risk premium. Considering the acquiree will continue to operate as a stand-alone entity and the business's underlying risk exposures remains the same as before the acquisition, you triangulated the attribution portion based on the operational leverage of 50.0%, as it represents the portion of risk exposure the earnout metric is subject to in proportion to the overall business.

The RMRP for the earnout metric is estimated to be 6.5% under the bottom-up method, as summarized in Table 3.

Table 3: Estimate the RMRP Using the Bottom-Up Method		
	Rate	
Step 1: Estimate the benchmark risk premium		
Beta for the earnout metric	0.3	A
Market risk premium	5.0%	B
Benchmark risk premium	<u>1.5%</u>	C=AxB
Step 2: Consider adjustments to the benchmark risk premium		
Benchmark risk premium	1.5%	D
Size premium	3.5%	E
Portion of the size premium applicable to the earnout metric	50.0%	F
Company-specific risk premium	6.5%	G
Portion of the company-specific risk premium applicable to the earnout metric	<u>50.0%</u>	H
RMRP	6.5%	I=D+ExF+GxH

Based on the RMRP, you calculated the appropriate discount rate for the earnout metric to be 11.5%, as summarized in Table 4.

Table 4: Select the Appropriate Discount Rate		
	Rate	
3-year risk-free rate	3.0%	A
RMRP	6.5%	B
Credit valuation adjustment	<u>2.0%</u>	C
Discount rate for the earnout metric	11.5%	D=A+B+C

Based on the scenarios developed and the discount rate determined, the present value of the contingent consideration is estimated to be \$24.8 million as of the valuation date and as summarized in Table 5.

Table 5: Calculate the Present Value of the Contingent Consideration				
	FY2021	FY2022	FY2023	Cumulative
Probability weighted average revenue	\$23,970	\$42,300	\$42,300	\$108,570
Contingent consideration payment ratio	<u>30%</u>	<u>30%</u>	<u>30%</u>	30%
Contingent consideration payment	\$7,191	\$12,690	\$12,690	\$32,571
Discounting period	0.5	1.5	2.5	2.5
Discount rate				<u>11.5%</u>
Discount factor				0.7618
Present value				\$24,811

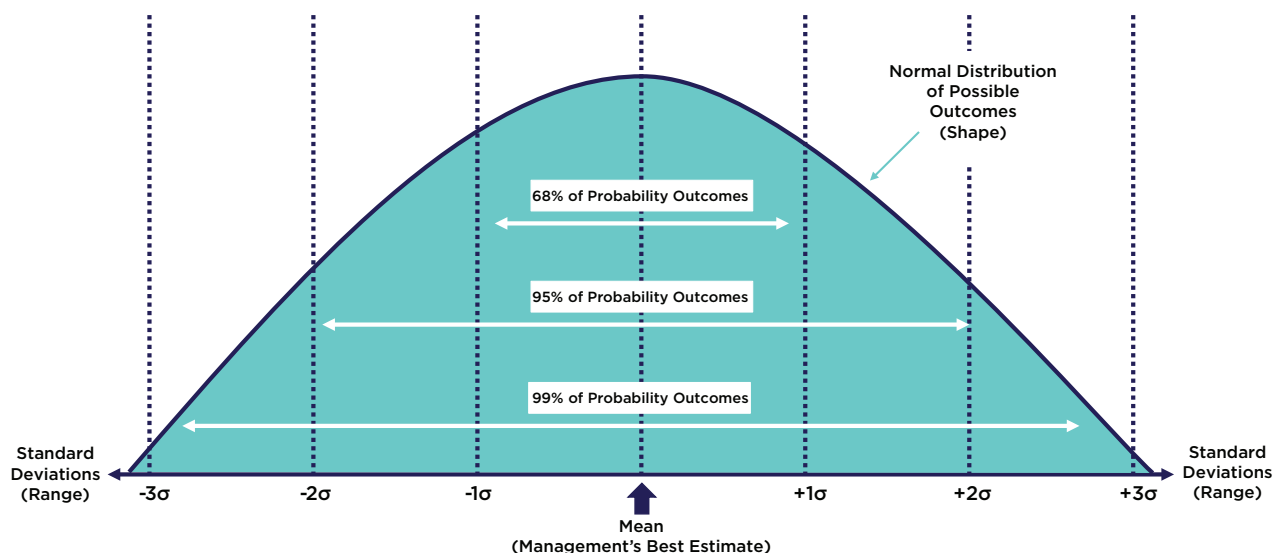
6.1.6 Income Approach – The Option Pricing Method

The option pricing method uses a statistical calculation to estimate the possible outcomes of the underlying metric based on management's best estimate. The average of all outcomes is then discounted at the risk-free rate to arrive at the expected present value of the contingent consideration.

There are two major differences between the option pricing method and the scenario-based method:

- Development of scenarios:
 - Under the scenario-based method, the valuator defines the possible outcomes as well as the probability of occurrence.
 - Under the option pricing method, the valuator uses a statistical calculation to estimate the full range of possible outcomes. Typically, the valuator defines the shape (or distribution in statistical terms) of the possible outcomes and the range of changes in value (or standard deviation in statistical terms). The shape of the possible outcomes is assumed to be normally distributed, which is a common assumption in derivative valuation, as discussed in **Module 5**. **Exhibit 6.3** demonstrates the key statistics concepts discussed in this section.

Exhibit 6.3: The Option Pricing Method in Valuing Contingent Consideration



- Risk-aversion versus risk-neutral assumption:
 - The scenario-based method assumes a risk-aversion framework in which the investors require a risk premium to compensate for any additional risks the contingent consideration payments are subject to.
 - The option pricing method assumes a risk-neutral framework in which the investors' expected return is risk free on the contingent consideration payments. The risk-neutral framework is a significant assumption in all option pricing models, as discussed in **Module 5**. To apply the risk-neutral framework in valuing contingent consideration, the valuator will need to adjust management's best estimate to a risk-neutral basis by discounting the projection at the appropriate rate. The valuator will divide management's projection by the selected discount rate to arrive at a risk-neutral projection. In selecting the appropriate rate for adjustment, the valuator will apply the concepts used in building the RMRP as discussed in **Section 6.1.5.2**.

The Monte Carlo simulation is a commonly used technique in valuing contingent consideration under the option pricing method. The valuator defines the distribution and volatility of the underlying metric. The calculation involves generating a random number that produces an iteration or trial of the possible outcome and a formula to determine the related payoff of the contingent consideration. Each iteration or trial of the payoffs is averaged to estimate the expected outcome and discounted at the risk-free rate to arrive at the expected value of the contingent consideration.

The Black-Scholes formula is an alternative technique in valuing contingent consideration under the option pricing method. This technique is most commonly used in non-linear payoff structures that include a minimum threshold. Contingent consideration can be considered a call option on the underlying metric — the minimum threshold is the exercise price beyond which the contingent consideration becomes valuable. The Black-Scholes formula approximates the value of the contingent consideration by estimating the possibilities of it becoming in the money.

Note: Although you should demonstrate an understanding of the option pricing method in valuing contingent consideration, you will not be asked to perform a calculation using the approach.

6.2 Real Options

6.2.1 Overview of Real Options

Recall that **Module 4** of **Level I** discussed the concept of NPV, which is commonly used as an evaluation tool in determining whether or not it is economically worthwhile to invest capital into a specific project. The NPV method creates a static picture of the project by estimating a single profile of the expected future cash flows and the initial investment costs as of today. The static assumption, however, is not the reality for most managerial decisions.

When presented with a business project, management has several options, such as acting immediately, delaying until the economics improve, abandoning and realizing its salvage value, and others. Management's flexibility in deciding its course of action regarding a business project is called the real option. The term *real* means that it refers to a tangible asset and not a financial instrument. Put differently, a real option is an economically valuable right but not an obligation to a company regarding business projects and investment opportunities.

Consider the following example. An oil company acquired the licensing rights to drill in an offshore area encompassing various reservoirs and terrains. Management divided the total area into smaller blocks to assess the best course of action in each block — some blocks are easy to drill and have positive NPVs, while others are more difficult to drill and will incur a high initial investment (using current technology) and yield negative NPVs. If the NPV analysis is the only evaluation tool used, the blocks that have a negative NPV today would be divested. However, management still has the option to delay until the drilling technology improves, which lowers the cost of drilling in those blocks. At this point, the economics or NPV will become positive. The thinking of valuing a business project as an option to develop is the thinking of real options. In other words, management is applying the notion of options conceived in the financial market to their business situation.

In addition to the cost of drilling, future oil prices can also impact the NPV analysis as of today. If oil prices go up, the NPV will go up for all the blocks, potentially bringing the NPV of difficult blocks positive. That is, there are uncertainties associated with the expected future cash flows and the initial investments that can significantly alter management's decisions. The uncertainties are not factored into the NPV analysis.

A real options analysis can be used as a strategic tool in assessing business situations where there are significant uncertainties in assumptions and various flexibilities in management decisions. The techniques used in valuing options in financial markets can be adopted to help management evaluate a business situation. Specifically, the Black-Scholes formula is used to evaluate real options as a way of strategic thinking, discussed in **Section 6.2.3**.

6.2.2 Examples of Real Options

The following are some examples of real options:

- Option to delay, which is the option of deferring the business decision to the future (for example, an oil company delays drilling on certain blocks until new drilling and production technologies yield higher recoverable reserves and lower initial investment costs);
- Option to expand, which is the option to make an investment or undertake a project in the future to expand the business operations (for example, an oil company expands its capacity in petroleum refining in a strategic geographic area);
- Option to abandon, which is the option to discontinue a project or an asset in order to realize its salvage value (for example, an oil company divesting a difficult block to competitors who would purchase for strategic, not economic, reasons);
- Option to stage, which is the option to make an investment in stages instead of a lump-sum upfront investment (for example, an oil company may divide the licensed region into small blocks and drill the easy blocks in the first stage and the difficult blocks in the second stage); and
- Option to switch, which is the option to alter or scale a project at some point in the future if the conditions are unfavourable and resume it when the conditions are favourable (for example, an oil company can shut down the operation of one of its plants when oil prices are low and resume operation when prices are high).

6.2.3 Evaluation of Real Options

To evaluate real options, the same techniques developed to value financial options discussed in **Module 5** are used. Specifically, **Section 6.2.3.1** discusses the use of the Black-Scholes formula in evaluating the option to delay while considering the uncertainties associated with the expected cash flows. **Section 6.2.3.3** discusses using the Monte Carlo simulation method to evaluate other real options when there are uncertainties associated with multiple factors.

6.2.3.1 The Analogy Between Real Options and Financial Options — Application of the Black-Scholes-Merton Formula

The Black-Scholes-Merton⁵ formula for dividend-paying (stock) call options can be denoted as the following:

$$C_t = S_t \times e^{-qt} \times N(d_1) - Xe^{-rt} \times N(d_2)$$

Of which:

$$d_1 = \frac{\ln\left(\frac{S_t}{X}\right) + t \times \left(r - q + \frac{\sigma^2}{2}\right)}{\sigma \sqrt{t}}$$

$$d_2 = d_1 - \sigma \times \sqrt{t}$$

Where:

C_t = the value of a call option at time t

S_t = the stock price at time t

q = the continuous dividend yield at time t

$N(x)$ = the standard normal cumulative distribution function

X = the exercise price

r = the risk-free rate

5 The Black-Scholes-Merton formula is a modification of the Black-Scholes formula introduced in **Module 5**. The Black-Scholes formula assumes the underlying stock pays no dividend, whereas the Black-Scholes-Merton formula takes into account the impact of dividends and assumes a constant continuous dividend yield.

t = the remaining term to maturity (in years)

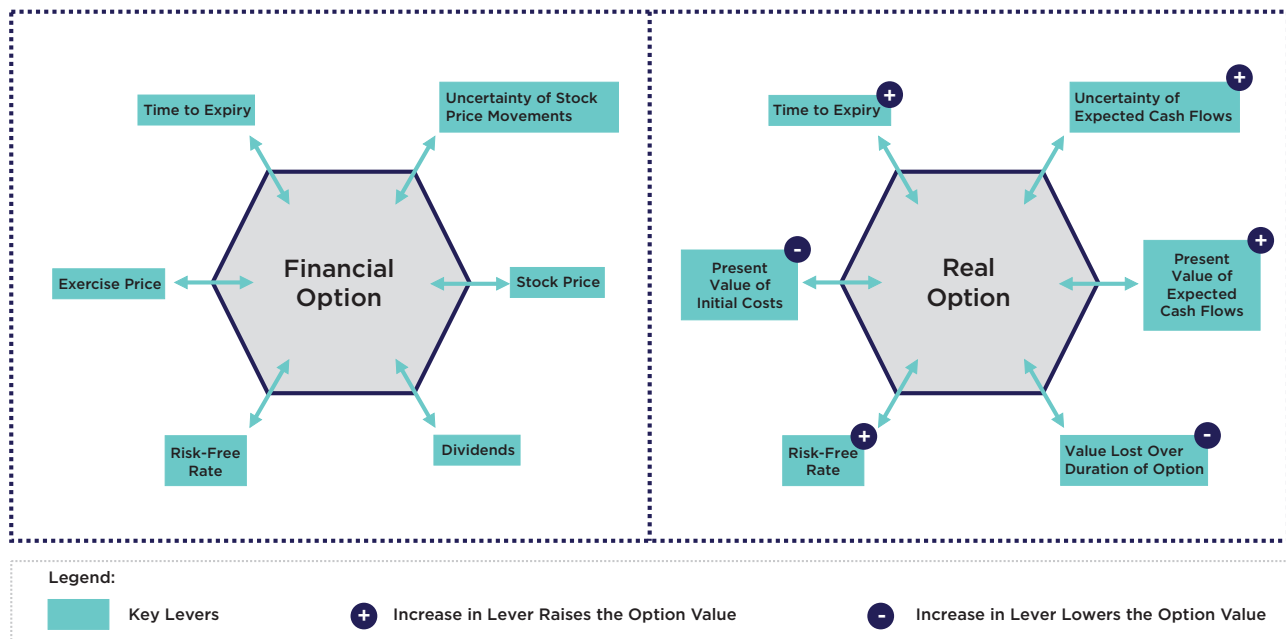
σ = the annualized volatility of the underlying

To draw an analogy between real options and financial options, the six key inputs into the Black-Scholes-Merton formula are compared, as follows:

- S_t – The equivalent in a real option is the present value of expected cash flows from the business project;
- q – The equivalent in a real option is the value that drains away over the duration of the option, such as the maintenance costs associated with the oilfield;
- X – The equivalent in a real option is the present value of all the initial costs expected over the lifetime of the investment opportunity;
- σ – The equivalent in a real option is the uncertainty in cash flows associated with the asset;
- t – The equivalent in a real option is the period for which the investment opportunity is valid. The length of the period depends on technology (a product's life cycle), competitive advantage (intensity of competition), and contracts (patents, leases, licences); and
- r – The risk-free rate, which is the same in real options and financial options.

Each of the six key inputs can be thought of as levers that impact the value of a real option. An increase in certain levers will raise the real option value, and vice versa. **Exhibit 6.4** compares the six levers of real options to those of financial options.

Exhibit 6.4: The Six Levers of Financial Options and Real Options



6.2.3.2 Real Options Thinking

Real options are important in strategic analysis because traditional evaluation tools such as NPV analysis ignore the value of flexibility. Consider the oil company example again as discussed in **Section 6.2.1** and focus on the uncertainty associated with future oil prices. Evaluating this opportunity under the NPV framework includes estimating the expected future cash flows and the initial investment costs. Say the block is expected to yield 50 million barrels of oil once developed, the current price of a barrel of oil is \$10, and the present value of the development cost is \$600 million. Using an NPV analysis, the economic value of the block is simply:

\$500 million - \$600 million = -\$100 million

The NPV analysis suggests that the company forgo the opportunity.

Now consider evaluating this opportunity as an option. Acquiring the licensing fee to drill (buying an option) gives the company the right to invest (at the exercise price) after uncertainty over the value of the developed reserves (stock price) is resolved. To begin with, such an evaluation recognizes the importance of uncertainty, which the NPV analysis assumed away. The uncertainties stem from the quantity of oil that would be produced once drilled and the oil prices at that point. The quantity of oil can be estimated based on geological studies and historical exploration data. The volatility of oil prices can also be estimated based on historical trading prices and traded futures prices.

For simplicity, assume that these two sources of uncertainty jointly result in a 30% uncertainty in the expected cash flows. Holding the option also incurs an annual fixed cost of \$15 million to keep the reserve active. This represents a dividend-like payout of 3% (\$15 million / \$500 million). Assume the licensing right expires in five years and the risk-free rate is 5%. Using the Black-Scholes-Merton formula, the real option value is estimated to be:

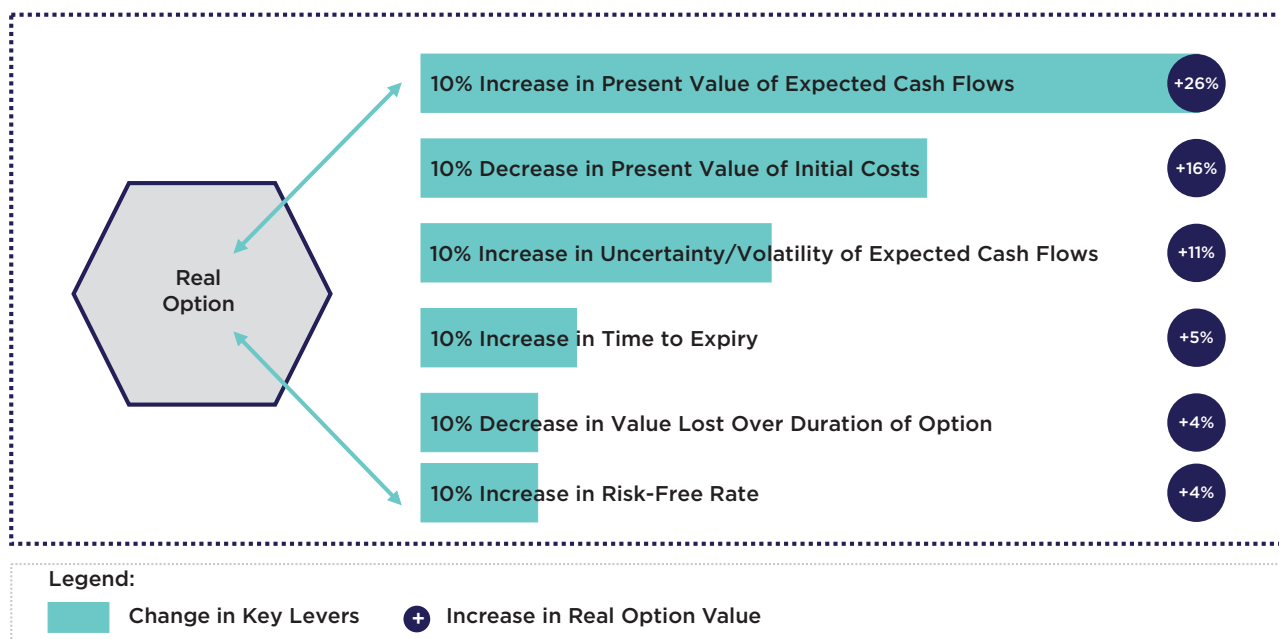
$$C_t = S_t \times e^{-qt} \times N(d_1) - X e^{-rt} \times N(d_2)$$

$$\text{Real option value} = 500 \times e^{-0.03 \times 5} \times 0.58 - 500 e^{-0.05 \times 5} \times 0.32 = + \$100 \text{ million}$$

The real options analysis suggests the block could yield positive economic NPV if the variability in future oil prices is considered. The value of real options stems from the flexibility inherent in not having to decide on full investment today but instead being able to wait and invest when the uncertainty is resolved.

One of the advantages of adopting real options thinking in evaluating a business situation is that it highlights the key levers that a company can manage proactively to maximize option value. To illustrate the impact of each of the six levers, a sensitivity analysis was performed by applying a 10% improvement in each lever, and the resulting change in real option value was calculated, as shown in **Exhibit 6.5**.

Exhibit 6.5: Sensitivity Analysis on the Six Levers of Real Options



That is, the most sensitive levers are increasing the present value of expected cash flows and reducing the present value of initial costs. The means to pull these levers are applying new technology to obtain more reliable profiles of an oilfield's value, better total oil recovery, and more efficient production facilities. The next most sensitive lever is increasing uncertainty or oil price volatility, but management cannot influence oil prices. At the less sensitive end of the spectrum, the option's duration should be managed to trade off potential improvements in cash flows against the cost of holding the option in the form of losing "dividend."

6.2.3.3 Application of the Monte Carlo Simulation Method

While the Black-Scholes-Merton formula is a relatively simple evaluation method, it makes restrictive assumptions, such as a normal distribution of asset values and the constancy of dividends, volatility, and interest rates. These assumptions may not be valid for real-world complications. In this case, the Monte Carlo simulation is a more appropriate method, because it considers multi-factor uncertainties, such as the uncertainties in initial costs and variability in growth rates of the expected cash flows.

Note: Although you should demonstrate an understanding of the Monte Carlo simulation method in valuing real options, you will not be asked to perform a calculation using the approach.

6.2.4 Criticisms of Real Options Thinking

Real options thinking presents an alternative framework that considers the impact of uncertainties and management flexibility in handling a business situation. Critics of real options thinking point to the heavy reliance on subjective inputs that are difficult to measure, such as the uncertainty or volatility of the expected cash flows. This often results in management taking on more risky business projects that would otherwise be rejected under the conventional NPV analysis.

Successful application of real options thinking steers management toward maximizing opportunity while minimizing obligation, encouraging management to think of every situation as an initial investment against future possibilities.

Appendix 6A: Consideration of Synergies

Recall from **Level I** that fair value is a financial reporting concept. Despite the nuances between the definitions of *fair market value* and *fair value*, it is generally accepted that the application of fair value in a financial reporting setting is broadly consistent with the definition of fair market value.

Fair market value is defined as the “highest price” that considers all potential special interest purchasers. Usually, it is only in negotiation that potential combined value increments can be identified and quantified. Contingent consideration is an example in which such value increments are identified and quantified by special interest purchasers.

Fair market value also takes on a market participant’s view. In the context of contingent consideration, the valuation takes on the perspective of a market participant in a hypothetical sale or transfer of a contingent consideration asset (or liability) on a stand-alone basis after the transaction.

A special interest purchaser negotiates the terms of contingent consideration to capture the potential synergies. As such, a market participant would consider all relevant post-combination synergies, including those specific to the acquirer. Any payments ultimately due will reflect the contractual terms of the contingent consideration and buyer-linked characteristics that are implicit in the contract. As such, all synergies relevant to calculating the payoff are generally included in the financial projections for the contingent consideration valuation.

Glossary

Contingent consideration	The obligation of an acquirer to transfer additional assets or equity interests to the former owners of the acquiree on meeting certain specified future events or conditions.
Linear payoff structure	A payoff of contingent consideration that is structured simply as a fixed percentage of an underlying metric.
Non-linear payoff structure	A payoff of contingent consideration that is structured with complexity and includes one or more of the following: (1) a minimum threshold in which no payment is made, (2) a cap that limits the maximum payoff, (3) a tiered structure in which different rates are assigned to each tier of performance, or (4) carryforward provisions that link payment in one period to the performance in subsequent periods.
Operational leverage	The operating cost structure of the business, calculated as the ratio of fixed cost over revenue.
Real option	An economically valuable right but not an obligation to a company regarding business projects and investment opportunities.
Systematic risk	The uncertainties associated with future cash flows resulting from market-wide events that threaten the broad market for all asset classes, such as wars, recession, inflation, and so on.
Unsystematic risk	The uncertainties that are particular to the asset and not associated with the broad market.
Underlying metric/metric	The criteria whose value or occurrence will determine the amount of contingent consideration to be paid.

MODULE 07

VALUATION OF SPECIFIC SHARE CLASSES

Module Overview

Welcome to Module 7. In previous levels and modules, you learned how to value the total equity of a business. This module explores issues encountered by valuers in the allocation of the total value of a firm's equity to specific share classes or shareholdings.

By the end of this module, you will be able to:

- Perform professional and technically correct calculations with respect to the allocation of value, under both a direct and indirect approach, and assess the reasonability of such calculations; and
- Discuss the differences between different classes of common and preferred shares, including rights and characteristics, and approaches to value.

The acronyms used throughout this module are:

CCPC Canadian-controlled private corporation

CRA Canada Revenue Agency

EBIT Earnings before interest and taxes

FMV Fair market value

SEC Securities Exchange Commission

Required Readings

Nobes, Christopher, Howard E. Johnson and Ian R. Campbell. *Canada Valuation Service 2018 Student Edition*. Vancouver: Carswell, 2017.

- Chapter 8, Special Situations — Preferred Shares

Johnson, Howard E. *Business Valuation in Canada*. Toronto: CPA Canada, 2021.

- Chapter 6 — Capitalized Cash Flow Methodology — Preferred Shares
- Chapter 9 — Valuing Minority Interests — Discounts for Non-Control and Illiquidity

7.1 Allocation of Equity Value

When valuing the common shares of a company that has issued other classes of shares, the valuator first determines 100% of the equity value (across all share classes) and then deducts the value attributed to other classes of shares (i.e., preferred shares) to determine the residual value attributable to the common shares.

A simple example is shown in **Example 7.1**.

Example 7.1: Value Determination of Common Shares

ABC Corp. acquired the assets of DEF Corp. at an enterprise value of \$715 million. As part of the transaction, ABC assumed the interest-bearing debt of \$200 million and the Class A and Class B special shares valued at \$50 million and \$75 million, respectively.

The value of the common shares is \$390 million, calculated as follows:

Enterprise value	715
Less: Interest-bearing debt	(200)
Equity value (across all share classes)	515
Allocated to:	
Class A special shares	50
Class B special shares	75
Residual allocated to common shares	390

Dividing the value allocated to each share class by the number of outstanding shares in each class results in the ratable or pro rata value of each share. In this exhibit, the total value of the common shares is \$390 million. If a shareholder owned 25% of the common shares, the pro rata value of their shares would be \$97.5 million (\$390 million × 25%).

Where only a partial interest in a business is to be valued, it is generally not sufficient to calculate the pro rata value. Pro rata or ratable value generally refers to share values before any discounts or premiums applicable to the specific shareholding being valued. The valuator may need to consider additional factors when valuing interests in classes of shares, including the various rights and characteristics of each class, relationships among shareholders, and the ranking of each class for dividends and repayments of capital.

7.1.1 Indirect and Direct Approaches to Valuing Shares

When valuing individual shares or share classes, the valuator should consider the following basic approaches:

- The **indirect approach** involves allocating the en bloc value to the various share classes on a pro rata basis, and making adjustments to this value for various features attached to the shares and for other considerations; and
- The **direct approach** involves valuing the shares or share class based on the present value of the future cash flows accruing to the shareholder.

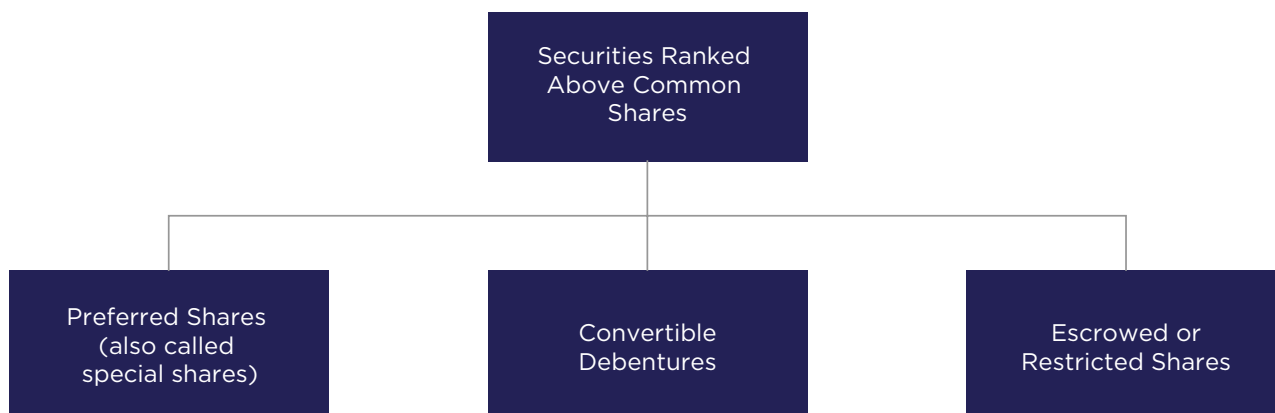
A valuator should consider both approaches and be able to reconcile the differences between the resulting conclusions under each approach.

7.1.2 Other Classes of Debt and Equity

Common shares typically rank behind preferred shares, or other special shares, with respect to the receipt of dividends and/or repayments of capital. To generate capital, a company may issue various forms of debt and equity with special features to increase their attractiveness to a potential investor.

Exhibit 7.1 illustrates the different types of securities that could have a priority claim on a company's capital before common shares.

Exhibit 7.1: Securities



7.2 Preferred Shares

A preferred share is a class of share capital that entitles the holder to preferred features, such as a stated dollar value per share at redemption or a preferred dividend ranking above that of the company's common shares. While preferred shareholders may be giving up some of the potential residual value and growth accruing to common shares, they receive protection from the downside risk through the special features attached to their shares.¹

Preferred shares have similarities to bonds or debt of a company, as they often receive a fixed dividend (similar to bonds or debt receiving fixed income payments) and rank higher than the common shares (as do bonds or debt). However, payments to preferred shareholders (either dividend payments or redemption of shares) are typically paid after all obligations to debtholders have been met, so despite these similarities, preferred shares are generally inferior to the debt obligations of a company in a firm's overall capital structure. **Exhibit 7.2** provides a summary of some of these differences.²

Exhibit 7.2: Attributes of Preferred Shares vs. Bonds

Factor	Preferred Shares	Bonds/Debt
Relative ranking in capital structure	Rank after debt	Senior to preferred shares
Tax treatment of dividends or interest paid for company	Not tax deductible	Tax deductible
Tax treatment of dividends or interest to holder	Gross-up and credit ³	Regular income
Consequence of missed payment	Dividends accumulate to be paid to preferred shareholder (if cumulative)	Creditors might take action

1 Preferred shares with conversion options can provide potential for residual value and growth accruing to common shares. Convertible preferred shares are discussed later in this module.

2 Adapted from *Valuing Preferred Shares* by Richard Wise.

3 This refers to preferred shares of Canadian corporations only. Dividends from preferred shares of companies based outside of Canada are treated as regular income.

7.3 Situations Involving Multiple Classes of Common and Preferred Shares

Under Canadian statutes, it is possible to create multiple classes of common and preferred shares and to assign complex and unique characteristics to each class. In private closely held companies, preferred shares are frequently referred to as “special shares.” For the purposes of this discussion, the terms “preferred shares” and “special shares” are used interchangeably.

Special shares are often created in family-controlled companies with the objective of income splitting and estate freezing. These shares generally reflect unique family and personal relationships, which tend to reduce the likelihood that a third party would purchase, or be given the opportunity to purchase, such shares. Private equity firms often acquire preferred/special shares with a similar objective of maintaining a certain level of control in their investment.

Shareholders who are all related can use several strategies to either prevent existing owners from selling their shares or prevent external parties from buying shares. For example, shares of a certain class that can only be sold for a prescribed nominal amount might dissuade existing shareholders from selling their shares. Requiring a unanimous vote of all shareholders for shares of a certain class might limit or prevent external parties from buying into said share class.

To effect a sale, either the family, or a third-party purchaser, may insist on changes to certain characteristics of a certain class of shares (e.g., features relating to voting or dividends).

Founders, or their descendants, commonly hold a special class of shares that include additional voting power. These shares typically provide the holder with almost total control of the company. Two-tiered share classes are encountered in many industries and consist of voting and non-voting classes of shares. Two-tiered voting classes can arise where a family-owned business has recently become public and is undergoing a transition from private to full public ownership. The founder is able to retain control of the company while the public can obtain an equity ownership.

Some critics have argued that the two-tiered structure thwarts shareholder democracy while also depressing stock prices, as this particular structure makes it less likely that the company will be acquired. Disgruntled shareholders have caused a number of companies to consolidate separate classes of shares.

The founders of companies with two-tiered share structures have argued that they have a right to control the company when they take it public, and shareholders understand those rules when they buy the shares. Many public companies continue to use the two-tiered structure, as they believe it effectively leads to achieving the long-term goals of the company and thwarts takeovers.

When valuing non-voting common shares, a discount from the pro rata value (which also typically assumes a pro rata level of votes) is generally applied. The differences in prices between voting shares and non-voting shares of publicly traded companies can be used as a benchmark to quantify such a discount.

Exhibit 7.3 summarizes the difference in prices of some publicly traded voting and non-voting shares.

Exhibit 7.3: Difference in Prices Between Some Publicly Traded Voting and Non-Voting Shares

Company	Trading Prices (Note 1)		Implied Discount for Lack of Voting Rights
	Voting Shares	Non-Voting Shares	
Canadian Tire Corp. Ltd.			
CCL Industries Inc.	317.27	186.87	-41.1%
Quebecor Inc.	57.49	57.14	-0.6%
Rogers Communications	28.11	27.72	-1.4%

Company	Trading Prices (Note 1)		Implied Discount for Lack of Voting Rights
	Voting Shares	Non-Voting Shares	
Teck Resources Limited	66.48	65.49	-1.5%
	48.00	45.64	-4.9%

Note:
(1) Trading prices at February 28, 2022

As shown in **Exhibit 7.3**, the quantum of the discount for lack of voting rights that are applied by investors in public equity markets can vary widely by company. Many factors can impact the size of the non-voting discount implied by public stock prices, including the size of blocks held by controlling shareholders and the liquidity of trades.

For example, Canadian Tire Corp. Ltd. has a dual class share structure consisting of (1) voting common shares and (2) Class A non-voting shares. The non-voting shares of Canadian Tire, in aggregate, are entitled to elect the greater of three directors or one-fifth of the company's directors. At the time of publication, Canadian Tire had 16 directors; accordingly, the non-voting shareholders only had the power to elect three directors (18.75% of the board of directors).

At the time of publication, Canadian Tire had 3.4 million common shares outstanding and 57.4 million Class A non-voting shares outstanding. In other words, even though the common shares only account for approximately 5.6% of Canadian Tire's total number of shares outstanding, this class of voting shares is entitled to 100% of the company's voting power and controls 13 of 16 seats on the board of directors (81.25% of the board of directors).

Moreover, at the time of publication, Canadian Tire's common shares were closely held by a small number of shareholders. As shown in the table below, two shareholders — with a family connection — controlled 61.4% of the company's common shares, though other blocks of shareholdings could potentially exert some influence.

Canadian Tire — Common Share Ownership Structure	
Shareholder Name	Percentage of Common Shares Beneficially Owned, Controlled, or Directed
Martha Billes	40.90%
Owen Billes	20.50%
C.T.C. Dealer Holdings Limited	20.60%
CTC's Deferred Profit Sharing Plan	12.20%
	94.20%

Accordingly, in the case of Canadian Tire, the 41.1% implied discount for the price of Class A non-voting shares versus voting shares reflects the ownership structure in which the company's common shares are effectively controlled by only two shareholders (in the event that these two shareholders act in concert). As discussed in **Level II**, the composition of the shareholdings of the common shareholders would arguably warrant a relatively high discount for lack of control — even for a minority shareholder with voting rights. It is therefore not surprising that non-voting shares, with a limited influence on the company's board of directors, trade at a significant discount to voting shares.

By contrast, Rogers Communications Inc.'s dual class share structure consists of (1) Class A voting shares and (2) Class B non-voting shares. At the time of publication, voting control was held by Rogers Control Trust; collectively, the Rogers Control Trust and other holding companies of the Rogers family controlled approximately 98% of the Class A voting shares and approximately 10% of the Class B non-voting shares (or approximately 29% of all shares outstanding across both classes). Despite the size of this family shareholding, there is a very small implied discount for lack of voting rights between Rogers' Class A voting shares and Class B non-voting shares (1.4% per **Exhibit 7.3**). There are several possible explanations for this:

- Regardless of whether a prospective shareholder is interested in Class A voting shares or Class B non-voting shares of Rogers, there is no expectation that their vote will have any real power, given that the Rogers family controls 98% of the votes. This is in contrast to Canadian Tire, where there is a possibility that a purchaser of Canadian Tire's common shares could theoretically obtain some meaningful ownership of the voting shares (since the controlling shareholders of Canadian Tire control approximately 61.4% of the votes, rather than the 98% voting control held by the Rogers family).
- Investors may view the governance structure of the Rogers Control Trust to provide non-voting shareholders with some level of protection.
- The Class A voting shares of Rogers are highly illiquid. Of approximately 111.1 million Class A voting shares outstanding, only roughly 2,000 of these shares traded on average, on a daily basis, at the time of publication. Accordingly, the Class A voting shares presumably suffer from some degree of a discount for illiquidity as compared to the Class B non-voting shares, which are highly liquid.

7.3.1 Illustration of an Open Market Transaction Involving Dual Class Share Structure

In 2007, CHUM Ltd. was acquired by Bell Globemedia Inc. CHUM's voting shares were acquired for \$52.50 and the non-voting shares were acquired for \$47.25, implying a 10% non-voting discount. The difference between the historical trading prices of the two shares was used as a benchmark in establishing the offer prices. Most of the voting shares were owned by CHUM's founders.

Some minority shareholders owning an interest in the non-voting share class claimed the offer was discriminatory as they believed the prices of the two classes should be equal in the acquisition. In addition, it was claimed that the voting shares historically lacked trading volume and the trading prices did not necessarily reflect market value. These shareholders argued that the historical differences in price between the voting and non-voting shares could not support the discount of 10% imposed by the offer price.

Conversely, it was argued that the non-voting shares had historically traded at an average of a 15% discount to the voting shares. In addition, it was claimed unfair that the minority shareholders who bought the lower priced shares would be able to sell at the higher share price. Further, it was stated that the non-voting shareholders were aware that CHUM did not have a "coattail provision."

(In the event of a takeover offer for a company, a coattail provision gives the holders of the non-voting or restricted voting shares the right to convert their shares into an equal number of the superior voting shares.)

7.3.2 Characteristics Influencing Value

The value of special shares depends on the various rights and characteristics attached to them. Attributes that impact value include:

- The potential of special shares to participate in the growth of the company (e.g., convertibility and participation rights). More features generally lead to a higher value;
- The demand and ease with which the shares can be sold. Better liquidity typically indicates a higher value;
- The degree of control the shares allow the shareholder to exercise over the company. More elements of control typically indicate a higher value;

- Specific rights and characteristics (voting, rank, dividends, conversion rights, etc.). More rights generally lead to a higher value;
- Ownership structure (number of shareholders and classes of shares owned by the same individuals). Smaller or fewer ownership groups can lead to a higher value; and
- Dividend history and the likelihood of future dividend declarations. Reliable dividends typically lead to a higher value for a given class of shares as compared to share classes without such dividend features.

Special features are typically added to these shares to increase their attractiveness on issuance. The following special features will influence the value of these shares:

- Special shareholders' ability to vote:
 - Specific circumstances under which they vote or do not vote;
 - Number of votes each share carries; and
 - Number of directors they can elect.
- Special shareholders' ability to access proceeds of liquidation:
 - Priority; and
 - Participation.
- Special shareholders' access to dividends:
 - Priority; and
 - Cumulative.
- Special shares' ability to convert into common shares.
- Special shares' ability to participate in the firm's earnings.
- Special shares' redemption and retraction features.

Where a company has issued preferred or special shares, their value must be deducted from the aggregate en bloc equity value to determine the value of the common shares (assuming no other classes of shares exist).

However, it should be noted that the reported value or par value (also sometimes referred to as liquidation value) of special shares on the balance sheet of a company, or their redemption value, may not necessarily be indicative of their fair market value. Par value is a nominal amount assigned to the shares, generally to calculate dividend payments.

As mentioned above, the valuator should consider the specific rights and characteristics of these shares, in addition to other factors.

7.4 Valuation Approaches for Preferred Shares

Valuation principles state that value: (1) is prospective; and (2) is equivalent to the present value of all future benefits anticipated to accrue from ownership. As such, the value of a preferred share is based on the anticipated future cash flows that accrue to the shareholder, discounted by a market-based rate of return or yield.

Valuation models for traditional preferred shares are based on the expected dividends to be received by the shareholder. Where a fixed dividend is payable at specified intervals on non-retractable, non-redeemable, cumulative preferred shares, with no other special features, the value of the preferred shares can be determined using the dividend discount model, as illustrated in **Exhibit 7.4**.

Exhibit 7.4: Dividend Discount Model

Value of preferred shares = D/r

Where:

D = expected constant dividend

r = required rate of return

Similar to the capitalization of earnings approach used in valuing businesses, the dividend discount approach:

- Assists in estimating the fair market value of preferred shares where there is no active market for the shares; and
- Assumes that a constant dividend amount is payable to the shareholder at prescribed intervals (e.g., quarterly or annually).

For example, if a cumulative preferred share pays a quarterly dividend of \$1 per share and an appropriate after-tax annual rate of return is estimated to be 8%, then the value of each preferred share would be \$50 (\$4 dividend / 8% rate of return).

In the event that dividends are expected to grow in the future, the valuator can use a variation of the formula set out in **Exhibit 7.5** (the Gordon growth model).

Exhibit 7.5: Gordon Growth Model

Value of preferred shares = $D / (r - g)$

Where:

D = expected constant dividend

r = required rate of return

g = expected constant growth rate

Building on the example of a preferred share with a \$1 quarterly dividend, if the expected growth rate of the dividend is 3%, then the value of each preferred share would be \$80 [\$4 annual dividend / (8% - 3%)].

If the preferred shares are redeemable, their value may be derived from the formula set out in **Exhibit 7.6**.

Exhibit 7.6: Value of Redeemable Preferred Shares

Value of preferred shares = $D / (1 + r)^1 + D / (1 + r)^2 \dots Dn + P / (1 + r)^n$

Where:

D = expected dividend for each period

P = proceeds received when sold or redeemed

r = required rate of return

n = number of periods until sale or redemption

Example 7.2: Valuation of Redeemable Special Shares

Emica has inherited special shares of Aqua-Glass Recyclers Ltd., a family-owned aquarium and specialty glass recycling business. The special shares have a total par value of \$1 million and an annual dividend of 3%. These shares are redeemable at the option of the holder in 3 years.

Emica has the following choice:

- To respond to the redemption call in three years for \$1 million; or
- To hold them for an indefinite period of time.

If the required annual rate of return for this investment is 4%, what is Emica's optimal choice, assuming a redemption call will be made in three years?

Solution:

As calculated below, the optimal choice for Emica is the one that will yield her the highest present value of cash flows:

Option 1: Sell shares in three years

- Annual dividends: $3\% \times \$1 \text{ million par value} = \$30,000$
- Present value of cash flows = $[(\$30,000) / (1 + 0.04)] + [(\$30,000) / (1 + 0.04)^2] + [(\$30,000 + 1,000,000) / (1 + 0.04)^3] = \mathbf{\$972,249}$

Option 2: Keep shares indefinitely

- Annual dividends: $3\% \times \$1 \text{ million par value} = \$30,000$
- Present value of cash flows = $30,000 / 0.04 = \mathbf{\$750,000}$

As illustrated above, Emica would be better off accepting a redemption call in three years than holding the shares indefinitely. Note that if there was a small growth rate assumed for the expected dividend stream, the indefinite hold scenario could be more valuable. For example, if the annual dividend is expected to grow at 1% per year, the present value of cash flows under Option 2 would increase to \$1 million:

$$[\$30,000 / (0.04 - 0.01)] = \$1,000,000$$

7.4.1 Rate of Return

The required rate of return on preferred share dividends must accurately reflect the risks of receiving dividends and the expected performance on other terms of the shares (such as redemption likelihoods or the ability to answer a retraction call). The valuator should consider the following factors when assessing a reasonable rate of return for preferred shares:

- Cumulative dividends versus non-cumulative dividends;
- Priority of dividends/capital against other share classes;
- Company's financial stability and cash flow needs;
- Company's earnings and asset coverage;
- Voting or conditional voting rights;
- Comparable dividend yields and payout ratios for similar investments; and
- Risk-free interest rates.

These considerations are discussed in the following section.

7.4.2 Cumulative Dividends

In the context of preferred shares with a specific dividend rate (which must still be declared before it can be paid), the term "cumulative" means that a company is contractually obligated to make up for any missed dividend payments — dividends in arrears — before declaring or paying dividends to any other subordinated class of shares such as common shares. The cumulative feature reduces the risk of non-payment, preserves the expected future cash flow stream to the shareholder, and accordingly increases value, all else being equal.

If dividends on preferred shares are in arrears, they should be discounted to present value — based on the expected time of payment — and added to the value of the preferred shares.

The valuator should deduct any dividends in arrears before allocating value to a class of shares ranking below.

7.4.3 Non-Cumulative Dividends

Non-cumulative dividends have a greater risk associated with the receipt of future cash flows and will therefore command a higher yield or capitalization rate as compared to shares with a cumulative dividend feature. The valuator should review the company's dividend history in assessing the likelihood of future dividends. Although past history does not necessarily guarantee future dividends, it provides an indication of the likelihood that dividends will be declared in the future. The valuator can also consider forecasts of future cash flows, indications of growth and related capital asset acquisitions, and other factors that could give an indication as to a company's ability and likelihood to pay dividends going forward.

7.4.4 Priority of Dividends/Capital

The ability of a share class to receive dividends in priority to another class increases its value; it reduces the risk of not receiving dividends or having dividends deferred if the company's cash flows decrease. In addition, upon the liquidation or sale of the company, share classes that receive their portion of capital first will be less risky than share classes that receive their portion of capital last (i.e., typically common shares receive the residual cash flows and capital once all creditors and other share classes have been paid).

7.4.5 Company's Financial Stability and Cash Flow Needs

The financial stability and cash flow needs of the company should be assessed as these factors relate to its ability to generate income and pay dividends in the future. If the company is having difficulty meeting its debt obligations or requires retained earnings to finance capital projects, it is less likely to declare or pay dividends in the near future. In addition to the company's financial status, the valuator should also assess the general risk of the business (industry, size, market share, competitors, etc.) and dividend yields and payout ratios of companies in similar industries.

7.4.6 Company's Earnings and Asset Coverage

The funds or cash flows available for distribution in a liquidation scenario should be assessed. If, on analysis, there appears to be sufficient funds to repay the redemption value of a preferred share class, the downside risk on the investment (and conversely, the rate of return) is reduced.

There are various ratios that can be used to assess earnings coverage and asset coverage in a company as shown in **Exhibit 7.7** and **Exhibit 7.8**.

The earnings coverage ratio relates to the adequacy of the company's earnings to pay dividends on preferred shares and interest on debt obligations. The higher the ratio, the lower the risk associated with dividend payments.

Exhibit 7.7: Assessing Earnings Coverage

Earnings Coverage Ratio

$$\text{Fixed charge coverage} = \text{EBIT} / [I + D / (1 - t)]$$

Where:

EBIT = earnings before interest and taxes

D = preferred dividend

I = interest expense

t = effective income tax rate

As dividends are paid from after-tax income, the dividend is grossed up to represent pre-tax income so it is comparable with EBIT.

Exhibit 7.8: Assessing Asset Coverage

Asset Coverage Ratio

$$\text{Asset coverage} = [\text{MVA} - \text{MVD}] / \text{L}$$

Where:

MVA = market value of assets

MVD = market value of debt

L = liquidation value of preferred shares

For the asset coverage ratio, assuming there are no other classes of shares that rank higher than the preferred shares, a *ratio greater than 1.0* indicates that there is enough capital in the company to pay the redemption value of the shares. A *ratio lower than 1.0* indicates that the company does not have enough coverage to fully redeem the preferred shares in the event of a liquidation, which would increase the risk associated with the shares. *The closer the ratio is to 1.0*, the higher proportion of redemption value that would be received by the preferred shareholders.

There could also be additional costs in the event of a liquidation, which would further reduce distributable cash to the preferred shareholders (i.e., taxes on disposition, sales commissions, severance, etc.). These should be considered in the MVA portion of the above formula if a liquidation scenario is likely.

In the event of a liquidation of the company, preferred shares rank below debt and above common shares. The capital structure of the company can also be used to assess the protection afforded to the preferred shareholders. A high debt to equity ratio puts preferred shareholders at greater risk, as there is less protection for these shares when a company experiences a reduction in cash flow.

7.4.7 Voting or Conditional Voting

Some preferred shares may receive voting rights or conditional voting rights when dividends are in arrears. This provides two main benefits to the preferred shareholder:

- A right to participate, to some extent, in determining the direction of the company; and
- An incentive for the board of directors to declare dividends to avoid giving away control.

Voting or conditional voting rights can reduce the uncertainty regarding repayment and increase the value of the preferred shares.

7.4.8 Comparable Dividend Yields and Payout Ratios

The dividend yield paid by comparable publicly traded companies, whose shares carry similar rights and characteristics, may be considered as reference points in the valuation of private shares of a subject company. However, the valuator should be careful in using publicly traded securities as benchmarks, as directly comparable securities are seldom found. The valuator will have to adjust for the differences between the two issues. The differences between public and private preferred shares will be discussed later in this module.

Example 7.3: Considerations in Valuing Preferred Shares

Rodeo Corp. manufactures electronic components for household appliances. Recently, the industry has slowed down and the company has needed to fund cash flows by issuing additional securities. Rodeo has issued \$25 million par value of preferred shares with non-cumulative dividends of 2% per year. These shares have first priority in dividends and capital of all other share classes. The company has been sporadic in paying dividends over the past five years and will not be able to pay dividends in the current year due to a lack of liquidity.

The following data exists for Rodeo:

- Revenues are \$75 million;
- Trailing 12-month EBIT is \$9 million;
- Total market value of debt is \$100 million at an interest rate of 7.5%;
- Estimated market value of assets is \$120 million; and
- Tax rate is 35%.

Required:

How would you classify the risk of the preferred shares based on the following criteria?

- Dividends (cumulative versus non-cumulative);
- Priority of dividends;
- Financial health of Rodeo;
- Earnings coverage;
- Asset coverage; and
- Voting rights.

Factors Considered in Assessing the Risk of Preferred Shares

Criteria	Risk	Explanation
Dividends — cumulative/ non-cumulative	Medium-High	The dividends are non-cumulative and therefore the risk to this share class increases. The company has not been consistent in paying dividends in the past. Its ability to pay future dividends is questionable.
Priority of dividends/capital	Low-Medium	The class of shares has priority of dividends/capital. Any available cash flow or sales/liquidation proceeds will accrue to the preferred shares before any other class.
Company health	High	The industry in which the company operates is in trouble. The company has had cash flow problems as indicated by its inability to make dividend payments.
Earnings coverage	High	Fixed charge coverage = $\$9 \text{ million} / [\$100 \text{ million} \times 7.5\% + (\$25 \text{ million} \times 2\%) / (1 - 0.35)] = 1.09$ The company has annual interest expense of \$7.5 million and preferred dividend payout of \$769,231 grossed up for taxes $[\$500,000 / (1 - 0.35)]$ for a total of \$8.3 million. There is only \$9 million of EBIT to cover these costs and very little cushion available. If the company's earnings fall, it may be in jeopardy of breaching its bank covenants.

Criteria	Risk	Explanation
Asset coverage	High	Asset coverage = $(\$120 \text{ million} - \$100 \text{ million}) / \$25 \text{ million} = 0.8$ Coverage is less than 1.0, which indicates that the net equity of the company is not sufficient to cover the liquidation value of the preferred shares.
Voting	Medium	As the shares are non-voting, they do not have any control over the direction of the company.

Solution:

Given the troubled state of the industry, and the poor financial position and prospects of the company, among the other factors indicated above, the risk profile of the preferred shares would rank medium to high. The valuator should consider all of the key features of a preferred share, including the status of the company and industry, in assessing the risk and corresponding valuation of the shares.

7.5 Rights and Characteristics of Special (Preferred) Shares

In addition to assessing the quantum and likelihood of future dividends, the valuator should consider other special features attached to the subject shares that provide the shareholder with various rights and/or disadvantages that, in turn, influence value. The following are some of the common features:

- Redemption features;
- Retraction features;
- Voting or non-voting rights;
- Participating or non-participating;
- Escrowed;
- Convertible; and
- Rank.

These are discussed in the next section.

7.5.1 Redemption

A redemption right is an embedded derivative that can be acted on by the issuer when market conditions make it advantageous for the company to redeem a class of preferred shares (i.e., when refinancing at a lower cost is advantageous). To compensate for this risk, the purchaser of a redeemable preferred share can demand a higher dividend rate.

Where preferred shares are redeemable at the issuer's option at any given point in time, the redemption price, plus any dividends in arrears, generally sets a ceiling on the value of the preferred shares. That is, a buyer would not pay more for a preferred share than the amount it could be redeemed for, even if the present value of future dividends was higher.

If the special shares are only redeemable at the option of the company's directors, but are held by persons who control the company, they may be treated as debt and valued at their redemption value. However, if the holders of special shares do not control the company, then it will be necessary to consider all other relevant factors, including the following:

- Security and certainty of dividend;
- Yield on special shares in relation to comparable publicly traded securities;

- Amount of real equity (i.e., availability of funds) in the company to redeem the shares;
- Likelihood of redemption; and
- Liquidity of shares.

Where the company's equity does not exceed the stated redemption price of the shares, a discount to the redemption price may be appropriate in quantifying the value of the preferred shares.

7.5.2 Retraction

Where the special shares are retractable at the option of the holder, they would typically be valued at their retractable value, plus any dividends in arrears. (Note: This might not be the case where the normal valuation method results in a higher value. That is, a shareholder would not retract if the present value of future dividends was greater than the retraction value.) A valuator should also consider the availability of funds in the company to meet retraction obligations. In addition to any other features of the special shares, the valuator should also consider whether the retraction right vests at a future date. If the retraction right does not vest, a discount might be appropriate.

7.5.3 Voting or Non-Voting

Special shares can have voting rights equivalent to that of common shares. Non-voting special shares can have features that give them voting rights if certain triggering events occur, such as dividends in arrears that are not paid within a specified period of time. If voting special shares can exercise control over the company, then it might be argued that they should be valued in excess of their redemption value.

Note: A super-voting share is a share that gives the holder increased voting rights. Super-voting shares allow a limited number of shareholders to control a company without owning more than 50% of the ordinary shares.

Where a shareholder owns both common shares and voting special shares — which, in combination, provide control of the company — it would be mutually advantageous to the shareholder and the purchaser to acquire the shares in tandem, thereby maintaining voting control. The value of each class of shares in a separate transaction might be worth significantly less, as each would represent a minority position.

7.5.3.1 Discounts for Non-Voting Shares

As described earlier in this module and as shown in **Exhibit 7.2**, empirical data exists that suggests that investors in public companies may ascribe a discount attributable to a lack of voting rights in cases where a company has both voting and non-voting common shares.

Similarly, in instances where a subject company has multiple classes of special shares, special shares with voting rights might warrant a premium to similar special shares without such voting rights, all other factors being equal.

7.5.4 Participation

Holders of participating preferred shares are entitled to receive payments over their stipulated amounts, either through dividends and/or the repayment of capital. The valuation of participating preferred shares is similar to valuing common shares in that they share in the growth of the company.

In some cases, based on the existence of constraints on the common shares, a fully participating preferred share will share equally with the common shareholders in any residual earnings after the dividends to the common shares have been paid.

The value of participating preferred shares is derived from the right to receive higher dividends and the likelihood of future payments. When assessing the value of these shares, the valuator should consider:

- The history of participating preferred and common share dividend payments;

- Operating projections of the issuer, including prospective cash reinvestment requirements and discretionary cash flows;
- Participating preferred and common share ownership percentages. Where the common shares and participating preferred shares are held by the same person(s), there is generally a greater likelihood of participating dividend payments; and
- Other features attaching to the participating preferred shares, such as redemption, retraction, and conversion rights that might encourage or discourage a company's board of directors from declaring common share dividends that give rise to participation rights.

In theory, in the absence of any form of distribution priority, the value of a participating share is never less than a similar non-participating share.

One approach to valuing participating special shares is to value the participating and non-participating elements separately (that is, value the participating and non-participating dividends separately). The yield associated with the non-participating dividend should be lower than the participating dividend to reflect the different risks in non-payment. The valuator should also keep in mind that while valuing the participation right in isolation, the shareholder does receive a benefit from the fixed non-participating dividend, thus reducing the overall risk in the security.

Another methodology for valuing participating securities is to value both dividend streams together, and to adjust the yield to account for the additional risk in non-payment of the participating shares. In either approach, estimating an appropriate yield for a participating special share can be extremely subjective. In assessing an appropriate yield, the valuator should be aware of any other features attached to participating shares.

Example 7.4: Valuation of Preferred Shares

Ralph Corp. has issued \$10 million in participating preferred shares that have an annual dividend of 5%. There are 1,000 preferred shares and 25,000 common shares. The equity of the company has been valued at \$25 million.

Required:

What is the value of one preferred share?

Solution:

Redemption value of preferred shares	\$ 10,000,000	
Number of preferred shares	\$ <u>1,000</u>	
Redemption value per preferred share	\$ <u>10,000</u>	A
Equity value	\$ 25,000,000	
Redemption value of preferred shares	\$ 10,000,000	
Residual value after redemption	\$ 15,000,000	
Total number of preferred and common shares	\$ 26,000	
Residual value per common and preferred share	\$ 577	B
Value of 1 preferred share	\$ 10,577	A+B

First calculate the redemption value of the preferred share, which is the value of a traditional preferred share before the participation feature. To value the participation feature, determine the amount available after redeeming the preferred shares (\$15 million) divided by all participating shares (26,000, including preferred and common shares).

7.5.5 Escrowed Shares

Escrowed shares, while entitled to vote and receive dividends, may not be purchased or sold for a prescribed period of time unless special approval is obtained. This restriction represents a disadvantage to the shareholder in terms of liquidity and, depending on the length of the time restriction, the value of the shares could be significantly eroded.

In valuing escrowed shares, the valuator should consider the following:

- The value of similar non-escrowed shares. This will provide an upper limit on the value of the escrowed shares;
- The restriction period. The shorter the restriction period, the smaller the discount;
- Whether the escrowed shares can be sold/purchased under a private agreement; and
- The conditions that must be satisfied to release the escrowed shares.

Escrowed shares are often encountered in discussions around restricted share discounts and discounts for lack of marketability.

A restricted share discount is a discount that arises from the inability of a shareholder to liquidate or transfer its shares.

Generally speaking, there are two ways to determine a restricted share discount. The *indirect method* relies on empirical studies that measure the quantum of a restricted share discount by measuring discounts observed in shares that are subject to restrictions typically associated with restrictions on initial public offerings imposed by the U.S. Securities Exchange Commission and articulated in the SEC's Rule 144 *Selling Restricted and Control Securities*.

The direct method estimates the discount through measurement typically through option analysis such as a put-call parity analysis or a binomial model analysis. Put-call parity and the binomial model were introduced in **Module 5**.

7.5.5.1 The Indirect Method — Restricted Stock Studies

Rule 144 of the U.S. SEC defines restricted securities as securities that have been acquired in unregistered, private sales from the issuer or from an affiliate of the issuer. Investors typically receive restricted securities through private placement offerings, employee stock benefit plans, as compensation for professional services, or in exchange for providing “seed money” or start-up capital to the issuing company. The restrictions imposed by Rule 144 have the effect of reducing the fair market value of the restricted stock in comparison to free-trading shares.

A number of empirical studies conducted since the late 1960s have attempted to quantify the discount attributable to restricted stock. James A. Debresser, writing in the *Business Valuation Digest*,⁴ provides an excellent summary of several major studies conducted before 1999. These studies support the traditional rule of thumb for restricted stock discounts in a range of 25% to 40%. However, as Debresser points out, this rule of thumb is based on average results. Actual discounts experienced ranged as high as 91% and as low as negative 30% (i.e., a premium was paid to acquire the block of restricted stock).

The 1969 SEC Institutional Investor Study on restricted stock provides guidance as to the size of the restricted stock discount for a particular transaction. The key findings were as follows:

- The larger the dollar value of the transaction, the smaller the restricted stock discount encountered;
- The larger the revenues of a company, the smaller the restricted stock discount encountered;
- Companies with higher levels of earnings tended to have smaller discounts associated with them; and

4 Debresser, James A. “Valuing Restricted Stock.” *Business Valuation Digest*, Vol. 5, No. 2 (1999): 1-8.

- Companies that traded on the New York Stock Exchange and American Stock Exchange tended to have smaller discounts associated with them than companies whose shares traded on over-the-counter exchanges, which had a larger discount associated with them.

Some of the SEC's findings were confirmed in a subsequent study carried out by Bruce A. Johnson, ASA, and published in the *Business Valuation Review*.⁵

In a December 2003 issue of the *Business Valuation Review*,⁶ Ashok B. Abbott, PhD, notes another statistically relevant factor: the turnover of shares in the stock market. The greater the turnover, the more rapidly a block of shares can be sold into the marketplace without depressing price.

It should be noted that the studies summarized by Debresser were conducted before the SEC reduced the hold period in 1997, from two years to one. However, the dribble-out rule remains. Under the dribble-out rule, the total amount of securities sold in any three-month period cannot exceed more than 1% of the total number of the company's outstanding shares or the average weekly reported trading volume during the four weeks preceding such sale.

A 2004 article by Shannon Pratt, FASA, MCBA, CFA, in the *Business Valuation Review*,⁷ notes that there are actually two factors that contribute to a restricted stock discount. First, a marketability discount applies during the holding period. Second, a blockage discount⁸ applies during the dribble-out period.

Pratt also notes that "...the larger the block of shares outstanding, the smaller the pool of potential buyers. For the foregoing reasons, restricted stock transactions consisting of the largest blocks as a percentage of shares outstanding have by far the largest discounts." He further notes that "the perceived holding period (which takes into account the 'dribble-out' period) is one of the major determinants of the magnitude of the discount for lack of marketability."

Note: There are countless academic papers concerned with the topic of restricted share discounts. If you are interested in this area, you are encouraged to search "discounts for lack of marketability" online.

7.5.5.2 The Direct Method — Put-Call Parity Analysis

The quantum of restricted share discount can also be estimated using a put-call parity analysis. To perform this analysis, the Black-Scholes formula is used to estimate the notional value of a call option and a put option at the given valuation date. The use of put-call parity analysis was discussed in further detail in **Module 5**.

7.5.6 Convertible Preferred Shares

Some securities can permit the holder to convert their shares into other classes of shares (typically common shares). Where preferred shares are convertible into common shares, the provisions of the conversion feature must be carefully considered.

7.5.6.1 Conversion at Any Time at the Option of the Holder

Where preferred shares are convertible at any time at the option of the holder, they are valued at the greater of their conversion value and their value based on other features including redemption and retraction value and dividend yield.

5 Johnson, Bruce A. "Quantitative Support for Discounts for Lack of Marketability." *Business Valuation Review*, Vol. 18, No. 4 (1999): 152-155.

6 Abbott, Ashok B. "Discount for Lack of Marketability: An Empirical Analysis." *Business Valuation Review*, Vol. 22, No. 4 (2003): 172-179.

7 Pratt, Shannon. "Using Pre-IPO and Restricted Stock Data to Estimate Discounts for Lack of Marketability." *Business Valuation Review*, Vol. 23, No. 2 (2004): 63-68.

8 A blockage discount is attributed to large blocks of publicly traded stocks not selling in the ordinary course of trading in the market without undue pressure on the market price of the stock.

Where conversion value is higher, no reduction in the en bloc equity value of the business is made in respect of the convertible preferred shares. The convertible preferred shares are assumed to be converted and, assuming no other class of shares outstanding, the entire equity value accrues to the notionally outstanding common shares (calculated on an as-converted basis). This results in a decline in the ratable value of the pre-conversion common shares.

Conversely, where the value of the convertible preferred shares (based on their features) is higher than conversion value — that is, the holder will not convert to common shares — the value determined for the preferred shares is deducted from the en bloc equity value and the pre-conversion common shares do not suffer dilution.

7.5.6.2 Conversion at Any Time at the Option of the Issuer

Where preferred shares are convertible at any time at the option of the issuer, they are valued at the lower of: (1) their conversion value; and (2) their value based on other features.

Where the preferred shares' conversion value is lower than their value based on other features, the preferred shares are assumed to be converted and, assuming no other class of shares outstanding, the entire equity value accrues to the notionally outstanding common shares.

Where the preferred share value based on other features is lower than the conversion value, the value of the preferred shares is deducted from the aggregate en bloc equity value accruing to the undiluted outstanding common shares.

Example 7.5: Ross Conversion Inc.

Ross Conversion Inc. has issued two securities: 30,000 preferred shares convertible into 30,000 common shares at a conversion price of \$2.00 per share, and 500,000 common shares. A valuation for the company has recently been completed, which indicated that the total en bloc equity value of the company (across both share classes) is \$1,560,000.

Required:

The preferred shareholders want to know whether they should convert their holdings into common shares.

Solution:

As shown below, if the preferred shareholders converted their shares into common shares, the total number of shares outstanding would be 530,000. Based on a total equity value of \$1,560,000, each of the 530,000 shares would be worth \$2.94 on an as-converted basis.

Pre-Conversion:	
	<u># of Shares</u>
Preferred shares	30,000
Common shares	500,000
Total number of shares of Ross	530,000 [A]
Equity value per share (as converted)	
En bloc equity value	1,560,000 [B]
Divide by: Total number of shares (above)	530,000
Implied value per share {[A] / [B]}	\$2.94

Post-Conversion:			
	# of Shares	Value per Share	Value of Share Class
Preferred shares	—	n/a	n/a
Common shares	530,000	\$2.94	\$1,560,000
Total equity value of Ross			\$1,560,000

As demonstrated above, the preferred shareholders are better off converting as the value of their shares increases from \$2.00 per share to \$2.94 per share.

The terms of the conversion indicate the rate of conversion, the time period under which the conversion can occur, and the types of shares that will be received in exchange.

Conversion rights are similar to a call option. An investor will normally accept a lower dividend rate for the conversion right and, upon issuance, the conversion price of the special shares will often be higher than the value upon conversion (i.e., the shares will be issued out of the money).

The value of convertible preferred shares is a function of the value of the preferred share, excluding the conversion right, in comparison to the value of the shares if converted. The highest value under both considerations would normally be deemed as the fair market value of the convertible preferred shares, assuming there were no restrictions on conversion. In essence, the value of a convertible preferred share is the value of the straight preferred share plus the value of the option to convert. (This is similar to the concept of convertible debt, which were explored in **Module 4**.)

Another way of viewing this scenario is to consider the value of the conversion option as just that — an option on common shares at a conversion price that could be valued using an option pricing formula, combined with a value of the preferred/special share as a straight yield instrument.

7.5.6.3 Convertible at Option of Shareholder

Example 7.6: Kelly Conversion Corp.

Kelly Conversion Corp. has issued two securities: 150,000 preferred shares convertible into common shares at a 1:1 ratio and 500,000 common shares recently valued at \$40 per share (pre-conversion value). The convertible preferred shares have a redemption value of \$5 million.

Required:

The preferred shareholders have the conversion right and want to know whether they should convert their holdings into common shares.

Solution:

The table below illustrates that where shares are convertible and retractable at any time at the option of the holder, the value of the shares is the greater of their converted value and their non-converted value. As shown below, the \$5.8 million converted value is greater than the \$5.0 million redemption value.

When the conversion value is greater, the other equity holders will experience a dilutive effect on the pro rata value of their shares as a result. The valuator should be aware of the impact of convertibility on the various share classes and should consider the time value element of the conversion option.

Pre-Conversion	
Equity value — common shares	\$ 20,000,000
Common shares outstanding	500,000
Pro rata value of common shares	\$ 40.00
Convertible preferred shares outstanding	150,000
Conversion ratio	1:1
Value from converting preferred shares	\$ 5,000,000
Total equity value, pre-conversion	\$ 25,000,000
Post-Conversion	
Equity value — common shares (per above)	\$ 20,000,000
Equity value — from converting preferred shares (per above)	\$ 5,000,000
Total equity value, post-conversion	\$ 25,000,000
Common shares outstanding, post-conversion	650,000
Pro rata value of common shares, post-conversion	\$ 38.46
Value to preferred shareholders upon conversion of preferred shares (150,000 × \$38.46)	\$ 5,769,231

7.5.6.4 Convertible at Option of Issuer

Example 7.7: Sandro Conversion Ltd.

Sandro Conversion Ltd. has issued two securities: 150,000 preferred shares convertible into common shares at a 1:1 ratio and 500,000 common shares with a total value of \$15 million (pre-conversion value). The convertible preferred shares have a redemption value of \$5 million.

Required:

Sandro Conversion Ltd. has the conversion right and wants to know whether it should exercise its conversion right.

Solution:

Where preferred shares are convertible at the option of the issuer, they would normally be valued at the lower of their converted value and their non-converted value. As shown below, the \$4.6 million converted value is less than the \$5.0 million redemption value.

Typically, an issuer would exercise this option if the non-converted value of the special shares exceeds the value after conversion. In such an instance, the holder of preferred shares would lose value [$\$4.6 \text{ million} - \$5.0 \text{ million} = -\$0.4 \text{ million}$], which would accrue to the common shares [existing common shares = $500 \times (\$30.77 - \$30.00) = \$0.4 \text{ million}$]. Assuming that the issuer wants to maximize common shareholder value, this conversion would be in the issuer's interest.

Note: This example is for illustration purposes only. In practice, one would question why the preferred holder would accept an unprotected forced conversion right.

Pre-Conversion	
Equity value — common shares	\$ 15,000,000
Common shares outstanding	500,000
Pro rata value of common shares	\$ 30.00
Convertible preferred shares outstanding	150,000
Conversion ratio	1:1
Value from converting preferred shares	\$ 5,000,000
Total equity value, pre-conversion	\$ 20,000,000
Post-Conversion	
Equity value — common shares (per above)	\$ 15,000,000
Equity value — from converting preferred shares (per above)	\$ 5,000,000
Total equity value, post-conversion	\$ 20,000,000
Common shares outstanding, post-conversion	650,000
Pro rata value of common shares, post-conversion	\$ 30.77
Value to preferred shareholders upon conversion of preferred shares (150,000 × \$30.77)	\$ 4,615,385

Where the conversion rights cannot be exercised for a specific period of time, the value of the special shares may be discounted to recognize this disadvantage to the holder.

These considerations apply to all convertible securities (e.g., convertible debentures) and the valuator should be aware of any potential for dilution when valuing an interest in the common shares of a company.

7.5.7 Ranking of Preferred Shares

The rank of a class of preferred shares influences its value. Subordinated shares are typically less valuable than higher ranking shares due to the greater risk associated with receiving dividends and repaying capital. The valuator should allocate value to the share class ranked as first priority for capital repayments.

The articles of incorporation and other corporate documents may stipulate the timing, amount, and restrictions on dividends, in addition to the ranking of the shares' class with regard to the repayment of capital on liquidation or sale.

7.5.8 Preferred Share Liquidation Premiums

In rare instances, holders of preferred shares are entitled to a premium over stated or par value on liquidation of the issuer. Where the issuer's business is valued as a going concern, such a premium typically would not be accounted for in the value of the preferred shares.

Where the business is valued on a liquidation basis, any appropriate liquidation premium normally would be considered a component of preferred share value. However, where the estimated net after-tax proceeds on liquidation at the corporate level is less than the liquidation value of the preferred shares, a discount from the liquidation value of the preferred shares would be applied to reflect this.

7.6 Discounts for Restricted Shares

In many circumstances, shares of a corporation will be subject to a restriction that limits the ability of the shareholder to vote and/or freely trade the shares. This section focuses on the inherent disadvantages associated with restrictions on transfer.

7.6.1 Studies on Restrictions on Fair Market Value (FMV)

The impact of restrictions on FMV has been the subject of numerous studies. For example, in one of the first studies in the area, William L. Silber noted in “Discounts on Restricted Stock: The Impact of Illiquidity on Stock Prices” (*Financial Analyst Journal*, July/August 1991), that, based on comparisons between restricted securities ineligible for resale for a two-year holding period and unrestricted (but otherwise identical) shares of the same company, the restricted shares are offered, on average, at a discount of more than 30%, although the discount varies widely from company to company. There are more recent articles and studies in this area, and you are encouraged to conduct your own review.

Other studies suggest, however, that the stocks analyzed in these cases have other attributes that affect value and therefore make a poor proxy for estimating marketability discount.

While Silber’s article (and other similar studies) may provide a starting point for determining the impact of transfer restrictions on the discount from ratable value, an analysis of the variance in discounts noted in those studies is required. The following factors may be considered:

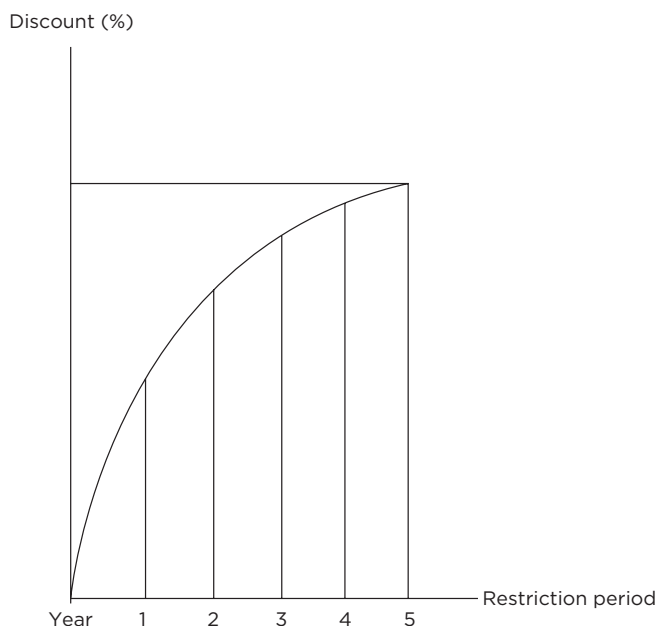
- Duration of the restriction period;
- Nature of the restriction; and
- Financial performance of the company.

7.6.1.1 Duration of the Restriction Period

In general, the longer the restriction period, the greater the disadvantage of not being able to trade the shares (and as a result, the greater the indicated discount for the restriction period).

A prevalent feature of many employer-sponsored restricted stock plans is that the restrictions on transfer are lifted for some fraction of the total award on each anniversary following the date of the award. For example, the employee may be awarded 1,000 shares with the transfer restriction lifted on 100 shares on each anniversary for 10 years. The discount applicable to each portion of the award will vary according to the length of the restriction period. The aggregate discount should reflect the progressive release provisions. Conceptually, the valuator can calculate a separate discount for each component of the restriction period, as illustrated below:

Exhibit 7.9: Calculating Percentage Discount — Restriction Period



7.6.1.2 Nature of the Restriction

The size of the discount depends on the specific restriction provisions associated with a particular shareholder. For example, in the case of shares issued by private corporations to employees, it is rare for the issuer to permit any other transfer while the individual remains employed with the company. In general, the applicable discount will vary inversely with the liquidity and transferability of the shares: the lower the liquidity of a given share, the higher the resulting discount.

7.6.2 Quantitative Analysis

Empirical studies of the inherent disadvantage of restrictions on transfer can provide a useful benchmark for the analysis. However, it is important to consider the specific circumstances of the shares being valued.

Several quantitative methodologies have been developed to help assess the particular attributes of a company that affect the discount from FMV. While these quantitative methodologies merit consideration, they must be applied with caution, given that the determination of the appropriate discount is by no means an exact science.

Option pricing models can provide a useful basis for quantifying the appropriate discount. In particular, the Black-Scholes option pricing model is often used because this model is based on European options⁹ that exhibit many similar traits to restricted shares. The date on which the European option may be exercised is akin to the expiry date of the restriction on transfer.

The formula and inputs for the Black-Scholes model are explored extensively in **Module 5**.

When using an option pricing model to quantitatively assess a restriction discount, it is, of course, useful to compare the results derived using such quantitative methodologies to the empirical studies.

⁹ As discussed in Module 5, European options are exercisable only on one specific date. In contrast, American options are exercisable at any time between the date of issue and the stipulated expiry date.

7.6.3 Restricted Shares Offered as Employee Compensation

More and more executives are finding their compensation is tied to the success of their employer company through vehicles such as stock options, restricted shares, and employee share ownership plans. Since this type of compensation is on the increase, it is important to know how the characteristics of these investments affect their valuation for income tax and other purposes.

In the case of restricted shares, the shares issued to the executive are not immediately transferable or saleable and are vested only after a specified period of future service.

On termination of employment for any reason before the date of vesting, the shares are usually forfeited by the employee and reacquired by the employer. This section examines the valuation of such shares and the impact of the “value to owner” concept advanced by the CRA.

Restricted shares issued by public companies can usually be traded freely after they are vested. Therefore, the period from the date of the award to the date of vesting (the vesting period) and the restriction period are one and the same. The shares of a private corporation, however, are not usually freely tradable after they vest. They typically cannot be transferred to a third party or sold back to the issuer, directly or indirectly, during the individual’s employment with the company. They may, however, be sold if some extraordinary triggering event occurs (i.e., if the entire business is sold to a third party).

7.6.3.1 Assessment of Value to Owner – Discount from Ratable FMV

For Canadian tax purposes, an employee is generally deemed to have acquired the shares and received a taxable benefit on the date that the restricted stock is awarded. According to paragraph 7(1)(a) of the Income Tax Act, the benefit is calculated as the “value” of the restricted shares at the time of the award, less any amount paid or payable to the corporation by the employee for the shares.

Where the issuer of restricted shares is a CCPC, and the employee deals at arm’s length with the CCPC, tax becomes payable only when the shares are ultimately sold by the employee. (Unless otherwise indicated, this section focuses on shares issued by public corporations and private corporations other than CCPCs.)

In general, the term “value,” as used in the Income Tax Act, is interpreted to mean FMV. The CRA has indicated, however, that in assessing the benefit to the employee, a “value to owner” concept is appropriate. Hence, the determination of the taxable benefit begins with a quantification of the ratable FMV of the underlying shares.

Generally, these “value” calculations will be relevant to private companies. With public companies, the trading price will most often be the starting point in determining FMV. The valuator can then determine the appropriate discount (if any) to reflect the specific characteristics, terms, and conditions of the shares under consideration (including the impact of the restriction period) and the employee’s specific circumstances.

The size of the appropriate discount will depend on the valuation methodology used. Any specific circumstances that might affect the discount should be separately assessed, including the likelihood that:

- The shares may not be freely tradable during the restriction period (“restriction period risk”);
- The shares will not be vested because the employee will leave the company during the restriction period (“risk of forfeiture”); and
- Other attributes, terms, and conditions of the shares and the issuer corporation may affect the ultimate benefit to the employee (“other attributes”).

The appropriate discount is usually expressed as a percentage reduction from ratable FMV.

Most plans provide that if employment ceases before the date of vesting, the shares are forfeited by the employee and reacquired by the company. Therefore, the determination of the benefit to the employee at the date of the award (i.e., value to owner) must include an evaluation of the likelihood that the employee will remain with the company until the date of vesting.

For example, consider the case of an employee who received restricted shares and resigns shortly thereafter (i.e., before the shares are irrevocably vested). Assuming that the valuator could have reasonably predicted the resignation at the date of valuation (if, for instance, the employee's dissatisfaction had been well documented, they were actively searching for other employment, etc.), the discount from ratable value would reflect the uncertainty of continued employment as of the date of valuation.

In general, as the vesting period increases, the risk of forfeiture also increases. A review of the average annual turnover among employees participating in the restricted stock plan can provide an initial benchmark for the risk of forfeiture. The analysis should focus on plan participants (as opposed to all employees) because participation in the restricted stock plan may suggest above-average performance and may reduce the likelihood of termination before vesting (i.e., plan participants may be a more homogeneous comparator group). The benchmark can then be adjusted according to the employee's specific circumstances.

The valuator may also consider the following factors:

- The employee's tenure;
- The employee's career progression with the corporation;
- The possibility of death or disability; and
- Corporate character and performance.

These are discussed in the following sections.

7.6.3.2 The Employee's Tenure

Since most employees with significant tenure may be considered less likely to leave the company before the expiration of the vesting period, tenure should be compared to the average tenure of employees within the corporation (particularly employees who have been awarded restricted shares), as well as industry norms. The employee's position should be considered, along with average tenures of that position in the relevant industry. For example, CEOs in certain industries have notoriously short employment tenures.

The availability of alternative employment should also be considered. Many restricted stock plans provide compensation for employees who have been laid off. To the extent that these provisions are available, the risk of forfeiture may be reduced.

7.6.3.3 The Employee's Career Progression Within the Corporation

The valuator may wish to interview the appropriate parties and review the employee's personnel file and documented performance appraisals.

7.6.3.4 The Possibility of Death or Disability

In the spirit of compassion, the death of an employee sometimes gives rise to full vesting. The valuator needs to consider the terms of the plan and the impact of a premature death. The concept of mortality has been accepted by the courts in the determination of benefits (e.g., in personal injury matters involving the determination of an individual's lost future income). Given the age of the participants, and the relatively short vesting periods typical of these plans, mortality will generally have a limited effect on value. The same can be said for disability, which is a more common occurrence.

7.6.3.5 Corporate Character and Performance

Corporate size, stage of development, and performance affect the risk of forfeiture. Successful companies are likely to keep good employees, and good employees are more likely to stay with successful firms than with those experiencing difficulties.

When calculating the benefit of a particular employee's shareholding, there are, of course, many other considerations that may give rise to a discount (particularly in the case of private corporations). A careful review of the agreement between the employer and the employee, for instance, will indicate the rights and privileges bestowed on the employee (i.e., the shareholder).

To the extent that the shareholder's rights, privileges, and benefits are further curtailed, the discount should be adjusted accordingly.

MQE Example 7.1

Michael, a resident of Canada, graduated last year with a bachelor's degree in computer science. He immediately gained employment with a highly regarded developer of healthcare-related software, HealthRecords Inc. HealthRecords went public approximately 15 months prior to the commencement of Michael's employment with the company. The public stock market price of HealthRecords enjoyed considerable gains over the period from its initial public offering in May last year to the end of last year. A significant component of Michael's compensation is in the form of restricted stock in the company.

Specifically, on June 30 last year, Michael received 25,000 restricted shares of HealthRecords (the Restricted Shares). The conditions and characteristics of the Restricted Shares are outlined below. Michael's tax accountant has correctly informed him that restricted shares are taxable to Canadian residents immediately upon issuance. As such, Michael understands that on his last year's tax return, which he has not yet filed, he must include the fair market value of the restricted shares. Michael's brother, Joel, has told him that "the fair market value of the restricted shares is equal to the stock market trading price as at the date of issue." Confused by his brother's statement, Michael has approached you, CBV, to provide insight in this regard.

Furthermore, Michael has heard rumours that next year, HealthRecords may give him the choice to receive either stock options in the company or additional restricted shares. As such, Michael would like you to advise him on the issues he should consider before making his decision.

A listing of the stock market price for HealthRecords shares over the relevant period is included below along with projections prepared by the company for additional financing purposes. You have also looked into some comparable companies, as outlined below.

Characteristics of the Restricted Shares

The following is an overview of the relevant characteristics of the Restricted Shares:

- The Restricted Shares have voting rights that are identical to HealthRecords common shares;
- The Restricted Shares cannot be sold, assigned, transferred (to anyone other than a spouse, child, grandchild, or trust), pledged, or otherwise disposed of until vested; and
- Vesting of Restricted Shares automatically ceases on the termination of employment with HealthRecords.

Vesting Period

Participants who hold Restricted Shares in HealthRecords are subject to the following vesting schedule: 25% in each of June 30 this year, December 31 this year, June 30 next year, and December 31 next year.

HealthRecords' historical stock prices are shown in the table below:

Historical Trading Prices	
HealthRecords	
May 31 last year	\$7.00
June 30 last year	\$7.50
July 31 last year	\$7.75
August 31 last year	\$10.00
September 30 last year	\$15.00
October 31 last year	\$22.75
November 30 last year	\$21.25
December 31 last year	\$17.50
January 31 this year	\$9.50
February 28 this year	\$4.00
March 31 this year	\$2.50
April 30 this year	\$2.25
May 31 this year	\$1.75
June 30 this year	\$1.50
July 31 this year	\$1.75
August 31 this year	\$2.50
September 30 this year	\$2.25

Information on guideline public companies somewhat comparable to HealthRecords is shown below:

Guideline Public Company	Market Price (August 31 this year)	Earnings	Revenues
Computers R us	\$3.50	(3,452,100)	10,000,000
Programmers Plus	\$28.75	865,000	25,000,000
Shrink Wrap Inc.	\$0.14	(114,524)	2,000,000

HealthRecords has prepared projections for the next five years as shown below:

Projections for the year ending August 31 ('000s)					
	Next Year	2nd Next Year	3rd Next Year	4th Next Year	5th Next Year
Gross revenues	1,052	2,014	4,208	8,416	16,832
Direct costs	106	175	314	592	1,148
Staff	1,034	1,187	1,494	2,107	3,333
Administration	53	94	175	338	663
Occupancy	92	134	218	386	721
Telephone and travel	42	78	151	295	585
Marketing	210	242	307	437	697
Amortization	69	82	109	162	269
Total expenses	1,606	1,992	2,768	4,317	7,416
Net income	(554)	22	1,440	4,099	9,416

Required:

Provide the requested advice to your boss, Maggie, a partner at your firm, for review.

Solution:**Memorandum**

To: Maggie

From: CBV

Re: Restricted stock

Fair Market Value

Joel is likely incorrect in suggesting that the fair market value of the Restricted Shares is equal to the public market trading price of the HealthRecords shares. The definition of fair market value suggests, among other factors, “highest price obtainable in an open and unrestricted market.” As a result of the significant restrictions that the Restricted Shares are subject to, a third-party purchaser would not be indifferent to owning a freely tradable common share of Health Records relative to the Restrictive Share. That is, a third-party purchaser of the Restricted Shares would require a discount relative to the price of a freely tradable share of HealthRecords, due to the relative illiquidity of the Restricted Share as compared to a freely tradable share (since HealthRecords shares are publicly tradable, the trading price includes liquidity value). The reasons warranting a restricted share discount include the following:

- During the restriction period, there is a risk that the trading price of HealthRecords shares will increase, and due to the illiquidity of the Restricted Shares, Michael will not be permitted to realize the gains;
- There is a risk that during the restriction period the public market trading price of HealthRecords shares will decrease, and due to the illiquidity of the Restricted Shares, Michael will not be permitted to liquidate his Restricted Shares to minimize losses; and
- There are opportunity costs of not being permitted to liquidate the Restricted Shares and use the proceeds in alternative investment opportunities.

Factors That Impact the Quantum of Discount

Various factors impact the quantum of discount and can be applied to the publicly traded price of HealthRecords shares to arrive at the fair market value of the Restricted Shares. Factors include:

- The volatility of the HealthRecords common shares — The greater the price volatility, the greater the risk there is to the holder of the Restricted Shares from illiquidity. My preliminary review of HealthRecords’ recent share trading prices indicates that significant volatility exists. This would have the effect of increasing the discount; and
- The duration of the restriction period — The longer the period of illiquidity, the greater the risk of holding the Restricted Shares, and the greater the required discount. Since the restriction period in respect of the Restricted Shares elapses over a two-year period, different illiquidity discounts would be required for each tranche of Restricted Shares.

Determination of Discount

The quantum of an illiquidity discount that a third-party purchaser would require is subjective. There are several methodologies that are commonly employed in helping to estimate this discount, such as restricted stock studies and option pricing models.

Restricted Stock Studies

Various North American studies have been undertaken over the past 50 years on the values of non- marketable or restricted shares. Some material considers “letter stock,” which is stock identical in all respects to freely traded stock except that it is restricted from trading in the open market for a specified period under the regional securities guidelines. The restrictions on the transfer of letter stock usually lapse within two years, which is generally longer than the restriction period of the Restricted Shares. In addition, volatility characteristics of the letter stock may be different for the Restricted Shares. The studies referred to above indicate average trading discounts in the range of 25% to 45%. More recent studies, however, indicate discounts in the lower end of this range.

These studies also indicate that the length of the period of share restriction would also impact the size of the discount. Generally, the longer the restriction period, the larger the discount.

Option Pricing

An option pricing model can be used to estimate the cost of a put option on freely tradable HealthRecords shares as a means of estimating an appropriate discount to reflect the illiquidity of the restricted shares. Theoretically, the put option would allow the holder of the restricted shares to sell the restricted share at the market trading price on the valuation date at the end of the vesting period. This would allow the holder of the restricted shares to minimize possible losses as a result of a drop in the value of the freely tradable HealthRecords shares during the restriction period. By purchasing put options, the holder can theoretically protect their position at the market price, as at the valuation date, over a specific time period. The cost of the put option reflects a cost required of a theoretical hedge on the shares over the applicable restriction period.

I suggest that Michael engage the services of a qualified CBV to assist him in determining the fair market value of the Restricted Shares so that he will have support of the income inclusion should the tax authorities request it.

Restricted Shares vs. Options Offered by Michael's Employer

In Canada, there are differences between stock options and restricted shares that should be considered before Michael makes a decision. The following is a summary of some of these factors:

- Stock options *are not* taxable upon issuance; restricted shares *are* taxable upon issuance. As such, there is a tax deferral opportunity to Michael if he selects the stock option alternative;
- Stock options will usually expire; restricted shares do not;
- Stock options generally *have* a cash cost to the holder when they are exercised; restricted shares *do not*; and
- Restricted shares usually participate on an equal basis with freely tradable common shares in terms of voting, dividend rights, and so on. Stock options are usually not regarded in the same manner as freely tradable stock. Since it is unlikely that HealthRecords will pay dividends given its start-up nature, and given the insignificant minority voting position Michael would hold in the company, this feature is not valuable to him at this time.

Given the significant preferential tax treatment accorded to stock options in Canada, the relative unlikelihood of HealthRecords paying dividends, and based on the other factors above, I suggest the stock option alternative.

7.7 Public vs. Private Preferred Shares

Exhibit 7.10 illustrates the number of differences between the preferred shares of publicly traded companies and private companies.

Exhibit 7.10: Public and Private Company Preferred Shares

	Public Companies	Private Companies
Retraction	Rarely retractable	Frequently retractable
Conversion	Can be convertible	Rarely convertible
Cumulative	Generally cumulative	Generally non-cumulative
Voting	Generally voting, but as individual interests represent minority interest, there is no voting control	Can be voting and can have voting control either through preferred shares or in conjunction with common shares

In determining an appropriate rate of return for valuing preferred shares, the valuator can consider comparable publicly traded shares with the same rights and characteristics as benchmarks. However, a directly comparable security is seldom found, and the valuator should be aware of the differences between the subject private shares and the publicly traded shares being used as a benchmark. In the comparative analysis, the valuator should justify this difference through an adjustment of the yield of a comparable security, considering the following factors:

- Financial health of issuer;
- Dividend structure — fixed or adjustable rate feature;
- Frequency of dividends;
- Participating or non-participating;
- Cumulative or non-cumulative;
- Voting or non-voting;
- Redeemable; and
- Retractable.

Higher-quality preferred shares will trade at a higher price and generally have a lower dividend yield (lower risk), reflecting the strength of the issuer.

Both S&P and Moody's rate preferred stock of publicly traded companies using specific valuation ratios relating to asset coverage and earnings coverage. Generally, the more favourable the ratios, the higher the rating and lower the yield.

The valuator should calculate similar ratios for the subject private company to determine where its preferred shares would rank in relation to the average yield of comparable publicly traded shares.

7.7.1 Marketability Discount

When the valuator uses publicly traded preferred shares as benchmarks, a marketability discount for the preferred private shares may be appropriate where:

- There is no retraction feature;
- The shareholder does not control the company; or
- There is no "put" provision in the shareholders' agreement.

The marketability discount is applied to reflect the difficulty that might be encountered by the shareholder in quickly selling their private company preferred shares.

Example 7.8: Public Company Benchmarks

Harold owns all of the preferred shares in Systems Sound Company (SSC). The shares earn a cumulative dividend of \$4.25 per share per year. The asset coverage ratios and earnings coverage ratios of SSC all fall into the BB ranking according to S&P's rating methodology for publicly traded preferred stock. Dividend yields for issuers of this credit rating range from 7.2% to 12.8%. As the valuator, you select an appropriate yield of 12% based on the available information.

Required:

What is the value of the marketability discount?

Solution:

The value of each preferred share using the dividend discount model is \$35.42 ($\$4.25/0.12$). Based on your research and analysis, you assess the quantum of the marketability discount to be 30%, which results in a value of \$24.79 per share [$\$35.42 \times (1 - 0.30)$].

Example 7.9: Preferred Shares

You have been asked to value a 33% interest (10,000 shares) in special shares that have the following terms:

- Dividend yield = 4%;
- Retraction price = \$100 per share;
- First priority in repayments of capital; and
- Characteristics: cumulative, voting, and retractable at par.

The special shares are widely held and represent 20% of voting control in aggregate.

The voting feature is therefore not considered significant in assessing a comparable market yield. None of the shareholders of special shares own any common shares. Comparable publicly traded non-voting preferred shares are offering a yield of 6%.

In part, the special shares are considered riskier than the publicly traded preferred shares due to their relative illiquidity. The company also carries a significant amount of debt in relation to other comparable companies, resulting in a low earnings coverage ratio and a low asset coverage ratio.

The company is also not generating an adequate return on its assets; its balance sheet is shown below.

Balance Sheet	
Assets	
Accounts receivable	\$ 1,300,001
Prepaid expenses	673,500
Capital assets, net	
Office and furniture	1,500
Vehicles	25,000
Building	4,500,000
Land	1,500,000
Total assets	8,000,001

Balance Sheet	
Liabilities	
Bank indebtedness	\$ 1,800,000
Accounts payable	1,500,000
	3,300,000
Long-term debt	3,500,000
Total liabilities	6,800,000
Shareholders' equity	
Special shares (30,000 shares)	3,000,000
Common shares	1
Retained earnings (deficit)	(1,800,000)
Total shareholders' equity	1,200,001
Liabilities and shareholders' equity	8,000,001

Solution:

Based on the above considerations, the valuator might decide to value the special shares using a rate of return as follows:

- Comparable market yield: 6%;
- Risk premium for illiquidity: 3%;
- Company-specific risk premium: 2%; and
- Estimated rate of return: 11%.

Based on the above, the estimated value of each special share is \$36.36, as follows:

$$\frac{D}{r} = \frac{\$100 \times 4\%}{0.11} = \frac{4}{0.11} = \$36.36$$

This calculation assumes that the shareholder could sell their shares at \$36.36 per share. In allocating en bloc value among the various share classes, the \$100 per share retraction value would typically be taken into consideration, as this is the stipulated amount obligated by the company. However, as the company is in financial difficulty, there may not be sufficient residual value to allocate to the special shares to recognize their full retraction value.

Assuming the net book value of the assets is representative of their fair market value, there is only \$1.2 million of en bloc equity value to “distribute” between the special shares and common shares on a going concern basis.

The company is obligated to distribute \$3 million to the special shares, but has only \$1.2 million in equity capital. The pro rata allocated value of the special shares is \$40 per share. If the company were sold for \$1.2 million, the shareholder would receive approximately \$40 per share from the company (excluding transaction costs) and no value would accrue to the common shareholders.

The difference between the valuation conclusion (\$36.36) and the pro rata liquidation value (\$40) could reflect factors such as the time value of money and liquidation costs. If the shares were to be sold today, the owner would receive \$36.36 per share. However, if the owner waited until future liquidation, they would be expected to receive \$40.

7.7.2 Options/Warrants

When determining the residual value of common shares, the valuator should be aware of other potential liabilities that could possibly lay claim to the capital or earnings of a company. Companies often issue options or warrants to outside investors, their directors, the management team, or to employees as performance incentives.

In allocating en bloc value, a valuator must consider how much a potential purchaser would have to pay to buy back any outstanding options or warrants, in order to effectively ensure the purchase of 100% of the company.

The valuator should first determine whether options and warrants are:

- In the money (exercise price < FMV of share); or
- Out of the money (exercise price > FMV of share).

Warrants that are in the money are more likely to be exercised. In such an event, the holders of the warrants will pay the company the exercise price for the warrants. The company will be in receipt of excess cash, which is added to the en bloc value of equity. Although the en bloc value of the equity will increase, the number of outstanding common shares will increase as well and a dilutive effect on the share values will take place.

The valuator should be aware of any options and any attached features when valuing an interest in common shares. It is possible that the exercise of options will not only decrease the value per share, but may also change the control position of each respective shareholder.

7.7.3 Other Classes of Common Shares

A company may have more than one class of common shares. In that case, a valuator may be required to allocate the en bloc value among the various common share classes. Under such an exercise, the same considerations would be required as discussed earlier. A valuator should identify the various rights and characteristics of each class, including rank, dividends, and voting rights, and quantitatively and qualitatively assess how and if the features impact value.

One difference between the valuation of common shares and preferred shares of a privately held company is the marketability discount. The return on preferred shares normally materializes through dividend payments. However, the return on common shares typically materializes when the shares are sold. As such, marketability becomes a greater concern for a holder of common shares, and a larger marketability discount than that on preferred shares may be appropriate.

7.8 Other Considerations When Valuing Shares

When valuing shares in companies with complex corporate structures, the multitude of rights, restrictions, and characteristics of the various share classes can be overwhelming. The valuator should remember and apply basic valuation principles used in assessing value for any other shares or assets. The following is a list of key questions to ask when encountering a share valuation:

- *Who would be the likely purchaser of the shares?*

Under the fair market value concept, the value of the shares would be the highest price available in an open and unrestricted market. In the case of a small, closely held family business, a potential third-party investor may be reluctant to be the “outsider” in a company. A more likely buyer might be one of the family members themselves, as they could be willing to pay the highest price for those shares.

- *How much would a buyer be willing to pay for these shares? What circumstances would a third-party purchaser encounter if they were to purchase the shares?*

In addition to considering the various rights and characteristics of the shares in question, the valuator should also assess the conditions a potential purchaser would face in the company. For example, the prospect of investing in a company whose shareholders are family members in constant conflict would not be attractive to an investor. Additionally, an investor would be reluctant to be involved in a company that has a history of deception and discord among shareholders. This would have a negative effect on the value of the shares and may effectively create a nil value if no purchaser is willing to buy the shares, including the existing shareholders.

- *In the event of a liquidation or sale of the company, how much of the proceeds would be available for these shares?*

The articles of incorporation and/or other corporate documents often contain clauses that dictate the rank and treatment of all share classes on certain events including the dissolution and/or sale of the company. The valuator should be aware of these considerations when allocating en bloc value to the various share classes.

- *Are there sufficient funds in the company to redeem the special shares?*

A value calculated using the dividend discount model may have no merit if the company does not have enough funds to pay future dividends. In addition, it is unlikely a prudent purchaser would buy the shares at a price above what it would realize if the company was liquidated, unless there was future potential for growth or earnings.

- *Have there been any recent sales or transfers of shares of the same class?*

The valuator should always inquire whether the subject shares have been sold, issued, or transferred. The transaction price can represent a comparable benchmark in assessing the value of the subject shares.

Example 7.10: Common Shares

Raj, a shareholder of Monroe Inc., owns 5% of Class B common shares.

Approximately four months ago, Meg, another shareholder, sold her 40% interest in Class B shares for \$700,000. This transaction would suggest that Raj's shares are worth \$87,500. However, further analysis of the transaction is required.

To assess comparability, the valuator should determine whether the transaction constituted fair market value and, if not, which principles were breached, how they were breached, and the impact of that breach on value.

Consider the following:

- Highest price available:
 - Did Meg approach various investors and sell to the highest bidder or did she accept the first offer?
 - How long did Meg search for a buyer? One week? One year?
 - Did Meg reject offers of higher prices because of other considerations?
- Open and unrestricted market:
 - Does any documentation exist that would restrict the transfer or ownership of shares?
 - If so, what criteria would allow for a new shareholder?
- Expressed in terms of cash equivalents:
 - What was the total consideration for Meg's shares?
 - Did she receive any non-monetary benefit from the purchaser (i.e., employment by purchaser at higher than market compensation? Were there discounts on goods sold by purchaser? Issuance of non-interest-bearing promissory note?)

- Buyer and seller both have reasonable knowledge of the facts:
 - How much did Meg know about the business?
 - Was she well informed about new developments?
 - Did she take an active interest in the business?
 - Did she hire a valuator or knowledgeable advisor to assist her in the sale?
 - How well informed was the purchaser?
- Acting at arm's length:
 - Was the purchaser related to Meg (i.e., shares gifted to her children, sold to her husband, or other non-arm's length tax planning objectives)?
 - Who are the other shareholders? Where a controlling shareholder also owns preferred shares, it is more likely they would act in their own interest with respect to declaring dividends on the preferred shares. The controlling shareholder would protect their interest in the preferred shares they own and, indirectly, the interest of the preferred shares they do not own.
- Neither is under compulsion to act:
 - Was Meg involved in a dispute with another shareholder or associate of the company that forced her to sell her shares?
 - Did Meg require funds to meet personal obligations?

When assessing comparability to Raj's shares, the valuator should determine whether the transaction constituted fair market value. Considering questions such as the above can be useful in making this determination of how comparable Meg's transaction is to Raj's transaction.