Corporate Finance Primer
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INTRODUCTION
The Corporate Finance course requires extensive use of a financial calculator. You should become familiar with the operation of your financial calculator if you are not already. A refresher on using the Texas Instruments BA II financial calculator is available on the website.

Finance deals with raising funds, referred to in finance as capital, and allocating that capital to investments with the purpose of increasing firm value and consequently shareholder wealth. The financial executive has three key finance functions that serve to protect the interests of the shareholders: investment, financing, and financial management of daily operating activities. More specifically, the role of corporate finance within a business organization is to answer the following three broad questions:

1. What investments, specifically long-term investments, should the firm make?
2. How should the firm raise the cash to make these long-term investments?
3. How should the firm manage its short-term or operating cash flows?

---

1 Most stakeholders have an explicit or implicit contract with the firm. Shareholders have no contract; they are owners and have a residual interest in the firm.
PART 1

Financial markets

There are two types of markets: the primary and the secondary markets. The primary market is where firms sell new issues of stock — initial public offerings (IPOs), seasoned equity offerings, and new bond issues. Secondary markets can be broken down into exchange markets and dealer or over-the-counter markets.

Market efficiency and the efficient-market hypothesis

There are three general types of market efficiency:

- **Operational efficiency**: Operations of the stock market are carried out at as low a cost as possible.
- **Allocational efficiency**: Markets channel funds to those firms with the best investment opportunities.
- **Informational (pricing) efficiency**: Stock prices reflect all relevant information about the stocks.

There are three forms of informational (pricing) efficiency under the efficient-market hypothesis:

1. Weak form, in which prices reflect all historical market data
2. Semi-strong form, in which prices reflect all publicly known and available information. The semi-strong form includes the weak form.
3. Strong form, in which prices reflect all information whether public or private. The strong form includes both the weak form and the semi-strong form.

An informationally (pricing) efficient market gives investors the confidence to buy long-term securities because they know that they can sell those securities at any time if they wish, and importantly at a fair price. An informationally efficient market is also important to the financial executive who uses market value of the stock as a measure of management performance. Undertaking corporate actions that maximize the market value of the stock is only meaningful if that market value accurately reflects the actions of the firm’s management.

Ethical use of non-traditional data

Investment analysts use a variety of traditional and non-traditional sources to gain information to make informed investment decisions. Corporations gather a variety of information from customers and suppliers, and investment analysts also consider when making investment decisions whether companies have ethically and legally managed their data. Non-traditional sources of information on companies include social media, internet web traffic, satellite imagery, drones, private-company data, and credit card data. Ethical and legal complications arise when private personal information has been
gained from these sources and used for purposes not originally intended. Many factors need to be addressed when using these sources of data. For example, what is the origin of the data; has the individual's permission been given to sell or use the data; is the data accurate and valid for the purposes intended? Regulators have started to scrutinize how data is gathered, stored, and used by other parties.

**Major financial securities**

There are two broad categories of financial securities: debt and equity. The basic forms of financial securities are outlined below.

<table>
<thead>
<tr>
<th>Type of security</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term securities</td>
<td>A fixed-income security, often unsecured, that matures in one year or less</td>
<td>T-bills, commercial paper, bankers’ acceptances</td>
</tr>
<tr>
<td>Long-term securities</td>
<td>A debt obligation that matures in more than one year</td>
<td>Bonds and debentures</td>
</tr>
<tr>
<td>Equity securities</td>
<td>Ownership positions in a corporation</td>
<td>Common shares, preferred shares</td>
</tr>
<tr>
<td>Mutual funds</td>
<td>Portfolios of investments</td>
<td>Canadian equity funds, global and international equity funds, money market funds</td>
</tr>
</tbody>
</table>

**Interest rates**

Interest rates represent the amount that will be earned on a dollar invested (loaned), or must be paid on a dollar borrowed, expressed in percentage terms. In this sense, the interest rate is the required return, or the cost associated with the borrowing and lending of funds and is one component of the cost of capital.

The interest rate is determined by the forces of supply and demand. The four major factors that determine interest rates are:

- the short-term, risk-free real interest rate
- expected inflation (nominal as opposed to real interest rates)
- investor and borrower time preferences (the term structure)
- default risk premium reflecting the credit risk of the borrower

**Time value of money (the mathematics of finance)**

The operating, financing, and investing decisions that the financial executive makes involve a series of cash flows, with these cash flows typically occurring at different points in time. Further, cash flows occurring in the future can only be estimated and will involve a degree of uncertainty.

Both the timing of the cash flows and their uncertainty can be incorporated into the analysis through the use of the mathematics of finance (time value of money).
Time value of money is the concept that a dollar invested today will be worth more in the future. A dollar received today can be expressed as an equivalent dollar value at a time in the future through the process of compounding it at an appropriate rate of return. Similarly, a dollar paid or received in the future can be expressed as an equivalent dollar value at the present time by discounting it at an appropriate rate of return. The following terms are presented in the formulas below:

\[
\begin{align*}
\text{PV} & = \text{present value} \\
\text{i} & = \text{rate of interest, or the current periodic rate of return} \\
n & = \text{number of periods the cash flows will occur} \\
\text{FV} & = \text{future value} \\
\text{A} & = \text{periodic amount of the annuity}
\end{align*}
\]

Using the financial calculator, the terms are:

\[
\begin{align*}
\text{PV} & = \text{present value} \\
\text{I/Y} & = \text{rate of interest or current yield (periodic rate of return)} \\
n & = \text{the number of periods the cash flows will occur} \\
\text{FV} & = \text{future value} \\
\text{PMT} & = \text{periodic amount of the annuity or payment}
\end{align*}
\]

There are two concepts that are key to the time value of money: future value, the value of an asset or cash at a specific future date; and present value, the equivalent dollar value today of one or a series of cash flows in later periods.

The formula to calculate future value of an individual cash flow is:

\[
FV = PV \times (1 + i)^n
\]

The formula to calculate present value of an individual cash flow is:

\[
PV = \frac{FV}{(1 + i)^n}
\]

For example, suppose you have $1,000 now and want to know how much will be available in five years’ time for a vacation. If you put the money into a five-year guaranteed investment certificate (GIC) that pays 5% interest compounded annually, the future value is $1,276.28 for your vacation.

\[
FV = 1,000 \times (1 + 0.05)^5 = 1,276.28
\]

Assume instead that you know you need $1,000 in five years’ time for a vacation. You want to determine how much you have to save today to have $1,000 for your trip. If you put the money into a five-year GIC that pays 5% interest compounded annually, you would need to put aside $783.53 today.

\[
PV = \frac{1,000}{(1 + 0.05)^5} = 783.53
\]

Present value is the value of future cash flows, discounted using a return determined by the risk of the future cash flows, in order to obtain their equivalent value at the present time.

---

2 Dollars are assumed here as the currency. However, the same principles apply regardless of currency.
3 The periodic required return will depend on the risk of the cash flows and how often the cash flows occur in a year. For example, for loans, the rate will be the periodic rate.
Annuities
An annuity is a series of cash flows that are the same in amount and occur at regular intervals. An ordinary annuity has the payments occurring at the end of each period, whereas an annuity due has the payments at the beginning of the period.

**Present value of an ordinary annuity**
The present value of an ordinary annuity can be calculated as:

\[ PV = A \left[ \frac{1 - (1 + i)^{-n}}{i} \right] \]

For example, suppose you want to be able to withdraw $20,000 per year for the next five years from your savings account starting exactly one year from today. Current interest rates are 6% on a savings account. How much do you need to deposit today to be able to take out the $20,000 per year for the next five years?

Using the financial calculator:

\[
\begin{align*}
N & = 5 \\
I/Y & = 6\% \\
PMT & = $20,000 \\
CPT PV & = $–84,247.27
\end{align*}
\]

Using the formula:

\[
PV = 20,000 \times \left[ \frac{1 - (1 + 0.06)^{-5}}{0.06} \right] = 84,247.27
\]

To verify:

<table>
<thead>
<tr>
<th>Date</th>
<th>Investment and income earned</th>
<th>Withdrawals</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning year 1</td>
<td>$84,247.27</td>
<td></td>
<td>$84,247.27</td>
</tr>
<tr>
<td>Interest year 1</td>
<td>5,054.84</td>
<td></td>
<td>89,302.11</td>
</tr>
<tr>
<td>Year 1 withdrawal</td>
<td></td>
<td>$20,000</td>
<td>69,302.11</td>
</tr>
<tr>
<td>Interest year 2</td>
<td>4,158.13</td>
<td></td>
<td>73,460.24</td>
</tr>
<tr>
<td>Year 2 withdrawal</td>
<td></td>
<td>20,000</td>
<td>53,460.24</td>
</tr>
<tr>
<td>Interest year 3</td>
<td>3,207.61</td>
<td></td>
<td>56,667.85</td>
</tr>
<tr>
<td>Year 3 withdrawal</td>
<td></td>
<td>20,000</td>
<td>36,667.85</td>
</tr>
<tr>
<td>Interest year 4</td>
<td>2,200.07</td>
<td></td>
<td>38,867.92</td>
</tr>
<tr>
<td>Year 4 withdrawal</td>
<td></td>
<td>20,000</td>
<td>18,867.92</td>
</tr>
<tr>
<td>Interest year 5</td>
<td>1,132.08</td>
<td></td>
<td>20,000.00</td>
</tr>
<tr>
<td>Year 5 withdrawal</td>
<td></td>
<td>20,000</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Future value of an ordinary annuity**
The future value of an ordinary annuity can be calculated as:

\[ FV = A \left( \frac{(1 + i)^n - 1}{i} \right) \]
For example, if you invest $10,000 per year for three years, compounded at 12% annually, what will the value be at the end of the three years?

Using the financial calculator:
N = 3; I/Y = 12%; PMT = $10,000; PV = 0; CPT FV = $33,744

Using the formula:
FV = $10,000 × \{[(1 + 0.12)^3 – 1] / 0.12\} = $33,744

Practice questions
1. Multiple-choice questions:
   i. You have just become a parent and have decided to start saving for your child’s education. Starting at the end of this year, you will deposit $2,000 every year for the next 20 years in an account with an expected return of 6% per year. What is the expected amount in the account at the end of the 20 years?
      a) $22,939.84
      b) $40,000.00
      c) $73,571.18
      d) $128,285.42

   Solution

   Option c) is correct. N = 20; I/Y = 6%; PMT = $2,000; PV = 0; CPT FV = $73,571.18

   Option a) is incorrect. This is the present value of the annuity, not the future value.

   Option b) is incorrect. This is calculated as 20 × $2,000; the effects of compounding interest were not accounted for.

   Option d) is incorrect. This is straight compounding of $2,000 at 6% for 20 years, multiplied by 20: ($2,000 × 1.06^{20}) × 20.

   ii. Neil wants to buy a house in five years and needs to save $150,000 for the down payment. He has $20,000 saved in a GIC earning 8% per year for the next five years. How much does he need to deposit to meet his goal of $150,000 in five years, if he can invest any new deposits at 12% per year?
      a) $18,985.73
      b) $23,611.46
      c) $33,459.34
      d) $41,611.46
Solution

Option a) is correct. First, you need to calculate the future value of the GIC at the end of the five years: $20,000 × 1.08^5 = $29,386.56. Neil needs a total of $150,000 and will have $29,386.56, so he needs an additional $120,613.44 ($150,000 – $29,386.56). Using the future value of an annuity equation, solve for A: A[(1.12^5 – 1) / 0.12] = $120,613.44, or A = $18,985.73. Or, using the financial calculator: N = 5; I/Y = 12%; FV = $120,613.44; PV = 0; CPT PMT = $18,985.73.

Option b) is incorrect. This is the annuity if the future value is $150,000. You forgot to subtract the value of the GIC that is maturing.

Option c) is incorrect. You calculated the annuity with a present value of $120,613.44 ($150,000 – $29,386.56), not the future value. N = 5; I/Y = 12; PV = $120,613.44; CPT PMT = $33,459.34

Option d) is incorrect. This is the annuity with a present value of $150,000.

iii. Which of the following statements about the efficient-market hypothesis is true?

a) Allocational efficiency ensures that information is allocated to the right people.

b) The semi-strong form of market efficiency means the market prices reflect all publicly known and available information.

c) The weak form of market efficiency means that the stock market could operate at a lower cost if it were more efficient.

d) The strong form of market efficiency means that market prices reflect all historical data only.

Solution

Option b) is correct. This is the definition of the semi-strong form of market efficiency.

Option a) is incorrect. Allocationally efficient markets channel funds to those firms with the best investment opportunities.

Option c) is incorrect. The weak form of market efficiency means prices on the market reflect all historical data.

Option d) is incorrect. This is the definition of the weak form of market efficiency. In the strong form of market efficiency, prices reflect all information whether public or private. This includes all historical and publicly known and available information.

2. Your friend has just won $5,000,000 in the lottery. She can receive $5,000,000 immediately or $550,000 per year for the next 10 years. The current interest rate is 9%. Which of these options will give her the most cash overall?
Solution

**CPA Way step: Assess the Situation**

The goal is to maximize cash overall in today’s dollars. In order to do so, the PV of each option will be calculated and compared with one another, the highest option being the recommendation.

**CPA Way step: Analyze Major Issues**

In order to determine which option is better, you need to bring all fund flows to today’s date so they can be compared. This requires calculating the present value of the annuity of $550,000 for 10 years at 9%:

\[
PMT = -550,000; \ I/Y = 9\%; \ N = 10; \ CPT \ PV = $3,529,712
\]

**CPA Way step: Conclude and Advise**

The stream of payments is worth $3,529,712 in today’s dollars, compared to a $5,000,000 payment now. Your friend maximizes her prize when taking the $5,000,000 lump sum.

3. Sharon purchased a new car for $25,600, making a $5,000 down payment. Sharon has borrowed the balance from OAC Lending at an annual rate of 21%. The balance of the loan is to be repaid in 60 equal monthly instalments, on the first of every month. The first monthly payment is due one month from today. Calculate Sharon’s monthly payment.

**Solution**

**CPA Way step: Assess the Situation**

Car payments are typically equal amounts paid monthly. To determine Sharon’s monthly payments, solve for the PMT amount.

**CPA Way step: Analyze Major Issues**

Determine the annuity required using the present value of an annuity calculation and solving for A: 

\[
A\left[1 - \left(1 + \frac{0.21}{12}\right)^{-60}\right] / \left(\frac{0.21}{12}\right) = ($25,600 – $5,000); \ A = $557.30
\]

END; PV = $25,600 – $5,000 = $20,600; N = 60 monthly payments; I/Y = 21/12 = 1.75% per month; CPT PMT = $557.30 per month.
**CPA Way step: Conclude and Advise**

Sharon’s equal monthly payments are $557.30.

Note: This is a very simple example of how to use the CPA Way to analysis a scenario.

4. You, CPA, work as a financial analyst for a credit card company, CCC Inc. CCC is currently looking at providing a loyalty points programs for its users and is in discussions with a third-party provider, Best Points Inc. (BPI). For each dollar spent on the credit card, a user will earn a certain number of BPI points that can then be redeemed for future purchases of flights, hotels, goods, and other services.

Before any agreement can be reached, BPI has requested information on CCC’s credit card users in order to provide a quote on how much it will charge CCC for this service. BPI would like personal information on each user so that it can determine whether any of its current members also use CCC credit cards. It would also like personal information on income levels and annual spending amounts on the credit cards for new potential members to project how many points might be issued and redeemed.

Your boss has asked you to get this data ready for BPI by the end of the day, tomorrow. BPI has stated that it will keep the information confidential.

**Required:**

Outline any concerns you may have about the request for this data.

**CPA Way step: Assess the Situation**

I have been asked to prepare data including personal information on CCC’s credit card users to be provided to a third party, BPI. BPI will use this information to prepare a quote of what CCC will have to pay for BPI to provide CCC with a loyalty points program. Concerns related to this request are outlined below.

**CPA Way step: Analyze Major Issues**

BPI is asking for personal data that CCC has collected. As such, CCC must first determine the origin of the data. Some of it will have been provided directly by the customer (income levels on the application forms) and some will have been gathered internally by CCC (annual spending on the credit card). Can we conclude that the data is accurate and valid?

More importantly, has each individual given their permission for their information to be provided to a third party? Likely, individuals believe only CCC will have access to their information. This access does not give CCC the right to give individuals’ information to BPI for any reason — even if BPI promises to keep it confidential.
**CPA Way step: Conclude and Advise**

If individual permission to give personal information to an outside party has not been provided to CCC, then CCC has no right to provide the information to BPI. Instead, CCC should summarize the information on a completely anonymous basis and provide only these summaries to BPI.
PART 2

Weighted average cost of capital (WACC) and capital structure

This part examines a firm’s capital structure and its WACC.

When financing its investments in operating assets such as property, plant, and equipment, a firm can choose from among a number of sources. The primary sources of long-term financing available to the firm are long-term debt (bonds), preferred shares, and common shares.

A firm’s capital structure is the mix of long-term financing that it uses, specifically the proportions of long-term financing raised through each of the three primary sources. The firm’s WACC is then the required return of these three sources.

Specifically, a firm’s WACC is the weighted average cost of each long-term financing source and represents the cost, in terms of required payments to investors, of raising additional investment capital. Since it is the required return on a dollar of new financing raised today, it reflects current market costs and values. Further, it is determined on an after-corporate-tax basis because the returns investors demand have tax implications.

The formula for calculation of a firm’s WACC is:

\[
WACC = k_d \times W_{debt} + k_p \times W_{preferred} + k_e \times W_{common}
\]

where \( k_d \), \( k_p \) and \( k_e \) are the component costs of debt, preferred shares, and common shares, respectively, and \( W_{debt} \), \( W_{preferred} \) and \( W_{common} \) are the weights, or proportions, of each source of financing.

Note, a firm’s WACC will change as its mix of debt and equity changes because a change in the mix will both alter the weights used in the formula and affect the firm’s level of risk and hence the cost of each source of financing. Further, in terms of taxes, interest payments made by the firm on its long-term debt are tax deductible, whereas dividends on both preferred and common shares are not. Thus, to determine the cost of long-term debt (\( k_d \)), the interest rate is multiplied by (1 – \( T_c \)) where \( T_c \) is the corporate tax rate. Thus, the tax deductibility of interest reduces the cost of debt to the firm.

The following information about Firefly Enterprises Ltd. will now be used to show how to calculate a firm’s WACC.

- Firefly has a bond issue outstanding for $2,000,000. The bonds pay interest at 6% semi-annually and mature in six years. The current yield to maturity (YTM) for similar bonds is 5%.
- Firefly has 50,000 preferred shares outstanding with a book value of $500,000 and a dividend per share of $1.00. The current market value of these shares is $12.50.
- Firefly has 1,000,000 common shares issued and outstanding. The beta on these shares is 1.3. Last year, these shares paid a dividend of $2.40 per share. The dividend is expected to grow at a rate of 1% annually for the foreseeable future. The
current risk-free rate of return is 5% and the market risk premium is 6.25%. The current market price for the shares is $20.

- Firefly’s tax rate is 25%.

Note, for simplicity, this illustration assumes that there are no issue (flotation) costs associated with raising new long-term financing. More typically, there will be issue costs which will increase the cost to the firm of each source of financing, although the net cost to the firm will be reduced because issue costs are tax deductible.

**Annuities — Valuing bonds and other debt**

A bond is much like an interest-only loan and consists of a series of interest payments, referred to as coupon payments, and repayment of the principal amount when the loan is due. Consequently, the present value of an annuity can be used to find how much a series of constant cash flows (such as the coupon requirements on a bond) is worth. The present value of a single amount can be used to find out how much the principal of the loan is worth.

Using Firefly’s information:

The cost of debt (kd) for the WACC calculation is:

\[
kd = Y(1 - Tc) \text{ where } Y \text{ is the YTM on bonds of similar risk} \\
= 0.05(1 - 0.25) = 0.0375 \text{ or } 3.75\% 
\]

The market value of the bonds is:

\[
\text{I/Y = 2.5 per semi-annual period; N = 12 semi-annual periods; PMT = $60,000 per semi-annual period; FV = $2,000,000; CPT PV = —$2,102,578}
\]

**Perpetuities and valuing preferred shares**

A perpetuity is a series of cash flows that recur regularly at the same amount each period and continue forever. It is assumed that the first cash flow occurs one period later than the time at which the cash flows are valued. Note that the formula shown below can be rearranged to calculate either the value of the preferred shares or the required return (cost of preferred shares).

\[
P_0 = D_p + k_p
\]

where

- \(P_0\) is the price or present value at the current time
- \(D_p\) is the constant cash inflow for each period (that is, the stated dividend per preferred share), because it usually does not change.
- \(k_p\) is the required return for the perpetual cash flows, based on risk

\[
k_p = \frac{1.00}{12.50} = 0.08, \text{ or } 8\%
\]
The current market value of Firefly’s preferred shares is 50,000 shares × $12.50 per share = $625,000.

Common shares

In an efficient market, the current value of any security, whether long-term debt (bonds), preferred shares, or common shares, is the present value of the cash flows that the investor expects to receive from the security. For common shares, these cash flows are the dividends that the firm pays out to investors.

Under the simplifying assumption that the dividends the firm pays will grow at a constant rate in perpetuity (for ever), the common shares of a firm can be valued using the constant growth dividend discount model (constant growth DDM). The formula for the constant growth DDM is:

$$P_0 = \frac{D_1}{k_e - g}$$

In a similar fashion to that illustrated for preferred shares above, this formula can be rearranged to calculate either the value of the common shares (as above) or the required return (cost of common shares), as follows:

$$k_e = \frac{D_1}{P_0} + g$$

An alternative approach to the constant growth DDM for valuing common shares is use of the capital asset pricing model (CAPM). Specifically, the CAPM can be used to estimate the return required on an individual asset or stock based on its systematic risk (beta) and the market risk premium (market price of risk) which is the difference between the return required on the market portfolio and the return on the risk-free asset. The formula for the CAPM is:

$$E(r_i) = r_f + \beta_i [E(r_m) - r_f]$$

where

$E(r_i)$ is the required one-period return for asset $i$

$k_e$ is the cost of common shares

$r_f$ is the risk-free rate (T-bill rate) for the next period

$\beta_i$ is the beta of asset $i$

$[E(r_m) - r_f]$ is the market risk premium (average market price of risk). Note, this amount is known as the market risk premium because it shows the extra return required for investing in the risky market portfolio above the risk-free rate of return.

For Firefly, first using the constant growth DDM:

$$D_1 = $2.40 \times 1.01 = $2.424$$

$$P_0 = $20 \text{ (current market price)}$$

$$g = 1\%$$

$$k_e = \frac{$2.424}{$20 + 0.01} = 0.1312, \text{ or } 13.12\%$$
The market value of Firefly’s common shares is $1,000,000 \times 20 = $20,000,000.

Alternatively, using the CAPM:

\[ k_e = r_f + \beta_i [E(r_m) - r_f] = 0.05 + 1.3 [0.0625] = 0.13125, \text{ or } 13.125\% \]

Where, two possible values are available, an average is taken and used in the WACC calculation. In this case, that amount would be: \((0.1312 + 0.13125)/2 = 0.131225\) rounded to four decimal places that would be 0.1312.

**WACC — Summary**

Putting together all the above data for Firefly, the WACC calculation becomes:

<table>
<thead>
<tr>
<th>Source of financing</th>
<th>Market value</th>
<th>Weighting*</th>
<th>Required return</th>
<th>Weighted cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt (bonds)</td>
<td>$2,102,578</td>
<td>0.0925</td>
<td>0.0375</td>
<td>0.0035</td>
</tr>
<tr>
<td>Preferred shares</td>
<td>625,000</td>
<td>0.0275</td>
<td>0.0800</td>
<td>0.0022</td>
</tr>
<tr>
<td>Common shares</td>
<td>20,000,000</td>
<td>0.8800</td>
<td>0.1312</td>
<td>0.1155</td>
</tr>
<tr>
<td>Total</td>
<td>$22,727,578</td>
<td>1.0000</td>
<td></td>
<td>0.1212</td>
</tr>
</tbody>
</table>

* The weighting for debt is calculated as 2,102,578/22,727,578, for preferred shares, 625,000/22,727,578, and for common shares, 20,000,000/22,727,578.

Thus, based on the figures provided, Firefly’s WACC is 12.12%.

**Choosing a capital structure**

As stated at the outset, a firm’s WACC will change whenever its mix of debt and equity changes. When choosing a capital structure, major considerations include the required return of each source of financing, the relative availability of each source of capital in the marketplace, the cost of raising the funds and matching capital structure with operating and business risk. The best capital structure for a firm is a complex decision.

While debt has a lower cost than equity (both preferred and common shares), as the percentage of debt in a firm’s capital structure increases, the risk profile of the firm also increases. This increase in risk leads to higher costs for both new long-term debt and new equity.

**Operating and financial leverage**

A firm’s business risk is the riskiness of its earnings as reflected by their variability. Sales fluctuate with the economy (macroeconomic effects) and with firm-specific events. The part of business risk that is related to the changes in the overall economy is reflected in the firm’s beta (\(\beta\)) because the returns on the shares are driven by the firm’s earnings, much the same way that returns on the market portfolio are driven by earnings at the market (economy) level.
Both operating and financial leverage magnify business risk and hence affect $\beta$. Operating leverage is the degree to which operating costs are fixed. Fixed costs must be paid regardless of the level of the firm's earnings. With high fixed costs, the firm runs the risk of operating at a loss. Equally, financial leverage is the degree to which financing costs are fixed. Firms with high financial leverage have a higher risk of default because they must pay their financing costs regardless of the level of their earnings. If a firm does not have enough money to pay its fixed financing costs, it may eventually have to declare bankruptcy. Therefore, higher operating leverage and higher financial leverage both lead to wider swings in net income (greater business risk) and hence a higher $\beta$.

**Dividends**

The term *dividend* refers to the distribution of earnings to shareholders, most typically in the form of cash. After a firm has paid dividends to its preferred shareholders (who have a priority claim to earnings), the firm can distribute residual net earnings to common shareholders, keep the net earnings as retained earnings to fund investment projects or some combination of the two. The dividend-payout ratio is the percentage of these residual net earnings that the firm actually pays out as dividends to common shareholders.

Dividends on common shares are not contractual obligations. The board of directors decides whether or not to pay a dividend. The sequence of events in paying a dividend is as follows:

- **announcement date** — the day the board’s decision is declared
- **dividend-on date** — the last day an investor can buy a share in time to receive the dividend
- **ex-dividend date** — the day after the dividend-on date
- **record date** — the cutoff date that determines who is entitled to receive the declared dividend
- **payment date** — the date the dividend is paid

There are four main dividend payment policies:

- **Constant dividend-payout ratio policy**: The same percentage of earnings is paid as dividends each period.
- **Residual dividend policy**: Dividends equal cash flow from operations less capital expenditures.
- **Constant dollar dividend policy**: The same dollar amount per outstanding common share is paid each period.
- **Steadily increasing dividend policy**: The dollar amount of dividends per share increases each year by some amount set by the company.
Practice questions
1. Multiple-choice questions:
   i. Your employer has given you the following information:

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost</th>
<th>Market value</th>
<th>Weighting</th>
<th>Weighted cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book value of debt</td>
<td>$1,500,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market value of debt</td>
<td>$1,350,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Book value of common shares</td>
<td>$1,150,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market value of common shares</td>
<td>$2,200,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of debt before taxes</td>
<td>8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of equity</td>
<td>16%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate tax rate</td>
<td>25%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   What is the WACC assuming no new capital is to be raised.

   a) 10.3%
   b) 11.5%
   c) 12.2%
   d) 13.0%

   Solution

   Option c) is **correct**. It is calculated as:

<table>
<thead>
<tr>
<th>Component</th>
<th>cost</th>
<th>Market value</th>
<th>Weighting</th>
<th>Weighted cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>(1 – 0.25)(0.08) = 0.06</td>
<td>$1,350,000</td>
<td>0.3803</td>
<td>0.0228</td>
</tr>
<tr>
<td>Equity</td>
<td>0.16</td>
<td>$2,200,000</td>
<td>0.6197</td>
<td>0.0992</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$3,550,000</td>
<td>1.0000</td>
<td>0.1220</td>
</tr>
</tbody>
</table>

   Option a) is incorrect. You used the book value rather than the market value for both debt and common shares.

   Option b) is incorrect. You used the book value rather than the market value for both debt and common shares, and you did not adjust the before-tax cost of debt to the after-tax rate.

   Option d) is incorrect. You forgot to adjust the before-tax cost of debt to the after-tax rate.
ii. The investors of Q Company have agreed that, one year from now, common share dividends will be $2.00. An analysis of Q Company shows that the required rate of return for the company’s equity is 10%. If dividends are expected to grow 3% per year, calculate the current price of Q Company’s shares.

a) $15.38  
b) $20.00  
c) $28.57  
d) $29.43

**Solution**

Option c) is correct. \[ PV_0 = \frac{2.00}{0.10 - 0.03} = 28.57 \]

Option a) is incorrect. You added the growth rate in the denominator of the formula rather than subtracting it.

Option b) is incorrect. This would be the price if there were no growth.

Option d) is incorrect. You added one year of growth to the dividend, but the dividend is already one year out.

2. Serenity Sofas Inc. has 5,000,000 preferred shares outstanding. The current market price is $16.50 per share. Serenity offers a dividend of $1.25 per share. Serenity’s tax rate is 28%.

**Required:**

Calculate the rate of return of the preferred shares.

**Solution**

\[ k_p = \frac{D_p}{P_p} = \frac{1.25}{16.50} = 0.0758 \]

Serenity’s rate of return on the preferred shares is 7.58%.

3. Galatica Gems Ltd. has 30,000,000 common shares outstanding that are currently trading at a price of $12 per share. These shares have a beta of 1.7, the market risk premium is 6% and the risk-free rate is 2.5%.

Galatica also has 1,000,000 preferred shares outstanding that have a book value of $10,000,000 and consistently pay a stated dividend of $1.50 per share. They currently trade at $15 per share.
In addition, Galatica has an outstanding bond issue for $145,000,000 that carries a coupon rate of 6% paid semi-annually and has a term to maturity of six years. The current YTM on bonds of similar risk is 4%.

Galatica’s current tax rate is 30%.

**Required:**

Calculate Galatica’s WACC, assuming there are no issue (flotation) costs associated with raising new long-term financing.

**Solution**

In order to calculate Galatica’s WACC, first calculate the component cost of each source of financing and then weight the sources proportionally to their respective amounts.

**Debt:**

\[ k_d = Y(1 - T_c) = 0.04(1 - 0.30) = 0.0280, \text{ or } 2.8\% \]

**MV of bond — Present value of the bond:**

\[
\begin{align*}
N & = 6 \times 2 = 12 \text{ semi-annual periods}; \\
I & = 4 \div 2 = 2\% \text{ per semi-annual period}; \\
PMT & = $145,000,000 \times 3\% = $4,350,000 \text{ per semi-annual period}; \\
FV & = $145,000,000; \\
CPT PV & = $160,334,245
\end{align*}
\]

**Preferred shares:**

\[ k_p = D_p \div PV_0; \ \$1.50 \div \$15.00 = 0.1000 \text{ or } 10.0\% \]

\[ MV = 1,000,000 \times \$15 = \$15,000,000 \]

**Common shares:**

\[ k_e = R_f + \beta_i(R_m - R_f); \ \$0.025 + 1.7(0.06) = 0.127 \text{ or } 12.7\% \]

\[ MV = 30,000,000 \times \$12.00 = \$360,000,000 \]

<table>
<thead>
<tr>
<th>Source of financing</th>
<th>Market value</th>
<th>Weighting</th>
<th>Component cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>$160,334,245</td>
<td>0.2995</td>
<td>0.0280</td>
</tr>
<tr>
<td>Preferred shares</td>
<td>$15,000,000</td>
<td>0.0280</td>
<td>0.1000</td>
</tr>
<tr>
<td>Common shares</td>
<td>$360,000,000</td>
<td>0.6725</td>
<td>0.1270</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$535,334,245</td>
<td>1.0000</td>
<td></td>
</tr>
</tbody>
</table>

\[ WACC = 0.2995 \times 0.0280 + 0.0280 \times 0.1000 + 0.6725 \times 0.1270 = 0.0966 \]

Galatica’s WACC is 9.66%.
4. Gotham Inc. has an outstanding bond issue with a face value of $50,000,000 and a market value of $47,444,294. The bond coupon rate is 8%, with interest paid semi-annually. The bonds mature in seven years.

Gotham has 2,000,000 preferred shares outstanding that have a book value of $4,000,000. These shares consistently pay an annual dividend of $0.50. They currently trade at $2.50 per share.

Gotham also has 5,000,000 common shares issued and outstanding that currently trade for $5.00 per share. These shares paid a dividend of $1.50 this year. This is expected to grow at a rate of 2% annually.

Gotham’s tax rate is 30%.

**Required:**

Calculate Gotham’s WACC assuming there are no issue (flotation) costs associated with raising new long-term financing.

**Solution**

In order to calculate Gotham’s WACC, first calculate the component cost of each source of financing and then weight the sources proportionally to their respective amounts.

Market value of the bond is given at $47,444,394.

To calculate the cost of debt, you first need to calculate what the market YTM is on the bond issue.

\[
PMT = $2,000,000 \text{ per semi-annual period}; \ N = 14 \text{ semi-annual periods}; \ FV = \$50,000,000; \ PV = -$47,444,294; \ CPT \ I/Y = 4.5\% \text{ which would be an annual YTM of 4.5 \times 2 = 9.00\%}
\]

Cost of debt: \(Y(1 – Tc) = (0.09)(1 – 0.30) = 0.063\), or 6.3%

Current market value of the preferred shares:

\[2,000,000 \text{ shares} \times $2.50 \text{ per share} = $5,000,000\]

Cost of preferred shares:

Using the formula: \(PV_0 = D_p + k_p\)

Or \(k_p = D_p + PV_0; \ 0.50 + $2.50 = 0.20 \text{ or 20\%}\)

Current market value of the common shares:

\[5,000,000 \text{ shares} \times $5.00 = $25,000,000\]
Cost of common shares:

Using the formula: \[ k_e = \frac{D_1}{P_0} + g \]

\[ D_1 = D_0 \times (1 + g); \quad D_1 = (1.50)(1.02) = $1.53 \]

\[ k_e = \frac{1.53}{5.00} + 0.02 = 0.326 \text{ or } 32.6\% \]

<table>
<thead>
<tr>
<th>Source of financing</th>
<th>Market value</th>
<th>Weighting</th>
<th>Cost</th>
<th>Weighted cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonds</td>
<td>$47,444,294</td>
<td>0.6126</td>
<td>0.063</td>
<td>0.0386</td>
</tr>
<tr>
<td>Preferred shares</td>
<td>5,000,000</td>
<td>0.0646</td>
<td>0.200</td>
<td>0.0129</td>
</tr>
<tr>
<td>Common shares</td>
<td>25,000,000</td>
<td>0.3228</td>
<td>0.326</td>
<td>0.1052</td>
</tr>
<tr>
<td>Total</td>
<td>$77,444,294</td>
<td>1.0000</td>
<td>0.1567</td>
<td></td>
</tr>
</tbody>
</table>

Gotham’s WACC is 15.67%. 
PART 3

Capital budgeting

This part focuses on the firm’s capital budgeting decision. Capital budgeting involves deciding what long-term investments the firm should make, such as, how to allocate funds for potential new capital assets like property, plant and machinery, or what expansion plans should be implemented. It can be one of the most important decisions for the financial executive because very large amounts of money can be involved, and the analysis is both complex and time consuming.

The capital budgeting process involves the following steps:

1. Estimating the project’s cash flows
2. Determining the risk profile of the project and assigning a discount rate based on that risk profile
3. Calculating the net present value of the project or applying an alternative method of analysis
4. Assessing whether the project should be undertaken, based on both the numerical analysis and other qualitative factors

There are three methods of analysis that are commonly applied to a capital budgeting decision, the net present value (NPV) method, the payback period (PBP) method, and the internal rate of return (IRR) method. Of these, the NPV method is the superior method because it considers all incremental cash flows associated with the proposed project, it directly measures the increase or decrease in the firm’s value if a project is accepted and it considers risk through the discount rate used. If a project has the same risk profile as the firm, then the firm’s WACC is used as the discount rate.

Irrespective of selected method, a capital budgeting analysis should be based on the relevant cash flows associated with the proposed project, where the notion of “relevant cash flows” refers to cash flows that differ between the decision to undertake a project and the decision to forgo it. There are five rules to follow for identifying and determining relevant cash flows:

- Use actual cash flows, not accounting income.
- Use incremental cash flows (that is, only those cash flows that relate directly to undertaking or forgoing the project); include opportunity costs, but exclude sunk costs.
- Use after-tax cash flows.
- Use nominal cash flows (that is, include inflation).
- Ignore financing costs (they are included through the use of the correct discount rate).
The following example illustrates the application of these rules to determine the relevant cash flows for a capital budgeting analysis.

Victoria Ltd. is considering a new project with a five-year life. It will involve an initial investment of $7,000,000 in a new building and of $3,000,000 in new equipment. Victoria believes there will also be an increased investment in net working capital (NWC) from $2,500,000 to $3,000,000. The salvage value of the equipment at the end of the five-year term is expected to be 10% of the purchase price, and the building is expected to be worth 60% of the original cost. Both the building and the equipment will be depreciated on a straight-line basis. An initial analysis prepared last month by an engineering consultant, which cost $50,000, indicates that the project is feasible.

Revenues from this project are expected to be $8,000,000 per year. Cost of goods sold (COGS) will be 60% of revenue. Victoria’s marginal tax rate is 33%.

The relevant cash flows are as follows:

1. **Initial investments (one-time cash outflows)**
   - Building $(7,000,000)
   - Equipment (3,000,000)
   - Increase in NWC ($3,000,000 – $2,500,000) (500,000)

   Note that it is the increase in NWC that is relevant, as it is part of the incremental cost of the project.

2. **Salvage (one-time cash recoveries)**
   - Building ($7,000,000 × 0.60) $ 4,200,000
   - Equipment ($3,000,000 × 0.10) 300,000
   - NWC recovered 500,000

   Under a capital budgeting analysis, all investments are assumed to be recovered or sold at the end of the project’s life (the planning horizon) unless the example states otherwise.

3. **Revenues and COGS per year (recurring cash flows)**
   - Revenues $ 8,000,000
   - COGS ($8,000,000 × 0.60) (4,800,000)
   - Contribution margin $ 3,200,000
   - Tax @ 33% 1,056,000
   - Increased cash flows per year $ 2,144,000

   The feasibility study cost is not relevant. It is a sunk cost that has already been incurred and can not be recovered irrespective of whether the project goes ahead or not.

You can see from the above that you have calculated three different types of cash flows: initial one-time cash outflows, one-time cash recoveries at the end of the project,
and recurring cash flows over the life of the project. This is the first step when setting up an NPV analysis.

**Capital cost allowance**

An important cash flow for most capital budgeting projects is the future reduction in taxes payable, as a result of the capital investment. Under the Canadian Income Tax Act, the depreciation calculated for tax purposes is called **capital cost allowance (CCA)**. CCA is most often determined on a declining balance basis where the rate is prescribed by the Canada Revenue Agency (CRA) for the asset class associated with the cash outlay.

Further it is CCA, not depreciation policy, which effects cash flow. Depreciation policy is a choice of the firm and affects accounting income but not actual cash flows. It is CCA as determined by the tax authorities that results in a tax shield.

From a tax perspective, individual assets are viewed as part of an **asset pool**. CCA is based on the remaining balance in the pool. This remaining balance is called the **undepreciated capital cost (UCC)** balance. As long as at least one asset remains in the asset pool, and the pool has a positive balance, CCA will continue.

The UCC pool increases in any given year by the amount of net acquisitions (acquisitions minus disposals) and decreases by the amount of CCA that is taken and by any asset salvage values that are removed from the pool. Note, the firm can take anywhere between 0% and the maximum rate allowed for the asset class. For example, assets in Class 1 have a maximum rate of 4%, so a firm could deduct no CCA in a given year or any amount up to 4%. Thus, if the firm suffers a loss, it can elect not to take the CCA that year and save the deduction for future years when it expects to be profitable. Finally, in the year of acquisition, firms will apply only one-half of the maximum CCA rate to the net acquisition amount and this is called the half-year rule. (Note: The CRA has changed the CCA rules for specific manufacturing and processing equipment purchased after November 20, 2018. It has also introduced a new Accelerated Investment Incentive for qualifying assets purchased after November 20, 2018. For the purposes of this course assume that none of the purchases of new equipment are made after November 20, 2018.)

The following formula presents the present value of the total (infinite) tax shield from CCA:

\[
\text{Present value of the CCA tax shield} = \frac{C dt}{d + r} \times \frac{1 + (0.5r)}{1 + r}
\]

where
- \(C\) = net acquisition cost of the asset (acquisition minus disposal)
- \(d\) = prescribed CCA rate
- \(t\) = firm’s tax rate
- \(r\) = appropriate discount rate
The final term \(\frac{[1 + (0.5r)]}{(1 + r)}\) of the formula represents the adjustment for the half-year rule.

As noted, this formula assumes that CCA will be taken on the new asset forever. However, when the asset is sold, the balance in the asset pool (UCC) is reduced by the amount of the proceeds from disposal. As long as there are assets remaining in the pool and there is a positive balance after the deduction of the salvage values, CCA can continue to be deducted. Thus, the amount of the tax shield that is lost by disposing of the asset must also be calculated. This is done using the following formula:

\[
\text{Present value of the CCA tax shield lost} = \frac{Sdt}{d + r} \times \frac{1}{(1 + r)^n}
\]

where

\(S\) = estimated salvage value of the asset

**NPV**

The NPV method is a discounted cash flow method. It estimates the future cash flows generated by the proposed investment and then discounts them back to the present time. The appropriate discount rate for use in the analysis is a discount rate that reflects the risk of the project cash flows. If the risk profile of the investment is similar to that of the firm as a whole, then the firm’s WACC can be used as a discount rate.

As noted, the NPV method is the preferred method for conducting a capital budgeting analysis because it considers all incremental cash flows related to the proposed project and it provides a direct measure of how much the firm’s value will change if the proposed project or investment is undertaken. In general, a firm should accept projects that have a positive NPV (those that are assessed to add value to the firm and increase shareholder wealth) and reject projects that have a negative NPV (those that are assessed to reduce value from the firm and shareholder wealth).

Use of the NPV method is illustrated in the following example:

Suppose Reynolds Radio-Controlled Toys Ltd. (Reynolds) is considering replacing an old machine with new technology. The new machine will cost $3,500,000 to purchase and install and has an estimated useful life of four years. The new machine will have a salvage value of $870,000 at the end of the four years. There will still be assets remaining in this class after the proceeds are deducted.

Revenues are expected to increase by $2,750,000 annually, with COGS remaining at 55% of sales if the new machine is purchased. Other operating costs will be $650,000 less per year with the new machine. The increase in sales will result in an increase of $325,000 in NWC.

Reynolds has a corporate tax rate of 27%, its cost of capital is 12% and the applicable CCA rate for the new machine is 20%. Because purchasing new technology is riskier
than staying with older, more familiar equipment, the required return of this project should be 2% higher than the WACC of the firm.

To determine whether it’s worth buying the new machine, Reynolds has decided to calculate the NPV of the project.

The relevant cash flows (excluding the CCA tax shield and CCA tax shield lost) for the proposed second plant and their timing are presented in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New machinery</td>
<td>(3,500,000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in NWC</td>
<td>(325,000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3,825,000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental annual cash flows</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenues</td>
<td>2,750,000</td>
<td>2,750,000</td>
<td>2,750,000</td>
<td>2,750,000</td>
</tr>
<tr>
<td>Cost of sales 55%</td>
<td>(1,512,000)</td>
<td>(1,512,000)</td>
<td>(1,512,000)</td>
<td>(1,512,000)</td>
</tr>
<tr>
<td>Other cost savings</td>
<td>650,000</td>
<td>650,000</td>
<td>650,000</td>
<td>650,000</td>
</tr>
<tr>
<td>Pre-tax operating income</td>
<td>1,887,500</td>
<td>1,887,500</td>
<td>1,887,500</td>
<td>1,887,500</td>
</tr>
<tr>
<td>Tax 27%</td>
<td>(509,625)</td>
<td>(509,625)</td>
<td>(509,625)</td>
<td>(509,625)</td>
</tr>
<tr>
<td>Annual cash flow</td>
<td>1,377,875</td>
<td>1,377,875</td>
<td>1,377,875</td>
<td>1,377,875</td>
</tr>
</tbody>
</table>

Salvage:
New machine: 870,000
Working capital: 325,000

Initial investment
New machine: 3,500,000 – 0 = 3,500,000
Working capital 325,000 = $(3,825,000)

Note that nothing needs to be done to the initial investment in terms of present value because these outlays are incurred at the very start of the project, at time zero.

CCA tax shield:
New technology = \( \frac{3,500,000 \times 0.20 \times 0.27}{(0.20 + 0.14)} \times \frac{1}{1.14} = 521,749 \)

Lost CCA tax shield:
New technology = \( \frac{870,000 \times 0.20 \times 0.27}{(0.20 + 0.14)} \times \frac{1}{1.14^4} = (81,812) \)

Note that the tax shield formula already incorporates the present value calculation, so no additional calculations are required.

Salvage
New technology: 870,000 \( \div (1.14)^4 \) = 515,110
NWC recovered: 325,000 \( \div (1.14)^4 \) = 192,426

The salvage occurs at the end of the project, so each of the relevant salvage cash inflows is discounted back to time zero, as can be seen by dividing each by 1.14^4.

Incremental revenue and cost savings
Net cash flow: revenue of $2,750,000 less COGS (55% of revenue figure) = $1,237,500
$1,237,500 plus cost savings of $650,000 = $1,887,500 \( \times (1 – 0.27) = $1,377,875 \)
This amount occurs over the four-year period, so, assuming equal cash flow over the four years, it must be present valued back to time zero.

\[
PMT = \$1,377,875; \ N = 4, \ I/Y = 14, \ CPT \ PV \quad 4,014,731
\]
\[
NPV \quad $1,337,204
\]

The NPV is positive, so Reynolds should replace its equipment.

**Payback period**

The payback period method determines the number of years required for a project to pay back the initial investment. The payback period method uses after-tax cash flows and includes CCA tax shields but does not take the time value of money into account.

Consider the cash flows from the Reynolds scenario above and assume they occur evenly over each year of the project. The initial investment was $3,500,000 for the machine plus a $325,000 increase in NWC.

<table>
<thead>
<tr>
<th>Year</th>
<th>Opening balance</th>
<th>Cash inflows, net of tax</th>
<th>CCA tax shield savings</th>
<th>Net shortfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$(3,825,000)</td>
<td>1,377,875</td>
<td>94,500</td>
<td>$(2,352,625)</td>
</tr>
<tr>
<td>2</td>
<td>$(2,352,625)</td>
<td>1,377,875</td>
<td>170,100</td>
<td>$ (804,650)</td>
</tr>
<tr>
<td>3</td>
<td>$ (804,650)</td>
<td>1,377,875</td>
<td>136,080</td>
<td>$ 709,305</td>
</tr>
</tbody>
</table>

Payback period = 2 + (804,650 ÷ 1,513,955) = 2.5315 years which would be rounded to 2.5 years.

To calculate the CCA tax shield:

<table>
<thead>
<tr>
<th>Year</th>
<th>Beginning-of-year balance</th>
<th>Maximum amount of CCA to claim at 20% rate</th>
<th>Tax shield at 27% tax rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$3,500,000</td>
<td>350,000*</td>
<td>94,500</td>
</tr>
<tr>
<td>2</td>
<td>$3,150,000</td>
<td>630,000</td>
<td>170,100</td>
</tr>
<tr>
<td>3</td>
<td>$2,520,000</td>
<td>504,000</td>
<td>136,080</td>
</tr>
</tbody>
</table>

*In Year 1, only 50% of the CCA is eligible to be claimed.

**Internal rate of return**

The IRR for a project or investment is the discount rate at which the project’s NPV is equal to zero. Based on the IRR method, a project should be accepted if its IRR exceeds the appropriate risk-adjusted discount rate for the project, because this means that the project has a positive NPV.

Whitehorse Ltd. is considering an investment in a new machine that will cost $350,000. The machine is estimated to generate positive year-end cash flows of $120,050 for the next seven years. Whitehorse’s tax rate is 37%. Ignoring CCA and salvage, what is the IRR for the investment?

The IRR is the rate at which the NPV = 0. Using the financial calculator:

\[
PV = \$350,000; \ PMT = -(1 - 0.37)(120,050) \text{ or } -\$75,631.50; \ FV = 0; \ N = 7; \ CPT \ I/Y = 11.56 \text{ or } 11.56\%
\]
Practice questions

1. Multiple-choice questions:

   i. Jones and Sons is considering a new capital project. Which of the following is a relevant cost in evaluating whether or not to undertake the project?

      a) A market survey, completed two months ago, assessing the profitability of the project
      b) A feasibility study of the engineering requirements for the equipment needed
      c) The change in depreciation expense that will flow from purchasing the equipment
      d) A decrease in the amount of NWC required

   Solution

   Option d) is correct. Any changes in NWC are relevant costs to consider when evaluating a project.

   Option a) is incorrect. A market survey undertaken to assess the profitability of a project is a sunk cost and is therefore not relevant.

   Option b) is incorrect. A feasibility study of the engineering requirements is a sunk cost and is therefore not relevant.

   Option c) is incorrect. A change in depreciation expense does not affect cash flows and is therefore not relevant.

   ii. Peter’s Playground Equipment Ltd. is looking at purchasing a new machine. The cost of the machine is $100,000. The machine has a useful life of six years. At the end of six years, the salvage value will be $4,000. Peter’s Playground Equipment will use straight-line depreciation for accounting purposes and Class 8 at 20% for CCA. The firm’s tax rate is 35% and its cost of capital is 15%. What is the present value of the CCA tax shield that Peter’s Playground Equipment will experience if it purchases the new machine and the project has the same risk level as the business?

      a) $346
      b) $16,000
      c) $18,350
      d) $18,696

   Solution

   Option d) is correct. The calculation is:

   \[
   \frac{Cdt}{d + r} \times \frac{1 + (0.5r)}{1 + r} = \frac{(100,000)(0.20)(0.35)}{0.20 + 0.15} \times \frac{1 + (0.5 \times 0.15)}{1 + 0.15} = $18,696
   \]
Option a) is incorrect. This is the present value of the CCA tax shield lost.

Option b) is incorrect. This is the straight-line depreciation, not the CCA tax shield.

Option c) is incorrect. This is the present value of the CCA tax shield less the tax shield lost.

2. Shelbourne Manufacturing is considering the introduction of a new product. This will require the purchase of a machine at a cost of $2,500,000. This machine has an estimated economic life of eight years, at the end of which its salvage value is estimated to be $250,000. Based on these estimates, for accounting purposes, the machine will be depreciated on a straight-line basis at a rate of $281,250 per year. There is sufficient floor space to install and operate the new machine within Shelbourne’s existing production facility. Common (overhead) costs for the facility are allocated based on how much floor space is used. On this basis, the new product will be allocated $150,000 per year to cover its share of the common facility costs. This floor space is currently unused. Manufacture of the new product will also require an investment in additional NWC of $350,000.

The financial executive has estimated that the contribution margin (before tax) from the new product for accounting purposes will be $400,000 for the first year of production. She then estimates that this figure will rise to $700,000 in each of the remaining seven years of the project’s life as the advantages of the product gain recognition in the marketplace.

Shelbourne’s tax rate is 37%. The applicable CCA rate for the new machine is 15%. Assume the project life is the same as the economic life of the new machine. As the product is a new product, the cash flows will be riskier than those of the firm in general. The firm’s WACC is 9.5%, and to compensate for increased risk, the project should be discounted at WACC plus 3%.

**Required:**

Identify all cash flows relevant to a capital budgeting analysis of the proposed purchase of the new machine. Include the present value of the CCA tax shield and the tax shield lost in your answer, if relevant. Assume there are still assets remaining in the CCA pool after the deduction of the salvage proceeds.

**Solution**

The relevant cash flows (excluding the CCA tax shield and CCA tax shield lost) for the new product and their timing are presented in the following table:
An objective survey of the problem indicates that Shelbourne is trying to decide whether or not a new product investment is a good idea. In assessing the situation, the first step is to determine what cash flows are relevant to making the decision.

You create a list of the relevant costs as follows:

Initial investments:
- New machine: $(2,500,000)
- Increase in net working capital: $(350,000)

CCA tax shield:
\[
\frac{2,500,000 \times 0.15 \times 0.37}{0.15 + 0.125} \times \frac{1.0625}{1.125} = 476,515
\]

Tax shield lost:
\[
\frac{250,000 \times 0.15 \times 0.37}{0.15 + 0.125} \times \frac{1}{1.125^8} = (19,664)
\]

Salvage:
- Machine at the end of Year 8: $250,000
- Net working capital at the end of Year 8: $350,000

Increased net revenue:
- Year 1: \((1 - 0.37) \times ($400,000) = 252,000\)
- Years 2-8: \((1 - 0.37) \times ($700,000) = 441,000\)

Note: Depreciation expense is an accounting concept; the $281,250 is therefore not a relevant cash flow. As the floor space is unused, the allocation of overhead ($150,000) is also irrelevant. The company will not be paying more by using the space. In addition, a it is a fixed cost, it would not be used in calculating the contribution margin.
3. Swirl Cookies Ltd. (Swirl) is wondering if it should increase its capacity by purchasing a new machine. This investment has the same risk as the business. The new machine has a cost of $1,500,000 and an economic life of five years. The salvage in five years will be $75,000. If Swirl purchases the new machine, revenues are expected to increase by $800,000 per year. COGS is 25% of sales. The increase in sales will require an investment in NWC of $125,000. Swirl has a corporate tax rate of 28%, its cost of capital is 11% and the applicable CCA rate is 20%.

**Required:**

Determine whether or not Swirl Cookies Ltd. should invest in the new machine.

**Solution**

The relevant cash flows (excluding the CCA tax shield and CCA tax shield lost) for the new machine and their timing are presented in the following table:

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New machine</td>
<td>(1,500,000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in NWC</td>
<td>(125,000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental annual cash flows (CFs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenues</td>
<td>800,000</td>
<td>800,000</td>
<td>800,000</td>
<td>800,000</td>
</tr>
<tr>
<td>Cost of sales 25%</td>
<td>(200,000)</td>
<td>(200,000)</td>
<td>(200,000)</td>
<td>(200,000)</td>
</tr>
<tr>
<td>Contribution margin</td>
<td>600,000</td>
<td>600,000</td>
<td>600,000</td>
<td>600,000</td>
</tr>
<tr>
<td>Tax 28%</td>
<td>(168,000)</td>
<td>(168,000)</td>
<td>(168,000)</td>
<td>(168,000)</td>
</tr>
<tr>
<td>Incremental operating CFs after tax</td>
<td>432,000</td>
<td>432,000</td>
<td>432,000</td>
<td>432,000</td>
</tr>
<tr>
<td>Salvage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New machine</td>
<td>75,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NWC</td>
<td>125,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To assess whether Swirl should purchase the new machine, an NPV analysis will be utilized.

**Initial investment**

- New machine: (1,500,000)
- Increase in NWC: (125,000)

\[
\text{Present value of the CCA tax shield:} \\
\text{New machine} = \frac{1,500,000 \times 0.20 \times 0.28}{(0.20 + 0.11)} \times \frac{1.055}{1.11} = 257,541
\]
Present value of the lost tax shield:

New machine = \( \frac{75,000 \times 0.20 \times 0.28}{(0.20 + 0.11)} \times \frac{1}{1.11^5} = (8,040) \)

Salvage

New machine: \( \frac{75,000}{1.11^5} = 44,509 \)
Release of NWC: \( \frac{125,000}{1.11^5} = 74,181 \)

Revenue and expenses

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in revenue</td>
<td>800,000</td>
</tr>
<tr>
<td>Increase in COGS</td>
<td>200,000</td>
</tr>
<tr>
<td>Net increase</td>
<td>600,000</td>
</tr>
<tr>
<td>Less tax at 28%</td>
<td>168,000</td>
</tr>
<tr>
<td>Net cash increase</td>
<td>432,000 as an annuity for five years at 11% = 1,596,628</td>
</tr>
</tbody>
</table>

Or, using a financial calculator:

\( N = 5; \ I/Y = 11; \ PMT = $432,000; \ FV = $0; \ CPT \ PV = $1,596,628 \)

\( \text{Net present value} = 339,819 \)

The NPV of the project is positive; therefore, Swirl should invest in the project.
PART 4

Lease financing

Once the firm has decided to undertake a project based on its capital budgeting analysis, it must then decide how to finance the project. For example, it could raise the funds required to finance the project by borrowing from its bank, or through the capital markets by issuing new debt or equity. Alternatively, when the project involves a specific asset such as new equipment, another option that is commonly available to a firm is to lease the asset.

As acquiring use of an asset through a lease represents an alternative to borrowing funds and purchasing the asset, an analysis of lease-versus-purchase decision involves comparing the relevant cash flows under these two funding options. As with a capital budgeting analysis, only those cash flows that differ between the two funding options should be compared; cash flows that occur under both options are not relevant. The basic relevant costs are summarized below:

<table>
<thead>
<tr>
<th></th>
<th>Purchase</th>
<th>Lease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition cost</td>
<td>Immediate cash outlay for entire purchase price</td>
<td>Series of tax-deductible lease payments over the term of the lease</td>
</tr>
<tr>
<td>CCA</td>
<td>Eligible to claim as owner of the asset</td>
<td>Ineligible to claim CCA</td>
</tr>
<tr>
<td>Salvage</td>
<td>By purchasing the asset, the firm benefits from the salvage</td>
<td>No benefit from the salvage</td>
</tr>
<tr>
<td>Maintenance costs</td>
<td>Payable by purchaser</td>
<td>Depends on the terms of the lease agreement</td>
</tr>
</tbody>
</table>

To determine which option is best, the net value to leasing (NVL) formula is used:

\[
\text{NVL} = \text{Purchase price} - \text{Equivalent loan}
\]

Equivalent loan = \( \text{PV of after-tax lease payments} + \text{Forgone CCA tax shield} + \text{Forgone salvage} \pm \text{PV of other relevant cash flows} \)

Note, the appropriate discount rate for the NVL calculation is the firm’s after-tax cost of borrowing because leasing is an alternative to borrowing funds to purchase the asset.

The NVL calculation is illustrated in the following example:
Van der Meer Enterprises (Van der Meer) is looking to acquire a construction crane, and management wants to know whether it is better to lease or buy. For the leasing option, annual lease payments would be made at the beginning of each year, with the first payment due on delivery and installation. Van der Meer would maintain the machine and pay any costs related to insurance, delivery, and installation.
In order to determine whether it is more beneficial to lease or purchase the asset, all cash outflows associated with the purchase will be positive and all cash flows associated with the lease will be negative. This has the effect of subtracting the value of the equivalent loan from the purchase price.

At the end of the analysis, if the NVL is negative, it would be cheaper to purchase. Conversely, if the NVL is positive, then it would be cheaper to lease.

Discount rate (the after-tax cost of debt): \( (1 – 0.32) \times 0.12 \) 8.16%
Initial investment outlay (the purchase): $210,000 $210,000
Present value of lease payments:
BEG; I/Y = 8.16; N = 10; PMT = $15,300 \[22,500 \times (1 – 0.32)\]; CPT PV $110,245
CCA tax shield: $210,000 \times 0.20 \times 0.32 \frac{1}{0.20 + 0.0816} \times \frac{1.0408}{1.0816} $45,927
Lost CCA tax shield: $50,000 \times 0.20 \times 0.32 \frac{1}{0.20 + 0.0816} \frac{1}{1.0816^{10}} $5,186
Present value of salvage: $50,000 \div (1.0816)^{10} $22,819
NVL: $210,000 – ($110,245 + $45,927 – $5,186 + $22,819) $36,195

The NVL is positive, so Van der Meer should lease the crane.

An alternative approach that provides the same answer is to compare the cost to purchase to the cost to lease. Using the same example, the cost to purchase would be -$210,000 + 45,927 in tax shield – 5,186 in tax shield lost + 22,819 in salvage = -$146,440. The present value of the cost to lease = -$110,245. Therefore, it would cost Van der Meer $36,195 less to lease than to purchase.

**Independent, mutually exclusive, or interdependent projects**

When a firm is considering a series of projects that it might undertake, it will classify each project as independent, mutually exclusive, or interdependent.

Independent projects are unrelated, which means that accepting one project does not influence the decision to accept or reject any other project. Thus, independent projects can be analyzed individually and subject to having access to sufficient finance, the firm can accept all positive NPV projects.
In contrast, mutually exclusive projects are projects where accepting one means the other is automatically rejected. An example of mutually exclusive projects is the decision to build a new plant in one location versus another location. If the firm only wishes to build one new plant, by selecting one location it has, by default, rejected the other location.

Interdependent projects are projects in which accepting one project requires accepting another related project. For example, upgrading equipment may also require upgrading the facilities required to operate the new equipment.

**Capital rationing**

Most of the time, a firm will have restrictions on the amount of money available for projects. This is called capital rationing. In the case of capital rationing, a firm should accept the combination of projects that fits within its budgetary constraints and has the highest total NPV.

For example, suppose Kaylee’s Klosets Inc. has $65,000 available for capital investment. Given the following information, what is the best combination of independent projects to invest in?

<table>
<thead>
<tr>
<th>Project</th>
<th>Initial outlay</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$40,000</td>
<td>$(10,000)</td>
</tr>
<tr>
<td>B</td>
<td>20,000</td>
<td>10,000</td>
</tr>
<tr>
<td>C</td>
<td>50,000</td>
<td>46,000</td>
</tr>
<tr>
<td>Total</td>
<td>$110,000</td>
<td>$46,000</td>
</tr>
</tbody>
</table>

The projects cannot be partially undertaken.

There are a number of options available to Kaylee’s Klosets:

<table>
<thead>
<tr>
<th>Combination</th>
<th>Total initial outlay</th>
<th>Total NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$40,000</td>
<td>$(10,000)</td>
</tr>
<tr>
<td>B</td>
<td>20,000</td>
<td>10,000</td>
</tr>
<tr>
<td>C</td>
<td>50,000</td>
<td>46,000</td>
</tr>
<tr>
<td>A and B</td>
<td>60,000</td>
<td>—</td>
</tr>
</tbody>
</table>

This is an exhaustive list of all the possible combinations of projects that can be undertaken. Other combinations are not possible because the initial outlay exceeds the budget constraint.

By reviewing the total NPV of the various combinations, you can determine that the best option is to undertake Project C only.

An exhaustive list is not always practical if the list of potential projects is long. Using the Kaylee’s Klosets example, though, notice that you can immediately eliminate Project A
because it has a negative NPV, leaving Projects B and C. Since you do not have funds for both, you should undertake the one that maximizes the company’s value — Project C with an NPV of $46,000.

**Capital budgeting for information technology (IT) projects**

IT investments have unique characteristics that make forecasting incremental cash flows challenging. These challenges include determining the financial and non-financial benefits that come from the improvement, the multiple stages required for planning through to implementation, the variety of costs incurred, and the risks of failure. Steps required for the development and implementation of new IT include planning, needs assessment, and development; cost-benefit analysis; testing; and implementation and data conversion. For each step the required time, employee resources, and software and hardware costs must all be projected. In addition, numerous cost-increasing risks may arise during implementation — for example, poor integration with the current systems, improper testing and errors in implementation, and development taking longer than intended.

**Practice questions**

1. Multiple-choice questions:

   i. Books R Us Inc. wants to purchase a new binding machine for $550,000. The contribution margin will increase by $250,000 and occurs evenly over the year. Additional working capital of $75,000 will be required. Books R Us has a corporate tax rate of 30% and its cost of capital is 25%. The CCA rate on the new machine will be 40%. What is the payback period for this investment?

   a) 2.50 years
   b) 2.55 years
   c) 2.85 years
   d) 2.92 years

   **Solution**

   Option d) is correct.

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net investment, opening balance</td>
<td>$(625,000)</td>
<td>$(417,000)</td>
<td>$(189,200)</td>
</tr>
<tr>
<td>Net cash flow$</td>
<td>175,000</td>
<td>175,000</td>
<td>175,000</td>
</tr>
<tr>
<td>CCA tax shield $</td>
<td>33,000</td>
<td>52,800</td>
<td>31,680</td>
</tr>
<tr>
<td>Shortfall</td>
<td>$(417,000)</td>
<td>$(189,200)</td>
<td>$ 17,480</td>
</tr>
</tbody>
</table>

   Payback period = 2 + (189,200 ÷ 206,680) = 2.92 years

   $ Increase in contribution margin, after taxes, for each year: $250,000 × (1 – 0.30) = $175,000
2 CCA tax shield calculations:

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning-of-year balance</td>
<td>$550,000</td>
<td>$440,000</td>
<td>$264,000</td>
</tr>
<tr>
<td>Maximum amount of CCA to claim at 40% rate</td>
<td>110,000*</td>
<td>176,000</td>
<td>105,600</td>
</tr>
<tr>
<td>Tax shield at 30% tax rate</td>
<td>33,000</td>
<td>52,800</td>
<td>31,680</td>
</tr>
</tbody>
</table>

*In Year 1, only 50% of the CCA is eligible to be claimed.

Option a) is incorrect. You took the net investment and divided by the increased contribution margin. You also forgot to adjust the cash inflows for tax and the CCA tax shield.

Option b) is incorrect. You forgot to include the increase in working capital in the initial outlay.

Option c) is incorrect. You forgot to adjust the first year's CCA by 50%.

ii. Harvard Locks Inc. is looking at developing a new front-door locking mechanism that can be activated from a smartphone. The costs to develop and market the new lock are estimated at $1,000,000. Net cash flows before tax are $300,000 per year for the next seven years. Harvard’s tax rate is 28% and its cost of capital is 12%. What is the IRR on the project?

a) 11.5%

b) 12.0%

c) 14.2%

d) 22.9%

Solution

Option a) is correct. The after-tax cash flows would be ($300,000)(1 – 0.28) = $216,000. N = 7; PV = $1,000,000; FV = $0; PMT = –$216,000; CPT I/Y = 11.5

Option b) is incorrect. This is the firm's cost of capital.

Option c) is incorrect. You reversed PV and FV in entering the information into the financial calculator.

Option d) is incorrect. You used the before-tax cash flows, not the after-tax cash flows.
2. Hamilton Industries (Hamilton) has decided to invest in a new machine because the NPV analysis indicates that it will increase shareholder value. The cost of the machine is $300,000. The CEO now wants to know if it would be better to purchase or lease the machine. The machine would be included in Class 8 with a 20% CCA rate. Salvage for the machine at the end of five years would be $15,000. The lease term is five years and the lease indicates that Hamilton would be required to maintain and insure the machine. The before-tax lease payments would be $32,100 at the beginning of each year. Hamilton’s tax rate is 35% and its cost of borrowing for five years is 15%.

**Required:**

Determine whether Hamilton should lease or buy the machine.

**Solution**

**CPA Way step: Assess the Situation**

To assess whether Hamilton should purchase or lease the asset, an NVL calculation should be utilized.

**CPA Way step: Analyze Major Issues**

The discount rate is the after-tax cost of debt to Hamilton:

\[(1 – 0.35)(0.15) = 0.0975 \text{ or } 9.75\%\]

The initial investment outlay (purchase) is $300,000.

Present value of the lease payments:

\[[(1 – 0.35)($32,100) \text{ as an annuity at } 9.75\% \text{ for five years}] \times (1 + 0.0975) = $87,364\]

Or, using a financial calculator:

BGN; N = 5, I/Y = 9.75, PMT = (1 – 0.35)($32,100) = $20,865, FV = $0, CPT PV = $87,364

Present value of the CCA tax shield:

\[
\frac{300,000 \times 0.20 \times 0.35}{(0.20 + 0.0975)} \times \frac{1.04875}{1.0975} = $67,453
\]

Present value of the CCA tax shield lost:

\[
\frac{15,000 \times 0.20 \times 0.35}{(0.20 + 0.0975)} \times \frac{1}{1.0975} = $2,217
\]

Present value of the salvage:

\[15,000 / 1.0975^5 = $9,420\]

NVL = $300,000 – ($87,364 + $67,453 – $2,217 + $9,420) = $137,980

Alternative approach: Cost to purchase = –$300,000 + 67,453 – 2,217 + 9,420 = –$225,344. The cost to lease = $87,364. Therefore, the cost to lease is $137,980 less than the cost to purchase.
CPA Way step: Conclude and Advise

As the NVL is positive, your analysis shows that leasing would be the cheaper option. You advise Hamilton’s management to lease the equipment.

3. Finlayson Industries is considering the following independent investment projects:

<table>
<thead>
<tr>
<th>Project</th>
<th>Initial investment</th>
<th>After-tax annual cash flows</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$225,000</td>
<td>$75,000</td>
<td>$2,801</td>
</tr>
<tr>
<td>B</td>
<td>120,000</td>
<td>55,000</td>
<td>78,263</td>
</tr>
<tr>
<td>C</td>
<td>80,000</td>
<td>35,000</td>
<td>4,064</td>
</tr>
<tr>
<td>D</td>
<td>70,000</td>
<td>22,000</td>
<td>20,451</td>
</tr>
<tr>
<td>E</td>
<td>150,000</td>
<td>45,000</td>
<td>12,215</td>
</tr>
</tbody>
</table>

Finlayson’s cost of capital is 12%.

Required:

If Finlayson has only $300,000 available for new investments, which projects should it choose to undertake? Assume that the projects must be taken on in full; they cannot be partially accepted and completed.

Solution

CPA Way step: Assess the Situation

Finlayson has more projects available for investment than funds for investing. Therefore, Finlayson must ration its investment funds. To do this appropriately, it must determine the best combination of projects to invest in.
CPA Way step: Analyze Major Issues

The following is an exhaustive list of possible combinations of investment options that do not exceed the budget, along with their total initial investments and their total NPVs:

<table>
<thead>
<tr>
<th>Project combinations</th>
<th>Total initial investment</th>
<th>Total NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$225,000</td>
<td>$ 2,801</td>
</tr>
<tr>
<td>B</td>
<td>120,000</td>
<td>78,263</td>
</tr>
<tr>
<td>C</td>
<td>80,000</td>
<td>4,064</td>
</tr>
<tr>
<td>D</td>
<td>70,000</td>
<td>20,451</td>
</tr>
<tr>
<td>E</td>
<td>150,000</td>
<td>12,215</td>
</tr>
<tr>
<td>A and D</td>
<td>295,000</td>
<td>23,252</td>
</tr>
<tr>
<td>B and C</td>
<td>200,000</td>
<td>82,327</td>
</tr>
<tr>
<td>B and D</td>
<td>190,000</td>
<td>98,714</td>
</tr>
<tr>
<td>B and E</td>
<td>270,000</td>
<td>90,478</td>
</tr>
<tr>
<td>C and D</td>
<td>150,000</td>
<td>24,515</td>
</tr>
<tr>
<td>C and E</td>
<td>230,000</td>
<td>16,279</td>
</tr>
<tr>
<td>D and E</td>
<td>220,000</td>
<td>32,666</td>
</tr>
<tr>
<td>B, C, and D</td>
<td>270,000</td>
<td>102,778</td>
</tr>
<tr>
<td>C, D, and E</td>
<td>300,000</td>
<td>36,730</td>
</tr>
</tbody>
</table>

CPA Way step: Conclude and Advise

The best combination of projects to invest in is B, C, and D, as it yields the highest NPV within the available funds for investment. These projects require a total initial investment of $270,000, which is within the budget constraints, and provide the highest total NPV at $102,778.

4. Paper Manufacturing Corp. (PMC) is currently assessing an IT improvement that would integrate its payroll system with its job order costing and production systems. The new IT system would reduce the time and resources required by entering information twice — once into the production system and once into the payroll system. You, CPA, currently work as a financial analyst for PMC, and your boss has asked you to prepare future cash flows and an NPV analysis for this new investment.

Required:

Outline additional factors that should be considered before the cash flows for this capital budgeting analysis can be completed for this IT investment.

CPA Way step: Assess the Situation

PMC is assessing an IT improvement that will integrate its payroll system with its job order costing and production systems and reduce the duplication of work required
under the current systems. However, there are several unique challenges in forecasting cash flows related to IT projects, and they will impact the cash flows related to the project. Given that there are multiple stages to the implementation of this new IT, cash flow forecasting needs to be determined at each stage. These stages and the issues to address are outlined below.

**CPA Way step: Analyze Major Issues**

Before the cash flows for this investment can be forecasted, the following will have to be completed:

- Planning, needs assessment, and development — In particular, have the needs of the human resources, job order costing, and production departments all been considered in designing the IT system? Who will carry out the development? How long will it take and how much will it cost?

- Cost-benefit analysis — What are the implications if the improvements are not made?

- Testing — What will be the nature of the tests? How long will the tests take? Who will be involved?

- Implementation — How will implementation be completed? How long will it take? Who will be involved and how much will it cost?

**CPA Way step: Conclude and Advise**

Before cash flows can be forecasted, all the above questions will have to be addressed. Without this analysis, the cash flow forecast is likely to significantly underestimate the costs to complete.
PART 5

Working capital

This part examines the firm’s management of its NWC.

Working capital is defined as the short-term current assets of a firm. NWC is the difference between current assets and current liabilities. Current assets are cash and other assets that will be converted to cash in a year. These other assets include marketable securities, accounts receivable, prepaid expenses, and inventory. Current liabilities are liabilities due within one year; they include short-term loans, accounts payable, accruals (such as a payroll liability), taxes payable, and the current portion of long-term debt.

Management of working capital components

NWC is necessary for the operation of a business. In this sense, working capital management focuses on a business’s day-to-day operations. Since NWC is the difference between current assets and current liabilities (where current assets typically exceed current liabilities), it can be thought of as an asset. Thus, in managing NWC, the financial executive wants to maximize the net benefits (total benefits minus total costs) while aligning with the firm’s strategy which may to a certain degree dictate levels of accounts receivable and inventory.

While determination of the marginal cost of any investment in NWC is relatively straightforward, identifying and quantifying the marginal benefits from an investment in NWC is not. Thus, the operational goal of NWC management is typically to minimize the firm’s investment in NWC subject to having enough NWC to meet the firm’s operational needs, specifically:

- sufficient cash for trading with customers and suppliers, and providing for other cash needs such as wages
- accounts receivable with trade terms that are competitive in the industry to attract and secure sales that otherwise would not be made
- enough inventory to prevent running out of stock and thereby missing sales

Cash and short-term investment management generally consists of determining the cash needs for the next period.

Cash is required for two basic reasons:

- For transactions: Businesses need a minimum amount of cash to cover normal short-term operations.
- As a cash buffer: Unexpected cash outflows are possible, and businesses usually maintain a minimum balance in their cash account for this reason. Accounts receivable management generally consists of deciding which customers are to be
granted credit, recording receivables when credit sales are made, ensuring that payments are properly credited and following up on overdue accounts. A major influence on the size of accounts receivable is the firm’s credit terms.

An example of standard credit policy terms is 2/10, net 30, which means that customers can take a 2% discount if they pay within 10 days; otherwise, they must pay in full within 30 days. When changing firm’s credit policy, the financial executive must consider the impact of the contemplated change on sales and production costs, accounts receivable balances, and bad debt expense, as well as the effect the change in discount might have on the net cash received. In addition, the change in discount might have an effect on the timing of cash receipts and, consequently, the payment period. A longer payment period increases the opportunity cost to the firm since it reflects cash that could otherwise be utilized for transactions or as a cash buffer. To perform this analysis, the financial executive would use marginal or incremental analysis, and possibly sensitivity analysis.

For example, suppose Metchosin Metal Fabricators Ltd. (MMFL) currently offers credit terms of net 45 but is considering changing to 2/10, net 30 to be more competitive. The change is expected to increase annual sales from $1,500,000 to $1,650,000. COGS will remain at 55% of sales. Currently, all customers pay at 45 days, and there are no bad debt losses. The new terms are expected to result in 70% of customers taking advantage of the discount, 1.5% of credit sales as bad debts and the balance of the customers who do pay paying at 30 days. MMFL’s bank will lend it money at a rate of 12%. Should MMFL switch to the new policy?

Increase in after-tax operating income: ($1,650,000 – $1,500,000)(1 – 0.55) $67,500
Decrease in receipts due to customers taking discount: 0.70 × $1,650,000 × 0.02 (23,100)
Increase in bad debts: 0.015 × $1,650,000 (24,750)
Opportunity cost:
- Average accounts receivable:
  - Old: (1,500,000)(45 ÷ 365) $184,932
  - New: (1,650,000)(0.70 × 10 + 0.285 × 30) ÷ 365 (70,295)
- Decrease in accounts receivable investment $114,637
- Decrease in investment cost at 12% 13,756
- **Net benefit** $33,406

MMFL should switch to the new policy as there is a net benefit.

Accounts payable and accruals are essentially interest-free, short-term loans, unless they are not paid on time. Management of accounts payable involves managing the credit terms of purchases.

The decision to take or not to take a discount offered involves comparing the cost of forgoing any available cash discount versus the cost of borrowing money to pay in time to get the discount.
The annualized cost of forgoing the cash discount is:

\[ k_{\text{effective}} = \left[ \frac{1}{1 - d} \right]^{\frac{365}{n}} - 1 \]

where

\[ d = \text{percentage discount offered for early payment} \]
\[ n = \text{number of days between the two payment dates} \]

For example, if Guardians Ltd. offers terms of 2/10 net 30 to Bruce Enterprises, whose cost of borrowing is 12%, the cost of not taking the discount would be 44.6%:

\[ k_{\text{effective}} = \left[ \frac{1}{1 - 0.02} \right]^{\frac{365}{20}} - 1 = 0.445853 \text{ or } 44.6\% \]

As this is significantly more than the 12% cost of borrowing Bruce Enterprises would incur, Bruce Enterprises should take the discount.

Accounts receivable and accounts payable are mirror images of each other, so the principles for managing them are similar — you want to take advantage of discounts offered to you and pay on the last possible date to maximize this free form of financing.

Inventory management generally consists of holding sufficient inventory to meet sales orders without holding excess inventory, thereby increasing firm value.

Five factors are used to determine how much inventory to hold:

1. The cost of restocking inventory
2. The rate of demand for the product
3. The cost of holding a unit of inventory (carrying costs)
4. The degree of uncertainty about future demand for the product
5. Obsolescence

Managing accounts receivable and inventory may cause conflicts among the marketing, production, and finance functions within a firm. Marketing will want large inventories to fulfil any sale that arises and generous credit terms for customers. Finance will want to minimize the investment in both accounts receivable and inventory to free up funds for more profitable investments. Production will want to maximize capacity, which could lead to higher inventory levels. Proper financial management will aim at finding the balance among these various goals, after having performed the required financial analysis and aligning working capital policy with the firm’s strategic goals.

**Cash conversion cycle**

The cash conversion cycle measures how long it takes to turn accounts receivable and inventory into cash, taking into account how long accounts payable remain outstanding.
Cash conversion cycle = (Days in inventory period + Accounts receivable turnover period) – Accounts payable turnover period

where

Days in inventory period = $\frac{\text{Average inventory} \times 365}{\text{COGS}}$

Average accounts receivable collection period = $\frac{\text{Average accounts receivable} \times 365}{\text{Net credit sales}}$

Accounts payable turnover period = $\frac{\text{Average accounts payable} \times 365}{\text{COGS} + \text{Cash expenses}}$

Note that, to be part of the accounts payable turnover, the expenses should have cash implications. For example, depreciation expense would not be included because it is a non-cash expense.

Financial planning and forecasting

One of the most important pieces of financial planning is cash flow prediction to ensure the firm can meet its financial obligations.

Cash flow projections involve the following:

- estimating cash inflows (for example, sales payments, increases in borrowings or in share capital, interest received, and proceeds from disposition of assets)
- estimating cash outflows (for example, accounts payable payments, capital expenditures and loan/interest/tax/dividend payments)

Once the cash flow projection is complete, the financial executive must be aware of the cyclical patterns in the various working capital accounts to plan for a source of funds when there is a cash shortfall and to plan for investments when there is excess cash. Approaches to dealing with cyclical cash requirements can be seen as operating along a continuum of possibilities.

The following are three approaches that can be considered:

- The conservative approach uses sufficient long-term financing to cover the largest possible current asset requirement.
- The aggressive approach uses sufficient long-term financing to cover the minimum possible current asset requirement (the permanent NWC).
- The moderately conservative approach uses a compromise that has enough long-term financing to cover a portion of current assets.

Ultimately, the appropriate approach for a firm will depend on the trade-off between the costs and benefits of short-term financing versus long-term financing. Short-term financing is typically cheaper. Alternatively, if the firm has long-term financing needs,
this short-term financing will have to be renewed at which time interest rates may have changed and/or the firm’s circumstances may have changed, either of which may lead to higher costs or difficulty accessing new financing.

**Practice questions**

1. Multiple-choice questions:
   
i. The following comparative information pertains to ButterBuns Inc. for the year ending December 31, 20X9:

<table>
<thead>
<tr>
<th></th>
<th>20X9</th>
<th>20X8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$ 215,782</td>
<td>$ 189,888</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>153,813</td>
<td>147,653</td>
</tr>
<tr>
<td>Inventory</td>
<td>67,543</td>
<td>78,653</td>
</tr>
<tr>
<td>Prepaid expenses</td>
<td>12,500</td>
<td>10,000</td>
</tr>
<tr>
<td>Accounts payable</td>
<td>123,766</td>
<td>135,678</td>
</tr>
<tr>
<td>Taxes payable</td>
<td>25,345</td>
<td>24,777</td>
</tr>
<tr>
<td>Sales</td>
<td>1,350,000</td>
<td>1,200,000</td>
</tr>
<tr>
<td>Cost of goods sold</td>
<td>742,500</td>
<td>660,000</td>
</tr>
<tr>
<td>Total expenses*</td>
<td>558,613</td>
<td>557,571</td>
</tr>
</tbody>
</table>

   *Includes depreciation of $35,901 in 20X8 and 20X9

   If ButterBuns has cash sales of 10% of total sales and the balance is on credit, calculate its cash conversion cycle for 20X9.

   a) 39.3  
   b) 43.8  
   c) 44.8  
   d) 51.2

   **Solution**

   Option b) is correct.

   Days in inventory period:
   
   \[\frac{[(67,543 + 78,653) / 2]}{742,500} \times 365\]  
   \[35.9\]

   Average accounts receivable collection period:
   
   \[\frac{[(153,813 + 147,653) / 2]}{[(1,350,000) \times (1 – 0.10)]} \times 365\]  
   \[45.3\]

   Accounts payable turnover period:
   
   \[\frac{[(123,766 + 135,678) / 2]}{(742,500 + 558,613 – 35,901) \times 365}\]  
   \[37.4\]

   Cash conversion cycle  
   \[43.8\]

   Option a) is incorrect. You forgot to take out the cash sales when calculating accounts receivable turnover — the accounts receivable turnover period uses net credit sales.
Option c) is incorrect. You forgot to subtract the depreciation expense in the accounts payable turnover calculation.

Option d) is incorrect. You used 20X8 numbers rather than 20X9 numbers in the denominator.

ii. Kwong’s Electronics’ supplier of cables changed its credit policy from net 30 days to 1/10 net 35. What is the cost to Kwong’s Electronics of forgoing the new discount?

a) 11.1%

b) 13.0%

c) 15.8%

d) 20.1%

Solution

Option c) is correct. \[ \frac{1}{1 - 0.01} \frac{365}{(35 - 10)} - 1 = 15.8\% \]

Option a) is incorrect. You used the new net number of days as denominator of the exponent.

Option b) is incorrect. You used the old net number of days as denominator of the exponent.

Option d) is incorrect. You used the old number of days less the discount period as denominator of the exponent.

2. XYZ Inc. is considering changing its credit policy from the current 2/10 net 30 to 2.5/15 net 40. Accounts receivable are currently collected on average every 35 days, with 25% of credit customers taking advantage of the discount. Under the new policy, the collection period will change to 46 days, with only 20% of credit customers taking the discount. Bad debts will increase from 3% to 4.5% of credit sales. The following accounts will see additional changes:

<table>
<thead>
<tr>
<th>Current</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit sales</td>
<td>$8,820,000</td>
</tr>
<tr>
<td>Contribution margin</td>
<td>3,447,500</td>
</tr>
</tbody>
</table>

Required:

Assuming that XYZ uses a 12% rate of return on working capital, calculate the net benefit to XYZ if the new terms are implemented.
Solution

To determine whether the new credit policy would be a benefit to XYZ, calculate and sum the individual incremental impacts to net income.

Increased contribution margin $1,256,500

Increased bad debt:
- Current: $8,820,000 × 3% = $264,600
- Proposed: $9,261,000 × 4.5% = 416,745
  (152,145)

Increased cash discount:
- Current: $8,820,000 × 25% × 2% = $44,100
- Proposed: $9,261,000 × 20% × 2.5% = 46,305
  (2,205)

Increased accounts receivable investment:
- Current: $8,820,000 × (35 ÷ 365) = $845,753
- Proposed: $9,261,000 × (46 ÷ 365) = 1,167,140
  (321,387) × 12% (38,566)

Net benefit $1,063,584

There is a net benefit of appropriately $1.06 million. Based on a purely quantitative analysis, XYZ should implement the new policy.
PART 6

Financial analysis

One of the primary sources of information about the firm’s economic position and performance available to external users is its financial statements. The purpose of financial statement analysis is to analyze the statements in order to evaluate the firm’s performance and to develop an understanding of the operating policies and strategies that management have put in place.

One tool for undertaking financial analysis is ratio analysis — that is, measuring how various components of the financial statements compare with each other, and how they vary over time. When doing any analysis, including ratio analysis, it is best to cover a number of periods so that you can get a more complete picture of how the results compare over time. In addition, you should always compare findings for a firm to industry data.

There are five key financial ratio areas:

1. **Short-term solvency or liquidity**
   These ratios measure the firm’s ability to meet its short-term obligations. They are the quick ratio \( \frac{(\text{current assets} - \text{inventory} - \text{prepaid expenses})}{\text{current liabilities}} \) and the current ratio \( \frac{\text{current assets}}{\text{current liabilities}} \).

2. **Activity or asset management**
   These ratios measure whether the firm’s assets, by type, are being used efficiently to generate sales (for example, total asset turnover = total operating revenue ÷ average total assets).

3. **Financial leverage or debt management**
   These ratios measure solvency and are of interest to the firm’s shareholders and lenders. An example of a financial leverage ratio is the debt ratio \( \frac{\text{total debt}}{\text{total assets}} \). An example of a debt management ratio is the times-interest-earned ratio (earnings before interest and taxes ÷ interest expense).

4. **Profitability**
   These ratios indicate the efficiency of the firm at generating income from its available resources. Examples of profitability ratios include the profit margin \( \frac{\text{net income}}{\text{total operating revenue}} \), return on assets (ROA(gross return) = EBIT ÷ total assets), and return on equity (ROE = (net income – preferred dividends) ÷ average total equity).

5. **Value or market value**
   These ratios are a blend of financial statement information and market information. The most widely used of these ratios is the price earnings (P/E) ratio (market price ÷ earnings per share).
Additional tools that can be used in conjunction with ratio analysis are vertical analysis and horizontal analysis. Vertical analysis presents statement of financial position items as a percentage of total assets and income statement items as a percentage of total sales revenue. Horizontal analysis measures the change in financial statement line items year over year.

**Valuation**

The purpose of valuation is to determine how much participants in the financial markets should be willing to pay to buy a business or its shares. Fair market value is an estimate of the market value based on what a willing and knowledgeable buyer would be willing to pay.

Depending on the method used and whether the entire firm or just the equity is being valued, valuation looks at many different inputs to quantify what is being valued:

- **Volatility** is a measure of the variation in the security’s price and a reflection of risk.
- **Discount rate** is the investor’s required rate of return.
- **Future flows** are estimates of the firm’s future cash flows.
- **Replacement cost** is the cost of replacing an existing asset with an identical asset adjusted for depreciation and condition.
- **Liquidation value** is the value that could be obtained from the sale of an asset less any costs incurred in facilitating that sale.

There are four main methods used to value a business or its shares:

<table>
<thead>
<tr>
<th>Method</th>
<th>Explanation</th>
<th>Ways to use it</th>
<th>How to calculate it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precedent transactions</td>
<td>This method involves researching the price paid for similar firms to determine a value.</td>
<td>No formulas for this method; purely research based</td>
<td>None – value is determined based on the comparable price</td>
</tr>
<tr>
<td>Asset-based</td>
<td>These methods assume that the value of a firm is a function of its net assets.</td>
<td>1. Net book value</td>
<td>$P_0 = \frac{\text{Total assets} - \text{Total liabilities} - \text{P/S}}{\text{# of C/S outstanding}}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Liquidation</td>
<td>$P_0 = \frac{\text{Total assets at NRV} - \text{Total liabilities at settlement values} - \text{P/S}}{\text{# of C/S outstanding}}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Replacement cost</td>
<td>$P_0 = \frac{\text{Total assets at replacement cost} - \text{Total liabilities at settlement values} - \text{P/S}}{\text{# of C/S outstanding}}$</td>
</tr>
</tbody>
</table>

where $P_0 = \text{current share price}$
<table>
<thead>
<tr>
<th>Method</th>
<th>Explanation</th>
<th>Ways to use it</th>
<th>How to calculate it</th>
</tr>
</thead>
</table>
| Earnings-based   | These methods look at future earnings/cash flows as the base for determining a firm’s value. | 1. Capitalization of future dividends | \[ P_0 = \frac{D_1}{k_e} \]  
2. Capitalization of future dividends with constant growth |  
\[ P_0 = \frac{D_1}{k_e - g} \]  
where  
P_0 = current share price  
D_1 = dividend to be received in one year; equal to \( D_0 \times (1 + g) \)  
k_e = required return or capitalization rate  
g = constant rate of growth expected in the dividend  
3. Capitalization of future earnings  
Calculate normalized earnings as follows:  
1. Start with the net income before taxes for the past four to five years.  
2. Adjust for unusual items such as gains and losses that will probably not repeat regularly.  
3. Adjust for any one-time expenses.  
4. Adjust for any excessive management fees or special interest rates that may be due to non-arm’s length dealings.  
5. Calculate a new net income before taxes (that is, the normalized income before taxes).  
6. Calculate tax on the normalized net income before taxes.  
7. Calculate an average net income (or weighted average net income, if you want the more recent years weighted more)
### Discounting of future free cash flows (FCFs)

Then, once you have normalized earnings, use the following formula:

\[ P_0 = \text{Normalized earnings} \div k_e \]

Earnings per share (EPS) method: Future EPS is calculated based on pro forma financial statements as it would be calculated for the firm’s regular financial statements:

\[ P_0 = \text{EPS} \div k_e \]

\[ P_0 = (\text{PV of future FCFs} - \text{market value of long-term debt}) - \text{market value of preferred shares} \div \# \text{ of C/S outstanding} \]

FCFs are the net cash flows from operations less taxes paid and less any amount required for additional investment in working capital or assets.

### Market-based

<table>
<thead>
<tr>
<th>Method</th>
<th>Explanation</th>
<th>Ways to use it</th>
<th>How to calculate it</th>
</tr>
</thead>
</table>
|                          |These approaches use market information like price earnings ratios or EV/EBITDA multiplier to establish a price. | 1. Price earnings ratio method | \[ P_0 = P/E \text{ ratio} \times \text{EPS} \] where EPS is calculated as follows:
\[ \text{EPS} = (\text{Net income} - \text{P/S dividends}) \div \text{Weighted average \# of C/S outstanding} \]
\[ \text{Firm value} = \text{EBITDA} \times \text{EV/EBITDA multiplier} \]
\[ \text{Equity value} = \text{Firm value} - \text{Market value of debt} \]
\[ \text{Share price} = \text{Equity value} \div \text{Number of shares outstanding} \] |
|                          |             | 2. EV/EBITDA multiplier method |
**Example**

Following is a partial statement of profit or loss for Carmen Inc. for its most recent year, in thousands of dollars:

<table>
<thead>
<tr>
<th>20X4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net sales</td>
</tr>
<tr>
<td>Operating expenses (excluding depreciation)</td>
</tr>
<tr>
<td>Depreciation (equal to CCA)</td>
</tr>
<tr>
<td>Operating income</td>
</tr>
<tr>
<td>Interest on long-term debt</td>
</tr>
<tr>
<td>Net income before taxes</td>
</tr>
<tr>
<td>Taxes (25%)</td>
</tr>
<tr>
<td>Net income</td>
</tr>
</tbody>
</table>

Carmen has projected that the net operating cash flows will grow annually by 15% for the next two years. After 20X6, it is assumed that the FCFs will grow at an average rate of 3%. The following amounts will be invested in working capital and new capital expenditures for the next two years:

<table>
<thead>
<tr>
<th>20X5</th>
<th>20X6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working capital investment</td>
<td>$ 12</td>
</tr>
<tr>
<td>Capital expenditures</td>
<td>110</td>
</tr>
</tbody>
</table>

To calculate the forecasted FCFs for this year and the next two years:

<table>
<thead>
<tr>
<th>20X4</th>
<th>20X5</th>
<th>20X6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>Forecast</td>
<td>Forecast</td>
</tr>
<tr>
<td>Operating income</td>
<td>$160.0</td>
<td></td>
</tr>
<tr>
<td>Add: depreciation</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>Operating cash flows before tax</td>
<td>190.0</td>
<td></td>
</tr>
<tr>
<td>Tax (25% × $190)</td>
<td>(47.5)</td>
<td></td>
</tr>
<tr>
<td>Operating cash flows after tax</td>
<td>142.5</td>
<td></td>
</tr>
<tr>
<td>Tax shield from CCA ($30 × 25%)</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Operating cash flows after all tax effects</td>
<td>$150.0</td>
<td></td>
</tr>
<tr>
<td>Operating cash flows forecasted (+15%)</td>
<td>$172.5</td>
<td>$198.4</td>
</tr>
</tbody>
</table>

Less: working capital investment (12.0) (11.0)
Less: capital expenditures (110.0) (111.0)
Forecasted FCFs $ 50.5 $ 76.4

Assuming a WACC of 14%, to calculate the total firm value at the end of 20X4, first calculate the terminal value (TV) at the beginning of the constant growth period:

\[
TV_{20X6} = \frac{CF_{20X6}}{WACC - g} = \frac{76.4 \times 1.03}{0.14 - 0.03} = 715.4
\]
The PV of future cash flows + PV of the TV:

<table>
<thead>
<tr>
<th>FCFs or TV</th>
<th>Periods (N)</th>
<th>PV @ 14%</th>
</tr>
</thead>
<tbody>
<tr>
<td>20X5 FCFs</td>
<td>50.5</td>
<td>1</td>
</tr>
<tr>
<td>20X6 FCFs</td>
<td>76.4</td>
<td>2</td>
</tr>
<tr>
<td>20X6 TV</td>
<td>715.4</td>
<td>2</td>
</tr>
<tr>
<td>Total value</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The total value of the firm at the end of 20X4 is $653,600.

**Corporate finance transactions**

Valuation is central to decisions to expand, divest, or deal with financial distress.

**Expansion**

Some of the more important motivations for mergers and acquisitions include the following:

- economies of scale/synergy
- tax or other value considerations
- cost considerations
- use of surplus funds
- management goals

Three methods of expansion follow:

- A horizontal merger is the merging of two businesses in the same industry that produce the same product lines.
- A vertical merger is the merging of two businesses in the same industry where one is the direct customer or direct supplier of the other when they merge.
- A conglomerate merger is the merging of two businesses in unrelated industries.

An added complication arises when the expansion decision is an international one. This comes with additional risks, such as exchange rate risk, political risk, and economic risk.

**Divestiture**

A firm may divest itself of a business line or unit to enhance firm value. Specifically, if a business loses sight of its original direction, it may sell off a portion of its operations to refocus on a core competency. It may also be necessary to unload a poor performer. Divestiture may also be motivated by a need for cash.
**Financial distress**

Financial distress occurs when a firm’s operating cash flows are insufficient to satisfy its current obligations.

**Treasury risk management**

Treasury risk management is concerned with managing a firm’s exposure to unanticipated changes in interest rates, foreign exchange rates, and commodity prices. One of the most common strategies is to mitigate the firm’s exposure to such risks through the use of a hedge. In the general sense, a hedge involves the adoption of an offsetting position to either reduce or eliminate risk exposure, and is typically implemented by creating a position in the derivatives markets.

A derivative is a security whose price (also known as its premium) depends on, or is derived from, the price of a related (underlying) asset. This underlying asset can either be a commodity or a financial asset. Derivatives are used for hedging purposes by individuals or firms that have a direct interest in the actual commodity or asset underlying the hedge instrument.

The following are some of the most common types of derivatives found:

- **Options**: The right (but not the obligation) to buy or sell an underlying asset at a fixed price for a specified period of time (two types: calls and puts)
- **Forward contracts**: Customized bank instruments that specify a price today for the delivery of a specified asset in the future
- **Futures contracts**: Traded on exchanges and involve a seller who agrees to deliver a commodity to a buyer at some point in the future at a specified price
- **Swaps**: Agreements between two parties to exchange cash flows in the future

**Securitization**

One way that many large corporations, including banks, manage their working capital and increase their borrowing capacity is through the process of securitization. For example, a bank that has provided financing to its customers will package and sell off a bundle of these loans to the investing public.

Securitization is not without risk. When you grant a loan you know you have to collect, you tend to be more careful when you assess the borrower’s credit worthiness than if you grant a loan that you then sell to somebody else who assumes the risk of default.
Practice questions
1. Multiple-choice questions:
   i. Hoban Industries Ltd. had sales revenue of $30 million in the most recently completed fiscal period. Its COGS was 60% of sales, and all remaining operating expenses amount to a further 20% of sales revenue. Hoban has a $2 million bond issue outstanding with a coupon rate of 10% paid semi-annually. Hoban’s marginal tax rate is 30%. What is Hoban’s times-interest-earned ratio?
      a) 20
      b) 30
      c) 60
      d) 150

   Solution
   Option b) is correct. Times interest earned is calculated as EBIT (earnings before interest and taxes) divided by interest expense:

   \[
   \text{EBIT} = 30,000,000 \times [1 - (0.60 + 0.20)] = 6,000,000 \\
   \text{Interest expense} = 2,000,000 \times 10\% = 200,000 \\
   \text{Times interest earned} = \frac{6,000,000}{200,000} = 30
   \]

   Option a) is incorrect. Operating income after taxes was used instead of EBIT in the calculation.

   Option c) is incorrect. The remaining operating expenses were not deducted in calculating EBIT.

   Option d) is incorrect. Sales revenue was used instead of EBIT in the calculation.

   ii. Based on the following select financial information for Argyle Co., what is the profit margin for the firm?
      
      | Sales                        | $ 2,500,000 |
      | Cost of sales                | (1,750,000) |
      | Gross profit                 | 750,000     |
      | Net operating income         | 200,000     |
      | Average accounts receivable  | 225,000     |
      | Average inventory            | 300,000     |

      a) 8.0% 
      b) 26.7% 
      c) 30.0% 
      d) 70.0%
Solution

Option a) is **correct**. The profit margin is calculated as net income divided by total operating revenue: $200,000 ÷ $2,500,000 = 8%.

Option b) is incorrect. This is net operating income divided by gross profit.

Option c) is incorrect. This is the gross profit margin — that is, gross profit divided by sales.

Option d) is incorrect. This is COGS divided by sales.

2. The following is a statement of financial position for Stanislaw Inc. for December 31, 20X5:

   **Assets**
   - Cash $100,000
   - Accounts receivable 250,000
   - Inventory 125,000
   - Property, plant, and equipment (PP&E) 1,000,000
   - Accumulated depreciation, PP&E (200,000)
   - **Total assets** $1,275,000

   **Liabilities and shareholders’ equity**
   - Accounts payable $150,000
   - Bonds 100,000
   - Preferred shares (2%; 10,000 shares) 200,000
   - Common shares (50,000 shares) 750,000
   - Retained earnings 75,000
   - **Total liabilities and shareholders’ equity** $1,275,000

The company issued a dividend in 20X5 of $3 per share on the common shares. Dividend growth is expected to be 2% for the next year. The required rate of return on the common shares is 16%. The market has assessed a price/earnings ratio of 12.1 and the company shows an EPS of 1.324. Stanislaw’s owner is considering selling but is unsure what her company may be worth or how to value it.

**Required:**

a) Calculate the price per share using the net book value method.

b) Calculate the price per share using the capitalization of future cash flows method.

c) Calculate the price per share using the price/earnings ratio.
Solution

Quantitatively assess Stanislaw’s value using the net book value, capitalization of future cash flows and price/earnings ratio methods.

a) Net book value method:

\[
\text{Value} = \frac{\text{Total assets} - \text{Total liabilities} - \text{Preferred shares}}{\text{Number of common shares outstanding}}
\]

\[
= \frac{$1,275,000 - $250,000 - $200,000}{50,000}
\]

\[
= \$16.50
\]

b) Capitalization of future cash flows method = \( P_0 = \frac{D_1}{k_e} \)

\[
P_0 = \frac{(3.00)(1.02)}{0.16} = $19.125
\]

c) \( P_0 = \frac{\text{P/E ratio}}{\text{EPS}} \)

\[
P_0 = 12.1 \times 1.324 = $16.02
\]

The highest valuation for the company is 19.125 per share, which means the company is worth as much as $956,250 (19.125 \times 50,000 shares).