公司金融/2020 Fall/ HW#1 Key

Chapter 2

Question 1

Building a Balance Sheet Bishop, Inc., has current assets of $5,700, net fixed assets of $27,000, current liabilities of $4,400, and long-term debt of $12,900. What is the value of the shareholders' equity account for this firm? How much is net working capital?

We know that total liabilities and owners' equity (TL & OE) must equal total assets of $32,700. We also know that TL & OE is equal to current liabilities plus long-term debt plus owner's equity, so owner's equity is:

OE = $32,700 –12,900 – 4,400 = $15,400

NWC = CA – CL = $5,700 – 4,400 = $1,300

Question 2

Building an Income Statement Travis, Inc., has sales of $387,000, costs of $175,000, depreciation expense of $40,000, interest expense of $21,000, and a tax rate of 35 percent. What is the net income for the firm? Suppose the company paid out $30,000 in cash dividends. What is the addition to retained earnings?

The income statement for the company is:

Income Statement	
Sales	$387,000
Costs	175,000
Depreciation	40,000
EBIT	$172,000
Interest	21,000
EBT	$151,000
Taxes	52,850
Net income	$ 98,150

One equation for net income is:

Net income = Dividends + Addition to retained earnings

Rearranging, we get:

Addition to retained earnings = Net income – Dividends
Addition to retained earnings = $98,150 – 30,000
Addition to retained earnings = $68,150

Question 3

Calculating OCF Ranney, Inc., has sales of $18,700, costs of $10,300, depreciation expense of $1,900, and interest expense of $1,250. If the tax rate is 40 percent, what is the operating cash flow, or OCF?

To calculate OCF, we first need the income statement:

Income Statement	
Sales	$18,700
Costs	10,300
Depreciation	1,900
EBIT	$6,500
Interest	1,250
Taxable income	$5,250
Taxes	2,100
Net income	$3,150

OCF = EBIT + Depreciation – Taxes
OCF = $6,500 + 1,900 – 2,100
OCF = $6,300

Question 4

Calculating Total Cash Flows Schwert Corp. shows the following information on its 2012 income statement: sales = $185,000; costs = $98,000; other expenses = $6,700; depreciation expense = $16,500; interest expense = $9,000; taxes = $19,180; dividends = $9,500. In addition, you're told that the firm issued $7,550 in new equity during 2012 and redeemed $7,100 in outstanding long-term debt.

a. What is the 2012 operating cash flow?
b. What is the 2012 cash flow to creditors?
c. What is the 2012 cash flow to stockholders?
d. If net fixed assets increased by $26,100 during the year, what was the addition to net working capital (NWC)?

To find the OCF, we first calculate net income.

Income Statement	
Sales	$185,000
Costs	98,000
Depreciation	16,500
Other expenses	6,700
EBIT	$63,800
Interest	9,000
Taxable income	$54,800
Taxes	19,180
Net income	$35,620
Dividends	$9,500
Additions to RE	$26,120

a. OCF = EBIT + Depreciation – Taxes
OCF = $63,800 + 16,500 – 19,180
OCF = $61,120

b. CFC = Interest – Net new LTD
CFC = $9,000 – (–$7,100)
CFC = $16,100

Note that the net new long-term debt is negative because the company repaid part of its long- term debt.

c. CFS = Dividends – Net new equity
CFS = $9,500 – 7,550
CFS = $1,950

d. We know that CFA = CFC + CFS, so:

CFA = $16,100 + 1,950 = $18,050

CFA is also equal to OCF – Net capital spending – Change in NWC. We already know OCF. Net capital spending is equal to:

Net capital spending = Increase in NFA + Depreciation
Net capital spending = $26,100 + 16,500
Net capital spending = $42,600

Now we can use:

CFA = OCF – Net capital spending – Change in NWC
$18,050 = $61,120 – 42,600 – Change in NWC.

Solving for the change in NWC gives $470, meaning the company increased its NWC by $470.

Chapter 3

Question 1

Equity Multiplier and Return on Equity Nuber Company has a debt–equity ratio of .80. Return on assets is 9.7 percent, and total equity is $735,000. What is the equity multiplier? Return on equity? Net income?

The equity multiplier is:

EM = 1 + D/E
EM = 1 + 0.80 = 1.80

One formula to calculate return on equity is:

ROE = (ROA)(EM)
ROE = 0.097(1.80) = .1746 or 17.46%

ROE can also be calculated as:

ROE = NI / TE

So, net income is:

NI = ROE(TE)
NI = (.1746)($735,000) = $128,331

Question 2

Using the DuPont Identity Y3K, Inc., has sales of $2,700, total assets of $1,310, and a debt–equity ratio of 1.20. If its return on equity is 15 percent, what is its net income?

This is a multi-step problem involving several ratios. The ratios given are all part of the Du Pont Identity. The only Du Pont Identity ratio not given is the profit margin. If we know the profit margin, we can find the net income since sales are given. So, we begin with the Du Pont Identity:

ROE = 0.15 = (PM)(TAT)(EM) = (PM)(S / TA)(1 + D/E)

Solving the Du Pont Identity for profit margin, we get:

PM = [(ROE)(TA)] / [(1 + D/E)(S)]
PM = [(0.15)($1,310)] / [(1 + 1.20)($2,700)] = .0331

Now that we have the profit margin, we can use this number and the given sales figure to solve for net income:

PM = .0331 = NI / S

NI = .0331($2,700) = $89.32

Question 3

Days' Sales in Receivables A company has net income of $265,000, a profit margin of 9.3 percent, and an accounts receivable balance of $145,300. Assuming 80 percent of sales are on credit, what is the company's days' sales in receivables?

This is a multi-step problem involving several ratios. It is often easier to look backward to determine where to start. We need receivables turnover to find days' sales in receivables. To calculate receivables turnover, we need credit sales, and to find credit sales, we need total sales. Since we are given the profit margin and net income, we can use these to calculate total sales as:

PM = 0.093 = NI / Sales = $265,000 / Sales; Sales = $2,849,462

Credit sales are 80 percent of total sales, so:

Credit sales = $2,849,462(0.80) = $2,279,570

Now we can find receivables turnover by:

Receivables turnover = Credit sales / Accounts receivable = $2,279,570 / $145,300 = 15.69 times

Days' sales in receivables = 365 days / Receivables turnover = 365 / 15.69 = 23.27 days

Question 4

Calculating the Cash Coverage Ratio Titan Inc.'s net income for the most recent year was $8,320. The tax rate was 34 percent. The firm paid $1,940 in total interest expense and deducted $2,730 in depreciation expense. What was Titan's cash coverage ratio for the year?

This problem requires you to work backward through the income statement. First, recognize that Net income = (1 – t_C)EBT. Plugging in the numbers given and solving for EBT, we get:

EBT = $8,320 / (1 – 0.34) = $12,606.06

Now, we can add interest to EBT to get EBIT as follows:

EBIT = EBT + Interest paid = $12,606.06 + 1,940 = $14,546.06

To get EBITD (earnings before interest, taxes, and depreciation), the numerator in the cash coverage ratio, add depreciation to EBIT:

EBITD = EBIT + Depreciation = $14,546.06 + 2,730 = $17,276.06

Now, simply plug the numbers into the cash coverage ratio and calculate:

Cash coverage ratio = EBITD / Interest = $17,276.06 / $1,940 = 8.91 times

Question 5

Ratios and Fixed Assets The Le Bleu Company has a ratio of long-term debt to total assets of .35 and a current ratio of 1.25. Current liabilities are $950, sales are $5,780, profit margin is 9.4 percent, and ROE is 18.2 percent. What is the amount of the firm's net fixed assets?

The solution to this problem requires a number of steps. First, remember that CA + NFA = TA. So, if we find the CA and the TA, we can solve for NFA. Using the numbers given for the current ratio and the current liabilities, we solve for CA:

CR = CA / CL
CA = CR(CL) = 1.25($950) = $1,187.50

To find the total assets, we must first find the total debt and equity from the information given. So, we find the net income using the profit margin:

PM = NI / Sales
NI = Profit margin × Sales = .094($5,780) = $543.32

We now use the net income figure as an input into ROE to find the total equity:

ROE = NI / TE
TE = NI / ROE = $543.32 / .182 = $2,985.27

Next, we need to find the long-term debt. The long-term debt ratio is:

Long-term debt ratio = 0.35 = LTD / (LTD + TE + CL)

Inverting both sides gives:

1 / 0.35 = (LTD + TE + CL) / LTD = 1 + (TE + CL/ LTD)

Substituting the total equity into the equation and solving for long-term debt gives the following:

1 + ($2,985.27+950) / LTD = 2.86
LTD = ($2,985.27+950) / 1.86 = $2,115.74

Now, we can find the total debt of the company:

TD = CL + LTD = $950 + 2,115.74= $3,065.74

And, with the total debt, we can find the TD&E, which is equal to TA:

TA = TD + TE = $3,065.74 + 2,985.27 = $6,051.01

And finally, we are ready to solve the balance sheet identity as:

NFA = TA – CA = $6,051.01 – 1,187.50 = $4,863.51

Chapter 4

Question 1

Present Value and Multiple Cash Flows Conoly Co. has identified an investment project with the following cash flows. If the discount rate is 10 percent, what is the present value of these cash flows? What is the present value at 18 percent? At 24 percent?

Year	Cash Flow
1	$ 960
2	840
3	935
4	1,350

The time line is:

0	1	2	3	4
PV	$960	$840	$935	$1,350

To solve this problem, we must find the PV of each cash flow and add them. To find the PV of a lump sum, we use:

PV = FV / $(1 + r)^t$

PV@10% = $960 / 1.10 + $840 / 1.10^2 + $935 / 1.10^3 + $1,350 / 1.10^4 = $3,191.49

PV@18% = $960 / 1.18 + $840 / 1.18^2 + $935 / 1.18^3 + $1,350 / 1.18^4 = $2,682.22

PV@24% = $960 / 1.24 + $840 / 1.24^2 + $935 / 1.24^3 + $1,350 / 1.24^4 = $2,381.91

Question 2

Calculating Annuity Present Value An investment offers $4,900 per year for 15 years, with the first payment occurring one year from now. If the required return is 8 percent, what is the value of the investment? What would the value be if the payments occurred for 40 years? For 75 years? Forever?

To find the PVA, we use the equation:

$$PVA = C(\{1 - [1/(1 + r)]^t\} / r)$$

0	1									15
PV	\$4,900	\$4,900	\$4,900	\$4,900	…	\$4,900	\$4,900	\$4,900	\$4,900	\$4,900

PVA@15 yrs: PVA = \$4,900{[1 – (1/1.08)^{15}] / .08} = \$41,941.45

0	1									40
PV	\$4,900	\$4,900	\$4,900	\$4,900	…	\$4,900	\$4,900	\$4,900	\$4,900	\$4,900

PVA@40 yrs: PVA = \$4,900{[1 – (1/1.08)^{40}] / .08} = \$58,430.61

0	1									75
PV	\$4,900	\$4,900	\$4,900	\$4,900	…	\$4,900	\$4,900	\$4,900	\$4,900	\$4,900

PVA@75 yrs: PVA = \$4,900{[1 – (1/1.08)^{75}] / .08} = \$61,059.31

To find the PV of a perpetuity, we use the equation:

PV = C / r

0	1									∞
PV	\$4,900	\$4,900	\$4,900	\$4,900	…	\$4,900	\$4,900	\$4,900	\$4,900	\$4,900

PV = \$4,900 / .08
PV = \$61,250

Notice that as the length of the annuity payments increases, the present value of the annuity approaches the present value of the perpetuity. The present value of the 75-year annuity and the present value of the perpetuity imply that the value today of all perpetuity payments beyond 75 years is only \$190.69.

Question 3

Calculating EAR Find the EAR in each of the following cases:

Stated Rate (APR)	Number of Times Compounded	Effective Rate (EAR)
7%	Quarterly	
16	Monthly	
11	Daily	
12	Infinite	

For discrete compounding, to find the EAR, we use the equation:

$$EAR = [1 + (APR / m)]^m - 1$$

$$EAR = [1 + (.07 / 4)]^4 - 1 \quad = .0719 \text{ or } 7.19\%$$

$$EAR = [1 + (.16 / 12)]^{12} - 1 \quad = .1723 \text{ or } 17.23\%$$

$$EAR = [1 + (.11 / 365)]^{365} - 1 \quad = .1163 \text{ or } 11.63\%$$

To find the EAR with continuous compounding, we use the equation:

$$EAR = e^r - 1$$
$$EAR = e^{.12} - 1 = .1275 \text{ or } 12.75\%$$

Question 4

Growing Perpetuities Mark Weinstein has been working on an advanced technology in laser eye surgery. His technology will be available in the near term. He anticipates his first annual cash flow from the technology to be $175,000, received two years from today. Subsequent annual cash flows will grow at 3.5 percent in perpetuity. What is the present value of the technology if the discount rate is 10 percent?

This is a growing perpetuity. The present value of a growing perpetuity is:

$$PV = C / (r - g)$$
$$PV = \$175{,}000 / (.10 - .035)$$
$$PV = \$2{,}692{,}307.69$$

It is important to recognize that when dealing with annuities or perpetuities, the present value equation calculates the present value one period before the first payment. In this case, since the first payment is in two years, we have calculated the present value one year from now. To find the value today, we simply discount this value as a lump sum. Doing so, we find the value of the cash flow stream today is:

$$PV = FV / (1 + r)^t$$
$$PV = \$2{,}692{,}307.69 / (1 + .10)^1$$
$$PV = \$2{,}447{,}552.45$$

Question 5

Balloon Payments On September 1, 2009, Susan Chao bought a motorcycle for \$30,000. She paid \$1,000 down and financed the balance with a five-year loan at a stated annual interest rate of 7.2 percent, compounded monthly. She started the monthly payments exactly one month after the purchase (i.e., October 1, 2009). Two years later, at the end of October 2011, Susan got a new job and decided to pay off the loan. If the bank charges her a 1 percent prepayment penalty based on the loan balance, how much must she pay the bank on November 1, 2011?

Since she put \$1,000 down, the amount borrowed will be:

Amount borrowed = \$30,000 – 1,000
Amount borrowed = \$29,000

So, the monthly payments will be:

$\text{PVA} = C(\{1 - [1/(1 + r)]^t \} / r)$
$\$29{,}000 = C[\{1 - [1/(1 + .072/12)]^{60} \} / (.072/12)]$
$C = \$576.98$

The amount remaining on the loan is the present value of the remaining payments. Since the first payment was made on October 1, 2009, and she made a payment on October 1, 2011, there are 35 payments remaining, with the first payment due immediately. So, we can find the present value of the remaining 34 payments after November 1, 2011, and add the payment made on this date. So the remaining principal owed on the loan is:

$\text{PV} = C(\{1 - [1/(1 + r)]^t \} / r)$
$\text{PV} = \$576.98[\{1 - [1/(1 + .072/12)]^{34} \} / (.072/12)]$
$C = \$17{,}697.79$

She must also pay a one percent prepayment penalty and the payment due on November 1, 2011, so the total amount of the payment is:

Total payment = Balloon amount(1 + Prepayment penalty) + Current payment
Total payment = \$17,697.79(1 + .01) + \$576.98
Total payment = \$18,451.74

Chapter 5

Question 1

Calculating Payback Period and NPV Fuji Software, Inc., has the following mutually exclusive projects.

Year	Project A	Project B
0	−$15,000	−$18,000
1	9,500	10,500
2	6,000	7,000
3	2,400	6,000

a. Suppose Fuji's payback period cutoff is two years. Which of these two projects should be chosen?

b. Suppose Fuji uses the NPV rule to rank these two projects. Which project should be chosen if the appropriate discount rate is 15 percent?

The payback period is the time that it takes for the cumulative undiscounted cash inflows to equal the initial investment.

Project A:

Cumulative cash flows Year 1 = $9,500 = $9,500
Cumulative cash flows Year 2 = $9,500 + 6,000 = $15,500

Companies can calculate a more precise value using fractional years. To calculate the fractional payback period, find the fraction of year 2's cash flows that is needed for the company to have cumulative undiscounted cash flows of $15,000. Divide the difference between the initial investment and the cumulative undiscounted cash flows as of year 1 by the undiscounted cash flow of year 2.

Payback period = 1 + ($15,000 – 9,500) / $6,000
Payback period = 1.917 years

Project B:

Cumulative cash flows Year 1 = $10,500 = $10,500
Cumulative cash flows Year 2 = $10,500 + 7,000 = $17,500
Cumulative cash flows Year 3 = $10,500 + 7,000 + 6,000 = $23,500

To calculate the fractional payback period, find the fraction of year 3's cash flows that is needed for the company to have cumulative undiscounted cash flows of $18,000.

Divide the difference between the initial investment and the cumulative undiscounted cash flows as of year 2 by the undiscounted cash flow of year 3.

Payback period = 2 + ($18,000 – 10,500 – 7,000) / $6,000
Payback period = 2.083 years

Since project A has a shorter payback period than project B has, the company should choose project A.

b. Discount each project's cash flows at 15 percent. Choose the project with the highest NPV.

Project A:
NPV = –$15,000 + $9,500 / 1.15 + $6,000 / 1.15^2 + $2,400 / 1.15^3
NPV = –$624.23

Project B:
NPV = –$18,000 + $10,500 / 1.15 + $7,000 / 1.15^2 + $6,000 / 1.15^3
NPV = $368.54

The firm should choose Project B since it has a higher NPV than Project A has.

Question 2

Calculating Discounted Payback An investment project has annual cash inflows of $5,000, $5,500, $6,000, and $7,000, and a discount rate of 14 percent. What is the discounted payback period for these cash flows if the initial cost is $8,000? What if the initial cost is $12,000? What if it is $16,000?

When we use discounted payback, we need to find the value of all cash flows today. The value today of the project cash flows for the first four years is:

Value today of Year 1 cash flow = $5,000/1.14 = $4,385.96
Value today of Year 2 cash flow = $5,500/$1.14^2$ = $4,232.07
Value today of Year 3 cash flow = $6,000/$1.14^3$ = $4,049.83
Value today of Year 4 cash flow = $7,000/$1.14^4$ = $4,144.56

To find the discounted payback, we use these values to find the payback period. The discounted first year cash flow is $4,385.96, so the discounted payback for an initial cost of $8,000 is:

Discounted payback = 1 + ($8,000 – 4,385.96)/$4,232.07 = 1.85 years

For an initial cost of $12,000, the discounted payback is:

Discounted payback = 2 + ($12,000 – 4,385.96 – 4,232.07)/$4,049.83 = 2.84 years

Notice the calculation of discounted payback. We know the payback period is between two and three years, so we subtract the discounted values of the Year 1 and Year 2 cash flows from the initial cost. This is the numerator, which is the discounted amount we still need to make to recover our initial investment. We divide this amount by the discounted amount we will earn in Year 3 to get the fractional portion of the discounted payback.

If the initial cost is $16,000, the discounted payback is:

Discounted payback = 3 + ($16,000 – 4,385.96 – 4,232.07 – 4,049.83) / $4,144.56 = 3.80 years

Question 3

Problems with Profitability Index The Robb Computer Corporation is trying to choose between the following two mutually exclusive design projects:

Year	Cash Flow (I)	Cash Flow (II)
0	−$30,000	−$12,000
1	18,000	7,500
2	18,000	7,500
3	18,000	7,500

a. If the required return is 10 percent and Robb Computer applies the profitability index decision rule, which project should the firm accept?
b. If the company applies the NPV decision rule, which project should it take?
c. Explain why your answers in (a) and (b) are different.

a. The profitability index is the PV of the future cash flows divided by the initial investment. The cash flows for both projects are an annuity, so:

PI_I = $18,000($PVIFA_{10\%,3}$) / $30,000 = 1.492

PI_{II} = $7,500($PVIFA_{10\%,3}$) / $12,000 = 1.554

The profitability index decision rule implies that we accept project II, since PI_{II} is greater than the PI_I.

b. The NPV of each project is:

NPV_I = – $30,000 + $18,000($PVIFA_{10\%,3}$) = $14,763.34

$NPV_{II} = – \$12,000 + \$7,500(PVIFA_{10\%,3}) = \$6,651.39$

The NPV decision rule implies accepting Project I, since the NPV_I is greater than the NPV_{II}.

c. Using the profitability index to compare mutually exclusive projects can be ambiguous when the magnitudes of the cash flows for the two projects are of different scales. In this problem, project I is 2.5 times as large as project II and produces a larger NPV, yet the profitability index criterion implies that project II is more acceptable.

Question 4

Problems with IRR McKeekin Corp. has a project with the following cash flows:

Year	Cash Flow
0	\$20,000
1	−26,000
2	13,000

What is the IRR of the project? What is happening here?

The IRR is the interest rate that makes the NPV of the project equal to zero. So, the IRR of the project is:

$0 = \$20,000 – \$26,000 / (1 + IRR) + \$13,000 / (1 + IRR)^2$

Even though it appears there are two IRRs, a spreadsheet, financial calculator, or trial and error will not give an answer. The reason is that there is no real IRR for this set of cash flows. If you examine the IRR equation, what we are really doing is solving for the roots of the equation. Going back to high school algebra, in this problem we are solving a quadratic equation. In case you don't remember, the quadratic equation is:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

In this case, the equation is:

$$x = \frac{-(-26{,}000) \pm \sqrt{(-26{,}000)^2 - 4(20{,}000)(13{,}000)}}{2(20{,}000)}$$

The square root term works out to be:

676,000,000 – 1,040,000,000 = –364,000,000

The square root of a negative number is a complex number, so there is no real number solution, meaning the project has no real IRR.

Question 5

Comparing Investment Criteria Mario Brothers, a game manufacturer, has a new idea for an adventure game. It can market the game either as a traditional board game or as an interactive DVD, but not both. Consider the following cash flows of the two mutually exclusive projects for Mario Brothers. Assume the discount rate for Mario Brothers is 10 percent.

Year	Board Game	DVD
0	–$750	–$1,800
1	600	1,300
2	450	850
3	120	350

a. Based on the payback period rule, which project should be chosen?
b. Based on the NPV, which project should be chosen?

a. The payback period is the time that it takes for the cumulative undiscounted cash inflows to equal the initial investment.

Board game:

Cumulative cash flows Year 1 = $600 = $600
Cumulative cash flows Year 2 = $600 + 450 = $1,050

Payback period = 1 + $150 / $450 = 1.33 years
DVD:

Cumulative cash flows Year 1 = $1,300 = $1,300
Cumulative cash flows Year 2 = $1,300 + 850 = $2,150

Payback period = 1 + ($1,800 – 1,300) / $850
Payback period = 1.59 years

Since the board game has a shorter payback period than the DVD project, the company should choose the board game.

b. The NPV is the sum of the present value of the cash flows from the project, so the NPV of each project will be:

Board game:

$NPV = –\$750 + \$600 / 1.10 + \$450 / 1.10^2 + \$120 / 1.10^3$
$NPV = \$257.51$

DVD:

$NPV = –\$1,850 + \$1,300 / 1.10 + \$850 / 1.10^2 + \$350 / 1.10^3$
$NPV = \$347.26$

Since the NPV of the DVD is greater than the NPV of the board game, choose the DVD.

Chapter 6

Question 1

Calculating Project NPV Raphael Restaurant is considering the purchase of a \$9,000 soufflé maker. The soufflé maker has an economic life of five years and will be fully depreciated by the straight-line method. The machine will produce 1,500 soufflés per year, with each costing \$2.30 to make and priced at \$4.75. Assume that the discount rate is 14 percent and the tax rate is 34 percent. Should Raphael make the purchase?

Using the tax shield approach to calculating OCF, we get:

OCF = (Sales – Costs)(1 – t_C) + t_C*Depreciation
OCF = [(\$4.75 × 1,500) – (\$2.30 × 1,500)](1 – 0.34) + 0.34(\$9,000/5)
OCF = \$3,037.50

So, the NPV of the project is:

NPV = –\$9,000 + \$3,037.50($PVIFA_{14\%,5}$)
NPV = \$1,427.98

Question 2

Calculating Project NPV The Best Manufacturing Company is considering a new investment. Financial projections for the investment are tabulated here. The corporate tax rate is 34 percent. Assume all sales revenue is received in cash, all operating costs and income taxes are paid in cash, and all cash flows occur at the end of the year. All net working capital is recovered at the end of the project.

	Year 0	Year 1	Year 2	Year 3	Year 4
Investment	\$24,000				
Sales revenue		\$12,500	\$13,000	\$13,500	\$10,500
Operating costs		2,700	2,800	2,900	2,100
Depreciation		6,000	6,000	6,000	6,000
Net working capital spending	300	350	400	300	?

a. Compute the incremental net income of the investment for each year.
b. Compute the incremental cash flows of the investment for each year.
c. Suppose the appropriate discount rate is 12 percent. What is the NPV of the project?

Net working capital spending = change in the new working capital

We will use the bottom-up approach to calculate the operating cash flow for each year. We also must be sure to include the net working capital cash flows each year. So, the net income and total cash flow each year will be:

		Year 1	Year 2	Year 3	Year 4
Sales		$12,500	$13,000	$13,500	$10,500
Costs		2,700	2,800	2,900	2,100
Depreciation		6,000	6,000	6,000	6,000
EBT		$3,800	$4,200	$4,600	$2,400
Tax		1,292	1,428	1,564	816
Net income		$2,508	$2,772	$3,036	$1,584
OCF	0	$8,508	$8,772	$9,036	$7,584
Capital spending	–$24,000	0	0	0	0
NWC	–300	–350	–400	–300	1,350
Incremental cash flow	–$24,300	$8,158	$8,372	$8,736	$8,934

The NPV for the project is:

$NPV = –\$24,300 + \$8,158 / 1.12 + \$8,372 / 1.12^2 + \$8,736 / 1.12^3 + \$8,934 / 1.12^4$
$NPV = \$1,553.87$

Question 3

Calculating Salvage Value An asset used in a four-year project falls in the five-year MACRS class for tax purposes. The asset has an acquisition cost of $7,100,000 and will be sold for $1,400,000 at the end of the project. If the tax rate is 35 percent, what is the aftertax salvage value of the asset?

To find the BV at the end of four years, we need to find the accumulated depreciation for the first four years. We could calculate a table with the depreciation each year, but an easier way is to add the MACRS depreciation amounts for each of the first four years and multiply this percentage times the cost of the asset. We can then subtract this from the asset cost. Doing so, we get:

$BV_4 = \$7,100,000 – 7,100,000(0.2000 + 0.3200 + 0.1920 + 0.1152)$
$BV_4 = \$1,226,880$

The asset is sold at a gain to book value, so this gain is taxable.

Aftertax salvage value = \$1,400,000 + (\$1,226,880 – 1,400,000)(.35)
Aftertax salvage value = \$1,339,408

Question 4

Calculating Project NPV Scott Investors, Inc., is considering the purchase of a \$360,000 computer with an economic life of five years. The computer will be fully depreciated over five years using the straight-line method. The market value of the computer will be \$60,000 in five years. The computer will replace five office employees whose combined annual salaries are \$105,000. The machine will also immediately lower the firm's required net working capital by \$80,000. This amount of net working capital will need to be replaced once the machine is sold. The corporate tax rate is 34 percent. Is it worthwhile to buy the computer if the appropriate discount rate is 12 percent?

We will calculate the aftertax salvage value first. The aftertax salvage value of the equipment will be:

Taxes on salvage value = (BV – MV)t_C
Taxes on salvage value = (\$0 – 60,000)(.34)
Taxes on salvage value = –\$20,400

Market price	\$60,000
Tax on sale	–20,400
Aftertax salvage value	\$39,600

After tax salvage value = SP – (SP – BV)* t = 60000 – (60000 – 0)*0.34 = 39600

Next, we will calculate the initial cash outlay, that is, the cash flow at Time 0. To undertake the project, we will have to purchase the equipment. The new project will decrease the net working capital, so this is a cash inflow at the beginning of the project. So, the cash outlay today for the project will be:

Equipment	–\$360,000
NWC	80,000
Total	–\$280,000

Now we can calculate the operating cash flow each year for the project. Using the bottom up approach, the operating cash flow will be:

Saved salaries	\$105,000
Depreciation	72,000

EBT	$33,000
Taxes	11,220
Net income	$21,780

And the OCF will be:

OCF = $21,780 + 72,000
OCF = $93,780

Now we can find the NPV of the project. In Year 5, we must replace the saved NWC, so:

NPV = –$280,000 + $93,780($PVIFA_{12\%,5}$) + ($39,600 – 80,000) / 1.12^5
NPV = $35,131.87

Question 5

Calculating NPV Howell Petroleum is considering a new project that complements its existing business. The machine required for the project costs $3.8 million. The marketing department predicts that sales related to the project will be $2.5 million per year for the next four years, after which the market will cease to exist. The machine will be depreciated down to zero over its four-year economic life using the straight-line method. Cost of goods sold and operating expenses related to the project are predicted to be 25 percent of sales. Howell also needs to add net working capital of $150,000 immediately. The additional net working capital will be recovered in full at the end of the project's life. The corporate tax rate is 35 percent. The required rate of return for Howell is 16 percent. Should Howell proceed with the project?

We will begin by calculating the initial cash outlay, that is, the cash flow at Time 0. To undertake the project, we will have to purchase the equipment and increase net working capital. So, the cash outlay today for the project will be:

Equipment	–$3,800,000
NWC	–150,000
Total	–$3,950,000

Using the bottom-up approach to calculating the operating cash flow, we find the operating cash flow each year will be:

Sales	$2,500,000
Costs	625,000
Depreciation	950,000
EBT	$925,000
Tax	323,750

Net income	$601,250

The operating cash flow is:

OCF = Net income + Depreciation
OCF = $601,250 + 950,000
OCF = $1,551,250

To find the NPV of the project, we add the present value of the project cash flows. We must be sure to add back the net working capital at the end of the project life, since we are assuming the net working capital will be recovered. So, the project NPV is:

NPV = –$3,950,000 + $1,551,250($PVIFA_{16\%,4}$) + $150,000 / 1.16^4
NPV = $473,521.38

Chapter 7

Question 1

Financial Break-even L.J.'s Toys Inc. just purchased a $390,000 machine to produce toy cars. The machine will be fully depreciated by the straight-line method over its five-year economic life. Each toy sells for $25. The variable cost per toy is $11, and the firm incurs fixed costs of $280,000 each year. The corporate tax rate for the company is 34 percent. The appropriate discount rate is 12 percent. What is the financial break-even point for the project?

When calculating the financial breakeven point, we express the initial investment as an equivalent annual cost (EAC). Dividing the initial investment by the five-year annuity factor, discounted at 12 percent, the EAC of the initial investment is:

EAC = Initial Investment / $PVIFA_{12\%,5}$
EAC = $390,000 / 3.60478
EAC = $108,189.80

Note that this calculation solves for the annuity payment with the initial investment as the present value of the annuity. In other words:

$PVA = C(\{1 - [1/(1 + R)]^t\} / R)$
$\$390,000 = C\{[1 - (1/1.12)^5] / .12\}$
$C = \$108,189.80$

The annual depreciation is the cost of the equipment divided by the economic life, or:

Annual depreciation = $390,000 / 5
Annual depreciation = $78,000

Now we can calculate the financial breakeven point. The financial breakeven point for this project is:

$Q_F = [EAC + FC(1 - t_C) - D(t_C)] / [(P - VC)(1 - t_C)]$
$Q_F = [\$108,189.80 + \$280,000(1 - 0.34) - \$78,000(0.34)] / [(\$25 - 11)(1 - 0.34)]$
$Q_F = 28,838.72$ or about 28,839 units

Question 2

Sensitivity Analysis Consider a four-year project with the following information: Initial fixed asset investment = $480,000; straight-line depreciation to zero over the four-year life; zero salvage value; price = $37; variable costs = $23; fixed costs = $195,000; quantity sold = 90,000 units; tax rate = 34 percent. How sensitive is OCF to changes in quantity sold?

Using the tax shield approach, the OCF at 90,000 units will be:

OCF = [(P – v)Q – FC](1 – t_C) + t_C(D)
OCF = [($37 – 23)(90,000) – 195,000](0.66) + 0.34($480,000/4)
OCF = $743,700

We will calculate the OCF at 91,000 units. The choice of the second level of quantity sold is arbitrary and irrelevant. No matter what level of units sold we choose we will still get the same sensitivity. So, the OCF at this level of sales is:

OCF = [($37 – 23)(91,000) – 195,000](0.66) + 0.34($480,000/4)
OCF = $752,940

The sensitivity of the OCF to changes in the quantity sold is:

Sensitivity = ΔOCF/ΔQ = ($743,700 – 752,940)/(90,000 – 91,000)
ΔOCF/ΔQ = +$9.24

OCF will increase by $9.24 for every additional unit sold.

Question 3

Break-Even Point As a shareholder of a firm that is contemplating a new project, would you be more concerned with the accounting break-even point, the cash break-even point (the point at which operating cash flow is zero), or the financial break-even point? Why?

From the shareholder perspective, the financial break-even point is the most important. A project can exceed the accounting and cash break-even points but still be below the financial break-even point. This causes a reduction in shareholder (your) wealth.

Question 4

Option to Wait Your company is deciding whether to invest in a new machine. The new machine will increase cash flow by $475,000 per year. You believe the technology used in the machine has a 10-year life; in other words, no matter when you purchase the machine, it will be obsolete 10 years from today. The machine is currently priced at $2,900,000. The cost of the machine will decline by $210,000 per year until it reaches $2,270,000, where it will remain. If your required return is 9 percent, should you purchase the machine? If so, when should you purchase it?

If we purchase the machine today, the NPV is the cost plus the present value of the increased cash flows, so:

NPV_0 = –$2,900,000 + $475,000($PVIFA_{9\%,10}$)
NPV_0 = $148,387.41

We should not necessarily purchase the machine today. We would want to purchase the machine when the NPV is the highest. So, we need to calculate the NPV each year. The NPV each year will be the cost plus the present value of the increased cash savings. We must be careful, however. In order to make the correct decision, the NPV for each year must be taken to a common date. We will discount all of the NPVs to today. Doing so, we get:

Year 1: $NPV_1 = [–\$2,690,000 + \$475,000(PVIFA_{9\%,9})] / 1.09$
$NPV_1 = \$157,742.27$

Year 2: $NPV_2 = [–\$2,480,000 + \$475,000(PVIFA_{9\%,8})] / 1.09^2$
$NPV_2 = \$149,039.08$

Year 3: $NPV_3 = [–\$2,270,000 + \$475,000(PVIFA_{9\%,7})] / 1.09^3$
$NPV_3 = \$120,652.60$

Year 4: $NPV_4 = [–\$2,270,000 + \$475,000(PVIFA_{9\%,6})] / 1.09^4$
$NPV_4 = –\$139,188.67$

Year 5: $NPV_5 = [–\$2,270,000 + \$475,000(PVIFA_{9\%,5})] / 1.09^5$
$NPV_5 = –\$422,415.65$

Year 6: $NPV_6 = [–\$2,270,000 + \$475,000(PVIFA_{9\%,4})] / 1.09^6$
$NPV_6 = –\$731,133.06$

The company should purchase the machine one year from now when the NPV is the highest.

Chapter 8

Question 1

Valuing Bonds Microhard has issued a bond with the following characteristics:

Par: \$1,000
Time to maturity: 15 years
Coupon rate: 7 percent
Semiannual payments

Calculate the price of this bond if the YTM is:

a. 7 percent
b. 9 percent
c. 5 percent

The price of any bond is the PV of the interest payment, plus the PV of the par value. Notice this problem assumes a semiannual coupon. The price of the bond at each YTM will be:

a. P = $\$35(\{1 – [1/(1 + .035)]^{30} \} / .035) + \$1,000[1 / (1 + .035)^{30}]$
P = \$1,000.00
When the YTM and the coupon rate are equal, the bond will sell at par.

b. P = $\$35(\{1 – [1/(1 + .045)]^{30} \} / .045) + \$1,000[1 / (1 + .045)^{30}]$
P = \$837.11
When the YTM is greater than the coupon rate, the bond will sell at a discount.

c. P = $\$35(\{1 – [1/(1 + .025)]^{30} \} / .025) + \$1,000[1 / (1 + .025)^{30}]$
P = \$1,209.30
When the YTM is less than the coupon rate, the bond will sell at a premium.

Question 2

Calculating Real Rates of Return If Treasury bills are currently paying 4.5 percent and the inflation rate is 2.1 percent, what is the approximate real rate of interest? The exact real rate?

The approximate relationship between nominal interest rates (*R*), real interest rates (*r*), and inflation (*h*) is:

$R = r + h$

Approximate r = .045 –.021 =.024 or 2.40%

The Fisher equation, which shows the exact relationship between nominal interest rates, real interest rates, and inflation is:

$(1 + R) = (1 + r)(1 + h)$

$(1 + .045) = (1 + r)(1 + .021)$

Exact $r = [(1 + .045) / (1 + .021)] - 1 = .0235$ or 2.35%

Question 3

Interest Rate Risk Laurel, Inc., and Hardy Corp. both have 7 percent coupon bonds outstanding, with semiannual interest payments, and both are priced at par value. The Laurel, Inc., bond has 2 years to maturity, whereas the Hardy Corp. bond has 15 years to maturity. If interest rates suddenly rise by 2 percent, what is the percentage change in the price of these bonds? If interest rates were to suddenly fall by 2 percent instead, what would the percentage change in the price of these bonds be then? Illustrate your answers by graphing bond prices versus YTM. What does this problem tell you about the interest rate risk of longer-term bonds?

Any bond that sells at par has a YTM equal to the coupon rate. Both bonds sell at par, so the initial YTM on both bonds is the coupon rate, 7 percent. If the YTM suddenly rises to 9 percent:

$P_{Laurel} = \$35(PVIFA_{4.5\%,4}) + \$1,000(PVIF_{4.5\%,4}) = \$964.12$

$P_{Hardy} = \$35(PVIFA_{4.5\%,30}) + \$1,000(PVIF_{4.5\%,30}) = \$837.11$

The percentage change in price is calculated as:

Percentage change in price = (New price – Original price) / Original price

$\Delta P_{Laurel}\% = (\$964.12 - 1,000) / \$1,000 = -0.0359$ or -3.59%

$\Delta P_{Hardy}\% = (\$837.11 - 1,000) / \$1,000 = -0.1629$ or -16.29%

If the YTM suddenly falls to 5 percent:

$P_{Laurel} = \$35(PVIFA_{2.5\%,4}) + \$1,000(PVIF_{2.5\%,4}) = \$1,037.62$

$P_{Hardy} = \$35(PVIFA_{2.5\%,30}) + \$1,000(PVIF_{2.5\%,30}) = \$1,209.30$

$\Delta P_{Laurel}\% = (\$1,037.62 - 1,000) / \$1,000 = +0.0376$ or 3.76%

$\Delta P_{Hardy}\% = (\$1,209.30 – 1,000) / \$1,000 = +0.2093$ or 20.93%

All else the same, the longer the maturity of a bond, the greater is its price sensitivity to changes in interest rates. Notice also that for the same interest rate change, the gain from a decline in interest rates is larger than the loss from the same magnitude change. For a plain vanilla bond, this is always true.

Question 4

Valuing Bonds What is the price of a 15-year, zero coupon bond paying $1,000 at maturity if the YTM is:

a. 5 percent?
b. 10 percent?
c. 15 percent?

The price of a pure discount (zero coupon) bond is the present value of the par value. Remember, even though there are no coupon payments, the periods are semiannual to stay consistent with coupon bond payments. So, the price of the bond for each YTM is:

a. $P = \$1,000/(1 + .05/2)^{30} = \$476.74$

b. $P = \$1,000/(1 + .10/2)^{30} = \$231.38$

c. $P = \$1,000/(1 + .15/2)^{30} = \$114.22$

Chapter 9

Question 1

Stock Values The Starr Co. just paid a dividend of \$2.15 per share on its stock. The dividends are expected to grow at a constant rate of 5 percent per year, indefinitely. If investors require a return of 11 percent on the stock, what is the current price? What will the price be in three years? In 15 years?

The constant dividend growth model is:

$P_t = D_t \times (1 + g) / (R - g)$

So, the price of the stock today is:

$P_0 = D_0 (1 + g) / (R - g) = \$1.90 (1.05) / (.11 - .05) = \$37.63$

The dividend at year 4 is the dividend today times the FVIF for the growth rate in dividends and four years, so:

$P_3 = D_3 (1 + g) / (R - g) = D_0 (1 + g)^4 / (R - g) = \$1.90 (1.05)^4 / (.11 - .05) = \$43.56$

We can do the same thing to find the dividend in Year 16, which gives us the price in Year 15, so:

$P_{15} = D_{15} (1 + g) / (R - g) = D_0 (1 + g)^{16} / (R - g) = \$1.90 (1.05)^{16} / (.11 - .05) = \$78.22$

There is another feature of the constant dividend growth model: The stock price grows at the dividend growth rate. So, if we know the stock price today, we can find the future value for any time in the future we want to calculate the stock price. In this problem, we want to know the stock price in three years, and we have already calculated the stock price today. The stock price in three years will be:

$P_3 = P_0(1 + g)^3 = \$37.63(1 + .05)^3 = \$43.56$

And the stock price in 15 years will be:

$P_{15} = P_0(1 + g)^{15} = \$37.63(1 + .05)^{15} = \$78.22$

Question 2

Valuing Preferred Stock Ayden, Inc., has an issue of preferred stock outstanding that pays a \$5.90 dividend every year, in perpetuity. If this issue currently sells for \$87 per share, what is the required return?

The price of a share of preferred stock is the dividend divided by the required return. This is the same equation as the constant growth model, with a dividend growth rate of zero percent. Remember that most preferred stock pays a fixed dividend, so the growth rate is zero. Using this equation, we find the price per share of the preferred stock is:

$R = D/P_0 = \$5.90/\$87 = .0678$, or 6.78%

Question 3

Nonconstant Growth Metallica Bearings, Inc., is a young start-up company. No dividends will be paid on the stock over the next nine years, because the firm needs to plow back its earnings to fuel growth. The company will pay a $15 per share dividend in 10 years and will increase the dividend by 5.5 percent per year thereafter. If the required return on this stock is 13 percent, what is the current share price?

Here we have a stock that pays no dividends for 10 years. Once the stock begins paying dividends, it will have a constant growth rate of dividends. We can use the constant growth model at that point. It is important to remember that the general form of the constant dividend growth formula is:

$P_t = [D_t \times (1 + g)] / (R - g)$

This means that since we will use the dividend in Year 10, we will be finding the stock price in Year 9. The dividend growth model is similar to the PVA and the PV of a perpetuity: The equation gives you the PV one period before the first payment. So, the price of the stock in Year 9 will be:

$P_9 = D_{10} / (R - g) = \$15.00 / (.13 - .055) = \$200$

The price of the stock today is simply the PV of the stock price in the future. We simply discount the future stock price at the required return. The price of the stock today will be:

$P_0 = \$200 / 1.13^9 = \$66.58$

Question 4

Differential Growth Janicek Corp. is experiencing rapid growth. Dividends are expected to grow at 30 percent per year during the next three years, 18 percent over the following year, and then 8 percent per year indefinitely. The required return on this stock is 11 percent, and the stock currently sells for $65 per share. What is the projected dividend for the coming year?

Here we need to find the dividend next year for a stock experiencing differential growth. We know the stock price, the dividend growth rates, and the required return, but not the dividend. First, we need to realize that the dividend in Year 3 is the current dividend times the FVIF. The dividend in Year 3 will be:

$D_3 = D_0 (1.30)^3$

And the dividend in Year 4 will be the dividend in Year 3 times one plus the growth rate, or:

$D_4 = D_0 (1.30)^3 (1.18)$

The stock begins constant growth after the 4th dividend is paid, so we can find the price of the stock in Year 4 as the dividend in Year 5, divided by the required return minus the growth rate. The equation for the price of the stock in Year 4 is:

$P_4 = D_4 (1 + g) / (R - g)$

Now we can substitute the previous dividend in Year 4 into this equation as follows:

$P_4 = D_0 (1 + g_1)^3 (1 + g_2) (1 + g_3) / (R - g_3)$

$P_4 = D_0 (1.30)^3 (1.18) (1.08) / (.11 - .08) = 93.33D_0$

When we solve this equation, we find that the stock price in Year 4 is 93.33 times as large as the dividend today. Now we need to find the equation for the stock price today. The stock price today is the PV of the dividends in Years 1, 2, 3, and 4, plus the PV of the Year 4 price. So:

$P_0 = D_0(1.30)/1.11 + D_0(1.30)^2/1.11^2 + D_0(1.30)^3/1.11^3 + D_0(1.30)^3(1.18)/1.11^4 + 93.33D_0/1.11^4$

We can factor out D_0 in the equation, and combine the last two terms. Doing so, we get:

$P_0 = \$65.00 = D_0\{1.30/1.11 + 1.30^2/1.11^2 + 1.30^3/1.11^3 + [(1.30)^3(1.18) + 93.33] / 1.11^4\}$

Reducing the equation even further by solving all of the terms in the braces, we get:

$\$65 = \$67.34D_0$

$D_0 = \$65.00 / 67.34 = \$0.9653$

This is the dividend today, so the projected dividend for the next year will be:

$D_1 = \$0.9653(1.30) = \$1.25$

Question 5

Negative Growth Antiques R Us is a mature manufacturing firm. The company just paid a dividend of \$9, but management expects to reduce the payout by 4 percent per year, indefinitely. If you require an 11 percent return on this stock, what will you pay for a share today?

The constant growth model can be applied even if the dividends are declining by a constant percentage, just make sure to recognize the negative growth. So, the price of the stock today will be:

$P_0 = D_0 (1 + g) / (R - g) = \$9(1 - .04) / [(.11 - (-.04)] = \$57.60$