GESTÃO FINANCEIRA II

PROBLEM SET 1 - SOLUTIONS

(FROM BERK AND DEMARZO'S "CORPORATE FINANCE")

LICENCIATURA – UNDERGRADUATE COURSE

1ST SEMESTER 2010-2011

Instituto Superior de Economia e Gestão
UNIVERSIDADE TÉCNICA DE LISBOA

Chapter 1
The Corporation

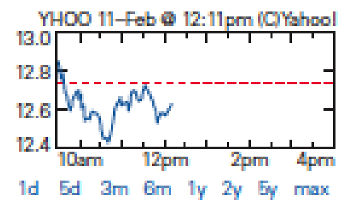
1-13. What is the difference between a public and private corporation?
The shares of a public corporation are traded on an exchange (or "over the counter" in an electronic trading system) while the shares of a private corporation are not traded on a public exchange.

1-14. Explain why the bid-ask spread is a transaction cost.
Investors always buy at the ask and sell at the bid. Since ask prices always exceed bid prices, investors “lose” this difference. It is one of the costs of transacting. Since the market makers take the other side of the trade, they make this difference.

1-15. The following quote on Yahoo! Stock appeared on February 11, 2009, on Yahoo! Finance:

Yahoo! Inc. (NasdaqGS:YHOO)
Real-Time: 12:57 ↓0.18 (1.41%) 12:34PM ET

Last Trade:	**12.53**	Day's Range:	12.42 – 12.91
Trade Time:	12:19PM ET	52wk Range:	8.94 – 30.25
Change:	↓0.22 (1.71%)	Volume:	5,996,715
Prev Close:	12.75	Avg Vol (3m)	21,536,800
Open:	12.86	Market Cap:	17.39B
Bid:	12.53 × 100	P/E (ttm):	41.35 ×
Ask:	12.54 × 13500	EPS (ttm):	0.30
1y Target Est:	15.00	Div & Yield:	N/A (N/A)



If you wanted to buy Yahoo!, what price would you pay? How much would you receive if you wanted to sell Yahoo!?
You would buy at $12.54 and sell for $12.5

Chapter 2
Introduction to Financial Statement Analysis

2-3. Find the most recent financial statements for Starbucks' corporation (SBUX) using the following sources:

a. From the company's Web site www.starbucks.com (*Hint* : Search for "investor relations.")

b. From the SEC Web site www.sec.gov. (*Hint* : Search for company filings in the EDGAR database.)

***c.* From the Yahoo! Finance Web site http://finance.yahoo.com.**

d. From at least one other source. (*Hint* : Enter "SBUX 10K" at www.google.com.)

Each method will help find the same SEC filings. Yahoo! Finance also provides some analysis such as charts and key statistics.

2-8. In March 2005, General Electric (GE) had a book value of equity of $113 billion, 10.6 billion shares outstanding, and a market price of $36 per share. GE also had cash of $13 billion, and total debt of $370 billion. Four years later, in early 2009, GE had a book value of equity of $105 billion, 10.5 billion shares outstanding with a market price of $10.80 per share, cash of $48 billion, and total debt of $524 billion. Over this period, what was the change in GE's

a. market capitalization?

b. market-to-book ratio?

c. book debt-equity ratio?

d. market debt-equity ratio?

e. enterprise value?

a. 2005 Market Capitalization: 10.6 billion shares x $36.00/share = $381.6 billion. 2009 Market Capitalization: 10.5 billion shares x $10.80/share = $113.4. The change over the period is $113.4 - $381.6 = -$268.2 billion.

b. 2005 Market-to-Book $= \frac{381.6}{113} = 3.38$. 2009 Market-to-Book $= \frac{113.4}{105} = 1.08$. The change over the period is: 1.08 – 3.38 = -2.3.

c. 2005 Book Debt-to-Equity $= \frac{370}{113} = 3.27$. 2009 Book Debt-to-Equity $= \frac{524}{105} = 4.99$. The change over the period is: 4.99 – 3.27 = 1.72.

d. 2005 Market Debt-to-Equity $= \frac{370}{381.6} = 0.97$. 2009 Market Debt-to-Equity $= \frac{524}{113.4} = 4.62$. The change over the period is: 4.62 – 0.97 = 3.65.

e. 2005 Enterprise Value = $381.6 - 13 + 370 = $738.6 billion. 2009 Enterprise Value = $113.4 - 48 + 524 = $589.4 billion. The change over the period is: $589.4 – 738.6 = - $149.2 billion

Chapter 3

Arbitrage and Financial Decision Making

3-12. Suppose Bank One offers a risk-free interest rate of 5.5% on both savings and loans, and Bank Enn offers a risk-free interest rate of 6% on both savings and loans.

a. What arbitrage opportunity is available?

b. **Which bank would experience a surge in the demand for loans? Which bank would receive a surge in deposits?**

c. **What would you expect to happen to the interest rates the two banks are offering?**

a. Take a loan from Bank One at 5.5% and save the money in Bank Enn at 6%.

b. Bank One would experience a surge in the demand for loans, while Bank Enn would receive a surge in deposits.

c. Bank One would increase the interest rate, and/or Bank Enn would decrease its rate.

3-13. Throughout the 1990s, interest rates in Japan were lower than interest rates in the United States. As a result, many Japanese investors were tempted to borrow in Japan and invest the proceeds in the United States. Explain why this strategy does not represent an arbitrage opportunity.

There is exchange rate risk. Engaging in such transactions may incur a loss if the value of the dollar falls relative to the yen. Because a profit is not guaranteed, this strategy is not an arbitrage opportunity.

3-14. An American Depositary Receipt (ADR) is security issued by a U.S. bank and traded on a U.S. stock exchange that represents a specific number of shares of a foreign stock. For example, Nokia Corporation trades as an ADR with symbol NOK on the NYSE. Each ADR represents one share of Nokia Corporation stock, which trades with symbol NOK1V on the Helsinki stock exchange. If the U.S. ADR for Nokia is trading for $17.96 per share, and Nokia stock is trading on the Helsinki exchange for 14.78 € per share, use the Law of One Price to determine the current $/€ exchange rate.

We can trade one share of Nokia stock for $17.96 per share in the U.S. and €14.78 per share in Helsinki. By the Law of One Price, these two competitive prices must be the same at the current exchange rate. Therefore, the exchange rate must be:

$$\frac{\$17.96/\text{share of Nokia}}{€14.78/\text{share of Nokia}} = \$1.215/€ \text{ today.}$$

3-18. Suppose a security with a risk-free cash flow of $150 in one year trades for $140 today. If there are no arbitrage opportunities, what is the current risk-free interest rate?

The PV of the security's cash flow is ($150 in one year)/(1 + r), where r is the one-year risk-free interest rate. If there are no arbitrage opportunities, this PV equals the security's price of $140 today. Therefore,

$$\$140 \text{ today} = \frac{\$150 \text{ in one year}}{1+r}$$

Rearranging:

$$\frac{\$150 \text{ in one year}}{\$140 \text{ today}} = 1+r = \$1.0714 \text{ in one year / \$ today, so } r = 7.14\%$$

Chapter 4

The Time Value of Money

4-8. Your daughter is currently eight years old. You anticipate that she will be going to college in 10 years. You would like to have $100,000 in a savings account to fund her education at that time. If

the account promises to pay a fixed interest rate of 3% per year, how much money do you need to put into the account today to ensure that you will have \$100,000 in 10 years?

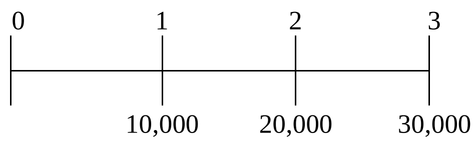
$$\text{PV}=\frac{100,000}{1.03^{10}}=74,409.39$$

4-12. You have just received a windfall from an investment you made in a friend's business. He will be paying you \$10,000 at the end of this year, \$20,000 at the end of the following year, and \$30,000 at the end of the year after that (three years from today). The interest rate is 3.5% per year.

a. What is the present value of your windfall?

b. What is the future value of your windfall in three years (on the date of the last payment)?

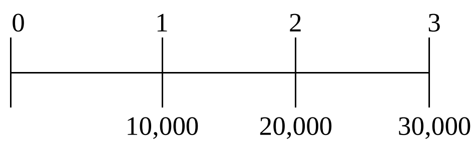
a. Timeline:



$$\text{PV}=\frac{10,000}{1.035}+\frac{20,000}{1.035^2}+\frac{30,000}{1.035^3}$$

$$=9,662+18,670+27,058=55,390$$

b. Timeline:

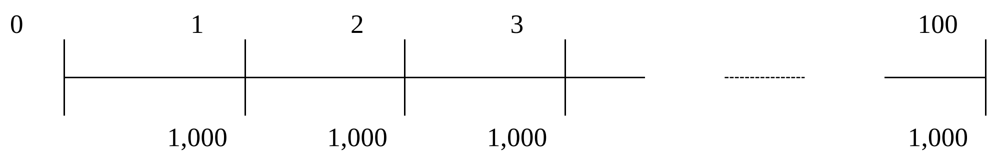


$$\text{FV}=55,390\times 1.035^3$$

$$=61,412$$

4-19. What is the present value of \$1000 paid at the end of each of the next 100 years if the interest rate is 7% per year?

Timeline:

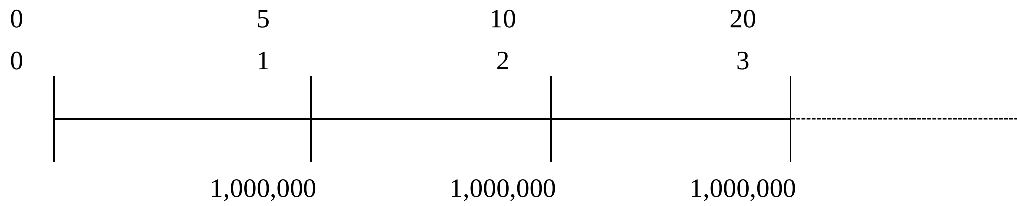


The cash flows are a 100 year annuity, so by the annuity formula:

$$\text{PV}=\frac{1,000}{0.07}\left(1-\frac{1}{1.07^{100}}\right)=14,269.25.$$

4-20. You are head of the Schwartz Family Endowment for the Arts. You have decided to fund an arts school in the San Francisco Bay area in perpetuity. Every five years, you will give the school \$1 million. The first payment will occur five years from today. If the interest rate is 8% per year, what is the present value of your gift?

Timeline:

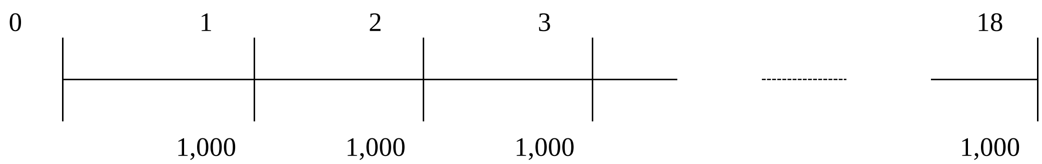


First we need the 5-year interest rate. If the annual interest rate is 8% per year and you invest $1 for 5 years you will have, by the 2nd rule of time travel, $(1.08)^5 = 1.4693\,2808$. So the 5 year interest rate is 46.93%. The cash flows are a perpetuity, so:

$$\text{PV} = \frac{1,000,000}{0.46932808} = 2,130,833.$$

4-23. Your grandmother has been putting $1000 into a savings account on every birthday since your first (that is, when you turned 1). The account pays an interest rate of 3%. How much money will be in the account on your 18th birthday immediately after your grandmother makes the deposit on that birthday?

Timeline:



We first calculate the present value of the deposits at date 0. The deposits are an 18-year annuity:

$$\text{PV} = \frac{1,000}{0.03}\left(1 - \frac{1}{1.03^{18}}\right) = 13,753.51$$

Now, we calculate the future value of this amount:

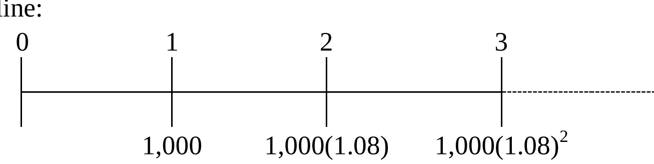
$$\text{FV} = 13,753.51(1.03)^{18} = 23,414.43$$

4-24. A rich relative has bequeathed you a growing perpetuity. The first payment will occur in a year and will be $1000. Each year after that, you will receive a payment on the anniversary of the last payment that is 8% larger than the last payment. This pattern of payments will go on forever. If the interest rate is 12% per year,

a. What is today's value of the bequest?

b. What is the value of the bequest immediately after the first payment is made?

a. Timeline:



Using the formula for the PV of a growing perpetuity gives:

$$\text{PV} = \left(\frac{1,000}{0.12 - 0.08}\right) = 25,000.$$

b. Timeline:

1	2	3	4	
0	1	2	3	...
	1,000	$1{,}000(1.08)^2$	$1{,}000(1.08)^3$	

Using the formula for the PV of a growing perpetuity gives:

$$PV = \frac{1,000(1.08)}{0.12 - 0.08} = 27,000.$$

4-34. **(includes 4.32) You are thinking of purchasing a house. The house costs \$350,000. You have \$50,000 in cash that you can use as a down payment on the house, but you need to borrow the rest of the purchase price. The bank is offering a 30-year mortgage that requires annual payments and has an interest rate of 7% per year.**

(a) What will your annual payment be if you sign up for this mortgage?

(b) You can afford to pay only \$23,500 per year. The bank agrees to allow you to pay this amount each year, yet still borrow \$300,000. At the end of the mortgage (in 30 years), you must make a *balloon* payment; that is, you must repay the remaining balance on the mortgage. How much will this balloon payment be?

(a)

Timeline: (From the perspective of the bank)

0	1	2	3	...	30
300,000					C

$$C = \frac{300,000}{\frac{1}{0.07}\left(1 - \frac{1}{1.07^{30}}\right)} = \$24,176$$

(b)Timeline: (where X is the balloon payment.)

0	1	2	3	...	30
–300,000	23,500	23,500	23,500		23,500 + X

The present value of the loan payments must be equal to the amount borrowed:

$$300,000 = \frac{23,500}{0.07}\left(1 - \frac{1}{1.07^{30}}\right) + \frac{X}{1.07^{30}}.$$

Solving for X:

$$X = \left[300,000 - \frac{23,500}{0.07}\left(1 - \frac{1}{1.07^{30}}\right)\right](1.07)^{30} = \$63,848$$

Chapter 5
Interest Rates

5-6. Your bank account pays interest with an EAR of 5%. What is the APR quote for this account based on semiannual compounding? What is the APR with monthly compounding?

Using the formula for converting from an EAR to an APR quote

$$\left(1+\frac{\text{APR}}{k}\right)^{k}=1.05$$

Solving for the APR

$$\text{APR} = \quad 1.05^{\frac{1}{k}} - 1 \;\; k$$

With annual payments k = 1, so APR = 5%
With semiannual payments k = 2, so APR = 4.939%
With monthly payments k = 12, so APR = 4.889%

5-26. If the rate of inflation is 5%, what nominal interest rate is necessary for you to earn a 3% real interest rate on your investment?

$1+r_r=\dfrac{1+r}{1+i}$ implies $1+r=(1+r_r)(1+i)=(1.03)(1.05)=1.0815$.

Therefore, a nominal rate of 8.15% is required.

5-30. Suppose the term structure of risk-free interest rates is as shown below:

Term	1 year	2 years	3 years	5 years	7 years	10 years	20 years
Rate (EAR, %)	1.99	2.41	2.74	3.32	3.76	4.13	4.93

What is the present value of an investment that pays $100 at the end of each of years 1, 2, and 3? If you wanted to value this investment correctly using the annuity formula, which discount rate should you use?

PV = 100 / 1.0199 + 100 / 1.0241^2 + 100 / 1.0274^3 =$285.61.

To determine the single discount rate that would compute the value correctly, we solve the following for r:
PV = 285.61 = 100/(1 + r) + 100 / $(1 + r)^2$ + 100/$(1 + r)^3$ = $285.61.

This is just an IRR calculation. Using trial and error or the annuity calculator, r = 2.50%. Note that this rate is between the 1, 2, and 3-yr rates given.

Chapter 6
Investment Decision Rules

[Type text]

6-5. **Bill Clinton reportedly was paid \$10 million to write his book *My Way*. The book took three years to write. In the time he spent writing, Clinton could have been paid to make speeches. Given his popularity, assume that he could earn \$8 million per year (paid at the end of the year) speaking instead of writing. Assume his cost of capital is 10% per year.**

a. What is the NPV of agreeing to write the book (ignoring any royalty payments)?

b. Assume that, once the book is finished, it is expected to generate royalties of \$5 million in the first year (paid at the end of the year) and these royalties are expected to decrease at a rate of 30% per year in perpetuity. What is the NPV of the book with the royalty payments?

a. Timeline:

0	1	2	3
10	–8	–8	–8

$$\text{NPV} = 10 - \frac{8}{0.1}\left(1 - \frac{1}{1.1^{3}}\right) = -\$9.895 \text{ million}$$

	1	2	3	4	5	6
10	–8	–8	–8	5	5(1 – 0.3)	$5(1 - 03)^2$

b. Timeline:

First calculate the PV of the royalties at year 3. The royalties are a declining perpetuity:

$$PV_5 = \frac{5}{0.1 - -0.3} = \frac{5}{0.4} = 12.5 \textit{ million}$$

So the value today is

$$PV_{royalties} = \frac{12.5}{1.1^{3}} = 9.391$$

Now add this to the NPV from part a), $NPV = -9.895 + 9.391 = -\$503,381$.

6-6. **FastTrack Bikes, Inc. is thinking of developing a new composite road bike. Development will take six years and the cost is \$200,000 per year. Once in production, the bike is expected to make \$300,000 per year for 10 years. Assume the cost of capital is 10%.**

a. Calculate the NPV of this investment opportunity, assuming all cash flows occur at the end of each year. Should the company make the investment?

b. By how much must the cost of capital estimate deviate to change the decision? (*Hint*: Use Excel to calculate the IRR.)

c. What is the NPV of the investment if the cost of capital is 14%?

a. Timeline:

0	1	2	3	...	6	7	...	16
	–200,000	–200,000	–200,000		–200,000	300,000		300,000

i. $$\text{NPV} = -\frac{200{,}000}{r}\left(1-\frac{1}{1+r^{\;6}}\right)+\left(\frac{1}{1+r^{\;6}}\right)\frac{300{,}000}{r}\left(1-\frac{1}{1+r^{\;10}}\right)$$

$$= -\frac{200{,}000}{0.1}\left(1-\frac{1}{1.1^{\;6}}\right)+\left(\frac{1}{1.1^{\;6}}\right)\frac{300{,}000}{0.1}\left(1-\frac{1}{1.1^{\;10}}\right)$$

=$169,482

NPV > 0, so the company should take the project.

ii. Setting the NPV = 0 and solving for r (using a spreadsheet) the answer is IRR = 12.66%.

So if the estimate is too low by 2.66%, the decision will change from accept to reject.

	1	2	3	4	5	6	1	2	3	4	5	6	7	8	9	10
	-200	-200	-200	-200	-200	-200	300	300	300	300	300	300	300	300	300	300
IRR	12.66%															
NPV																
10%	$169.482															
14%	($64.816)															

iii. $$\text{NPV} = -\frac{200{,}000}{r}\left(1-\frac{1}{1+r^{\;6}}\right)+\left(\frac{1}{1+r^{\;6}}\right)\frac{300{,}000}{r}\left(1-\frac{1}{1+r^{\;10}}\right)$$

$$= -\frac{200{,}000}{0.14}\left(1-\frac{1}{1.14^{\;6}}\right)+\left(\frac{1}{1.14^{\;6}}\right)\frac{300{,}000}{0.14}\left(1-\frac{1}{1.14^{\;10}}\right)$$

$= -\$64.816$

6-11. How many IRRs are there in part (a) of Problem 5? Does the IRR rule give the right answer in this case? How many IRRs are there in part (b) of Problem 5? Does the IRR rule work in this case?

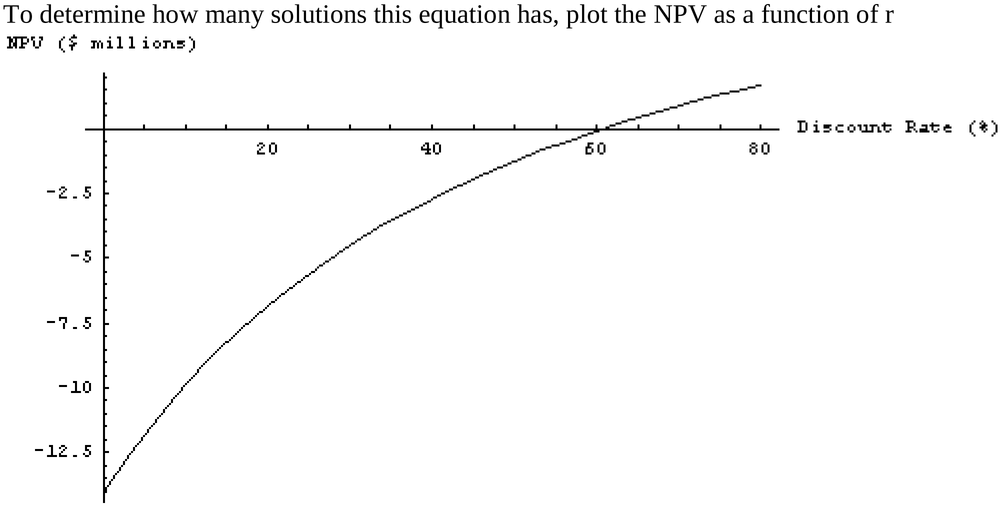
Timeline:

0	1	2	3
10	–8	–8	–8

IRR is the r that solves

$$NPV = 0 = 10 - \frac{8}{r}\left(1-\frac{1}{1+r^{\;3}}\right)$$

To determine how many solutions this equation has, plot the NPV as a function of r



From the plot there is one IRR of 60.74%.

Since the IRR is much greater than the discount rate, the IRR rule says write the book. Since this is a negative NPV project (from 6.5a), the IRR gives the wrong answer.

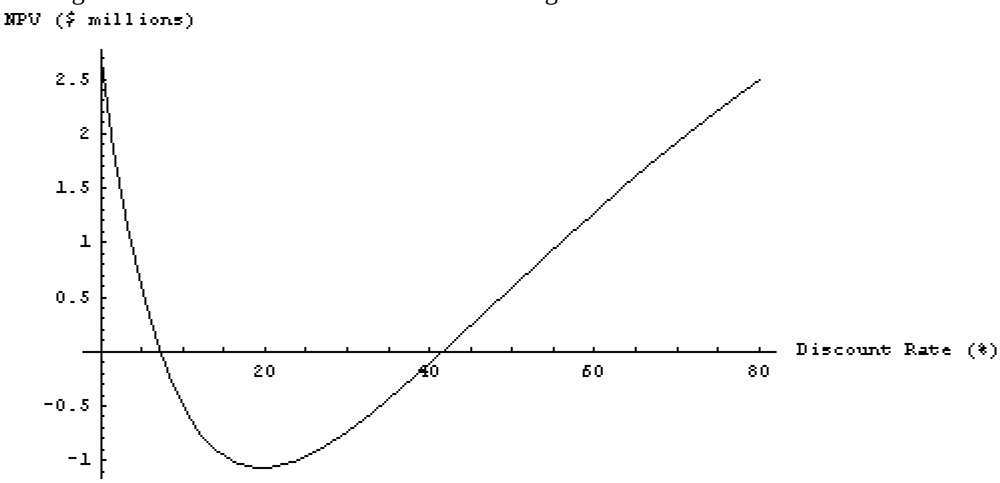
Timeline:

	1	2	3	4	5	6
10	–8	–8	–8	5	5(1 – 0.3)	$5(1.03)^2$

From 6.5(b) the NPV of these cash flows is

$$NPV = 10 - \frac{8}{r}\left(1 - \frac{1}{(1+r)^3}\right) + \frac{1}{(1+r)^3}\left(\frac{5}{r+0.3}\right)$$

Plotting the NPV as a function of the discount rate gives



The plot shows that there are 2 IRRs – 7.165% and 41.568%. The IRR does give an answer in this case, so it does <u>not</u> work

6-20. You are considering making a movie. The movie is expected to cost $10 million upfront and take a year to make. After that, it is expected to make $5 million when it is released in one year and $2 million per year for the following four years. What is the payback period of this investment? If you require a payback period of two years, will you make the movie? Does the movie have positive NPV if the cost of capital is 10%?

Timeline:

0	1	2	3	4	5	6
–10	0	5	2	2	2	2

It will take 5 years to pay back the initial investment, so the payback period is 5 years. You will <u>not</u> make the movie.

$$NPV = -10 + \frac{5}{(1+r)^2} + \frac{2}{r}\left(1 - \frac{1}{(1+r)^4}\right)\frac{1}{(1+r)^2} = -10 + \frac{5}{1.1^2} + \frac{2}{0.1\ 1.1^2}\left(1 - \frac{1}{1.1^4}\right) = -\$628{,}322$$

So the NPV agrees with the payback rule in this case

0	1	2	3	4	5
-10	5	2	2	2	2
Payback =	4 years				
NPV at 10% =		$0.31	million		

6-23. You are deciding between two mutually exclusive investment opportunities. Both require the same initial investment of $10 million. Investment A will generate $2 million per year (starting at the end of the first year) in perpetuity. Investment B will generate $1.5 million at the end of the first year and its revenues will grow at 2% per year for every year after that.

a. Which investment has the higher IRR?

b. Which investment has the higher NPV when the cost of capital is 7%?

c. In this case, for what values of the cost of capital does picking the higher IRR give the correct answer as to which investment is the best opportunity?

d. Use the incremental IRR rule to correctly choose between the investments when the cost of capital is 7%. At what cost of capital would your decision change?

a. Timeline:

	0	1	2	3
A	–10	2	2	2
B	–10	1.5	1.5(1.02)	$1.5(1.02)^2$

$$NPV_A = \frac{2}{r} - 10$$

Setting $NPV_A = 0$ and solving for r

$IRR_A = 20\%$

$$NPV_B = \frac{1.5}{r - 0.02} - 10$$

Setting $NPV_B = 0$ and solving for r

$$\frac{1.5}{r - 0.02} = 10 \Rightarrow r - 0.02 = 0.15 \Rightarrow r = 17\%. \ So,\ IRR_B = 17\%$$

Based on the IRR, you always pick project A.

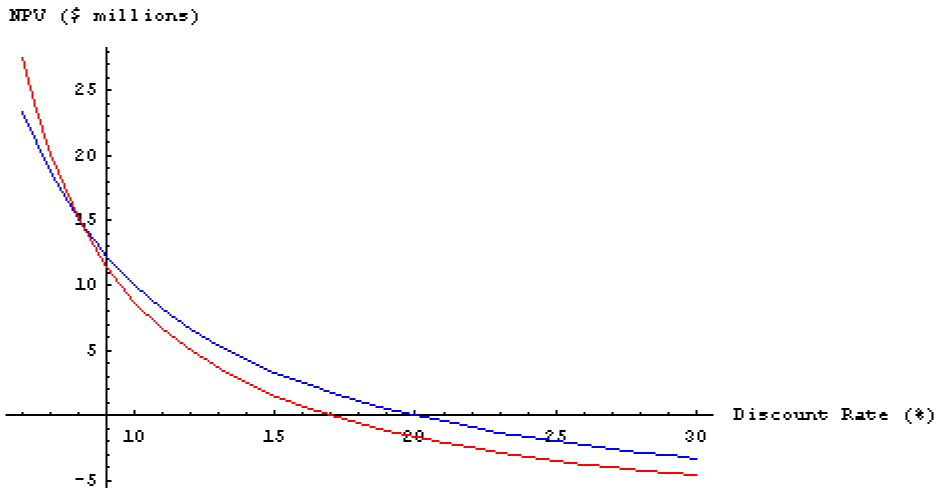
b. Substituting r = 0.07 into the NPV formulas derived in part (a) gives

NPV_A = $18.5714 million,

NPV_B = $20 million.

So the NPV says take B.

c. Here is a plot of NPV of both projects as a function of the discount rate. The NPV rule selects A (and so agrees with the IRR rule) for all discount rates to the right of the point where the curves cross.



$$
\begin{aligned}
NPV_A &= NPV_B \\
\frac{2}{r} &= \frac{1.5}{r-0.02} \\
\frac{r}{2} &= \frac{r-0.02}{1.5} \\
1.5r &= 2r - 0.04 \\
0.5r &= 0.04 \\
r &= 0.08
\end{aligned}
$$

So the IRR rule will give the correct answer for discount rates greater than 8%

(d)Timeline:

	0	1	2	3
A	–10	2	2	2
B	–10	1.5	1.5(1.02)	$1.5(1.02)^2$

To calculate the incremental IRR subtract A from B

0	1.5 – 2	1.5(1.02)–2	$1.5(1.02)^2$–2	…

$$NPV = \frac{1.5}{r-0.02} - \frac{2}{r} = 0$$

$$\frac{2}{r} = \frac{1.5}{r - 0.02}$$
$$\frac{r}{2} = \frac{r - 0.02}{1.5}$$
$$1.5r = 2r - 0.04$$
$$0.5r = 0.04$$
$$r = 0.08$$

So the incremental IRR is 8%. This rate is above the cost of capital, so we should take B.

6-24. You work for an outdoor play structure manufacturing company and are trying to decide between two projects:

	Year-End Cash Flows ($ thousands)			
Project	**0**	**1**	**2**	**IRR**
Playhouse	–30	15	20	10.4%
Fort	–80	39	52	8.6%

You can undertake only one project. If your cost of capital is 8%, use the incremental IRR rule to make the correct decision.

Timeline:

	0	1	2
Playhouse	–30	15	20
Fort	–80	39	52

Subtract the Playhouse cash flows from the Fort

–50 24 32

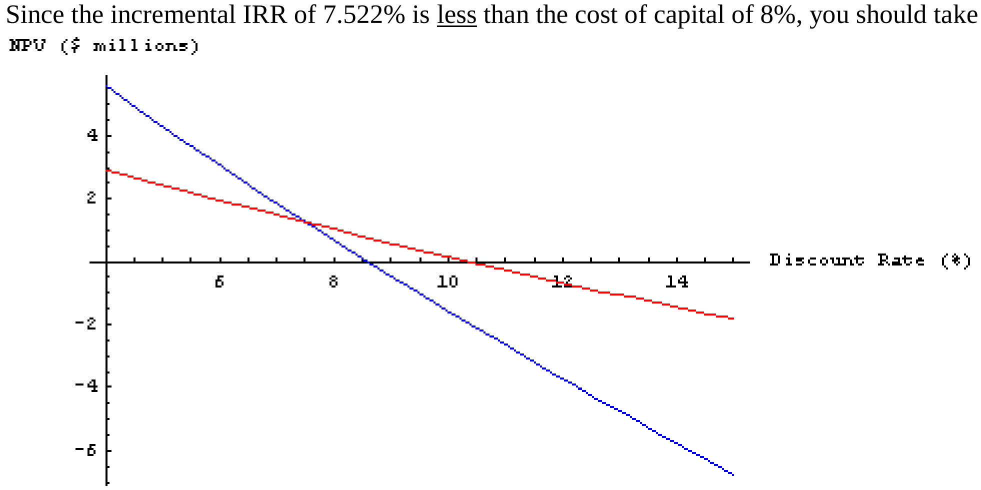
$$NPV = -50 + \frac{24}{1+r} + \frac{32}{1+r^{\ 2}}$$

Solving for r

$$r = \frac{-2\ \ 50\ \ +24+\sqrt{24^2+4\ \ 50\ \ \ 32}}{2\ \ 50}$$

$= 7.522\%$

Since the incremental IRR of 7.522% is <u>less</u> than the cost of capital of 8%, you should take the Playhouse.



6-31. Kaimalino Properties (KP) is evaluating six real estate investments. Management plans to buy the properties today and sell them five years from today. The following table summarizes the initial cost and the expected sale price for each property, as well as the appropriate discount rate based on the risk of each venture.

Project	Cost Today	Discount Rate	Expected Sale Price in Year 5
Mountain Ridge	$ 3,000,000	15%	$18,000,000
Ocean Park Estates	15,000,000	15%	75,500,000
Lakeview	9,000,000	15%	50,000,000
Seabreeze	6,000,000	8%	35,500,000
Green Hills	3,000,000	8%	10,000,000
West Ranch	9,000,000	8%	46,500,000

KP has a total capital budget of $18,000,000 to invest in properties.

a. What is the IRR of each investment?

b. What is the NPV of each investment?

c. Given its budget of $18,000,000, which properties should KP choose?

d. Explain why the profitably index method could not be used if KP's budget were $12,000,000 instead. Which properties should KP choose in this case?

a. We can compute the IRR for each as IRR = $(\text{Sale Price}/\text{Cost})^{1/5} - 1$. See spreadsheet below.

b. We can compute the NPV for each as NPV = Sale Price/$(1+r)^5$ – Cost. See spreadsheet below.

Project	Cost Today	Discount Rate	Expected Sale Price in Year 5	IRR	NPV	Profitability Index
Mountain Ridge	$ 3,000,000	15%	$ 18,000,000	43.1%	$ 5,949,181	1.98
Ocean Park Estates	15,000,000	15%	$ 75,500,000	38.2%	22,536,844	1.50
Lakeview	9,000,000	15%	$ 50,000,000	40.9%	15,858,837	1.76
Seabreeze	6,000,000	8%	$ 35,500,000	42.7%	18,160,703	3.03
Green Hills	3,000,000	8%	$ 10,000,000	27.2%	3,805,832	1.27
West Ranch	9,000,000	8%	$ 46,500,000	38.9%	22,647,119	2.52

c. We can rank projects according to their profitability index = NPV/Cost, as shown below. Thus, KP should invest in Seabreeze, West Ranch, and Mountain Ridge. (Note that ranking projects according to their IRR would not maximize KP's total NPV, and so would not lead to the correct selection.)

d. The profitability index fails because the top-ranked projects do not completely use up the budget. In this case, you should take Mountain Ridge and West Ranch.

Chapter 7

Fundamentals of Capital Budgeting

7-2. Kokomochi is considering the launch of an advertising campaign for its latest dessert product, the Mini Mochi Munch. Kokomochi plans to spend $5 million on TV, radio, and print

advertising this year for the campaign. The ads are expected to boost sales of the Mini Mochi Munch by $9 million this year and by $7 million next year. In addition, the company expects that new consumers who try the Mini Mochi Munch will be more likely to try Kokomochi's other products. As a result, sales of other products are expected to rise by $2 million each year. Kokomochi's gross profit margin for the Mini Mochi Munch is 35%, and its gross profit margin averages 25% for all other products. The company's marginal corporate tax rate is 35% both this year and next year. What are the incremental earnings associated with the advertising campaign?

	A	B	C	D	E
1			**Year**	**1**	**2**
2	**Incremental Earnings Forecast ($000s)**				
3	1	Sales of Mini Mochi Munch		9,000	7,000
4	2	Other Sales		2,000	2,000
5	3	Cost of Goods Sold		(7,350)	(6,050)
6	4	**Gross Profit**		3,650	2,950
7	5	Selling, General & Admin.		(5,000)	-
8	6	Depreciation		-	-
9	7	**EBIT**		(1,350)	2,950
10	8	Income tax at 35%		473	(1,033)
11	9	**Unlevered Net Income**		**(878)**	**1,918**

7-3. **Home Builder Supply, a retailer in the home improvement industry, currently operates seven retail outlets in Georgia and South Carolina. Management is contemplating building an eighth retail store across town from its most successful retail outlet. The company already owns the land for this store, which currently has an abandoned warehouse located on it. Last month, the marketing department spent $10,000 on market research to determine the extent of customer demand for the new store. Now Home Builder Supply must decide whether to build and open the new store.**
Which of the following should be included as part of the incremental earnings for the proposed new retail store?

a. The cost of the land where the store will be located.

b. The cost of demolishing the abandoned warehouse and clearing the lot.

c. The loss of sales in the existing retail outlet, if customers who previously drove across town to shop at the existing outlet become customers of the new store instead.

d. The $10,000 in market research spent to evaluate customer demand.

e. Construction costs for the new store.

f. The value of the land if sold.

g. Interest expense on the debt borrowed to pay the construction costs.

a. No, this is a sunk cost and will not be included directly. (But see (f) below.)

b. Yes, this is a cost of opening the new store.

c. Yes, this loss of sales at the existing store should be deducted from the sales at the new store to determine the incremental increase in sales that opening the new store will generate for HBS.

d. No, this is a sunk cost.

e. This is a capital expenditure associated with opening the new store. These costs will, therefore, increase HBS's depreciation expenses.

f. Yes, this is an opportunity cost of opening the new store. (By opening the new store, HBS forgoes the after-tax proceeds it could have earned by selling the property. This loss is equal to the sale price less the taxes owed on the capital gain from the sale, which is the difference between the sale price and the book value of the property. The book value equals the initial cost of the property less accumulated depreciation.)

g. While these financing costs will affect HBS's actual earnings, for capital budgeting purposes we calculate the incremental earnings without including financing costs to determine the project's unlevered net income.

7-7. Castle View Games would like to invest in a division to develop software for video games. To evaluate this decision, the firm first attempts to project the working capital needs for this operation. Its chief financial officer has developed the following estimates (in millions of dollars):

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash	6	12	15	15	15
Accounts Receivable	21	22	24	24	24
Inventory	5	7	10	12	13
Accounts Payable	18	22	24	25	30

Assuming that Castle View currently does not have any working capital invested in this division, calculate the cash flows associated with changes in working capital for the first five years of this investment.

		Year0	Year1	Year2	Year3	Year4	Year5
1	Cash		6	12	15	15	15
2	Accounts Receivable		21	22	24	24	24
3	Inventory		5	7	10	12	13
4	Accounts Payable		18	22	24	25	30
5	Net working capital (1+2+3-4)	0	14	19	25	26	22
6	Increase in NWC		14	5	6	1	-4

7-9. Elmdale Enterprises is deciding whether to expand its production facilities. Although long-term cash flows are difficult to estimate, management has projected the following cash flows for the first two years (in millions of dollars):

	Year 1	Year 2
Revenues	125	160
Costs of goods sold and operating expenses other than depreciation	40	60
Depreciation	25	36
Increase in net working capital	5	8
Capital expenditures	30	40
Marginal corporate tax rate	35%	35%

a. What are the incremental earnings for this project for years 1 and 2?

b. What are the free cash flows for this project for the first two years?

a.

Incremental Earnings Forecast ($000s)		Year 1	2
1	Sales	125.0	160.0
2	Costs of good sold and operating expenses other than depreciation	(40.0)	(60.0)
3	Depreciation	(25.0)	(36.0)
4	**EBIT**	60.0	64.0
5	Income tax at 35%	(21.0)	(22.4)
6	**Unlevered Net Income**	**39.0**	**41.6**

b.

Free Cash Flow ($000s)		1	2
7	Plus: Depreciation	25.0	36.0
8	Less: Capital Expenditures	(30.0)	(40.0)
9	Less: Increases in NWC	(5.0)	(8.0)
10	**Free Cash Flow**	**29.0**	**29.6**

7-17. Arnold Inc. is considering a proposal to manufacture high-end protein bars used as food supplements by body builders. The project requires use of an existing warehouse, which the firm acquired three years ago for $1m and which it currently rents out for $120,000. Rental rates are not expected to change going forward. In addition to using the warehouse, the project requires an up-front investment into machines and other equipment of $1.4m. This investment can be fully depreciated straight-line over the next 10 years for tax purposes. However, Arnold Inc. expects to terminate the project at the end of eight years and to sell the machines and equipment for $500,000. Finally, the project requires an initial investment into net working capital equal to 10% of predicted first-year sales. Subsequently, net working capital is 10% of the predicted sales over the following year. Sales of protein bars are expected to be $4.8m in the first year and to stay constant for eight years. Total manufacturing costs and operating expenses (excluding depreciation) are 80% of sales, and profits are taxed at 30%.

a. What are the free cash flows of the project?

b. If the cost of capital is 15%, what is the NPV of the project?

a. Assumptions:

(1) The warehouse can be rented out again for $120,000 after 8 years.

(2) The NWC is fully recovered at book value after 8 years.

FCF = EBIT (1 – t) + Depreciation – CAPX – Change in NWC

FCF in year 0: – 1.4m CAPX – 0.48m Change in NWC = –1.88m

FCF in years 1-7:		
	$4.8m	Sales
	–$3.84m	–Cost (80%)
	$0.96m	=Gross Profit
	–$0.12m	–Lost Rent
	–$0.14m	–Depreciation
	$0.70m	=EBIT
	–$0.21m	–Tax (30%)
	$0.49m	= (1 – t) x EBIT
	$0.14m	+Depreciation
	$0.63m	= FCF

Note that there is no more CAPX nor investment into NWC in years 1–7.

FCF in year 8: \$0.63m + [\$0.5m – 0.30 x (\$0.5m – \$0.28m)] + \$0.48m = \$1.544m

Note that the book value of the machinery is still \$0.28m when sold, and only the difference between the sale price (\$0.5m) and the book value is taxed.

The NWC (\$0.48m) is recovered at book value and hence its sale is not taxed at all.

b. The NPV is the present value of the FCFs in years 0 to 8:

NPV= -\$1.88m

+ an annuity of \$0.63m for 7 years

$$+ \frac{\$1.544m}{1.15^8}$$

$$= -\$1.88m + \frac{\$0.63m}{0.15}\left(1 - \frac{1}{1.15^7}\right) + \frac{\$1.544m}{1.15^8}$$

$$= \$1.2458m$$

7-23. Bauer Industries is an automobile manufacturer. Management is currently evaluating a proposal to build a plant that will manufacture lightweight trucks. Bauer plans to use a cost of capital of 12% to evaluate this project. Based on extensive research, it has prepared the following incremental free cash flow projections (in millions of dollars):

	Year 0	Years 1–9	Year 10
Revenues		100.0	100.0
– Manufacturing expenses (other than depreciation)		–35.0	–35.0
– Marketing expenses		–10.0	–10.0
– Depreciation		–15.0	–15.0
= EBIT		40.0	40.0
– Taxes (35%)		–14.0	–14.0
= Unlevered net income		26.0	26.0
+ Depreciation		+15.0	+15.0
– Increases in net working capital		–5.0	–5.0
– Capital expenditures	–150.0		
+ Continuation value			+12.0
= Free cash flow	–150.0	36.0	48.0

a. For this base-case scenario, what is the NPV of the plant to manufacture lightweight trucks?

b. Based on input from the marketing department, Bauer is uncertain about its revenue forecast. In particular, management would like to examine the sensitivity of the NPV to the revenue assumptions. What is the NPV of this project if revenues are 10% higher than forecast? What is the NPV if revenues are 10% lower than forecast?

c. Rather than assuming that cash flows for this project are constant, management would like to explore the sensitivity of its analysis to possible growth in revenues and operating expenses. Specifically, management would like to assume that revenues, manufacturing expenses, and marketing expenses are as given in the table for year 1 and grow by 2% per year every year starting in year 2. Management also plans to assume that the initial capital expenditures (and therefore depreciation), additions to working capital, and continuation value remain as initially specified in the table. What is the NPV of this project under these alternative assumptions? How does the NPV change if the revenues and operating expenses grow by 5% per year rather than by 2%?

d. To examine the sensitivity of this project to the discount rate, management would like to compute the NPV for different discount rates. Create a graph, with the discount rate on the *x*-axis and the NPV on the *y*-axis, for discount rates ranging from 5% to 30%. For what ranges of discount rates does the project have a positive NPV?

	Year	0	1	2	3	4	5	6	7	8	9	10
Free Cash Flow Forecast ($ millions)												
1	Sales	—	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2	Manufacturing	—	(35.0)	(35.0)	(35.0)	(35.0)	(35.0)	(35.0)	(35.0)	(35.0)	(35.0)	(35.0)
3	Marketing Expenses	—	(10.0)	(10.0)	(10.0)	(10.0)	(10.0)	(10.0)	(10.0)	(10.0)	(10.0)	(10.0)
4	Depreciation	—	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)	(15.0)
5	EBIT	—	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
6	Income tax at 35%	—	(14.0)	(14.0)	(14.0)	(14.0)	(14.0)	(14.0)	(14.0)	(14.0)	(14.0)	(14.0)
7	**Unlevered Net Income**	—	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
8	Depreciation	—	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
9	Inc. in NWC	—	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)
10	Capital Expenditures	(150.0)	—	—	—	—	—	—	—	—	—	—
11	Continuation value	—	—	—	—	—	—	—	—	—	—	12.0
12	**Free Cash Flow**	(150.0)	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	48.0
13	**NPV at 12%**	**57.3**	—	—	—	—	—	—	—	—	—	—

a. The NPV of the estimate free cash flow is

$$\text{NPV} = -150 + 36 \times \frac{1}{0.12}\left(1 - \frac{1}{1.12^9}\right) + \frac{48}{1.12^{10}} = \$57.3 \text{ million.}$$

b.

Initial Sales	90	100	110
NPV	20.5	57.3	94.0

c.

Growth Rate	0%	2%	5%
NPV	57.3	72.5	98.1

d. NPV is positive for discount rates below the IRR of 20.6%.