Chapter 7 Risk, Return, and the Capital Asset Pricing Model

Chapter Overview

The *What Companies Do* opening feature introduces the concept of beta and the use of beta in choosing shares and the Capital Asset Pricing Model. It discusses the occurrence of a high-beta rally and the relationship that investors perceive exists between high beta shares and share price volatility. In other words, high-beta shares are considered to be more risky shares. This practical use of beta by financial professionals illustrates the importance of using beta to analyse the risk in various investments and portfolios.

What Companies Do Discussion Questions

1. If analysts were recommending that investors put their money in high beta shares, what does this say about what these analysts thought about the volatility of the market?
2. How do markets react to uncertainty? Note that risk is quantifiable uncertainty. There is a great deal of uncertainty concerning terrorist attacks and their impact on the world economy – it is difficult, if not impossible, to quantify this uncertainty.

This chapter discusses:

7-1. Expected Returns
7-2. Risk and Return for Portfolios
7-3. Pulling It All Together: the CAPM
7-4. Are Share Returns Predictable?

Technology

1. **Smart Video** features Andrew Karolyi of Cornell University talking about international diversification and the unique industrial compositions of markets.

2. **Smart Video** shows William Sharpe of Stanford University, and co-founder of Financial Engines, speaking about CAPM risk and investors' aversion to doing badly in bad times..

3. **Smart Video** introduces Todd Richter, Managing Director, Head of Equity Healthcare Research, Bank of America Securities, discussing market efficiency and his belief that markets are not always efficient.

4. **Smart Concepts** shows how short selling affects the risk/return profile of a portfolio; provides a step-by-step explanation of the Capital Asset Pricing Model, and discusses aspects of market efficiency.

After studying this chapter you will be able to:

- illustrate three different approaches for estimating an asset's expected return
- calculate a portfolio's expected return and its beta
- explain how the Capital Asset Pricing Model (CAPM) links an asset's beta to its expected return
- describe the concept of market efficiency and its important lessons for investors.

Lecture Guide

This chapter takes up where Chapter 6 left off. Chapter 7 introduces beta, the relevant measure of risk. If investors only are concerned about systematic risk, and beta measures this risk, then there should be a positive correlation between beta and returns. This is the core of the Capital Asset Pricing Model.

7.1 Expected Returns

Note that while decisions must be made on expected returns, this is not the only decision factor. Investors take both risk and return into account in making investment decisions.

7.1a The Historical Approach

There is a great deal of information available concerning historical returns, and a great deal of debate about whether share returns will continue to be as high as they have been in the past century. US equities have returned more than equities in other developed countries during the 20th century. From 1926-2003, US stocks have earned about 8-10% per year. Other developed countries have not done as well, for example, German, Belgian and Italian equities have returned only 3% a year over this time period. Over the last 111 years, US shares have earned an average risk premium of 7.5%. Australian shares have performed similarly, earning an average risk premium of 7%.

What implication does this have for investors? Does performance in the past necessarily mean similar performance in the future? These are questions still being debated. Recent articles in the business press show estimates of future equity returns from as low as 1 or 2 per cent to double-digit returns.

7.1b Probabilistic Approach

Explain that the market as a whole makes forecasts for the future. Those expectations, or the probability of them occurring – whether the economy will boom or enter a recession and how each company will perform in each economic alternative – are combined to form expected return for a firm. Note that the probabilities of each state of nature occurring must sum to 1 or 100%. Expected return is the sum of the probability of each state of nature occurring times the expected return in that state of nature.

7.1c Risk-Based Approach

A second method for estimating expected returns is a risk-based approach. This assumes that investors hold diversified portfolios and, therefore, only systematic risk – risk that affects the entire market – is relevant. Students should understand the statement that the market only rewards systematic risk, or that only systematic risk is priced. Investors expect to be rewarded for taking on risk – higher risk, higher expected return. If investors know they can diversify away firm-specific risk, they will not reward the firm for diversifying. Investors will not pay firms to do what they can do easily by themselves.

- Student Interaction: Ask students if it is easy for an individual investor to diversify. Most will agree that an individual can diversify by buying investment funds. The instructor can point out that there are many different share and bond funds – share funds for aggressive growth, those that invest only in blue chip shares, those that invest in only environmentally sensitive companies. In short, there are funds for every conceivable investment objective. If an investor does not hold a diversified portfolio, he or she will not be compensated for all the risk borne by the portfolio. As an illustration, equity funds typically hold many shares, more than enough to be considered diversified. If the market rewarded taking on non-systematic risk, then equity funds would sell at a premium to the value of their underlying shares. Instead, most equity funds fail to make excess returns, particularly after taking transactions costs and fund fees into account.

The next problem is measuring systematic risk. A common method is using regression analysis, regressing individual share returns against market returns. One problem is measuring 'the market.' The

theory states that the market is all assets in the economy in the correct proportions that they are in the economy. It is impossible to construct an actual market portfolio, and market proxies, like the S&P/ASX 200 Index, MSCI or S&P 500 Index are used instead.

Fig. 7.1 The Standard and Poor's / ASX Share 200 Index as a Proxy for the Australian Market

Fig. 7.2A Scatter Plot of Monthly Returns for Oroton Group Limited Against the ASX 200 Index

Fig. 7.2B Scatter Plot of Monthly Returns for AGL Energy Limited Against the ASX 200 Index

Fig. 7.2C Scatter Plot of Monthly Returns On a Portfolio Invested Equally in Oroton Group and AGL Energy Against the ASX 200 Index

The difference between scatter plots for the two firms is highly visible. Data points for Oroton Group are more concentrated, and it is easy to see an upward sloping pattern to the points. As expected, the regression line is sharply upward sloping. This firm has a beta greater than one. It is hard to see any particular pattern in the plot for AGL Energy. The fitted line has a very small slope and therefore a very low beta; in fact, AGL Energy has a beta close to zero. Notice what happens in the third figure when a portfolio is made up equally of both shares. The new portfolio is an averaging of the individual ones and the beta is an average of the two betas.

- Student Interaction: Students can be asked why Oroton Group varies so strongly with the economy (more pictures, vacations in good economic times) and why AGL Energy is not particularly correlated with the economy.

The Capital Asset Pricing Model is a way to compute expected return. If you know the risk free rate and the return on an average share, you can plot a straight line (Ask students why. From their algebra courses, they know two points are all that are needed to define a straight line.) After you compute beta for a specific security you can find its expected return by moving along the Security Market line.

Fig. 7.3 Beta and Expected Returns

This is a graphical representation of the Capital Asset Pricing Model. Note the assumptions of the CAPM:

- There are no transactions costs or taxes
- Investors have identical expectations and assessments of an asset's risk
- Investors choose some combination of the risky portfolio and the risk-free asset.
- Student Interaction: Ask students which assumptions are true in the real world. What happens if the assumptions are violated? The model assumes investors are right on average – they don't have to be right all of the time.

7.2 Risk and Return for Portfolios

7.2a Portfolio Expected Returns

Most investors do not hold just a single security – they hold a portfolio of securities. Portfolio beta is simply a weighted average of the securities in the portfolio. Note that while a typical problem assumes a portfolio of shares, the same principle applies no matter what the financial assets – shares, bonds, etc.

This concept illustrates the expected return for a $20,000 portfolio of four shares. First, the student must compute the weights of each share in the portfolio. Students should note that the weights must add to 1 or 100%. The portfolio return must be larger than the return of the lowest-returning share and less than the return of the highest-returning share.

- Short selling is discussed in this section. It is often a difficult concept for students to grasp. An example is the easiest way. The fall of Apple in 2008 was one of the most profound examples –

with it dropping into the 70 dollar range. Illustrate what they could have made if they had owned Apple before the fall and shorted the shares.

7.2b Portfolio Risk

Relevant, or market, portfolio risk is much easier to compute than portfolio standard deviation. While portfolio total risk, as measured by standard deviation or variance, is not a weighted average, portfolio beta is a weighted average of the betas of the individual securities in the portfolio. An individual share beta may not be accurate because it depends on the time period, whether any substantial firm-specific events were impacting the share's price during the regression period, etc. Portfolio betas tend to be more accurate – underestimated betas tend to be cancelled out by overestimated betas, leading to a more accurate portfolio beta.

- Student Interaction: Have students examine the betas from markets around the world. How could they design a portfolio that would increase their return by using shares from markets around the world?

7.3 Pulling It All Together: The CAPM

The CAPM is derived from the Security Market Line and is the best place to start to give them a visual representation of the concept. Students can think of the Security Market Line as a plot of the x-axis intercept, the risk free rate, and the return on the market or the return on an average share.

Fig. 7.4 The Security Market Line

This section presents the equation for the security market line. Note that the x axis intercept is the risk free rate. The slope of the line is the expected return on the market minus the risk free rate. This is called the equity risk premium and is the reward that investors expect to take on additional risk. Beta represents the number of units of risk that a particular security has. Note that the equity risk premium must be positive – investors must expect shares to have a positive return, or else they will not invest in equities. Note that actual share market returns can be, and have been, negative in the past.

CAPM is an extensively studied model, and for the most part has been found to work well enough. Point out to students the five testable assumptions of CAPM:

- Return should increase with risk
- There should be a linear relationship between risk and return
- Non-systematic risk should not impact returns
- The slope of the security market line should be the market risk premium, $E(R_m) - R_f$
- The intercept of the SML should be the risk free rate.

The first three have been empirically verified, but the slope is not as steep as CAPM predicts, and the intercept is a little higher than CAPM predicts. This doesn't mean CAPM doesn't work; it just isn't perfect and is still widely used in practice in spite of its shortcomings.

It is true that for some shares, average return has not depended on beta at certain times. For example, there was a period of time when Apple Computer was financially distressed. Its beta was computed at that time as 0.2 (seemingly very low risk). At the same time IBM had a beta of 1.1. Looking at betas alone, you would conclude that Apple was a much safer investment than IBM. This certainly was not true. Apple was very risky because of its financial distress, but it was temporarily disconnected from the market. Instead of moving up when the market went up or down when the market went down, it was moving up and down because of news about the company's fortunes. This means that you must look carefully at beta. Depending on what historical period was used to compute beta, the resulting beta may or may not be representative of the future risk of the company. It would have been more reasonable in Apple's case to use a historical period when Apple was healthy or to use an industry average, if you believed Apple would eventually recover from its financial difficulties.

Note that equilibrium means that all shares are fairly priced. If all information were available to all investors, shares would always be fairly priced. There are tens of thousands of analysts studying shares and working to identify which ones to buy and which ones to sell. Their work helps return mispriced securities to equilibrium.

Students should be familiar with the terminology concerning securities and the Security Market Line:

- Overvalued or overpriced. Although it is a little counterintuitive, these securities lie below the SML. As investors identify these securities as overpriced (not returning as much as they should, given their risk), they will sell them, putting downward pressure on the price and increasing the return, until the security once again lies on the SML
- Undervalued or underpriced. These securities lie above the SML. As investors identify these securities as undervalued (returning more than they should, given their risk), they will buy them, putting upward pressure on the price and decreasing return, until these securities lie on the SML.
- Fairly priced. These securities return exactly what they should, given their risk level.
- Student Interaction: Students can take a 'quiz' on the SML – in other words, hold a discussion on some of the main take aways concerning the Capital Asset Pricing Model. Ask students the following discussion questions:

  1. What is the return on a Treasury bill? A proxy for the risk free rate
  2. What is the required return on a share with a variance of 25%? Who knows – the relevant measure of risk is beta, not standard deviation or variance.
  3. Is the premium per unit of risk always positive? Yes, if investors expected a negative future return, they would not invest in that security. The expected return on the market cannot be negative.
  4. During economic downswings, isn't the return on the market less than the risk free rate? Yes, actual returns can be negative. The CAPM uses expected returns, not actual returns.
  5. What is the required return on a negative beta asset? A return that is less than the risk free rate.
  6. Why is the CAPM called a pricing model when it only yields the required return on an asset? This return will be used in later chapters as the discount rate (or as a component in the discount rate) which is used to value assets and arrive at a price.

7.4 Are Share Returns Predictable?

Many empirical studies have found that financial markets are largely efficient. For the most part, publicly available information is incorporated into share prices. This means that it is very difficult to profit from undervalued securities using publicly available information. It is possible to earn excess returns with inside information; however, investors who trade on inside information risk going to prison.

Even though markets are largely efficient, the CAPM is still useful. Studies have confirmed the risk-return relationship – investors expect higher returns from investments with higher risk. A couple of examples of the usefulness of CAPM include: CAPM is used by corporate financial managers to determine a cost of equity for the firm, and by portfolio managers to determine the risk level of a given portfolio.

Summary

This chapter presents key concepts that will continue to be used in future chapters. Students will take the principles learned here and apply them to a variety of situations, all requiring a risk assessment.

Enrichment Exercises

1. Ask students to pick a company and download share prices and index data (Yahoo! Finance is a good source for this.) They should then compute total risk by converting their price series into a return series by calculating $return_t = (P_t - P_{t-1})/P_{t-1}$. Calculate the mean, standard deviation and coefficient of variation of returns for the share using the data they have collected.

Calculate beta by regressing the share's returns on the returns to the index chosen. Look up the company's real beta – there are many online sources for this. Compare published betas to the calculated beta. Why are they different? What difference does time period make?

Answers to Concept Review Questions

1. The difference between an asset's expected return and its actual return is that the expected return is a best guess of what the actual return will be, but of course there is no guarantee that actual returns will equal expected returns. Expected returns are important because managers and investors must make decisions in a world of uncertainty. They cannot know for sure what outcomes will occur, but they need to make educated guesses. So the expected return on an investment is of vital importance.

2. The historical approach begins with an estimate of the historical risk premium on a particular asset. To that an analyst could add the current return on a risk-free instrument like a Treasury bill to arrive at an estimate of expected return. This approach assumes that the historical risk premium is a good estimate of the future risk premium. The probabilistic approach, on the other hand, assumes that an analyst can construct a list of outcomes that might occur and attach a probability to each outcome. Estimating the expected return on a share means listing the returns that the share might earn and multiplying each possible return by the appropriate probability. These probabilities may be derived from historical data, but they do not have to be.

3. Both beta and expected returns are driven by systematic risk. Standard deviation measures both systematic and unsystematic risk, and therefore it is unreliably related to returns. Beta focuses only on a share's systematic risk, so a positive relationship should hold between betas and returns.

4. The *risk-based* approach is the best approach for estimating a share's expected return for several reasons. The historical approach is valid only to the extent that the future distribution of returns is similar to the historical distribution. The probabilistic approach is difficult to implement because it is impossible to observe probabilities of various return outcomes directly. The *risk-based* approach has strong theoretical underpinnings. We know that because investors are risk averse, there should be a trade-off between risk and return in financial markets. Therefore, if we can first measure the risk of an asset, then map that risk measure into an estimate of expected returns, we are likely to do a better job of projecting expected returns than if we rely solely on historical data or manufactured probabilities.

5. The weight given to a particular share portfolio can exceed 100 % if leverage is involved. If, for example, an investor short sells a share, they are borrowing money, which they can then invest in another security. Therefore, if an investor short sells share A to invest more money in share B, then the fraction of the investor's money invested in share B is actually greater than 100%. For example, if an investor has $100 of his own money to put in share B, but he raises another $100 by shorting share A, then the weight on share B is 200%. The weight in Share A is –100%

6. The standard deviation of an *asset* is a measure of its total risk which comprises both unsystematic risk and systematic risk. The standard deviation of a *portfolio* is typically less than the average of standard deviation of the assets in the portfolio because when individual shares are combined in a portfolio, some of the unsystematic risk disappears (or is 'diversified away'), so the portfolio's standard deviation is less than the average of the shares' standard deviations. On the other hand, a share's beta measures only its systematic risk. This type of risk does not vanish in a portfolio, so the portfolio beta equals the average of the share betas.

7. Three factors that influence a share's expected return according to the CAPM are the risk-free rate, the beta, and the market risk premium.

8. A share with no systematic risk has a beta of zero. From the equation of the Security Market Line, we see that a share with a beta of zero has an expected return equal to the risk-free rate. This makes sense because even if a share has some unsystematic risk, investors can eliminate all of that through diversification. Therefore, in a portfolio this share is essentially risk free.

9. Competition for information makes the market efficient. It is the actions of traders who are trying to gain an informational advantage on everyone else that makes that very advantage so hard to obtain.

10. The CAPM is designed to establish a link between the risk of an asset and its *expected* return. We expect that assets with higher betas will, on average, earn higher returns than assets with low betas. This may be true even if on a year-to-year basis, prices *do* move almost at random and actual returns are unable to be forecast. The efficient markets hypothesis says that deviations in share returns from the expected return are essentially unpredictable.

Answers to Self-Test Problems

ST7-1. Calculate the mean, variance, and standard deviations for a share with the probability distribution outlined in the following table:

Outcome	Probability	Share Return
Recession	10%	–40%
Expansion	60%	20%
Boom	30%	50%

A: The expected return is $0.10(–0.40) + 0.60(0.20) + 0.30(0.50) = 0.23$. The variance equals $0.10(–0.4–0.23)^2 + 0.60(0.2–0.23)^2 + 0.30(0.50–0.23)^2 = 0.0621$. The standard deviation is the square root of the variance, or 0.2492.

ST7-2. You invest $25,000 in Treasury notes and $50,000 in the market portfolio. If the risk-free rate equals 2% and the expected market risk premium is 6%, what is the expected return on your portfolio?

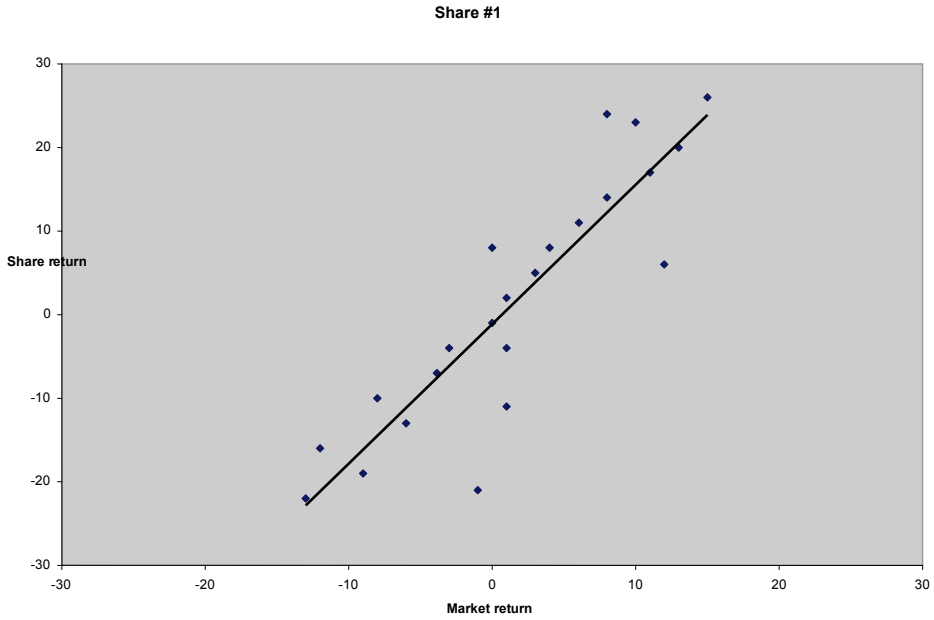
A: The portfolio is invested one-third in Treasury notes ($25K/$75K) and two-thirds in shares ($50K/$75K). The risk-free rate is 2%. If the *market risk premium* is 6%, then the market's *expected return* is 8%. Therefore, the portfolio's expected return is 1/3(2%) + 2/3(8%) = 6%.

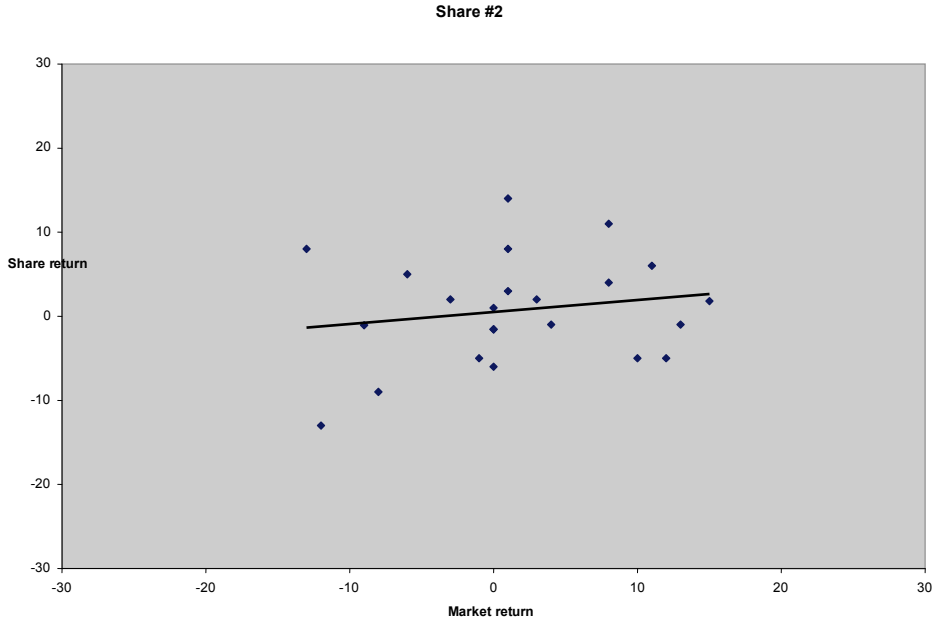
ST7-3. The risk-free rate equals 4% and the expected return on the market is 10%. If a share's expected return is 13 %, what is the share's beta?

A: Plug the known values into equation 7.2. 13% = 4% + B(10% – 4%) which implies that the beta equals 1.5.

Answers to End-of-Chapter Questions

Q7-1. Based on the graphs below, which share has more *systematic risk*, and which share has more *unsystematic risk*?





A7-1. The trend line is steeper for share #1, so it is more sensitive to market movements and has higher systematic risk. Most of the points cluster tightly around the line for share #1, but not so for share #2. Most of share #2's risk is unsystematic.

Q7-2. The table below shows the expected return and standard deviation for two shares. Is the pattern shown in the table possible?

Share	Beta	Std. Dev.
1	1.5	22%
2	0.9	35%

A7-2. Yes, this is possible. A share with a high beta might have a higher or lower standard deviation than a share with a low beta. The standard deviation is made up of both systematic and unsystematic risk, whereas beta measures just systematic risk. Share #1 has a high beta and a relatively low sigma, but this might simply reflect that most of share #1's risk is systematic. On the other hand, share #2 has a higher variance, but if most of this risk is unsystematic, share #2 will have a lower beta.

Q7-3. Which type of company do you think will have a higher beta: a fast-food chain or a cruise-ship firm?

A7-3. Cruises are luxuries, and cruise purchases are probably more sensitive to economic conditions than are hamburger sales. The cruise operator would have a higher beta in all likelihood.

Q7-4. Is the data in the following table believable?

Share	Std. Dev.
1	40%
2	60%
50-50 Portfolio	50%

A7-4. It is possible but not very likely that the portfolio's standard deviation would equal the weighted average of the share standard deviations. It is almost a sure bet that the portfolio standard deviation would be less than 50%.

Q7-5. How can investors hold a portfolio with a weight of more than 100 % in a particular asset?

A7-5. This requires taking a short position, or borrowing another asset. The portfolio weight on the borrowed asset becomes negative, and the other weight can exceed one.

Q7-6. According to the Capital Asset Pricing Model, is the following data possible? Explain your answer.

Asset	Return	Std. Dev.
#1	4%	0%
#2	2%	20%

A7-6. Yes, this is possible. The first asset is the risk-free asset with a 4% return and no standard deviation. The second asset is risky in the sense that its standard deviation is positive, but it offers a return below a T-bill. However, this is possible if the asset's beta is negative.

Q7-7. Share A has a beta of 1.5, and share B has a beta of 1.0. Determine whether each of the statements below is true or false.

a. Share A must have a higher standard deviation than Share B.
b. Share A has a higher expected return than Share B.
c. The expected return on Share A is 50 per cent higher than the expected return on B.

A7-7. a. False. b. True. c. False.

Q7-8. If an asset lies above the security market line, is it overpriced or underpriced? Explain why.

A7-8. Underpriced. An asset above the SML offers an expected return that is 'too high' given its beta. Therefore, this asset is a bargain and is underpriced. Investors will flock to buy it, driving up its price and pushing its expected return down to the SML.

Q7-9. A share has a beta equal to 1.0. Is the standard deviation of the share equal to the standard deviation of the market?

A7-9. No. The share may have a high (low) degree of diversifiable risk, which is part of its standard deviation, but not part of its beta. Because the share has both systematic and unsystematic risk, and because its systematic risk is equal to that of the market (which has only systematic risk), the share's standard deviation will probably be greater than that of that market.

Q7-10. If share prices move unpredictably, does this mean that investing in shares is just gambling? Why or why not?

A7-10. No. Shares move randomly around a long-term trend in the sense the higher-risk shares earn higher returns, but year-to-year returns are essentially random.

Q7-11. Explain why the *efficient markets hypothesis* implies that a well-run company is not necessarily a good investment.

A7-11. An efficient market will recognise the talent of a firm's managers and price that into the shares. That is, other things being equal, the share price will be higher for firms with better managers. Therefore, the value of the talent is already incorporated into the price and can't lead to higher returns unless the managers are even better than the market already thinks.

Solutions to End-of-Chapter Problems

Expected Returns

P7-1.
a. Suppose that, over the long run, the risk-premium on shares relative to Treasury notes has been 7.6 % in Australia. Suppose also that the current Treasury note yield is 1.5%, but the historical average return on Treasury notes is 4.1%. Estimate the expected return on shares and explain how and why you arrived at your answer.
b. Suppose that, over the long run, the risk-premium on shares relative to Treasury bonds has been 6.5%. The current Treasury bond yield is 4.5%, but the historical return on T-bonds is 5.2%. Estimate the expected return on shares and explain how and why you arrived at your answer.
c. Compare your answers above and explain any differences.

A7-1.
a. Based on Treasury notes, the expected return on shares is 1.5% + 7.6% = 9.1%. Based on historical Treasury note yields, the expected return is 4.1% + 7.6% = 11.7%. In other words, the current expectation is 9.1%, but this can be expected to rise to 11.7% over the long run.

b. Based on T-bonds, the expected return on shares is 4.5% + 6.5% = 11% now. Based on historical returns, the expected return in 5.2% + 6.5% = 11.7%.

c. Current bond yields appear to provide better indicators of long run share returns. T-bill rates may be more variable and may temporarily deviate from long run averages.

P7-2. The table below shows the difference in returns between US shares and US Treasury bills and the difference between US shares and US Treasury bonds at 10-year intervals.

	Shares vs Treasury bonds	Shares vs Treasury bills
1964-73	3.7%	8.3%
1974-83	0.2%	8.6%
1984-93	7.5%	5.4%
1994-2003	4.8%	2.1%

a. At the end of 1973, the yield on Treasury bonds was 6.6% and the yield on T-bills was 7.2%. Using these figures and the historical data above from 1964-1973, construct two estimates of the expected return on equities as of December 1973.
b. At the end of 1983, the yield on Treasury bonds was 6.6% and the yield on T-bills was 7.2%. Using these figures and the historical data above from 1974-1983, construct two estimates of the expected return on equities as of December 1983.
c. At the end of 1993, the yield on Treasury bonds was 6.6% and the yield on T-bills was 2.8%. Using these figures and the historical data above from 1984-1993, construct two estimates of the expected return on equities as of December 1993.
d. At the end of 2003, the yield on Treasury bonds was 5.0% and the yield on T-bills was 1.0%. Using these figures and the historical data above from 1994-2003, construct two estimates of the expected return on equities as of December 2003.
e. What lessons do you learn from this exercise? How much do your estimates of the expected return on equities vary over time, and why do they vary?

A7-2. a. Using T bonds, expected return on shares was 6.6% + 3.7% = 10.3%. Using T bills, it was 7.2% + 8.3% = 15.5%.

b. Using T bonds, expected return on shares was 6.6% + 0.2% = 6.8%. Using T bills, it was 7.2% + 8.6% = 15.8%

c. Using T bonds, expected return on shares was 6.6% + 7.5% = 14.1%. Using T bills, it was 2.8% + 5.4% = 8.2%.

d. Using T bonds, expected return on shares was 5% + 4.8% = 9.8%. Using T bills, it was 1% + 2.1% = 3.1%.

e. This shows that the risk premium on shares is very variable over time. Returns depend on how shares are performing and on interest rates. Ten years is probably not a long enough period on which to compute a long-term market risk premium.

P7-3. Use the information below to estimate the expected return on the shares of Bieber Corporation.
Long-run average share return = 10%
Long-run average Treasury note return = 4%
Current Treasury note return = 2%

A7-3. The long-run risk premium on the share is 6%, so add the current Treasury note rate, 2%, to get the expected return, 8%.

P7-4. Calculate the expected return, variance, and standard deviation for the shares in the table below.

Product Demand	Probability	Share #1	Share #2	Share #3
High	20%	30%	20%	15%
Medium	60%	12%	14%	10%
Low	20%	–10%	–5%	–2%

A7-4. Expected returns are: Share 1: 11.2%; Share 2: 11.4%; Share 3: 8.6%
Variances are: Share 1: $160.96\%^2$; Share 2: $72.64\%^2$; Share 3: $31.84\%^2$
Standard deviations are: Share 1: 12.7%; Share 2: 8.5%; Share 3: 5.6%

P7-5. Calculate the expected return, variance, and standard deviation for each share listed below.

State of the Economy	Probability	Share A	Share B	Share C
Recession	15%	–20%	–10%	–5%
Normal growth	65%	18%	13%	10%
Boom	20%	40%	28%	20%

A7-5. Share A:
Expected return = 0.15 (–20%) + 0.65 (18%) + 0.2 (40%) = 16.7%
Variance = $0.15 (-20\% - 16.7\%)^2 + 0.65 (18\% - 16.7\%)^2 + 0.2 (40\% - 16.7\%)^2$
= $202.03\%^2 + 1.10\%^2 + 108.58\%^2$
= $311.71\%^2$
Standard deviation = 17.66%

Share B:
Expected return = 0.15 (–10%) + 0.65 (13%) + 0.2 (28%) = 12.55%
Variance = $0.15 (-10\% - 12.55\%)^2 + 0.65 (13\% - 12.55\%)^2 + 0.2 (28\% - 12.55\%)^2$
= $76.28\%^2 + 0.13\%^2 + 47.74\%^2$
= $124.15\%^2$
Standard deviation = 11.14%

Share C:
Expected return = 0.15 (–5%) + 0.65 (10%) + 0.2 (20%) = 9.75%
Variance = $0.15 (-5\% - 9.75\%)^2 + 0.65 (10\% - 9.75\%)^2 + 0.2 (20\% - 9.75\%)^2$
= $32.63\%^2 + 0.04\%^2 + 21.01\%^2$
= $53.68\%^2$
Standard deviation = 7.33%

P7-6. Refer to Figure 7.2 and answer the following questions.
a. What return would you expect on a share with a beta of 2.0?
b. What return would you expect on a share with a beta of 0.66?
c. What determines the slope of the line in Figure 7.2?

A7-6. a. Beta = 2, Expected return = 4% + 2 (10% – 4%) = 16%

b. Beta = 0.66, Expected return = 4% + 0.66 (10% – 4%) = 7.96%

c. The slope is the market risk premium. $R_m - R_f$ = 10% – 4% = 6%

Risk and Return for Portfolios

P7-7. Calculate the portfolio weights implied by the dollar investments in each of the asset classes below.

Asset	$ Invested
Shares	$10,000
Bonds	$10,000
Treasury note	$5,000

A7-7. The weights are 40% each in shares and bonds and 20% in Treasury note.

P7-8. Wendi Deng recently inherited $1 million and has decided to invest it. Her portfolio consists of the following positions in several shares. Calculate the portfolio weights to fill in the bottom row of the table.

	Intel	General Motors	P & G	Exxon Mobil
Shares	7,280	5,700	5,300	6,000
Price per share	$25	$45	$55	$45
Portfolio weight				

A7-8.

	Intel	General Motors	P & G	Exxon Mobil
Shares	7,280	5,700	5,300	6,000
Price per share	$25	$45	$55	$45
Portfolio $ amount Price × Shares	$182,000	$256,500	$291,500	$270,000
Portfolio weight: $ amount/Total portfolio value	182,000/1,000,000 = 0.182	256,500/1,000,000 = 0.2565	291,500/1,000,000 = 0.2915	270,000/1,000,000 = 0.27

P7-9. Victoria Goldman is a financial adviser who manages money for high net worth individuals. For a particular client, Victoria recommends the following portfolio of shares.

	Global Recording Artists (GRA)	Soccer Intl. (SI)	Liquid Oxygen Corp. (LO)	Viva Mfg. (VM)	Wannabe Travel (WT)
Shares	8,000	9,000	7,000	10,500	4,000
Price per share	$40	$36	$45	$30	$60
Portfolio weight					

a. Calculate the portfolio weights implied by Ms Goldman's recommendations. What fraction of the portfolio is invested in GRA and SI combined?

b. Suppose that the client purchases the shares suggested by Ms Goldman, and a year later the prices of the five shares are as follows: GRA($60), SI($50), LO($38), VM($20), WT($50). Calculate the portfolio weights at the end of the year. Now what fraction of the portfolio is held in GRA and SI combined?

A7-9.

	Global Recording Artists (GRA)	Soccer Intl. (SI)	Liquid Oxygen Corp. (LO)	Viva Mfg. (VM)	Wannabe Travel (WT)
Shares	8,000	9,000	7,000	10,500	4,000
Price per share	$40	$36	$45	$30	$60
$ amount No. shares × Price	$320,000	$324,000	$315,000	$315,000	$240,000
Portfolio weight: $ amount/ Total port-folio amt.	$\frac{320,000}{1,514,000} = 0.2114$	$\frac{324,000}{1,514,000} = 0.214$	$\frac{315,000}{1,514,000} = 0.2081$	$\frac{315,000}{1,514,000} = 0.2081$	$\frac{240,000}{1,514,000} = 0.1585$

a. The fraction of the portfolio in GRA and SI is 21.13% + 21.4% = 42.53%
b. New portfolio weights:

	Global Recording Artists (GRA)	Soccer Intl. (SI)	Liquid Oxygen Corp. (LO)	Viva Mfg. (VM)	Wannabe Travel (WT)
Shares	8,000	9,000	7,000	10,500	4,000
Price per share	$60	$50	$38	$20	$50
$ amount No. shares × Price	$480,000	$450,000	$266,000	$210,000	$200,000
Portfolio weight: $ amount/ Total port-folio amt.	$\frac{480,000}{1,606,000} = 0.2989$	$\frac{450,000}{1,606,000} = 0.2802$	$\frac{266,000}{1,606,000} = 0.1656$	$\frac{210,000}{1,606,000} = 0.1308$	$\frac{200,000}{1,606,000} = 0.1245$

The fraction of the portfolio in GRA and SI is 29.89% + 28.02% = 57.91

P7-10. Calculate the expected return, variance, and standard deviation for the shares in the table below. Next, form an equally weighted portfolio of all three shares and calculate its mean, variance, and standard deviation.

State of the Economy	Probability	Cycli-Cal Inc.	Home Grown Corp.	Pharma-Cel
		Returns in Each State of the Economy		
Boom	20%	40%	20%	20%
Expansion	50%	10%	10%	40%
Recession	30%	–20%	–10%	–30%

A7-10. Expected return:
Cycli-Cal: 0.2 (40%) + 0.5 (10%) + 0.3 (–20%) = 7%
Home Grown: 0.2 (20%) + 0.5 (10%) + 0.3 (–10%) = 6%
Pharma-Cel: 0.2 (20%) + 0.5 (40%) + 0.3 (–30%) = 15%

Variance for Cycli-Cal $= 0.2 (40\% - 7\%)^2 + 0.5 (10\% - 7\%)^2 + 0.3 (-20\% - 7\%)^2$
$= 217.8\%^2 + 4.5\%^2 + 218.7\%^2$
$= 441\%^2$

Standard deviation for Cycli-Cal = 21%

Variance for Home Grown = $0.2\ (20\% - 6\%)^2 + 0.5\ (10\% - 6\%)^2 + 0.3\ (-10\% - 6\%)^2$
$= 39.2\%^2 + 8\%^2 + 76.8\%^2$
$= 124\%^2$

Standard deviation for Home Grown = 11.1%

Variance for Pharma-Cel = $0.2\ (20\% - 15\%)^2 + 0.5\ (40\% - 15\%)^2 + 0.3\ (-30\% - 15\%)^2$
$= 5\%^2 + 312.5\%^2 + 607.5\%^2$
$= 925\%^2$

Standard deviation for Pharma-Cel = 30.4%

To calculate these statistics for the equally weighted portfolio, we first must calculate the portfolio's return in each state of the economy. That's fairly simple.

Economy	**Portfolio Return**
Boom	(1/3)40% + (1/3)20% + (1/3)20% = 26.67% or 0.2667
Expansion	(1/3)10% + (1/3)10% + (1/3)40% = 20% or 0.2
Recession	(1/3)(–20%)% + (1/3)(–10%) + (1/3)(–30%) = –20% or –0.2

The portfolio's expected return is: 0.2(26.67%) + 0.5(20%) + 0.3(–20%) = 9.33%.

The variance is $375.11\%^2$ and the standard deviation is 19.4%. Notice that this is less than the average of the standard deviations of the three shares.

P7-11. You analyse the prospects of several companies and come to the following conclusions about the expected return on each:

Share	**Expected Return**
Bega Cheese	18%
Woolworths	8%
Carsales.com	16%
Fisher & Paykel	12%

You decide to invest $4,000 in Bega Cheese, $6,000 in Woolworths, $12,000 in Carsales.com, and $3,000 in Fisher & Paykel. What is the expected return on your portfolio?

A7-11. Total portfolio value = 4,000 + 6,000 + 12,000 + 3,000 = $25,000

Portfolio expected return = $4{,}000/25{,}000 \times 18\% + 6{,}000/25{,}000 \times 8\% + 12{,}000/25{,}000 \times 16\% + 3{,}000/25{,}000 \times 12\%$
$= 13.92\%$

P7-12. Calculate the expected return of the portfolio described in the accompanying table.

Share	**$ Invested**	**Expected Return**
A	$40,000	10%
B	$20,000	14%
C	$25,000	12%

A7-12. Expected return: 40,000/85,000 × 10% + 20,000/85,000 × 14% + 25,000/85,000 × 12% = 11.53%

P7-13. Calculate the portfolio weights based on the dollar investments in the table below. Interpret the negative sign on one investment. What is the size of the initial investment on which an investor's rate of return calculation should be based?

Share	$ Invested
1	$10,000
2	–$5,000
3	$5,000

A7-13. Weight for Share 1: 10,000/10,000 = 1, or 100%
Weight for Share 2: –5,000/10,000 = –0.5, or –50%
Weight for Share 3: 5,000/10,000 = 0.5, or 50%

The negative sign in the table indicates that the investor actually sold Share 2 *short*, effectively borrowing $5,000 and combining it with $10,000 of his own money in order to buy Shares 1 and 3. The return should be calculated on $10,000, the amount of the *investor's* money at stake.

P7-14. Pete Pablo has $20,000 to invest. He is very optimistic about the prospects of two companies, 919 Brands Inc., and Diaries.com. However, Pete has a very pessimistic view of one company, a financial institution known as Star Bank. The current market price of each share and Pete's assessment of the expected return for each share appear below.

Share	Price	Expected Return
919 Brands	$60	10%
Diaries.com	$80	14%
Star Bank	$70	−8%

a. Pete decides to purchase 210 shares of 919 Brands and 180 shares of Diaries.com. What is the expected return on this portfolio? Can Pete construct this portfolio with the amount of money he has to invest?
b. If Pete sells short 100 shares of Star Bank, how much additional money will he have to invest in the other two shares?
c. If Pete buys 210 shares of 919 Brands and 180 shares of Diaries.com, and he simultaneously short sells 100 shares of Star Bank, what are the resulting portfolio weights in each share? (Hint: the weights must sum to one, but they need not all be positive).
d. What is the expected return on the portfolio described in part (c.)?

A7-14. a. Dollars invested in 919 Brands: 210 × $60 = $12,600
Dollars invested in Diaries.com: 180 × $80 = $14,400
Total investment: $27,000 (This is $7,000 more than Pete actually has to invest.)

$E(R_p)$ = 12,600/27,000 × 10% + 14,400/27,000 × 14% = 12.13%

b. If Pete sells short 100 shares of Lloyd Bank, he will have an additional 100 × $70 = $7,000 to invest.

c. The weights are:
919 Brands: 12,600/20,000 = 0.63
Diaries.com: 14,400/20,000 = 0.72
Lloyd Bank: −7,000/20000 = –0.35

d. The portfolio expected return is: $0.63 \times 10\% + 0.72 \times 14\% + (-0.35 \times -8\%) = 19.18\%$

P7-15. Shares in Springfield Nuclear Power Corp. (SNP) currently sell for $25. You believe that the shares will be worth $30 in one year, and this implies that return you expect on these shares is 20% (the company pays no dividends).

a. If you invest $10,000 by purchasing 400 shares, what the expected value of your holdings next year?
b. Now suppose that you buy 400 shares of SNP, but you finance this purchase with $5,000 of your own funds and $5,000 that you raise by selling short 100 shares of Nader Insurance Inc. Nader Insurance shares currently sell for $50, but next year you expect them to be worth $52. This implies an expected return of 4%. If both shares perform as you expect, how much money will you have at the end of the year after you repurchase 100 Nader shares at the market price and return them to your broker? What rate of return on your $5,000 investment does this represent?
c. Suppose you buy 400 shares of SNP and finance them as described in part b. However, at the end of the year SNP share is worth $31. What was the percentage increase in SNP share? What is the rate of return on your portfolio (again, after you repurchase Nader shares and return them to your broker)?
d. Finally, assume that at the end of one year, SNP shares have fallen to $24. What was the rate of return on SNP share for the year? What is the rate of return on your portfolio?
e. What is the general lesson illustrated here? What is the impact of short selling on the expected return and risk of your portfolio?

A7-15. a. $400 \times \$30 = \$12,000$

b. Value of $12,000 from SNP. Pay $100 \times \$52 = \$5,200$ for Nader shares.
Rate of return = (12,000 – 10,000 – 200)/5,000 = 36%

c. SNP price = $31. Return: (31–25)/25 = 24%
Portfolio return: (400 x 31 – 200 – 10,000)/5,000 = 44%

d. SNP price = $24, return on SNP share: (24 – 25)/25 = -4%
Rate of return = $(400 \times 24 - 200 - 10,000)/5,000 = -12\%$

e. Incorporating short selling in this manner can increase risk. The strategy produces larger gains when the price of the purchased share (in this case, SNP) goes up, but it also produces greater losses when the share price goes down.

P7-16. You are given the following data on several shares:

State of the Economy	Probability	Returns in Each State of the Economy		
		Gere Mining	Reubenfeld Films	DeLorean Automotive
Boom	25%	40%	24%	–20%
Expansion	50%	12%	10%	12%
Recession	25%	–20%	–12%	40%

a. Calculate the expected return and standard deviation for each share.
b. Calculate the expected return and standard deviation for a portfolio invested equally in Gere Mining and Reubenfeld Films. How does the standard deviation of this portfolio compare to a simple 50-50 weighted average of the standard deviations of the two shares?

c. Calculate the expected return and standard deviation for a portfolio invested equally in Gere Mining and DeLorean Automotive. How does the standard deviation of this portfolio compare to a simple 50-50 weighted average of the standard deviations of the two shares?
d. Explain why your answers regarding the portfolio standard deviations are so different in parts b and c.

A7-16. a. Gere: 0.25 (40%) + 0.5 (12%) + 0.25 (–20%) = 11%

Variance for Gere = $0.25 (40\% - 11\%)^2 + 0.5 (12\% - 11\%)^2 + 0.25 (-20\% - 11\%)^2$
$= 210.25\%^2 + 0.5\%^2 + 240.25\%^2$
$= 451\%^2$

Standard deviation for Gere = 21.24%

Reubenfeld: 0.25 (24%) + 0.5 (10%) + 0.25 (–12%) = 8%

Variance for Reubenfeld = $0.25 (24\% - 8\%)^2 + 0.5 (10\% - 8\%)^2 + 0.25 (-12\% - 8\%)^2$
$= 64\%^2 + 2\%^2 + 100\%^2$
$= 166\%^2$

Standard deviation for Reubenfeld = 12.88%

DeLorean: 0.25 (–20%) + 0.5 (12%) + 0.25 (40%) = 11%

Variance for DeLorean = $0.25 (-20\% - 11\%)^2 + 0.5 (12\% - 11\%)^2 + 0.25 (40\% - 11\%)^2$
$= 240.25\%^2 + 0.5\%^2 + 210.25\%^2$
$= 451\%^2$

Standard deviation for DeLorean = .2124, or 21.24%

b. Expected portfolio return for Gere and Reubenfeld: $.5 \times 11\% + .5 \times 8\% = 9.5\%$
Standard deviation is 17.04%. This is roughly equal to a 50-50 weighted average of the standard deviations of the two shares in the portfolio.

c. Expected portfolio return for Gere and DeLorean: $.5 \times 11\% + .5 \times 11\% = 11\%$
Standard deviation is 1%. In this case the standard deviation is much lower than the simple weighted average of the standard deviations of the two shares because they are negatively correlated.

d. DeLorean is strongly negatively correlated with Gere and Reubenfeld (which are strongly *positively* correlated with each other). The correlation between the two shares influences the risk of the portfolio. If the shares are positively correlated, there will not be much risk reduction – i.e., the portfolio's standard deviation will be close to the weighted average of the two shares' standard deviations. However, if the shares are negatively correlated, substantial risk reduction is possible.

P7-17. In an odd twist of fate, the return on the share market has been exactly 1% in each of the last eight months. The return on Simon Entertainment share in the past eight months has been as follows: 8%, 4%, 16%, –10%, 26%, 22%, 1%, –55%. From this information, estimate the beta of Simon share.

A7-17. The beta tells us how much, on average, a share moves when the market moves by 1%. Because the market's move in all eight months was 1%, we can simply take the average of the eight monthly share returns, which is 1.5%. From that we can infer that the share beta is 1.5.

P7-18. Petro-Chem Pty Ltd's share has a beta equal to 0.9. Digi-Media Corp.'s share beta is 2.0. What is the beta of a portfolio invested equally in these two shares?

Portfolio beta = $0.5 \times 0.9 + 0.5 \times 2 = 1.45$

Putting It All Together: The CAPM

P7-19. The risk-free rate is currently 5%, and the expected risk premium on the market portfolio is 7%. What is the expected return on a share with a beta of 1.2?

A7-19. $E(R) = R_f + \beta(E(R_m) - R_f)$
$= 5\% + 1.2\ (7\%)$
$= 13.4\%$

P7-20. The expected return on the market portfolio equals 12%. The current risk-free rate is 6%. What is the expected return on a share with a beta of 0.66?

A7-20. $E(R) = R_f + \beta(E(R_m) - R_f)$
$= 6\% + 0.66 \times (12\% - 6\%)$
$= 9.96\%$

P7-21. The expected return on a particular share is 14%. The share's beta is 1.5. What is the risk-free rate if the expected return on the market portfolio equals 10%?

A7-21. $E(R) = R_f + \beta(E(R_m) - R_f)$
$14\% = R_f + 1.5\ (10\% - R_f)$
$14\% = R_f + 15\% - 1.5\ R_f$
$0.5\ R_f = 1\%$
$R_f = 2\%$

P7-22. If the risk-free rate equals 4% and a share with a beta of 0.75 has an expected return of 10%, what is the expected return on the market portfolio?

A7-22. $E(R) = R_f + \beta(E(R_m) - R_f)$
$10\% = 4\% + 0.75\ (E(R_m) - 4\%)$
$10\% = 4\% + 0.75\ E(R_m) - 3\%$
$9\% = 0.75\ E(R_m)$
$E(R_m) = 12\%$

P7-23. You believe that a particular share has an expected return of 15%. The share's beta is 1.2, the risk-free rate is 3%, and the expected market risk premium is 6%. Based on this, is your view that the share is overvalued or undervalued?

A7-23. $R = R_f + \beta(E(R_m) - R_f)$
$= 3\% + 1.2\ (6\%) = 10.2\%$

Since the expected return of 15% exceeds the required return of 10.2%, the share is undervalued – i.e., it is currently selling at a 'bargain' price.

P7-24. A particular share sells for $30. The share's beta is 1.25, the risk-free rate is 4%, and the expected return on the market portfolio is 10%. If you forecast that the share will be worth $33 next year (assume no dividends), should you buy the share or not?

A7-24. Required return on the share = $R_f + \beta(E(R_m) - R_f) = 4\% + 1.25\ (10\% - 4\%) = 11.5\%$
Expected return on the share: (33–30)/30 = 10%.
Don't buy the share. You expect a return of 10%, but the share should return 11.5%, according to CAPM. A 10% return is not enough in this case to compensate you fairly for the share's risk.

P7-25. Currently the risk-free rate equals 5% and the expected return on the market portfolio equals 11%. An investment analyst provides you with the following information:

Share	Beta	Expected Return
A	1.33	12%
B	0.70	10%
C	1.50	14%
D	0.66	9%

a. Indicate whether each share is overpriced, underpriced, or correctly priced.
b. For each share, subtract the risk-free rate from the share's expected return and divide the result by the share's beta. For example, for asset A this calculation is (12% − 5%) ÷ 1.33. Provide an interpretation for these ratios. Which share has the highest ratio and which has the lowest?
c. Show how a smart investor could construct a portfolio of shares C and D that would outperform share A.
d. Construct a portfolio consisting of some combination of the market portfolio and the risk-free asset such that the portfolio's expected return equals 9%. What is the beta of this portfolio? What does this say about share D?
e. Divide the risk premium on share C by the risk premium on share D. Next, divide the beta of share C by the beta of share D. Comment on what you find.

A7-25. Return for share:
a. Required return for each share:
A: 5% + 1.33 (11% – 5%) = 12.98%, overpriced
B: 5% + 0.7 (11% – 5%) = 9.2%, underpriced
C: 5% + 1.5 (11% – 5%) = 14%, fairly priced
D: 5% + 0.66 (11% – 5%) = 8.96%, only slightly underpriced

b. A: (12% – 5%) / 1.33 = 5.26%
B: (10% – 5%) / 0.7 = 7.14%
C: (14% – 5%) / 1.5 = 6%
D: (9% – 5%) / 0.66 = 6.06%

These ratios compare the share's excess return (above the risk-free rate of 5%) to the share's systematic risk as measured by beta. C, the fairly priced share, has a ratio exactly equal to the market risk premium of 6%. The overvalued share has a ratio less than the market risk premium and the underpriced shares have ratios greater than the market risk premium.

c. A portfolio of C and D that would equal the return of A can be found:
$w_c \cdot 14\% + (1 - w_c)\ 9\% = 12\%$
Solving, we find $w_c = 0.60$.
A portfolio of 60% share C and 40% share D would have a beta of only 0.6 (1.5) + 0.4 (0.66) = 1.164. Therefore, a smart investor could achieve the same expected return as

share A with lower risk. (We could also outperform share A by constructing a portfolio with the same beta but a higher expected return.)

d. A portfolio with a return of 9% combining the risk free rate and market can be found:
$w_{rf} \cdot 5\% + (1 - w_{rf})\ 11\% = 9\%$
Solving, we find $w_{rf} = 1/3$
Portfolio beta = $1/3 \times 0 + 2/3 \times 1 \approx 0.667$

This suggests that share D is very close to being fairly priced since its expected return is also 9% and its beta is 0.66.

e. The ratio of betas is 1.5/0.66 = 2.28. The ratio of risk premiums = 9% / 4% = 2.25. Both shares are essentially fairly priced. C is 2.28 times as risky as D, and as expected, it has a correspondingly higher risk premium relative to the risk-free rate.

Answer to MiniCase

Risk, Return, and the Capital Asset Pricing Model

On your first day as an intern at Tri-Star Management Pty Ltd the CEO asks you to analyse the following information pertaining to two ordinary share investments, Tech.com and Sam's Grocery. You are told that a one-year Treasury note will have a rate of return of 5% over the next year. Also, information from an investment advisory service lists the current beta for Tech.com as 1.68 and for Sam's Grocery as 0.52. You are provided a series of questions to guide your analysis.

		Estimated Rate of Return		
Economy	**Probability**	**Tech.com**	**Sam's Grocery**	**ASX 200**
Recession	30%	–20%	5%	– 4%
Average	20%	15%	6%	11%
Expansion	35%	30%	8%	17%
Boom	15%	50%	10%	27%

Assignment

1. Using the probabilistic approach, calculate the expected rate of return for Tech.com, Sam's Grocery, and the ASX 200 Index.
2. Calculate the standard deviations of the estimated rates of return for Tech.com, Sam's Grocery, and the ASX 200 Index.
3. Which is a better measure of risk for the ordinary share of Tech.com and Sam's Grocery – the standard deviation you calculated in Question 2 or the beta?
4. Based on the beta provided, what is the expected rate of return for Tech.com and Sam's Grocery for the next year?
5. If you form a two-share portfolio by investing $30,000 in Tech.com and $70,000 in Sam's Grocery, what is the portfolio beta and expected rate of return?
6. If you form a two-share portfolio by investing $70,000 in Tech.com and $30,000 in Sam's Grocery, what is the portfolio beta and expected rate of return?
7. Which of these two-share portfolios do you prefer? Why?

Answers

		Tech.com	**Sam's Grocery**	ASX 200
1.	Expected rate of return	15%	7%	11%
2.	Standard deviation	29.55%	2.22%	12.97%
3.	Beta is the better measure.			
4.	Beta	1.68	0.52	
	$E(R_i) = R_f + B_i[E(R_m)-(R_f)]$	15.08%	8.12%	
	Investment	$30,000	$70,000	
	B_p			0.87
5.	$E(R_p) = R_f + B_p[E(R_m)-(R_f)]$			10.21%
	Investment	$70,000	$30,000	
	B_p			1.33
6.	$E(R_p) = R_f + B_p[E(R_m)-(R_f)]$			12.99%
7.	Depends on an investor's risk preference.			