Corporate Finance, Module 6, “Risk, Return, and the Opportunity Cost of Capital”

Readings for the Fourteenth Edition (2022) of the Brealey, Myers, Allen, and Edmans text

(The attached PDF file has better formatting.)

The sections in this posting are for the *fourteenth* edition of the Brealey, Myers, Allen, and Edmans text. You may also use the seventh through thirteenth editions; final exam problems can be answered from any edition.

{The Brealey, Myers, Allen, and Edmans textbook is excellent. We say to read certain sections and to skip others. This does not mean that certain sections are better; it means that the homework assignments and exam problems are based on the sections that you must read for this course. Some of the skipped sections are fascinating, but they are not tested.}

Section 7-1 “The relationship between risk and return” on pages 160-167 reviews modern portfolio theory, which is needed for the discussions of stock values, dividends, and capital structure. This is not a course on investment analysis, but we use investment concepts for financial theory. The value of a firm depends on its capital structure, which is optimized by the cost of equity capital, the cost of debt capital, and debt tax shields, which depend on market risk premiums and the Capital Asset Pricing Model. Section 7.1 gives you the background for these concepts. The financial principles are tested on the final exam; you need not know the history of U.S. stock returns.

Modules 1-5 are mathematical tools (present value, NPV, IRR, stock values). Modules 6 - 23 are theory; they posit relations that explain how firms act.

We use the material in Module 6 when setting rates of return for insurance products. You need not memorize the details (such as Figures 7.3 and 7.4), but you should know the *relative* returns of different investments; see Table 7.1 on page 185, with a 7.8% risk premium for common stocks. The relative returns are important for the modules on CAPM betas and capital structure.

Read the subsection on “arithmetic averages and compound annual returns” on page 188. Brealey, Myers, Allen, and Edmans conclude that “if the cost of capital is estimated from historic returns, only the arithmetic average gives the right answer, not the geometric average.” Some investment analysts use the geometric average, reasoning as follows:

> Suppose a firm has two possible returns, with equal probability: +25% and -20%. Over a two year period, the chances of +25% followed by -20% are the same as the chances of -20% followed by +25%. The two year return is ½ × (1.25 × 0.80 + 0.80 × 1.25) = 1.00, which is the geometric average of 1.25 and 0.80.

The reasoning is faulty: four scenarios are equally likely over the two years, with an average of

$$0.25 \times (1.25 \times 1.25 + 1.25 \times 0.80 + 0.80 \times 1.25 + 0.80 \times 0.80) = 1.050625$$

The one year return is the square root of 1.050625: $1.050625^{0.5} = 1.025$, which is the arithmetic average of 1.25 and 0.80.

Read the subsection on “using historical evidence to evaluate today’s cost of capital.” We use historical data to evaluate the market risk premium, which we add to the current risk-free rate.

Section 7-2 “How to Measure Risk” explains how to calculate variances and standard deviations, which you already know. The section *measuring variability* is similar. This is background reading; if you are unfamiliar with these topics, read the text. We use the tools to measure betas in later modules. The final exam may ask to compute the variance of a portfolio of diversified stocks. Know the formulas for the variance of correlated random variables.

Read section 7-3 “How Diversification Reduces Risk.” Know Figure 7.10, which shows the variance of a two-stock portfolio. Final exam problems may give proportions, standard deviations, and correlations and ask

for the variance of the portfolio. Know the distinction between specific risk and systematic risk at the bottom of page 198. Know the relation between the covariance and correlation on page 197 and the formula for the portfolio variance on page 197. Know example 7.2, "limits to diversification" and the formula for the portfolio variance towards the bottom of page 200.

The CAPM beta is the covariance of the stock return with the market return divided by the variance of the market return. This is the beta (slope parameter) of the regression of the stock return on the market return. The final exam may give the correlation and standard deviations and ask you to derive the beta.

The final exam may give the average variances and covariances among stocks in a well-diversified portfolio and ask you to calculate the standard deviation of the portfolio.

Read section 7-4 "Systematic Risk Is Market Risk." Brealey, Myers, Allen, and Edmans are strong advocates of NPV, the CAPM, and real options. Most financial analysts agree with their general views, but not all share their zeal on these subjects. This course emphasizes these subjects, since we are using their textbook. Many insurers prefer IRR to NPV, use market averages instead of the CAPM, and disregard real options. These views may reflect well-thought out opinions, not ignorance; you should understand all sides of these subjects for real life, even if this course stresses one view.

Know the conclusion of the top paragraph on page 201: "You can only diversify away specific risk, not systematic risk." Know the definitions of efficient portfolios and the efficient frontier on the top of page 204.

Know the subsection "Portfolio Choice with Borrowing and Lending" on pages 205-206, along with figure 7.15 on page 205, the formulas for expected return and standard deviation on page 205, and the Sharpe ratio on page 206. Know the conclusion on pages 206-207: "This is a powerful result. What it means is that all investors will hold the same portfolio of stocks: the tangency portfolio T. Even though investors have different preferences for risk and return, they'll satisfy their preferences by borrowing and lending different amounts (choosing different points on the lending-borrowing line), not by changing their choice of stocks. Page 207As long as investors all have the same information and make the same assessments of expected returns, standard deviations, and correlations, then everyone sees the same investment opportunity set and efficient frontier, and everyone sees the same tangency portfolio T. Simply put, if all investors have access to the same information, all should hold the same portfolio of stocks." Not all financial analysts agree, but the textbook uses this result.

Know the subsection "Market Risk" on pages 207-209, which concludes that "So we have another separation theorem. We separate the investor's job into two stages. The first is to select the best portfolio of stocks, which is the portfolio T with the highest Sharpe ratio. The second step is to blend this portfolio with borrowing or lending to match the investor's willingness to bear risk. Each investor holds just two investments—the market portfolio T and the amount of lending or borrowing. This result is known as the *two-fund separation theorem*. Because investors hold the entire stock market, all unsystematic risk is diversified away. *All of the remaining systematic risk is market risk.*" Know the equation for the capital market line at the bottom of page 208.

Know the equation for beta as the covariance divided by the market variance in Table 7.7 and the footnote at the bottom of page 181. This relation comes up frequently, and it is tested on the final exam. The formula for beta is repeated in subsequent modules.

Read section 7-5 "Should Companies Diversify?" Know the conclusion: "Because investors can diversify on their own account, they won't pay any extra for a firm that is diversified."

Read the *key takeaways* on pages 210-211.

Review problems 1, 2, 3, 4, 5; think carefully before answering 5a; review problems 23, 24, 25, 26a,b,d.

Illustrative test questions, problems, and homework assignments are shown separately on the discussion forum.