

Chapter 8 Portfolio Theory and the Capital Asset Pricing Model

OVERVIEW

This is a very important chapter as it deals with portfolio theory and the Capital Asset Pricing Model (CAPM). The concepts of efficient portfolios and the risk-free asset are explained. It concentrates on the Markowitz portfolio selection model and CAPM and builds on the previous chapter. Other theories like arbitrage pricing theory (APT) and the Three-Factor model are discussed.

LEARNING OBJECTIVES

- To understand the portfolio theory and the related concepts of efficient portfolios, the market portfolio, and the risk-free asset.
- To understand CAPM, the security market line (SML) and its implications for risk-return tradeoffs.
- To understand other theories like the arbitrage pricing theory and the Three-Factor model.

Harry Markowitz and the birth of portfolio theory

We took a close look at daily returns of stock and compared them with the normal distribution. The risk and return of a portfolio is reviewed. The idea of an efficient portfolio is introduced. Finally it is shown that when risk-free borrowing or lending is allowed, the investor can easily identify the best portfolio of risky assets.

The relationship between risk and return

The security market line is described and how it can be used to estimate the required rate of return on a common stock. The CAPM and its usefulness are also elaborated.

Validity and role of the Capital Asset Pricing Model

CAPM's assumptions were revisited as well as the empirical evidence supporting it. An important point is that whilst CAPM is not perfect, it does seem to capture important elements of risk. It is worth emphasising the role of the market portfolio in the CAPM. For *any* efficient portfolio, the expected risk premium on each stock ($r - r_f$) must be proportional to its Beta measured relative to that efficient portfolio. If the market portfolio is efficient, then ($r - r_f$) will be proportional to Beta measured relative to the market portfolio (i.e. the CAPM will hold).

Relation of Markowitz portfolio theory to core concepts studied in Economics 101

CAPM is equivalent to the statement that the market portfolio is mean-variance efficient. This makes the model difficult to test conclusively. The market portfolio should, in principle, include all assets; the available market indices clearly fall short of that ideal. Assumptions behind the CAPM are:

- Investors maximise the expected utility of terminal wealth at the end of one period.
- Investors choose between portfolios on the basis of the mean and variance of return. This implies that investors have quadratic utility functions or (more realistically) that returns are normally distributed.

- Investors can borrow or lend at an exogenously determined risk-free rate of interest.
- There are no restrictions on short selling.
- Investors have homogeneous probability beliefs.
- The market is perfect. Thus, all assets are marketable, there are no transaction costs or taxes, and all investors are price takers.

Some alternative theories

Alternative models of risk and return are explained: the Arbitrage Pricing Theory (APT), and the Three-Factor model. A comparative analysis of the CAPM and APT is provided. A comparison of the Three-Factor Model and the CAPM is also provided. The difficulties inherent in testing and using these models in practice were also pointed out.