EMPIRICAL EVIDENCE ON SECURITY RETURNS

In this chapter, we consider the empirical evidence in support of the CAPM and APT. At the outset, however, it is worth noting that many of the implications of these models already have been accepted in widely varying applications. Consider the following:

1. Many professional portfolio managers use the expected return–beta relationship of security returns. Furthermore, many firms rate the performance of portfolio managers according to the reward-to-variability ratios they maintain and the average rates of return they realize relative to the CML or SML.
2. Regulatory commissions use the expected return–beta relationship along with forecasts of the market index return as one factor in determining the cost of capital for regulated firms.
3. Court rulings on torts cases sometimes use the expected return–beta relationship to determine discount rates to evaluate claims of lost future income.
4. Many firms use the SML to obtain a benchmark hurdle rate for capital budgeting decisions.

These practices show that the financial community has passed a favourable judgment on the CAPM and the APT, if only implicitly.

In this chapter we consider the evidence along more explicit and rigorous lines. The first part of the chapter presents the methodology that has been deployed in testing the single-factor CAPM and APT and assesses the results. The second part of the chapter provides an overview of current efforts to establish the validity of the multifactor versions of the CAPM and APT. In the third part, we discuss recent literature on so-called anomalies in patterns of security returns and some of the responses to these puzzling findings. We briefly discuss evidence on how the volatility of asset returns evolves over time. Finally, we present interesting research on stock returns that examines the size of the equity risk premium. Conventional wisdom has held for a long time that the history of returns on equities is quite puzzling. Recent studies address the puzzle.

Why lump together empirical works on the CAPM and APT? The CAPM is a theoretical construct that predicts *expected* rates of return on assets, relative to a market portfolio of all risky assets. It is difficult to test these predictions empirically because both expected returns and the exact market portfolio are unobservable (see Chapter 7). To overcome this difficulty, a single-factor or multifactor capital market usually is postulated, where a broad-based market index portfolio (such as the S&P 500 or the TSE 300) is assumed to represent the factor, or one of the factors. Furthermore, to obtain more reliable statistics, most tests have been conducted with the rates of return on highly diversified portfolios rather than on individual securities. For both of these reasons tests that have been directed at the CAPM actually have been more suitable to establish the validity of the APT. We will see that it is more important to distinguish the empirical work on the basis of the factor structure that is assumed or estimated than to distinguish between tests of the CAPM and the APT.

10.1 THE INDEX MODEL AND THE SINGLE-FACTOR APT

The Expected Return–Beta Relationship

Recall that if the expected return–beta relationship holds with respect to an observable ex ante efficient index, M, the expected rate of return on any security i is

$$E(r_i) = r_f + \beta_i[E(r_M) - r_f] \tag{10.1}$$

where β_i is defined as $\text{Cov}(r_i, r_M)/\sigma^2_M$.

This is the most commonly tested implication of the CAPM. Early simple tests followed three basic steps: establishing sample data, estimating the SCL (security characteristic line), and estimating the SML (security market line).

Setting Up the Sample Data Determine a sample period of, for example, 60 monthly holding periods (five years). For each of the 60 holding periods collect the rates of return on 100 stocks, a market portfolio proxy (e.g., the S&P 500 or the TSE 300), and one-month (risk-free) T-bills. Your data thus consist of

- r_{it} Returns on the 100 stocks over the 60-month sample period; $i = 1, \ldots, 100$, and $t = 1, \ldots, 60$
- r_{Mt} Returns on the S&P 500 index over the sample period
- r_{ft} Risk-free rate each month

This constitutes a table of $102 \times 60 = 6{,}120$ rates of return