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The Arbitrage Theory of Capital Asset Pricing

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The purpose of this paper is to examine rigorously the arbitrage model of capital asset pricing developed in Ross [13, 14]. The arbitrage model was proposed as an alternative to the mean variance capital asset pricing model, introduced by Sharpe, Lintner, and Treynor, that has become the major analytic tool for explaining phenomena observed in capital markets for risky assets. The principal relation that emerges from the mean variance model holds that for any asset, i, its (ex ante) expected return

$$E_i = \rho + \lambda b_i , \tag{1}$$

where ρ is the riskless rate of interest, λ is the expected excess return on the market, $E_m - \rho$, and

$$b_i = \sigma_{im}^2/\sigma_m^2,$$

is the beta coefficient on the market, where σ_m^2 is the variance of the market portfolio and σ_{im}^2 is the covariance between the returns on the ith asset and the market portfolio. (If a riskless asset does not exist, ρ is the zero-beta return, i.e., the return on all portfolios uncorrelated with the market portfolio.)[1]

The linear relation in (1) arises from the mean variance efficiency of the market portfolio, but on theoretical grounds it is difficult to justify either the assumption of normality in returns (or local normality in Wiener diffusion models) or of quadratic preferences to guarantee such efficiency, and on empirical grounds the conclusions as well as the

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[1] See Black [2] for an analysis of the mean variance model in the absence of a riskless asset.