

Capital Market Equilibrium with Restricted Borrowing†

INTRODUCTION

Several authors have contributed to the development of a model describing the pricing of capital assets under conditions of market equilibrium.¹ The model states that under certain assumptions the expected return on any capital asset for a single period will satisfy

$$E(\tilde{R}_i) = R_f + \beta_i[E(\tilde{R}_m) - R_f]. \quad (1)$$

The symbols in equation (1) are defined as follows: \tilde{R}_i is the return on asset i for the period and is equal to the change in the price of the asset, plus any dividends, interest, or other distributions, divided by the price of the asset at the start of the period; \tilde{R}_m is the return on the market portfolio of all assets taken together; R_f is the return on a riskless asset for the period; β_i is the "market sensitivity" of asset i and is equal to the slope of the regression line relating \tilde{R}_i and \tilde{R}_m . The market sensitivity β_i of asset i is defined algebraically by

$$\beta_i = \text{cov}(\tilde{R}_i, \tilde{R}_m) / \text{var}(\tilde{R}_m). \quad (2)$$

The assumptions that are generally used in deriving equation (1) are as follows: (a) All investors have the same opinions about the possibilities of various end-of-period values for all assets. They have a common joint probability distribution for the returns on the available assets. (b) The common probability distribution describing the possible returns on the available assets is joint normal (or joint stable with a single characteristic exponent). (c) Investors choose portfolios that maximize their expected end-of-period utility of wealth, and all investors are risk averse. (Every investor's utility function on end-of-period wealth increases at a decreasing rate as his wealth increases.) (d) An investor may take a long or short position of any size in any asset, including the riskless asset. Any investor may borrow or lend any amount he wants at the riskless rate of interest.

The length of the period for which the model applies is not specified. The assumptions of the model make sense, however, only if the period is taken to be infinitesimal. For any finite period, the distribution of possible returns on an asset is likely to be closer to lognormal than normal;

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1. A summary of the development of the model may be found in William F. Sharpe, *Portfolio Theory and Capital Markets* (New York: McGraw-Hill Book Co., 1970).