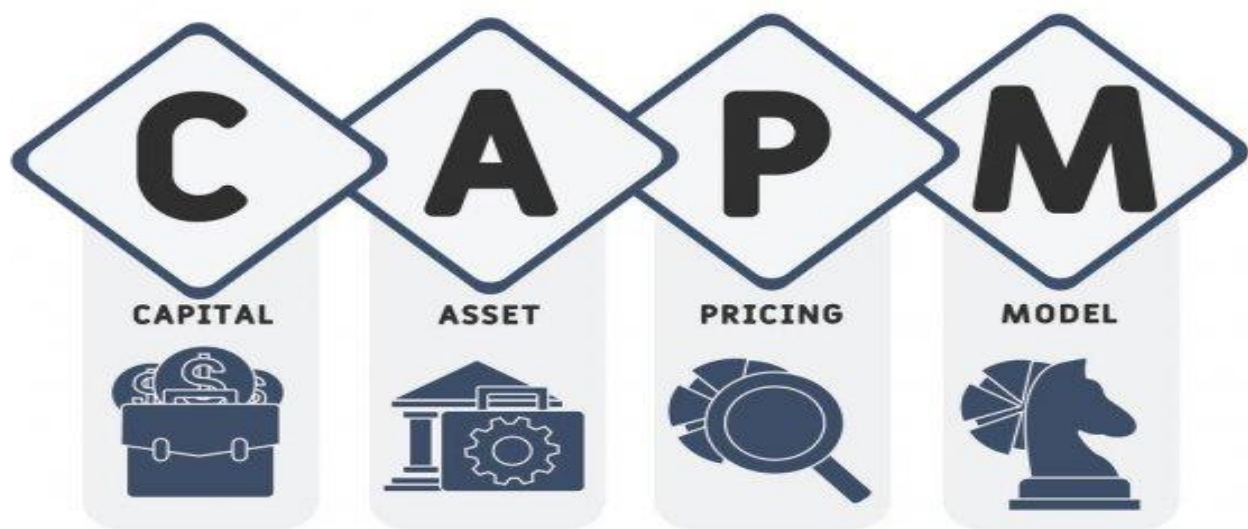Submitted By Lubdhak Mondal   A Review Submitted to Prof. Suman Saurabh

Capital Asset Pricing Model: Theory and Evidence
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INTRODUCTION

The capital asset pricing model (CAPM) provides an appealing explanation of the relationship between risk and asset returns. The authors summarize the theory and review empirical tests of the CAPM. The CAPM fails to fully explain the relationship between risk and returns. They conclude that the empirical failures of the CAPM invalidate most of its applications.

CAPM and Markowitz Model

The capital asset pricing model (CAPM) builds on the Markowitz mean–variance-efficiency model in which risk-averse investors with a one-period horizon care only about expected returns and the variance of returns (risk). These investors choose only efficient portfolios with minimum variance, given expected return, and maximum expected return, given variance. Expected returns and variance plot a parabola, and points above its global minimum identify a mean–variance-efficient frontier of risky assets.

CAPM and Sharpe-Lintner Model

Sharpe–Lintner CAPM theory converts the mean–variance model into a market-clearing asset-pricing model. All investors agree on the distributions of returns and may borrow or lend without limit at a risk-free rate. The risk-free rate clears the market for borrowing and lending. Combining the risk-free asset and risky assets results in a linear mean–variance-efficient frontier that is tangent to the efficient frontier/risky asset frontier. All who hold risky assets hold this tangent portfolio, the value-weighted portfolio of all risky assets. The CAPM implies that the market portfolio is efficient.

CAPM and Black Model

The Sharpe–Lintner version assumes a risk-free rate, whereas the Black version of the CAPM allows unlimited short selling. Both imply that beta, the covariance of asset returns with the market relative to variance of the market, is sufficient to explain differences in asset or portfolio expected returns and that the relationship between beta and expected returns is positive. The risk-free rate is the intercept in the Sharpe–Lintner version, but the Black version requires only that the expected market return be greater than the expected return on assets that are uncorrelated with the market.

Early Empirical Test:

- **Tests on Risk Premiums**
- **Market Betas Explains Expected Returns?**

Early cross-sectional and time-series regression tests on the linear relationship between asset returns and beta show that although the relationship is approximately linear, the observed slope is flatter than the slope predicted by the Sharpe–Linter CAPM. Other early tests find no improvement from additional explanatory variables, indicating that the market proxy portfolio is efficient. This finding is consistent with the Black version.

Recent Tests

More recent tests, both cross-sectional and time series, find that variables such as size, earnings to price, debt to equity, and the book-to-market ratio (B/M) provide explanatory power not captured by beta. These studies confirm the now-recognized empirical flaws in both the Sharpe–Lintner and the Black versions of the CAPM. Behavioralists interpret the results as evidence of irrational pricing caused by investor overreaction. The rational pricing interpretation is that a more sophisticated asset-pricing model is needed.

Irrational Pricing or Risk?

The intertemporal CAPM expands investor behavior to include values of future state variables, such as labor income, consumer goods prices, and investment alternatives, after the initial period. Additional betas capture the effects of these variables in multifactor models. The most common is the three-factor model that relates expected excess return to excess market return, measures the difference in returns between small- and big-company portfolios, and measures the difference between returns on portfolios with high and low B/Ms.

The Market Proxy Problem

The three-factor model captures variations in asset returns that the CAPM misses. Behavioralists argue that violations of the CAPM reflect irrational pricing that the three-factor model catches with the B/M factor. In fact, it is impossible to tell whether the problem in explaining returns is because of irrational pricing or rational pricing in an incomplete model. Testing the CAPM is difficult because of lack of theoretical or empirical clarity on what constitutes the market portfolio. Some argue that it is impossible to test the CAPM because empirical results test whether the market portfolio proxy is efficient but tell nothing about the CAPM. Efforts to find a reasonably efficient proxy have extended the market portfolio to include assets other than stocks and international assets. Still, the market proxy is ineffective because adding the B/M and other variables in regressions effectively annuls the CAPM-predicted beta–expected return relationship.

Conclusion

The authors conclude that the power of variables other than beta to explain average returns invalidates most CAPM applications. They specifically reject using the CAPM to estimate the cost of equity capital and to evaluate performance of mutual fund managers.