Capital Asset Pricing Model And Arbitrage Pricing Theory: A Comparative Analysis

The two leading models in financial economics that attempt to explain the relationship between the riskiness and assets returns are the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT).

Capital Asset Pricing Model (CAPM)

The CAPM model was developed by William Sharpe (1964), and Parallel work was performed by Lintner (1965) and Mossin(1966).CAPM is the simplest form of the asset pricing model that is determined by the measure of the market price of risk known as beta. The mean and the variance are the main parameters upon which this theory depends. According to this model, the only variables needed in calculating the expected returns on security are: the risk-free rate (a constant),the expected excess return on the market, and the security's beta (a constant). The simplicity of its logic and prediction relating to how it measures risk and the relationship between expected return and risk makes CAPM attractive. The CAPM takes the following linear form:

Rt= ? + ?Xt+ ?t…….(1)

where:

Rt represents the return to an asset,

Xt represents the return of an underlying portfolio of assets, and

?t represents the asset-specific return, all at time t,

?(i.e. beta), the key term of the model, indicates the statistical relationship between the asset's return and the return on the total portfolio of assets.

Assumptions of Capital Asset Pricing Model (CAPM)

The CAPM is based upon several assumptions. The important ones are given below:

- All investors are rationally risk-averse individuals, mean-variance optimizers.
- Their planning horizon is a single period.
- All investors are price takers; so that, no investor can influence the market price by the scale of his or her own transactions.
- All assets are public held and traded on public exchange, short positions are allowed, and investors can borrow or lend at a common risk-free rate.
- Information is publicly free and simultaneously available to all investors.
- All investors have homogeneous expectations about assets return (identical input list).
- All securities are highly divisible, i.e., they can be traded in small package.
- Investors pay no taxes on returns and there are no transaction cost entailed in the

trading securities, so expected returns only relate to risk.

Limitations of CAPM

The above assumptions have been criticized on the ground that not all of them, underlying the derivation of the CAPM conform to reality. They are mere premise that permit the development of the CAPM; they do not reflect or predict the behaviors of investors. These assumptions are criticized as follows;

- There are such market imperfections such as bankruptcy cost, taxes and institutional restraints.
- There are anomalies such as small-firm effect, low price/earnings and market - to – book – value ratio.
- Beta has been criticized as a predictor of average stock returns. Instead, a firm's market capitalization (size) and market – to – book – value ratio give a more reliable prediction of average stock returns.
- The assumptions that all assets are traded; there is no transaction cost; and single-period horizons are unrealistic
- This leads us to the second model that tends to remedy the lapses of the CAMP model.

Arbitrage Pricing Model (APM)

An alternative theoretical framework to the CAPM is the arbitrage pricing model (APM), in which the return on an asset is specified as a function of a number of risk factors common to that asset class. This model is an improvement on the lapses of the CAPM. The model is built on the assumption that investors take advantage of arbitrage opportunities in the broader market; therefore, an asset's rate of return is dependent on the returns on alternative investments and other risk factors. This theory, created in 1976 by Ross, shows a relationship between the returns of a portfolio and the returns of a single asset through a linear combination of many independent macro-economic variables, but it does not explain how many risk factors there are and what the prices of these factors are.

According to the theorist, the following macro-economic factors are posited as significant in explaining security returns: variations in inflation, variations in gross national product as indicated by an industrial production index, variations in investor confidence due to changes in default premium in corporate bonds, surprise shifts in the yield curve, etc.

A standard arbitrage model takes the following form:

Rt= ?+ ?1X1t+ ?2X2t+...+ ?kXkt+ ?t…….(2.2)

The model is similar in form to equation 2.1, except that the X's represent a set of risk factors common to a class of assets, and the betas represent the sensitivity of the asset's return to each factor.

Assumptions of APM

The assumptions upon which APM are based are stated below:

- All markets are perfectly competitive and frictionless.
- All investors have homogeneous expectations that returns are generated randomly according to a k-factor model (equation 2.2).
- The number of assets existing in the capital market from which portfolios are formed is much larger than the number of factors.
- There are no arbitrage opportunities. Because there are no arbitrage conditions holding for any subset of securities, it is unnecessary to identify all risky assets or a market portfolio to test the APT.
- There are no restrictions on short selling. (This assumption is crucial to the equilibrium, as it constitutes one side of the arbitrage portfolio; equally important is the requirement that the proceeds from short selling are immediately available.)

Since APM accommodates multiple sources of risk and alternative investments, it also suffers similar challenge of identification of factor since many factors, both international and domestic, could influence an asset’s performance (Mosley and Singer, 2007).