What is capm regression?

Introduction

The Capital Asset Pricing model attempts to price various assets in accordance with their riskiness relative to an all-encompassing market portfolio. The underlying concept behind the CAPM is that investors can easily diversify their unique risks and are only systematic risk – the risk inherent in a market portfolio. Ideally, the market portfolio includes all types of observable assets including equities, fixed income securities, and physical assets. However, a more simplistic model usually takes a large stock index as a proxy for market portfolio. The reasoning behind the model is that an investor should not worry about the individual changes the stock returns (unique risk), but only about the changes in the stock returns that correlate with changes in market returns. This idea based on Harry Markowitz's theory of portfolio diversification that forms the basis of modern portfolio management (Markowitz, 1952). While the model is based on a simple idea, it makes a number of assumptions before making any predictions (Defuso et al., 2004):

1- Investors are aware of the expected returns, variances, and covariance of all assets involved.

2- Investors have homogenous expectations about the variables involved.

3- Investors can easily buy, sell and short sell assets without any influence on price.

4- Investors can borrow and lend at the risk-free rate without any limitations.

5- Markets are frictionless – investors pay no taxes and/or transactions costs on trades.

If these assumptions hold, CAPM delineates that the following equation can be used to derive the expected return on any security:

$E(R_i) = R_f + \beta_i [E(R_m) - R_f]$

Where,

$E(R_i)$ = expected return on asset i

R_f = risk-free rate

β_i = beta of asset i

$E(R_m)$ = expected return on market portfolio

The mechanics behind the CAPM equation are exceedingly simple. The risk-free rate is the rate that an investor can obtain by investing in a riskless security. The treasury securities are often used as an example of a risk-free security since the securities are guaranteed by the federal government. The risk-free rate is the minimum rate an investor should be getting for investing in a security. However, many assets also embody a certain degree of risk such as default or liquidity risk. Therefore, many securities will offer a risk premium. The CAPM equation compensates for this risk premium with the component $\beta_i [E(R_m) - R_f]$, representing the asset's risk premium. $E(R_m) - R_f$ is the difference between return on market portfolio and the risk-free rate and represents the market risk premium. The beta (β_i) is measure of asset

return sensitivity to market returns. It is meant to scale the market risk premium into as asset-specific risk premium.

In econometrics, a popular way of using the CAPM model is the use the Sharpe-Litner version of the CAPM model. Under this model the risk-free rate from the standard CAPM is moved from right hand side of the equation to the left hand side so that the equation becomes:

$E(R_i) - R_f = + ?_i [E(R_m) - R_f]$

This equation can be restated in the following form:

$Z_i = ?_i Z_m$

Where,

$Z_i = E(R_i) - R_f$

$Z_m = E(R_m) - R_f$

Historical data about Z_i and Z_m can be used to form a regression equation, which takes the following form:

$Z_i = ?_i + ?_i Z_m + ?$

Where,

$?_i$ = intercept

$?$ = error term

The most important variable that can be obtained from this equation is the regression coefficient beta ($? i$). The beta represents the responsiveness on asset's return to the returns of the market. This historical estimate of the beta can be used to forecast future returns on the asset i based on the future expected returns on the market. It is important to note that the intercept of the regression equation – $? i$–is expected to be zero in this regression equation. This is because the risk-free rate, which is estimated by the intercept in standard CAPM models, has already been accounted for in the dependant variable (Zi) of the regression equation. Therefore, it is not possible to use the intercept as a historical estimate of the risk-free rate when using this regression equation

Present and briefly comment on the economic evidence in the literature with regard to this model.

The capital asset market is based on a number of assumptions that might not hold if the efficient markets hypothesis is violated. A lot of research has been conducted to show that factors such as company size, industry trends, economic state, and dividend policies affect the return generated by stocks. These anomalies seem to be arguing against that CAPM, which predicts that market movements should fully explain stock returns. The question is: how much role these anomalies play in dictating stock returns. Researchers use the term alpha to describe the abnormal return – return that is different from the expected return under CAPM – generate by assets or stocks. A lot of research has been conducted to determine if the alpha generated by stocks is significant enough to compromise the validity of CAPM.

While the CAPM offers simple and intuitive explanation for the relationship between return and risk, the empirical record of the prediction made by the model is not very attractive. Fama & French (2004 pp. 25-46) believe that the record is poor enough to invalidate the usefulness of the model. Fama and French (1992) used a large sample of stocks from NYSE, AMEX, and NASDAQ to discover that including a ' value' variable and a ' size' variable increases the explanatory power of the CAPM. The paper later become famous as the ' beta is dead' paper, implying that asset (or stock) pricing may also be affected by the company size or its growth rate. Mullins (1982) found that stocks with abnormally low long-term returns experienced abnormally high future returns and vice versa. Lakonishok, Shleifer & Vishny (1994) found a strong positive relationship between average returns and book to market ratio, as well as between returns and cash flow to price ratio. In general, may studies have put forward a belief that asset price may be affected by other factors in addition to market returns, as contended by CAPM.

On the other hand, many researchers have found to be able to explain the returns based on the data observed. Gyorgy et al. (1999) found that the CAPM model was able to explain the monthly return on seventeen Hungarian stocks during the period from 1991 to 1999. Blake (2005) found a similar result for twenty stocks within the S&P 500 index for the period from January 1995 to December 2004. Nawalkha & Schwartz (2007) argue that the CAPM model has responded to criticism by developing modified models such as conditional CAPMs, inter-temporal CAPMs, and higher-order Co-Moments-based CAPMs. The further contend that some of these models have high

explanatory power and satisfy the requirements of empirical tests (Nawalkha & Schwartz, 2007). Therefore, while researchers have found alternative models that appear to have high explanatory power, the CAPM is still alive as a potent model for forecasting expected returns on assets.

In the light of the above answer, how useful do you think reliance on the model is for an investor?

Besides forecasting expected returns on assets, the CAPM makes an interesting proposition. The model proposes that investors should ideally hold a combination of risk-free asset and the market portfolio as part of their portfolio. The optimum proportion of risk-free asset and market portfolio is dependent on the individual risk profile of each investor. The proposition is unusual because an ideal market portfolio – consisting of all of the assets present in the world – simply does not exist. Even if such a portfolio did exist, it will be impossible for an investor to buy even a fraction of such a portfolio with his limited resources. Therefore, it is obvious that an investor cannot simply use CAPM as a hard-line for his investment decisions. However, the CAPM remains a simple and powerful model to forecast expected returns. While investors cannot rely on the model alone, it is a useful source of information required for other complex models. For example, the CAPM model is often employed to calculate the alphas for the Treynor-Black model. Similarly, the Fama-French model is also based as an extension of the CAPM and adjusts the expected return, generate by CAPM, for other factors such as company size and growth classification. While investors should be wary of being misguided by the restrictive assumptions of the model, they should continue to put the model to its best use.

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