IS BETA DEAD?

Justin Timpano, Longwood University
Frank Bacon, Longwood University

ABSTRACT

Some experts deny beta is an efficient form of measuring risk, but are those doubts valid? The capital asset pricing model has long been relied on by professionals in order to find the required return using the coefficient beta, but some are now shying away from this technique claiming beta is an inaccurate measure of risk. The purpose of this paper will be to test through regression if the coefficient beta has correlation with returns. Return information will be collected on 70 different stocks and the S&P 500 in order to run a regression and show if there is correlation.

INTRODUCTION

The CAPM model was first published by William Sharpe in 1964 and later extended by Treynor (1965), Lintner (1965), and Mossin (1966). The model is used to determine a proper rate of return of an asset, or more specifically a stock. Three things the capital asset pricing model takes into consideration are the expected return for the market, expected return of the risk free asset, and the coefficient beta, which represents the asset's sensitivity to non-diversifiable risk. This model uses the formula: $Ke = Rf + (Rm - Rf)\ \beta e$; which demonstrates that the firms cost of equity (Ke) is a linear function of its risk correlated with the market. The variable Rf represents the risk-free rate, while (Rm – Rf) is the market risk premium. βe signifies beta, which is defined as the market risk. CAPM makes three critical assumptions in order to simplify the measure. The first assumption is that there are no transactions costs or taxes. The second notion is that all investors have the exact same intentions with their investments. The last assumption is that all investors have the same opinions on things such as return and risk. The CAPM also divides a portfolio's risk into two separate categories, systematic and unsystematic risk. Unsystematic risk can be defined as risk that is not correlated with the market, and therefore can be diversified away. Systematic risk is correlated with the market and is measured by beta.

Some of the issues experts have listed with the CAPM model are the errors in benchmarking. If an error in the benchmark occurs, the risk premium and beta cannot be calculated accurately. The three assumptions listed earlier are often viewed as too unrealistic and provides inflated measures. The literature review will provide an in depth look at some of the most well-known oppositions against CAPM and the response studies that attempt to prove the validity of the model.

LITERATURE REVIEW

The CAPM formula has been debated for decades since its publication in 1964 by Sharp. Black, Jensen, and Scholes (1972) were the first to refute the equation. This study consisted of testing stock returns from 1931-1965 using CAPM and concluded that returns for low-beta stocks were underestimated and high-beta stocks were overestimated. Fama and Macbeth (1972) performed a similar study using data from 1931-1968 finding similar results. Roll (1977) made detrimental claims about the model's use of the S&P 500 as an index stating that different indexes would result in inconsistent expected returns. Other studies like Stambaugh (1982) and Lakonishok and Shapiro (1986) used data from the 1970's in order to question the accuracy of beta measuring portfolio return.

The most significant opposition of CAPM came from Fama and French in 1992. In their studies, they presented for the first time a three factor model. The two variables they added to their asset pricing model were SMB and HML. SMB stands for "small minus big" which refers to the capitalization rate and HML stands for "high minus low," or the book to market ratio. They believed that the book to market ratio and capitalization rate help provide a more accurate measure of risk because it takes more into consideration than the capital asset pricing model. Their resulting data concluded that value portfolios and small cap portfolios have a greater opportunity for return, associated with a larger risk. Although beta also represents this relationship, Fama and French found the CAPM beta being 20% less accurate than their three factor model. Since FF, several researchers (Malkiel and Xu, 1997; Leland, 1999; and Grauer 1999) have produced empirical evidence supporting FF's findings.

FF's work has resulted in other experts conducting similar studies on the risk-return relationship of portfolios. One of the first studies was done later in 1992 by Amihud, Christensen, and Mendelson. The purpose of their study was to demonstrate the CAPM model is still significant by using the specific technique of joint pooled cross-section and time-series estimation and generalized least squares. The data shows the two techniques showed a significant relationship between beta and return on a portfolio. This correlation helps prove their theory that the death of beta was over exaggerated and still has relevance. Fischer Black (1993) wrote an article criticizing Fama and French suggesting that they misinterpreted the results. Black believes that a one factor model is a sufficient way to measure risk on a portfolio. He accuses the two of data mining and manipulating the numbers in order to represent their original hypothesis. Fama and French also fail to explain connection between size and return, which is one of their biggest assumptions. Black suggests that CAPM is more alive than ever and to be cautious of the three factor method.

Chan and Lakinshok (1993) provided results showing a positive correlation between beta and return in a bear market by using stock data from the previous sixty years. Grundy and Malkiel (1996) also studied the effects of beta during a down market. Their research not only showed a relationship between beta and downside risk but also showed beta was consistent regardless of which index is used. A more recent study from Chan, Dimmock, and Lakonishok (2009) demonstrated that the three factor model does a poor job of finding correlations between risk and return. The study consisted of 25 weighted portfolios based on the company's size and

value. They decided to benchmark it against the Russell style indexes because it is the most popular benchmark among equity investors in the industry. Their conclusion states that not only was the three factor model a poor measure of returns, but it also provided an unrealistic number of over and underperformers. The writers of this journal recommend to continue using the CAPM formula and to be skeptical of other risk-return models.

METHODOLOGY

In order to analyze the correlation of beta to market return, we must first determine what time period is going to be used. Data will be collected using the stock screener tool provided by www.finance.yahoo.com. Monthly returns from the last 10 years will be collected starting in November 2001 and ending in November 2011. Monthly returns will also be gathered for the S&P 500 as it is our market index used to compare and run the regression. A total of 70 stocks were recorded and then allocated into seven different portfolios based on their beta. The stock with the lowest beta was -0.5238 while the highest was 2.881. The portfolios are grouped by betas less than 0, 0, 0.5, 1, 1.5, 2.0, and 2.5. In order to find the beta of the portfolio each stock's beta was multiplied by the percentage of the total portfolio that the stock represents in order to get a weighted average. Once the monthly return data is gathered for the stocks and S&P 500, a holding period return must be calculated for the 70 stocks and market index. To calculate the monthly holding period return take the price of the stock at the end of the month less the price at the beginning of the next month divided by the price at the beginning of the month. Once the individual monthly holding period returns are found, the next step is to find the holding period returns for the 7 portfolios. In order to do so, the stocks in each portfolio were accumulated and then an average was found. The same data was found for the S&P 500 in order to run a regression comparing the returns.

In order to test the effectiveness of beta measuring the risk-return relationship of stocks, we must list the following null and alternative hypothesis:

Ho: *Beta is not an accurate tool for measuring the risk-return relationship of stocks recorded in November 2001 through November 2011 when using monthly returns.*

Ha: *Beta is an accurate tool for measuring the risk-return relationship of stock recorded in November 2001 through November 2011 when using monthly returns.*

In order for the null hypothesis to be proven, data must show that the betas used to screen the stocks should be similar to betas found by calculating the actual portfolio returns. The published betas should show positive correlation with the actual betas. Results should demonstrate that stocks with high betas are correlated with higher negative returns.

QUANTITATIVE TESTS AND RESULTS

After splitting the 70 stocks into 7 portfolios according to their beta and calculating the monthly returns for the portfolios and S&P 500, excel was used to run a regression and find correlations.

Table 1
Regression Results

		Portfolio Beta	Actual Beta	R^2	P-Value	F
Portfolios	< 0	-0.5238	-0.4658	0.5733	0.2676	0.9332
	0	0.0084	0.1040	0.1234	0.5400	0.5309
	0.5	0.4886	0.6312	0.6940	0.0125	29.8455
	1.0	1.0025	0.9903	0.7354	0.0033	35.0589
	1.5	1.4733	1.5222	0.7821	0.0000	69.5422
	2.0	2.0101	2.2510	0.8404	0.0000	87.1165
	2.5	2.4931	2.8211	0.8522	0.0000	86.0451

From the following table, we can distinguish that the regression has provided an actual beta with an increasing pattern very similar to the portfolio beta. The R^2 values demonstrate a rising trend, suggesting it has a linear relationship. Those values that are close to 1, like the portfolios with a beta of 2.0 and 2.5, suggest that the data closely fits with the regression line. The portfolio with a beta of 0 is the only portfolio that does not show a large amount of correlation with the market movements. The P-value represents the chances of obtaining data that are extreme as the one already recorded. The chart shows that almost every portfolio has a low chance of encountering any extreme test statistic except for the portfolio representing betas that are 0. The F statistic demonstrates a linear relationship and also shows that the portfolios with the higher betas have more risk associated with them.

CONCLUSION

Through this study it can be determined that through November 2001 to November 2011 beta has been a relevant factor in measure risk. Correlations shown by the test statistics R^2, P-value, and F prove that there is a positive relationship between beta and monthly returns when compared to the S&P500. These results suggest beta is still an accurate measure of risk and should not be abandoned yet.

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