What is the Expected Return on a Stock?

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Overview

There is, of course, an expansive literature concerned with determining future returns on assets. The contribution of this paper is the derivation of a formula motivated by theory that calculates the expected return on a stock computed solely from index and stock option prices. Unlike typical asset pricing models it does not require historical estimation of various parameters like factor loadings, which are inherently difficult to measure and prone to error. Interestingly, the authors find that the model performs well at various forecast horizons, both within and out of sample, and captures information beyond that of well-known predictors including beta, book-to-market, and momentum. The authors argue that expected returns on individual stocks are more volatile than previously understood, both over time and across stocks.

Investigation

The authors derive a new formula that calculates the expected return on an individual stock based on three measures of volatility — the market, the individual stock, and the value-weighted-average of individual stocks — all computed directly from option prices. In this way, their measure is similar and theoretically consistent with the well-known VIX index which is measured at the index level. The authors suggest several unique features of their model that distinguish it from more conventional approaches:

- It uses available, current market prices and so can be implemented in real time. It does not require historical information or data that arrives with a long delay such as from financial statements.
- Forecasts are calculated at the individual stock level (e.g., what is the expected return for Apple today?). This contrasts with calculating the expected return on a stock, or a portfolio of stocks, with a specific set of characteristics, say large cap value.
- Using the relationship between the stock and the three measures of risk-neutral variance, the model quantitatively predicts the stocks' expected returns. Typically, quantitative investors employ regression models that estimate statistically and economically relevant factor loadings from historical data. There are tradeoffs to both approaches. The authors' approach provides a specific relationship between returns and the three volatility measures that provides a tight connection between expected returns and these measures, which allows the framework to make precise predictions. Conventional factor regression frameworks provide less structure (e.g., on the number or identity of factors), which makes them more flexible but perhaps less precise. The novel approach in this paper is an interesting contrast to the ubiquitous factor models employed more generally.

The authors next set out to determine the predictive power of their model both in-sample and out-of-sample for firms in the S&P 100 and S&P 500 at horizons ranging from one month to one year. The data is from OptionMetrics from January 1996 to August 2014, and from CRSP, Compustat, and Ken French's data library. The authors report the following results:

- In predicting individual stock excess returns over one-, three-, six-, and twelve-month horizons using full sample information to estimate model parameters via panel regressions, it is the longer six-month and one-year horizons that have the strongest predictive power, statistically. Consistent with the CAPM, predicted stock excess returns are broadly increasing relative to the volatility of the stock market.
- The authors then explore forecasting returns out of sample by strictly employing the theoretical formulas without flexibility, and comparing these results to alternative specifications such as the CAPM and a random walk model. The authors find that their model performs better at longer horizons, controlling for the selected benchmarks, similar to the in-sample analysis. And, in some cases for certain horizons, their model can outperform a model that uses beta, size, book-to-market, and past returns, which the literature has shown are related to average returns in sample.

Conclusions

The authors present a new model for forecasting the cross-section of stock excess returns expressed using three measures of risk-neutral volatility all computed from observed option prices. The approach is therefore inherently forward looking and has similarities with the CAPM which employs betas in order to make quantitative predictions about a stock's returns. However, CAPM betas are estimated over some

historical horizon and are particularly difficult to pin down during turbulent markets. Whereas by using only option prices, the option-based model can be estimated in real time. In empirical tests of the model for stocks within the S&P 100 and S&P 500, the authors find supportive results at the six-month and one-year horizon, with less robust results at shorter horizons. The model also does reasonably well when controlling for the well-known factors CAPM beta, book-tomarket, and past returns, but less so when controlling for size effects. Finally, the authors find that the cross-sectional volatility of expected returns from the model is roughly three times greater than that of forecasts based on the CAPM.