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Do Investors Require a Volatility Risk Premium?

by Chryssa Markopoulou, Doctoral Candidate

Any financial asset investment entails two major sources of uncertainty for the investor, uncertainty about future investment return levels and uncertainty about the return levels volatility. Both of them have been major focal points for the research efforts of academics and practitioners alike, with the second moment of returns, i.e. the volatility, capturing an ever growing research interest.

A number of volatility measures have been proposed in the open literature, with the most well-known ones being the measures of implied and the realized volatility. The former is calculated as the volatility that sets the theoretical price of an option equal to its market price, based on an option pricing model. Realized volatility is defined as the sum of squares of intraday returns and is considered as an unbiased estimator of the observed volatility. From the above definitions, the competitive advantage of realized volatility becomes apparent on the grounds that it does not require any explicit model for its calculation.

Moreover, responding to the investors' growing interest in volatility, the Chicago Board Options Exchange (CBOE) introduced in 2003 the Volatility Index (VIX) as an implied volatility measure of the S&P 500 index options, while three years later, in February 2006, VIX options were also launched. The figures confirm the popularity of these new investment and hedging opportunities; while in 2006 the daily trading volume amounted to 7.896 contracts, in 2008 there were over 100.000 VIX options traded daily.

It is hence important to understand how investors deal with volatility uncertainty when managing risk, allocating assets, pricing and hedging derivative securities. Do investors require an extra risk premium for the volatility uncertainty they undertake? And if yes, how is that incorporated in the pricing process?

The research interest has been stimulated by the findings of French, Schwet and Stambaugh (1987) who were the first to observe that shocks to market volatility are negatively correlated with market returns. The negative correlation implies that market volatility increases when the market return is negative. If investors have aversion to volatility, high levels of volatility will result to high price risk premiums since price and volatility are negatively correlated. In this case, an investor may decide to include options in a portfolio in order to hedge market risk; thus paying a premium for the long option position, implying a negative volatility risk premium.

Empirical findings suggest that the market volatility risk premium is nonzero, rather than negative. Some of them are listed below.

- *Implied volatility, derived from the Black - Scholes option pricing model, is consistently higher than the realized volatility,* measured as the square root of the empirical quadratic variations of the price sampled intradaily at small time intervals. This difference is sometimes regarded as a measure of market-implied risk aversion.

- *Increased realized volatility coincides with downward market moves*. This is what is often referred to as the "investor fear gauge" (Whaley, 2000). A possible economic interpretation is that investors are alarmed by increased market volatility, regarded as unfavorable shocks to the investment opportunity and therefore, are willing to pay a premium for possible downside movements.

Several studies have examined the predictive ability of implied volatility for future returns. Giot (2005) found that when high VIX levels are observed, future returns are always positive. Banerjee et al. (2007) examined the relationship between future portfolio returns, which were sorted according to their beta, size and book-to-market equity characteristics, and implied volatility. They found that future returns were significantly related to both VIX levels and innovations for most portfolios. Results tended to be stronger for high beta portfolios. Thus, VIX may be a priced risk factor for security returns.

Taking the argument one step further, Bakshi and Kapadia (2003b) examined the cross sectional behavior of the volatility risk premium. They observed that the difference between implied and realized volatility for individual equity options is less than that for the market index. Consequently, the impact of the market volatility risk premium seems to be smaller on individual equity options than on the index option. The question that arises is the existence of a systemic risk component in the market portfolio.

Correlation also plays a vital role in financial risk management. It is well established that an increase in correlation diminishes the diversification benefits. The key question that evolves is whether the market rewards investors for undertaking such a risk. Or otherwise, do assets that have good pay offs when marketwide correlations are higher than expected, earn lower returns than can be justified by their exposure to other priced risk factors?

According to Bakshi and Kapadia, it is the pricing of correlation risk that makes this possible. Intuitively, index options are expensive and earn lower returns than individual options, because they offer a valuable hedge against correlation increases and insure against the risk of losing diversification benefits.

Effective risk management requires precise estimation of both volatility and correlation measures. With applications on asset pricing models, portfolio allocation management and market risk management, any failure to accurately measure the volatility and correlation may prove devastating for the investor. Although, the main principles of financial risk management have been well documented, the recent financial turmoil has cast many of them under serious doubts. Particular attention and prudence should be paid to the estimation and measurement of key financial figures, as well as to the models used for measuring financial risk.

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