PhD Finance Seminar
Spring 2023

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Assignment 6

Our final Assignment concerns measurement of the (unconditional) Variance Risk Premium. For this purpose, you need to compute the realized volatility (RV) over the same period as the traditional VIX refers to, namely 30 (calendar) days. The most critical point is to include the squared overnight (or close-to-open) return for the S&P 500 index in computing the RV. The "overnight return" uses the increment in the log-price between the prior market close and the subsequent market open. An alternative is to estimate the average overnight squared return relative to the intraday RV and then scale up the intraday RV for a given day with the ratio of [average (intraday RV + squared overnight return) / average intraday RV]. We use the first approach below.

1) Go back to the daily RV series for the spider that you computed in the last assignment based on returns sampled at a 5-minute frequency. Compute the mean for the daily RV series, where you express the mean value in terms of the daily squared percentage annualized value. Note that this computation involves only the high-frequency returns within the trading day (so any squared return overnight is ignored). Please assume there are 252 trading days per year when you annualize the trading day RV measure.

2) Repeat the computation in question 1), but after adding the preceding squared overnight return to the RV. In this manner, the daily RV includes the cumulative squared returns for the trading day ***plus*** the squared return over the ***preceding*** non-trading period.

3) Now download the daily closing values for the VIX series from the Cboe website for historical VIX data. Note that these values are designed to reflect the *square-root of the annualized 30-day expected return variation* (RV) for the S&P 500.

   Using the period of overlap between your RV series in question 2) and the VIX series, compute the average square-root of the 30 calendar-day annualized RV measure. What is the difference between this value and the average VIX computed over the full sample? This value is our simple estimate of the Volatility (square-root of variance) Risk premium. Computing the same differential between the corresponding RV and VIX^2 series yields an estimate of the Variance Risk Premium.

4) Plot the annualized percentage VIX and square-root RV series over the full sample period of overlap for the two series.