

Empirical Asset Pricing:

Problem Set 5

March 18, 2024

1. The term structure of variance risk premia

- (a) Go to OptionMetrics in WRDS. Go to Options → Option Prices and select all the options for the S&P500 (SPX).
- (b) Compute straddle returns: find a call and a put option, closest to at-the-money, with a maturity closest to, but longer than, one month. The holding period is one month.
- (c) Repeat the same exercise for options with a maturity longer than, but closest to, one year.
- (d) Report the risk premium, volatility, and Sharpe ratio of the straddle returns. Use the risk-free rate from Ken French's website to compute excess returns. The sample is from January 1996 until December 2021.
- (e) Use the GMM framework to derive a test where the Null is that Sharpe ratios increase with maturity. The alternative is that Sharpe ratios decline with maturity. Report (i) the test-statistic (report the analytical expression), (ii) the critical value, and (iii) compute the test statistic. Comment on the results.
- (f) Study mean returns and Sharpe ratios on the straddles, conditional on high and low volatility periods, using the median VIX value in the sample as the demarcation line. What do you find?

2. The variance risk premium and the equity risk premium

- (a) Download the data [here](#), which contains the variance risk premium updated to include the financial crisis from Bollerslev, Tauchen, and Zhou (2009). This file is on Hao Zhou's website and updated regularly.
- (b) Download the cum-dividend return from Datastream on the S&P500 and the risk-free rate from Ken French's website.
- (c) Report predictive regressions of excess returns on the variance risk premium for monthly, quarterly, and annual returns for two samples (in case of lower frequencies, use overlapping data):
 - i. 1990.1-2007.12.
 - ii. 1990.1-2023.12.
- (d) So far, we have estimated the predictive regressions using OLS. However, we can also estimate predictive regressions using GLS. As a simple version, use the squared VIX as the weight in weighted least squares. That is, the estimator solves

$$(\beta_0, \beta_1) = \arg \min_{\beta_0, \beta_1} \sum_{t=1}^{T-1} \frac{(R_{t+1}^e - \beta_0 - \beta_1 V R P_t)^2}{VIX_t^2}.$$

Report the same results as above for month, quarterly, and annual returns and discuss whether GLS estimation is preferred and whether it is economically sensible.