

Variance Risk Premium in Energy Markets: Ex-Ante and Ex-Post Perspectives

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The financialization of commodity markets has drawn the attention of risk managers and policy-makers on the assessment of the commodity risk arising from commodity prices fluctuations. Energy markets have revealed to be strongly connected to financial markets and to investor sentiment, which has a relevant role in the prediction of volatility. A relevant question concerns the prediction of the risk aversion of investors towards the risk generated by the variability in commodity price fluctuations, the commodity variance risk. In this study, we introduce notion of the ex-ante variance risk premium and apply it to forecast the energy markets, capturing the expected degree of distress as measured by the predicted propensity of market participants to hedge energy variance risk.

We use daily stock prices that span the period from October 2011 to February 2022 and focus on two energy indices, the Energy Select Sector SPDR Fund (XLE) and the United States Oil Fund (USO), and compare the results to the benchmark of the equity market, the SPX. To accomplish our goal, the methodology proposed relies on GARCH-type models to provide the forecasts of the realized variance whereas we retrieve the variance swap rates through the volatility indices VXXLE, OVX, and VIX of the corresponding market indices.

We account for the typical stylized facts of asset returns such as conditional heteroskedasticity, regime-switching, skewness, and kurtosis estimating the ex-ante variance risk premium from GARCH and Markov-switching GARCH (MS-GARCH) models with different distributions for the innovations (Gaussian, Student's-t, Skewed Gaussian, Skewed Student's-t). The MS-GARCH specification allows us to appraise the structural differences within energy and equity markets, especially through the computation of filtered and smoothed probabilities.

Our main result is that the ex-ante variance risk premium succeeds to anticipate the spikes of the ex-post variance risk premium which naturally arise during periods of increasing uncertainty in the market. In particular, the magnitude of the ex-ante variance risk premium highlights that investors require a higher premium to bear the expected oil variance risk relative to energy variance risk. We believe this is principally related to the increased diversification in the energy market, proxied by XLE, which also invests in other energy sectors.

Important policy implications can be gathered from this study. First, the ex-ante variance risk premium may be employed to carry out extended risk mapping. Second, it may be used to gauge the effects of hypothetical measures for policy designs. Third, preannouncing the outbreak of a crisis, the ex-ante variance risk premium captures the market scenarios that necessitate careful attention for pricing the related financial instruments and for the management of reserving risk.

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