How do investors perceive the risks from macroeconomic and financial uncertainty? Evidence from 19 option markets

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Introduction

- Uncertainty and volatility major drivers of macro and finance models
- Macro models sometimes say uncertainty contractionary
  - Real options/wait-and-see (Bloom)
  - Discount rates and labor markets (Leduc and Liu; Hall)
  - Precautionary saving (Basu and Bundick)
- Finance: some uncertainty is good
  - Pastor and Veronesi; Segal, Shaliastovich, and Yaron
- Empirical evidence (e.g. VARs) is mixed; theory is ambiguous
- Do investors think uncertainty is a bad thing?
This paper

- Basic question: are uncertainty shocks bad on average?
- Novel method: examine cost of hedging uncertainty
  - Unc. bad $\Rightarrow$ high in high MU states $\Rightarrow$ positive cost to hedge
  - Assets that hedge uncertainty would earn negative average returns
- Advantages: no VAR identification; valid under general conditions; easy to measure; wide range of uncertainties
Suppose some shock process $\varepsilon_t$ has conditional variance
\[ \text{var}_t \varepsilon_{t+1} = \sigma_t^2 \]
\[ E_t \varepsilon_{t+1}^2 = \sigma_t^2 \]

- Uncertainty/implied volatility is $\sigma_t^2$ (IV)
- Realized volatility is $\varepsilon_t^2$ (RV)

What is the cost of hedging $\sigma^2$/IV?
- If uncertainty is bad, assets exposed to $\sigma^2$ should earn negative returns
This paper

- Novel dataset of option prices in 19 markets – exposure to both financial and macro uncertainty and RV
  - Daily option and futures data from CME on financials and nonfinancials (metals, energy, agricultural products)
  - Start in 1983 – 32 years of data
  - Past work mainly on S&P 500, $\varepsilon^2$; we expand to real assets, focus on $\sigma^2$

- **Consistent result:** IV earns zero or positive premium, RV earns negative premium
  - Investors view periods with extreme moves as typically bad; high uncertainty is, if anything, good
  - $\varepsilon^2$ is the relevant risk factor, rather than $\sigma^2$

- Investors care about jumps, not uncertainty
Study returns on at-the-money straddles (buy put and call)

Straddles exposed to both realized and implied volatility

- $RV$: movement in spot in either direction is good
- $IV$: bigger expected future moves increase current value
How are straddles exposed to RV and IV?

- Black–Scholes model gives exposure of straddle return to spot, spot$^2$, and $\Delta IV$:

$$r_{n,t} \approx 0 \times f_{n,t} + \frac{1}{2} \left( \frac{f_{n,t}}{\sigma_{t-1}} \right)^2 + \frac{\Delta \sigma_t}{\sigma_{t-1}}$$

Key intuition: exposures change with maturity

- Portfolios exposed only to IV or RV:

$$r_{RV,t} \quad = \quad \frac{5}{2} (r_{1,t} - r_{5,t}) \quad \approx \quad \left( \frac{f_{n,t}}{\sigma_{t-1}} \right)^2$$

$$r_{IV,t} \quad = \quad \frac{5}{4} r_{5,t} - \frac{1}{4} r_{1,t} \quad \approx \quad \frac{\Delta \sigma_t}{\sigma_{t-1}}$$

- See Cremers, Halling, and Weinbaum (2016)
Uncertainty hedging (iv) portfolios

Sharpe ratio for US stock market in this sample: 0.42
Summary of main results

- Evidence inconsistent with investors worrying about uncertainty shocks
  - Paper shows this implies uncertainty shocks are neutral overall – some good, some bad

- Evidence shows variance risk premium is very robust
  - Short-term straddles hedge against *jumps*
  - Consistent with a model with skewed fundamental shocks
  - Large shocks tend to be bad (note business cycle is also asymmetric)
Hedging macroeconomic uncertainty

- Can we use these markets to hedge macroeconomic uncertainty?
- We take external measures of uncertainty from Jurado, Ludvigson and Ng (2015)
- We have financial, real, and prices uncertainty indexes
- Show that our IVs are strongly related to these indexes
- Construct mimicking portfolios of each index using our 19 markets
The 19 IVs span a large fraction of aggregate uncertainty.
The 19 IVs span a large fraction of aggregate uncertainty

- R2s of these projections are 60-80%, so there is a part of the index that is not spanned
- **However, the spanned part is the only one that correlates with economic activity**
  - Decompose $JLN = JLN_{spanned} + JLN_{unspanned}$
  - Real shocks are correlated with the spanned part, but uncorrelated with the unspanned part
- Compute risk premia of the mimicking portfolios
Main result: uncertainty-hedging (iv) portfolios
Main result: volatility-hedging (rv) portfolios

The graph shows realized volatility premia for various assets. The x-axis represents different asset categories, including S&P 500, Treasuries, Swiss Franc, Yen, British Pound, Gold, Silver, Copper, Crude oil, Heating oil, Natural gas, Corn, Soybeans, Soybean oil, Wheat, Lean hog, Feeder cattle, Live cattle, Overall mean, Non-fin. mean, JLN fin., JLN macro, JLN price, EPU. The y-axis represents the realized volatility premia. The graph includes symbols for rv portfolio Sharpe ratios and $f^2$ factor risk premia.
Robustness results

1. Using a factor model instead of Black-Scholes to compute risk premia
2. Orthogonalize the returns of the \( rv \) and \( iv \) portfolios (i.e., estimating SDF loadings)
3. Use EPU instead of the JLN indexes
4. Scale returns by the most liquid price (mitigate measurement error)
5. Use 1-week instead of 2-week returns
6. Study liquidity along the term structure
7. Split sample and rolling-window
8. Case study: crude oil
Conclusion: interpretation

- Key result: macro and financial uncertainty have zero or positive price
  - **Investors have not viewed high uncertainty as bad**
- Big priced risk is RV/jumps
  - There is something special about assets that insure against extreme movements
  - Skewness explanation: $E[\varepsilon^3] < 0 \Rightarrow \text{cov} (\varepsilon, \varepsilon^2) < 0$
- Consistent with VAR evidence in Berger, Dew-Becker, and Giglio (2018): high RV followed by contractions, nothing for IV