Hedging macroeconomic and financial uncertainty and volatility
by Dew-Becker, Giglio, and Kelly

Alex Hsu

Georgia Institute of Technology
Prepared for the 14th MFW

Nov 2nd, 2019
Motivation

- Uncertainty can be either good or bad; theoretical and empirical results are mixed thus far.

- Bloom (2014, JEP):
  - bad uncertainty: real-options, risk-premium, and precautionary savings
  - good uncertainty: growth options and Oi-Hartman-Abel effect

- What is the average effect of uncertainty?

- Empirical identification of uncertainty shocks is a challenge.

- Novel use of financial data can shed light on the issue.
The Hedging Argument

- Portfolio approach to hedge innovations to uncertainty.
- Like insurance, negative returns on the hedging portfolio can be thought of as premium paid to insure against bad outcomes.
- Employing a large set of derivative contracts to zero in on different aspects of uncertainty in the economy.
Portfolio Construction

- Use of zero-delta straddles (one- and five-month): exposure to both realized and implied volatility.

- Straddle return sensitivities:

\[
\frac{\partial r_{n,t}}{\partial f_t} \approx 0
\]

\[
\frac{\partial^2 r_{n,t}}{\partial (f_t/\sigma_{t-1})^2} \approx n^{-1}
\]

\[
\frac{\partial r_{n,t}}{\partial (\Delta \sigma_t/\sigma_{t-1})} \approx 1
\]

- For each market, there are two hedging portfolios: \( rv_{i,t} \) and \( iv_{i,t} \).
Empirical Results

- Average uncertainty hedging portfolio returns are positive across 19 option markets.
- This is particularly true for non-financial underlying and macro uncertainty indexes.
- Average realized volatility hedging portfolio returns, on the other hand, are significantly negative.
- Downside jump risk, or rare disaster, is priced in options markets.
Hedging Indexes

- Project Baker, Bloom, and Davis EPU and Jurado, Ludvigson, and Ng uncertainty (realized volatility) indexes on the uncertainty (volatility) of straddle portfolios.
- Estimated coefficients loadings are the portfolio weights.
- Hedging portfolios are weighted averages of the straddle portfolio returns.
Portfolio Risk Premia

Summary Remarks
Asset Pricing Model

- Consumption growth process contains long-run risk, good and bad volatilities, as well as jump shocks.
- The negative premium on realized volatility is driven by downward jumps.
- The sign of the premium on implied volatility depends on the contribution of good versus bad volatility.
  - “When good volatility shocks, where high volatility is associated with high future growth, are relatively larger than bad volatility shocks, the premium on implied volatility can be positive.”
Comments

• Thorough empirical execution.
• Novel hedging strategy.
• I have learned a lot.
• Some big picture questions...
Quibbles

• Financial uncertainty seems to behave differently.
• What if we hedge innovations to uncertainty instead of levels?
Factor Mimicking Portfolios

- Treat the uncertainty indexes (JLN and BBD) as non-traded assets. The log growth rate of indexes as “shocks.”
- Implied volatility of S&P 100 (VXO).
- Sample period from 1985 to 2018.
- Regression log growth rate of uncertainty and RV indexes on factor portfolio returns (HXZ q5) to obtain weights.
- Results are very similar using FF5 factors.
# Portfolio Sharpe Ratios

<table>
<thead>
<tr>
<th>logΔ</th>
<th>(1) $R^2$</th>
<th>(2) Corr</th>
<th>(3) SR</th>
<th>(4) DBGK</th>
</tr>
</thead>
<tbody>
<tr>
<td>JLN FIN</td>
<td>0.1200</td>
<td>0.3617</td>
<td>-0.2959</td>
<td>Insig. (+)</td>
</tr>
<tr>
<td>BBD EPU</td>
<td>0.0709</td>
<td>0.2870</td>
<td>-0.1535</td>
<td>Insig. (+)</td>
</tr>
<tr>
<td>S&amp;P VXO</td>
<td>0.3431</td>
<td>0.5928</td>
<td>-0.1809</td>
<td>Insig. (+)</td>
</tr>
</tbody>
</table>
Good vs. Bad Volatility

- In the model, shocks to good volatility also raise the long-run expectation of consumption growth.
- Shocks to bad volatility do the opposite.
- Simple modeling tool, but what about the economic mechanism?
Model with Production

- Production economy with NO rigidities, i.e., wage and price.
- No capital adjustment cost.
- Epstein-Zin preferences with nested external habit.
- Firms optimize the present value of future dividends.
- Transitory productivity:

\[
\begin{align*}
    z_t &= (1 - \rho_z) \cdot z_{ss} + \rho_z \cdot z_{t-1} + vol_{z,t} \cdot \varepsilon_{z,t} \\
    vol^2_{z,t} &= (1 - \rho_{vol_z}) \cdot vol^2_{z,ss} + \rho_{vol_z} \cdot vol^2_{z,t-1} + vol_{vol_z} \cdot \varepsilon_{vol_z,t}
\end{align*}
\]

- Monopolistic producer with constant markup.
Impulse Responses

- **Output**: A graph showing a steep decline followed by a flat line.
- **Consumption**: A graph showing an initial increase, then leveling off to a constant value.
- **Investment**: A graph indicating a gradual decline.
- **Markup**: A graph depicting a sharp decrease.
- **Hours Worked**: A graph illustrating a steep drop, followed by a gradual decline.
- **Uncertainty**: A graph showing a sharp decrease at the beginning, then leveling off to a constant value.
Theoretical Mechanism

• Uncertainty works through expectations.

• High productivity uncertainty today raises expected productivity tomorrow (think of the log-normal case).

• High expected productivity tomorrow implies the return (cost) of capital will be high.

• If the cost of capital is expected to be high tomorrow, entrepreneurs have less incentive to decrease capital investment today.

• In a production economy, capital acts as a hedging instrument for (productivity) uncertainty.

• Households consume less but investment more today when uncertainty is high.
Conditional Effect of Uncertainty

Stylized features of uncertainty in the data via local projection:

- Bretschler, Hsu, Tamoni (2019):
  - Negative impact of uncertainty shocks are more accentuated when risk aversion is high.

- Diercks, Hsu, and Tamoni (2019):
  - Cascading effect - in a sequence of positive uncertainty shocks, late arriving shocks are more powerful than early ones.

These phenomenon hold for both JLN FIN and BBD EPU.
Time-varying Risk Aversion

(a) Output

(b) Consumption

(c) Investment

(d) Stock

(e) Output

(f) Consumption

(g) Investment

(h) Stock
Cascading Effect

(i) Output  (j) Investment  (k) Stock

(l) Output  (m) Investment  (n) Stock
Final Thoughts

- Very innovative paper.
- For those of us interested in uncertainty, this is a must read.
- Financial assets can bring new light to the economic literature concerning the price of risk and risk itself.
- What’s next?