Research Proposal

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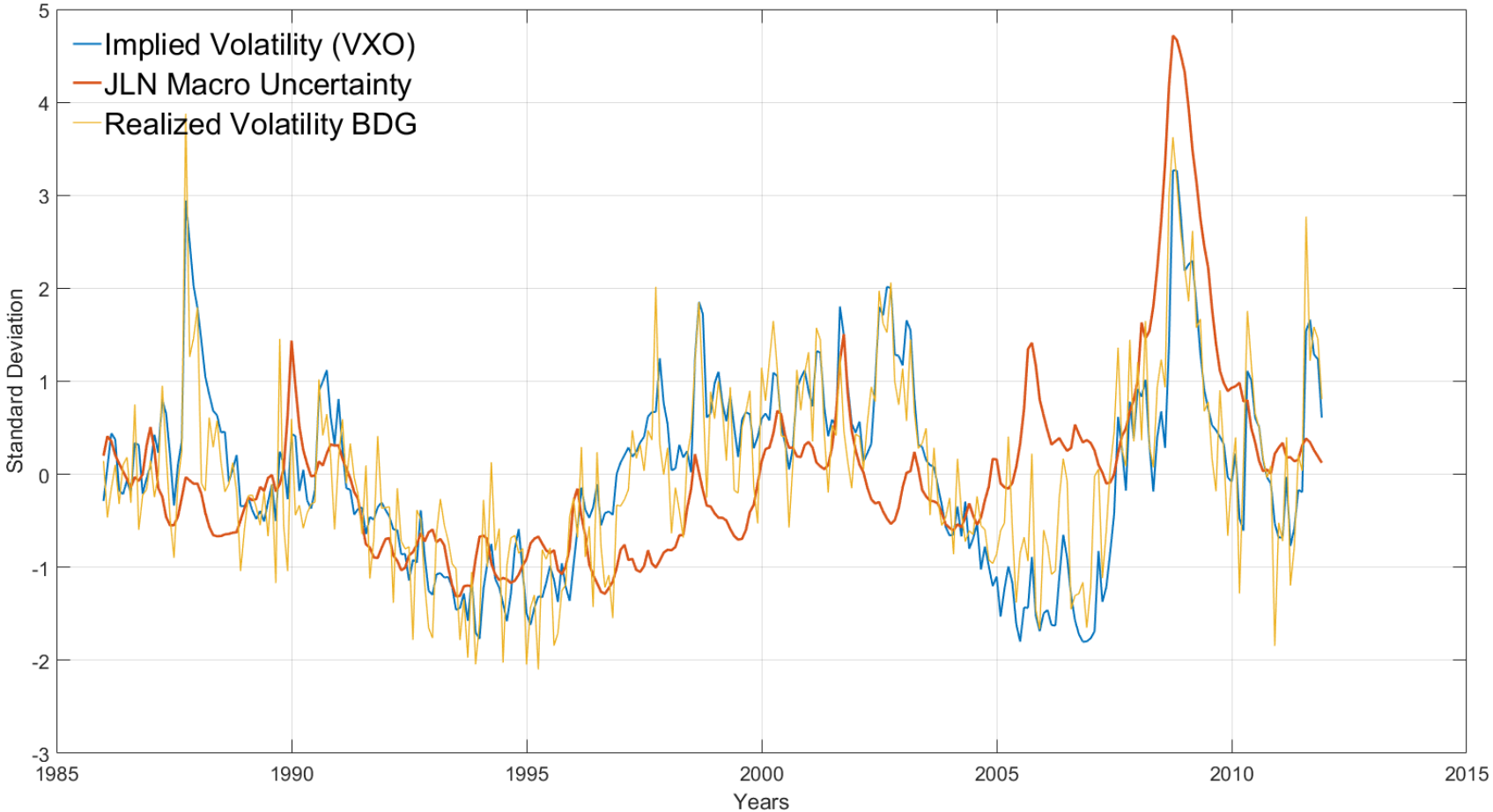
Dissertation Workshop

Relevance



	VXO	JLN	BDG
IP	-0.2358	-0.4935	-0.2822

Uncertainty as a driver of the business cycle

The acute instability that featured financial markets during the 2007-09 crisis and the relation with its unprecedented severity and duration have set doubts on known sources of economic fluctuations.

Since then, uncertainty has been proposed as a new potential driver of the business cycle.

Empirical literature has been called to answer the following positive questions

- Is uncertainty just an endogenous response to 1st-moment shocks?
- Does uncertainty plays an autonomous and active role as a driver of the cycle?

Uncertainty as a theoretical concept

- Frank Knight in 1921 defined **uncertainty** as people's inability to forecast the likelihood of events happening.

- Today, uncertainty is represented by the expected volatility of the unforecastable part of key macroeconomic variables.
  - Uncertainty $\neq$ Volatility (!)

Uncertainty as an empirical measure

- Uncertainty cannot be directly observed

- A series of different proxies
  1. Financial realized volatility
  2. Financial implied (expected) volatility
  3. Disagreement among a group of forecasters
  4. Cross sectional dispersion of firm profits
  5. Narrative approach

- Jurado et al. (2015) provided a generalized measure of macro uncertainty which is consistent with its theoretical concept.

Research Question

- Which is the **causal effect** of uncertainty on economic activity?
- In other words, which is the effect of an **uncertainty shock** on macroeconomic variables?
- Ideally, I would like to estimate through a **semi-structural model** a series of *primitive* and *exogenous* changes in agents' ability to forecast economic variables.
  - In this specific case, structural models tend to impose the result by construction.

Main Contribution

1. Provide a new empirical evidence on the effect of uncertainty shocks
2. Show how to clean out uncertainty shocks from signals regarding future states of the economy
3. Suggest a new family of internal instruments able to disentangle financial shocks from uncertainty shocks

Main Related Literature

- Stock and Watson (2012) - Brookings;
- Jurado, Ludvigson, and Ng (2015) - AER;
- Caldara, Fuentes-Albero, Gilchrist, and Zakrajsek (2016) - EER;
- Berger, Dew-Becker, and Giglio (2019) - R&R REStud;
- Cascaldi-Garcia and Galvao (2019) - forthcoming JMCB;
- Ludvigson, Ma, and Ng (2017) - NBER working paper.
- Carriero, Clark, and Marcellino (2019) - forthcoming REStat
- Carriero, Clark, and Marcellino (2018) - working paper

Challenges

1. It is a **latent variable**
   - it cannot be directly observed
2. Potential **simultaneity** with other shocks
   - uncertainty responds on impact to any 1st-moment shocks
   - aggregate variables respond on impact to uncertainty shocks
3. Potential **reverse causality** with any news shocks
   - Signal regarding future states of the economy may affect current uncertainty
4. It is deeply confounded with **financial shocks**
   - Exogenous changes in borrowing conditions

Technically Speaking (I)

Assume you use OLS techniques to regress X_t on its own past

$$X_t = B_1 X_{t-1} + B_2 X_{t-2} + \cdots + B_p X_{t-p} + \iota_t$$

where $X_t = [U_t \quad Y_t \quad F_t]'$, U_t represents a proxy for uncertainty, Y_t a column vector of macro variables, and F_t a vector of financial variables.

Moreover, $\iota_t = [\iota_t^U \quad \iota_t^Y \quad \iota_t^F]'$ is a vector of time-varying innovations related to the corresponding variables.

In general, ι_t does not represent a vector of structural shocks since

$$\iota_t \iota_t' \neq I_n$$

which implies that innovations represent a (linear) combination of the structural shocks.

Technically Speaking (II)

Structural VARs methods aim to solve the following system in order to recover structural shocks

$$\iota_t = C s_t \quad \Rightarrow \quad s_t = C^{-1} \iota_t \quad \Rightarrow \quad s_t = A \iota_t$$

which is

$$\begin{cases} s_t^U = A_{11} \iota_t^U + A_{12} \iota_t^Y + A_{13} \iota_t^F \\ s_t^Y = A_{21} \iota_t^U + A_{22} \iota_t^Y + A_{23} \iota_t^F \\ s_t^U = A_{31} \iota_t^U + A_{32} \iota_t^Y + A_{33} \iota_t^F \end{cases}$$

1. **Latent variable** $\Rightarrow$ ι_t^U may not represent innovations to uncertainty
2. **Simultaneity** $\Rightarrow$ Each element of A is different from zero
3. **Reverse causality** $\Rightarrow$ ι_t^U may be lead by $s_{t,t+h}$, $h > 0$
4. **Financial shocks** $\Rightarrow$ $E[\iota_t^U \iota_t^{F\prime}] \neq 0$ and large

(1) Latent Variable

Not surprisingly, $Corr(VXO_t, JLN_t) = 0.4139$

However, $Corr(\iota_t^{VXO}, \iota_t^{JLN}) \in [-0.1865 \;\; 0]$

Which means that although the 2 raw series are highly correlated, once we control for available information at $t-1$ then they convey different information.

Solution. JLN proxy is consistent with the theoretical definition of uncertainty.

$\Rightarrow$ VXO measures **macro volatility** and not macro uncertainty.

(2) Simultaneity with other shocks

In general,

$$corr(\iota_t^{JLN}, s_t^Y) \approx 0$$

which implies that uncertainty innovations are fairly uncorrelated with macro structural shocks series derived in the literature.

s_t^Y are several series of macro structural shocks derived by the literature (possibly via narrative approach).

- Romer and Romer (2010) unanticipated tax shocks
- Martens and Ravn (2011) labor productivity shocks
- Leeper et al. (2013) anticipated tax shocks
- Kilian (2009) oil shocks
- ...

(3) Reverse causality with news shocks

- **JLN proxy** controls for the forecastable part of each variable
- Some structural shocks shown above are **anticipated**
- We can possibly control for **news shocks** to TFP
  - However, we will have to assume that TFP is fully exogenous
- **Surveys** can help for the short run horizon
  - SPF has the best timing
- Most importantly, we should control for the shocks and the **square of the shocks**
  - Potentially, uncertainty may evenly react for large shocks no matter the sign

(4) Financial Shocks vs Uncertainty Shocks

Stock and Watson (2012); Caldara, Fuentes-Albero, Gilchrist, and Zakrajzek (2016) shown that uncertainty shocks and financial shocks are deeply confounded.

$$corr(\iota_t^{EBP}, \iota_t^{JLN}) \approx 0.45$$

where ι_t^{EBP} is an innovation in the **excess bond premium** from Gilchrist and Zakrajzek (2012).

Literature did not succeed yet to disentangle the two exogenous sources:

- **External instruments** do not seem to be available
- **Internal instruments** are difficult to find because variables respond analogously to both shocks

(4) Financial Shocks vs Uncertainty Shocks - Solution (I)

I propose a **novel family of internal instruments** which can help out to disentangle the two exogenous shocks.

Economic Intuition.

- An exogenous deterioration of credit conditions should display the attempt of borrowers to fund their projects with **alternative sources** (at least on impact): internal cash flow, equity issuance, ...
- Alternatively, following real-options models (Bernanke, 1983; Brennan and Schwartz, 1985; McDonald and Siegel, 1986) after an uncertainty shock firms prefer to **wait-and-see** without undertake any investment.

(4) Financial Shocks vs Uncertainty Shocks - Solution (II)

Although the impact effect on investment is expected to be negative in both cases, I expect

- a financial shock to have a **negative impact** on internal cash flow;
- an uncertainty shock to have a **non-negative impact** on internal cash flow.

The two shocks can be disentangled via **sign restrictions** à la Uhlig (2005)