Uncertainty Shocks and Financial Shocks

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Financial Shocks and Uncertainty Shocks

Stock and Watson (2012); Caldara et al. (2016) among others 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 unpredictable innovation in the **excess bond premium** from Gilchrist and Zakrajzek (2012) and ι_t^{JLN} is an unpredictable innovation in the **uncertainty proxy** from Jurado et al. (2015).

Both a theoretical and empirical question

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

1. Simultaneity
   - Both types of variables are fast moving
2. Effect on observables
   - They have the same qualitative effects on prices and quantities

As a result, both **zero-impact restrictions** cannot be used and **internal instruments** are not available.

This Project

I want to take a step back and argue that it is conceptually wrong to disentangle these two shocks as defined by the literature.

From a theoretical point of view, uncertainty shocks can potentially be a primitive source of financial shocks.

It is more important to gauge how much of the combinations of these shocks appears to be

- a credit supply shock $\Rightarrow$ **financial shock**
- a credit demand shock $\Rightarrow$ **macro uncertainty shock**

Main Contribution

1. I present evidence and theory of an **internal instrument** able to disentangle shifts in credit supply and demand.
2. I provide a **new econometric method** which can be applied to disentangle two structural shocks when an internal instrument is available.

Corporate Cash Reserves

Cash reserves (or **cash holdings**) refer to money or extremely liquid short-term investment which an individual corporation saves in order to be ready to cover any emergency funding or short-term requirements.

The typical U.S. large firm has cash equal to about 10% and 15% of total assets.

Together with current cash flow is consider the most important **internal source of finance**.

Cash Reserves and Financial Frictions

Almeida, Campello, Weisbach, 2004. *The Journal of Finance*

$\Rightarrow$ Financially constrained firms tend to build larger cash reserves as a buffer against potential credit supply shocks.

Kaplan and Zingales, 1997. *Quarterly Journal of Economics*

$\Rightarrow$ Investment is positive related to cash reserves when firms are financially constrained.

Campello, Graham, Harvey, 2010. *Journal of Financial Economics*

$\Rightarrow$ After the 2008-09 credit supply shock, cash reserves decrease because adopted as internal source of finance.

Cash Reserves and Uncertainty

Bloom, Mizen, Smietanka (2018). *Working Paper*

$\Rightarrow$ Higher economic uncertainty in the years 2007-09 is related to an increase in cash holdings.

Alfaro, Bloom, Lin (2018). *NBER Working Paper*

$\Rightarrow$ Firms accumulate cash reserves and short-term liquid instruments following uncertainty rises.

Economic Intuition I

To provide an economic intuition of the differential response of **cash holdings** to uncertainty and financial shocks, I present a properly augmented model in the spirit of

- Almeida, Campello, and Weisbach (2004)
- Han and Qiu (2007)

It is a simple representation of a dynamic setting where a credit-constrained profit-maximizing firm has

- a trade-off between present and future investment opportunities
- current cash flow and external sources of finance might not be enough to fund all profitable projects

Economic Intuition I

Model has three periods: 0, 1 and 2.

Discount factor $\beta = 1$

In P0 firm can invest I_0

- I_0 pays a deterministic return $g(I_0) = G(I_0) + qI_0$ in P2

In P1 firm can invest I_1

- I_1 pays a deterministic return $h(i_0) = H(i_0) + qI_0$ in P2

Step 1

Regress both a proxy for uncertainty and financial conditions on lagged principal components obtained from a large dataset,

- $F_t = \alpha^F + A_F(L)PC_{t-1} + \iota_t^F$
- $U_t = \alpha^U + A_U(L)PC_{t-1} + \iota_t^U$

where

- F_t is a proxy of financial conditions
- U_t is a proxy of uncertainty
- PC_t is a vector of principal components

Goal is to obtain ι_t^F and ι_t^U as **unforecastable components** of F_t and U_t, respectively.

Step 2

Regress normalized cash flow on both innovations ι_t^F and ι_t^U, controlling for its forecastable part,

$$\tilde{CF}_t = \alpha + B(L)PC_{t-1} + \beta^F \iota_t^F + \beta^U \iota_t^U + \varepsilon_t$$

where $\tilde{CF}_t$ is cash flow normalized by corporate profits.

Results.

- β^F is always **positive** and **significant** at 1%.
- β^U is almost always **not significant**.

Robustness Checks

- Changing the number of lags, ranging from 3 to 6
- Changing the number of PC_t, ranging from 4 to 8
- Adding different controls in both steps
- Using different measures of uncertainty and credit supply

Penalty Functions

Penalty functions is a constrained maximization problem where the importance of the constraint depends on a exogenously given coefficient.

Given a standard constrained maximization problem,

$$\max_x f(x) \ \text{ s.t } \ g(x) \geq 0$$

a penalty function is

$$\max_x f(x) + \delta g(x), \quad \delta > 0$$

- If $\delta = 0$ the constraint $g(x)$ is not taken into account
- If $\delta \to \infty$ optimal solution maximizes constraint $g(x)$

Penalty Functions Approach (PFA) on Structural VARs

Firstly presented by Uhlig (2005), PFA has the flavor of **sign restrictions** but with the advantage that the problem is just identified, delivering an **unique solution**.

Shortcoming: parameter δ is exogenously chosen making the identification strategy less credible.

I suggest a **general penalty function approach** for internal instruments where δ is treated as an endogenous parameter chosen by the data.

Step 1 - Identifying uncertainty shocks

Given the reduced-form system $X_t = BX_{t-1} + \iota_t$ where

- $X_t = [U_t \;\; F_t \;\; Y_t]'$ where Y_t are macroeconomic variables.
- $\iota_t' \iota_t = \Sigma_\iota$

Step 1

$$\begin{array}{rc} \max\limits_{\gamma_U} & \sum_{t=0}^{K} e_U' B^t \tilde{A}_0 \gamma_U - \delta e_{CF}' \tilde{A}_0 \gamma_U \\ \text{subject to} & \delta \geq 0 \;\; \text{and} \;\; \gamma_U \gamma_U' = 1 \end{array}$$

where

- $\tilde{A}_0 \tilde{A}_0' = \Sigma_\iota$
- e_j is a selection vector of variable j

An uncertainty shock maximizes its effect on uncertainty over the

Step 2 - Identifying financial shocks

Given the reduced-form system $X_t = BX_{t-1} + \iota_t$ where

- $X_t = [U_t \quad F_t \quad Y_t]'$ where Y_t are macroeconomic variables.
- $\iota_t' \iota_t = \Sigma_\iota$

Step 2

$$\begin{aligned} \max_{\gamma_F} \qquad & \textstyle\sum_{t=0}^{J} e_F' B^t \tilde{A}_0 \gamma_F + \delta e_{CF}' \tilde{A}_0 \gamma_F \\ \text{subject to} \qquad & \delta \geq 0, \quad \gamma_F \gamma_F' = 1 \quad \text{and} \quad \gamma_U \gamma_F' = 0 \end{aligned}$$

where

- $\tilde{A}_0 \tilde{A}_0' = \Sigma_\iota$
- e_j is a selection vector of variable j

A financial shock maximizes its effect on credit spread over the

How to choose δ

Choose δ large enough such that it does not matter if you run Step 1 or Step 2 first.

In other words, internal instrument intervention should be strong enough such that $\gamma_U \gamma_F' \simeq 0$

Solution is **unique** over many dimensions.