

Monetary Policy and Asset Prices: Evidence from the US Data

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OVERVIEW (1/2)

- ▶ **The aim** of the research is to investigate the scope of the reaction of different asset prices to a contractionary monetary policy shock.
- ▶ **Method.** I am using a structural vector autoregression model (SVAR) model based on the US historical data.
- ▶ The **main achievement** would be to provide additional evidence on how changes in central bank target rate affect asset prices.

OVERVIEW (2/2)

- ▶ **Motivation.** Asset prices are a part of a monetary transmission mechanism - the process by which monetary policy decisions are affecting macroeconomic conditions and primarily, the output.
- ▶ **Contribution.** Using US monthly data from 1964 to 2007, and applying SVAR, I am reporting the results on 10 asset price and 2 bond yield variables - which to my knowledge has not been done before.
- ▶ **Preview of the results.** Investment asset prices react negatively to a monetary policy shock (in line with the theory). However, some industrial asset prices react positively to a monetary policy shock (not expected, needs to be further investigated).

LITERATURE REVIEW

I closely follow the methodology and approach of **Benati (JME, forthcoming)**, "Leaning Against House Prices: A Structural VAR Investigation".

Other references may be categorized in the following manner:

- ▶ **Evolution in discussion of asset prices in a monetary policy framework**
Mishkin (2001); Mussa (2003); White (2006); Issing (2009); Kohn (2009); Caballero, Simsek (2020)
- ▶ **Discussion of transmission mechanisms:** Tobin (1969); Modigliani (1971); Bernanke and Blinder (1992); Bernanke and Gertler (1995), Mishkin (1996), Smets (1997); Gilchrist, Leahy (2002); Aikman and Paustian (2006)
- ▶ **SVAR Methodology:** Primiceri (2005), Rubio-Ramirez, Waggoner and Zha (2013); Arias, Caldara, and Rubio-Ramirez (2018)
- ▶ **Literature reporting responses of asset prices to monetary policy shocks:** Rigobon and Sack (2004); Li et al. (2010); Gali and Gambetti (2014); Miranda-Agrippino and Ricco (2018); Paul (2019); Alessi and Kersefischer (2019)

VARIABLES

- ▶ I am estimating the reaction of the total of **19 variables**.
- ▶ The **baseline set-up** includes 7 variables:
 - ▶ Non-borrowed reserves
 - ▶ M2 money
 - ▶ Total credit aggregate
 - ▶ NEER
 - ▶ Fed rate
 - ▶ GDP
 - ▶ CPI
- ▶ The **asset price variables** are estimated separately, each one together with the baseline variables.

ASSET PRICES

Asset prices, the reaction of which I am estimating, fall into two groups:

- ▶ **Investment assets**

- ▶ Equity
- ▶ Bonds
- ▶ Real estate
- ▶ Precious metals

- ▶ **Capital equipment and raw materials**

- ▶ Industrial metals
- ▶ Capital equipment

STRUCTURAL VAR (1/2)

- ▶ I follow **Arias, Caldara, and Rubio-Ramirez (2018)** in their approach to SVAR methodology.
- ▶ The **structural model** is:

$$y_t' A_0 = \sum_{l=1}^L y_{t-l}' A_l + c + \epsilon_t' \quad \text{for } 1 \leq t \leq T \quad (1)$$

where y_t is a $1 \times N$ vector containing endogenous variables, ϵ_t is a $1 \times N$ vector of structural shocks, A_l is a $N \times N$ matrix of structural parameters with $0 \leq l \leq L$ (A_0 being invertible), c is a $1 \times N$ vector of parameters, L is the lag length, T is the sample size. Matrices A reflect contemporaneous relation between the variables of the model.

STRUCTURAL VAR (2/2)

- The structural representation can be rewritten as:

$$y'_t A_0 = x'_t A_+ \epsilon'_t \quad \text{for } 1 \leq t \leq T \quad (2)$$

where $A'_+ = [A'_1 \dots A'_L \ c']$ and $x_t = [y_{t-1} \dots y_{t-L} \ 1]$ for $1 \leq t \leq T$. A_+ is of dimension $m \times N$, where $m = NL + 1$. A_0 and A_+ are called structural parameters.

- The **reduced-form VAR** is denoted by the following equation:

$$y'_t = x'_t B + u'_t \quad \text{for } 1 \leq t \leq T \quad (3)$$

with $B = A_+ A_0^{-1}$, $u'_t = \epsilon'_t A_0^{-1} \mathbb{E}[u_t u'_t] = \Sigma = (A_0 A'_0)^{-1}$.

IDENTIFICATION

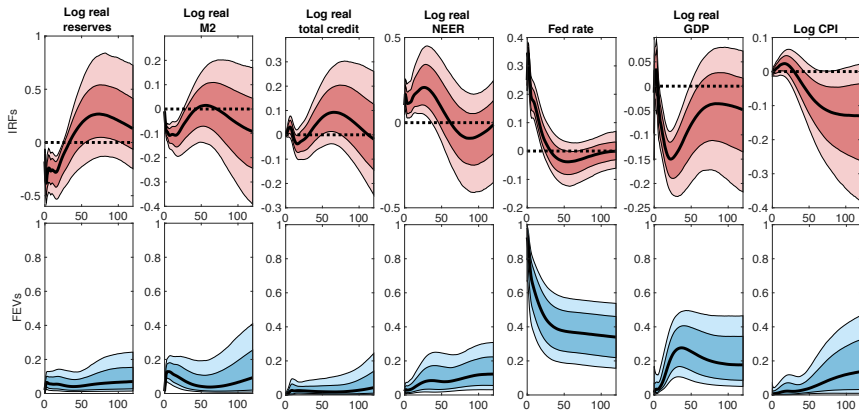
Since the structural parameters are not identified, some restrictions are needed to recover the structural shocks.

- ▶ **Sign restrictions.** The non-borrowed reserves and the M2 money are restricted to react negatively to a contractionary monetary policy shock. The exchange rate is restricted to a positive reaction.
- ▶ **Monetary policy rule.** I impose sign and zero restrictions on the systematic component of monetary policy in such a way that:
 - ▶ A central bank only reacts contemporaneously to output and inflation.
 - ▶ The contemporaneous reaction of the federal funds rate to output and prices is positive.

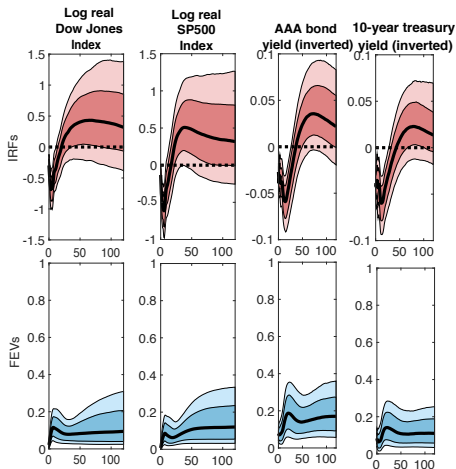
ALGORITHM

- ▶ **Step 1. Setting priors.** Prior for the VAR states is taken to be normal with mean equal to the OLS estimates of the time-invariant VAR over the first eight years of data.
- ▶ **Step 2. Reaching ergodic distribution** via Gibbs sampling (including burn-in)
 - ▶ Obtaining initial structural impact matrix A_0^* .
 - ▶ Obtaining A_0 matrices
- ▶ **Step 3. Obtaining impulse response functions and forecast error variance decompositions**

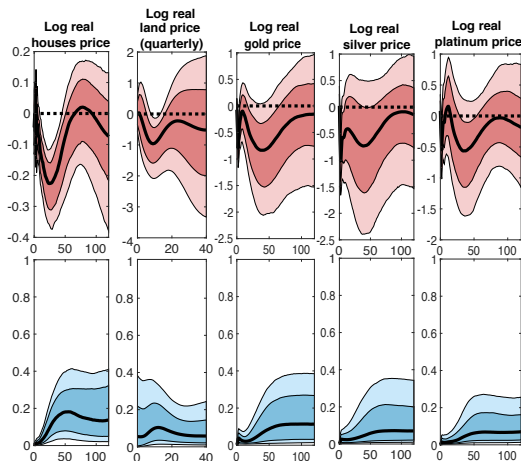
RESULTS: BASELINE VARIABLES



RESULTS: INVESTMENT ASSETS (1/2)



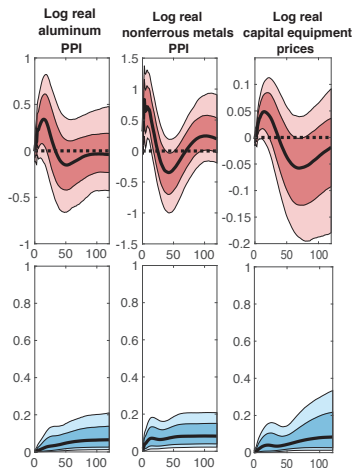
RESULTS: INVESTMENT ASSETS (2/2)



WHAT HAPPENS TO THE PRICES: INVESTMENT ASSETS

- ▶ Changes in the asset prices following a contractionary monetary policy shock are usually explained by the following effects:
 - ▶ **Cash flow effects.** Higher interest rates discount any future flow of real income generated by the assets, causing their prices to fall.
 - ▶ **Switching to bonds.** Rising bond yields make them more attractive compared to other assets.
 - ▶ **Wealth effects.** Declining asset prices affect financial wealth of households and decreases their will to invest. This lowers demand for and further reduces prices of assets.
 - ▶ **Balance sheet effect.** Credit becomes more expensive and also less available due to deteriorating financial standing of borrowers. Lower credit availability further decreases demand for assets.

RESULTS: CAPITAL EQUIPMENT AND RAW MATERIALS

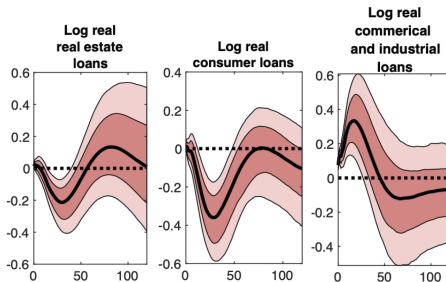


WHAT HAPPENS TO THE PRICES: CAPITAL EQUIPMENT AND RAW MATERIALS (1/2)

- ▶ **Increase** in some capital equipment and raw materials prices is **not explained by the traditional effects**.
- ▶ It may be connected to the observation, noted by Bernanke and Gertler (1995), that firms finance **inventory buildup** after short-term rate increase.
- ▶ another effect reported in the literature (Petursson 2001) is **expectations of accelerating economic activity** (weak reaction of the CB)

WHAT HAPPENS TO THE PRICES: CAPITAL EQUIPMENT AND RAW MATERIALS (2/2)

- ▶ Contractionary monetary policy shock causes **growth in commercial and industrial loans**.
- ▶ Real estate and consumer loans drop on impact whereas commercial loans increase.



ASSET PRICES AND MONETARY TRANSMISSION: DISCUSSION

The asset prices transmission channels reported in the literature:

► Tobin Q effect

$$M \text{ (money)} \downarrow \Rightarrow P_e \text{ (price of equity)} \downarrow \Rightarrow q \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow \quad (4)$$

► Wealth effect

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow \text{wealth} \downarrow \Rightarrow \text{consumption} \downarrow \Rightarrow Y \downarrow \quad (5)$$

► Balance sheet effect

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow \text{adv. sel. \& moral hazard} \uparrow \Rightarrow \text{lending} \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow \quad (6)$$

CONCLUSION

To sum up, the major results of the current investigation are the following:

- ▶ The reaction of 10 price variables and 2 bond yields to a contractionary monetary policy shock has been estimated using a structural VAR model.
- ▶ Investment asset prices react negatively to a contractionary monetary policy shock, while capital equipment and some raw materials react positively.
- ▶ Available explanations for the rising prices include:
 - ▶ inventory buildup (higher demand for storage facilities),
 - ▶ expectations of economic acceleration.

FURTHER RESEARCH

Based on the results of the current investigation some further work may be done:

- ▶ The reaction of capital assets and raw materials prices may be further examined based on the available data.
- ▶ Theoretical explanation to the rise in some price should be investigated. This may be done alongside with the explanation of the rise in business loans.
- ▶ Some extensions to the existing views on monetary transmission may be proposed based on the analysis of the empirical evidence.