Project

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Objective of the Project

Estimating responses of key macroeconomic variables to a noise shock.

Preview of the results:

1. GDP, consumption, investment, and hours worked display a positive and hump-shaped response over the first 6-8 quarters.
2. Counterintuitively, inflation tends to decrease with some lags (6-8 quarters).
3. Real profits tend to display a negative response after 4-6 quarters which lasts for almost one year.

Econometric Procedure - Overview

We use a 2-step procedure

1. Estimate series of noise shocks controlling for other possible source of fluctuations
2. Estimate IRFs via local projection à la Jorda (2005)

Step 1 - Overview

We estimate a noise shock as a change in the expected future growth rate of real GDP which is orthogonal to

1. contemporaneous structural shocks
2. lagged principal components from a large dataset
3. past and future TFP

Step 1 - Estimation of Z_t

Data

- X_t is log of Real GDP at time t
- $X_{t+k|t} = E[X_{t+k}|I(t)]$ provided by Survey of Professional Forecasters

Procedure

$$Z_t = (X_{t+4|t} - X_{t|t}) - (X_{t+4|t-1} - X_{t|t-1})$$

where

- $(X_{t+4|t} - X_{t|t})$ is expected growth rate of Real GDP conditional on information set up to time t
- $(X_{t+4|t-1} - X_{t|t-1})$ is expected growth rate of Real GDP conditional on information set up to time $t-1$
- Z_t is a shock to the expectations of output growth rate

Step 1 - Estimation of $\tilde{Z}_t$

Problem. Z_t is correlated with current and future fundamentals such as fiscal policy, monetary policy, current and future TFP.

Solution. Estimate $\tilde{Z}_t$ as follows

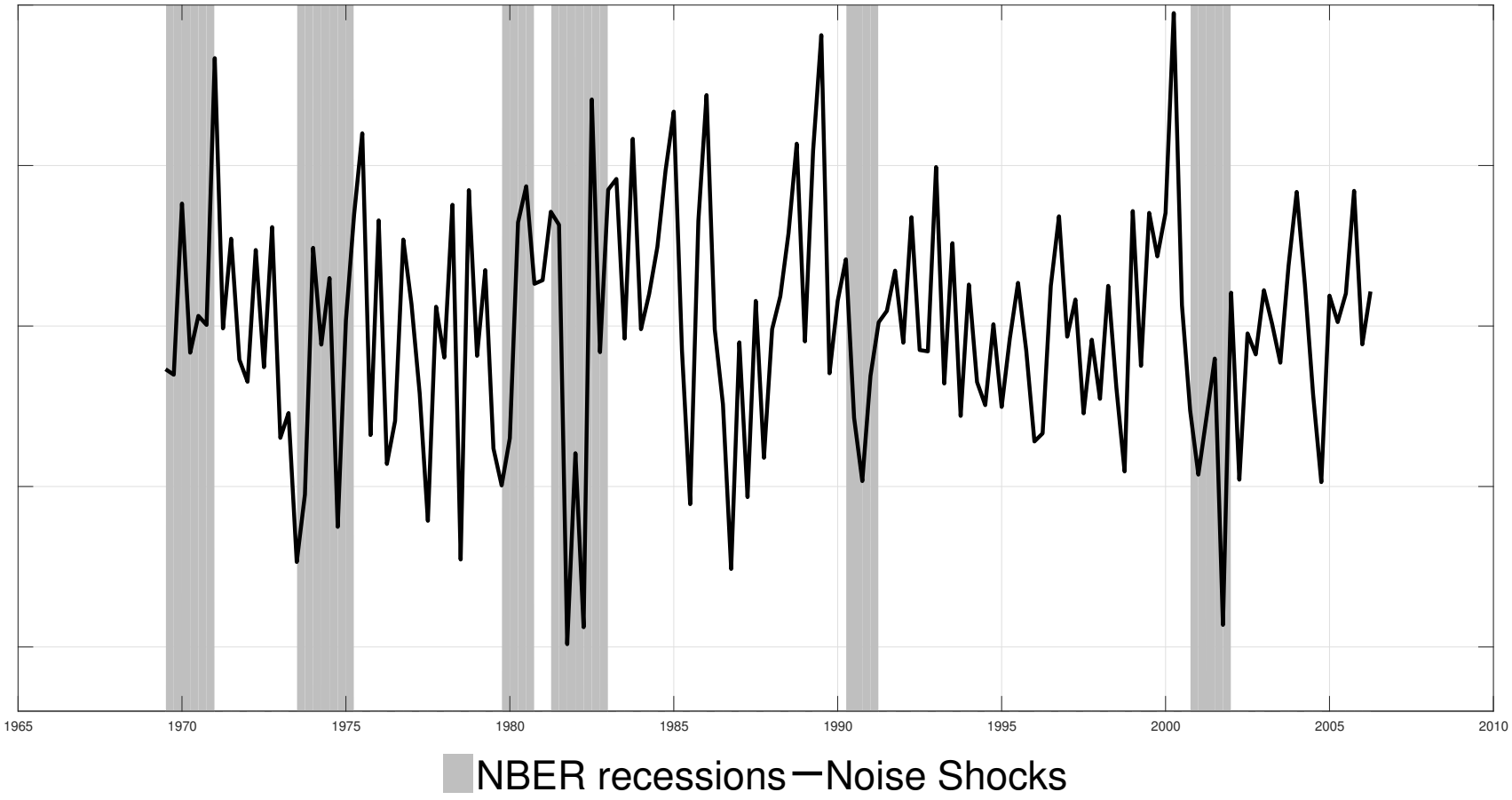
$$Z_t = C + \sum_{j=-J}^{H} \delta_j \Delta TFP_{t+j} + \gamma SS_t + \mu PC_{t-1} + \tilde{Z}_t$$

where

- C is a constant parameter
- ΔTFP_t is first difference of utility-adjusted total factor productivity at time t
- SS_t is a vector of structural shocks at time t possibly estimated via narrative approach
- PC_{t-1} is a vector of principal component at time $t-1$

$\tilde{Z}_t$ represents a change in expectations which is orthogonal to any source of fundamental fluctuations, i.e. a **noise shock**.

Noise Shocks $\tilde{Z}_t$



Step 2 - Estimation of IRFs to $\tilde{Z}_t$

Define Y_t to be the log-transformation of an endogenous aggregate macroeconomic variable.

Using standard OLS techniques we estimate H regressions

$$Y_{t+h} = C + \gamma T_t + \Theta_h^Y \tilde{Z}_t + \delta X_{t-1} + \epsilon_{t+h}$$

where

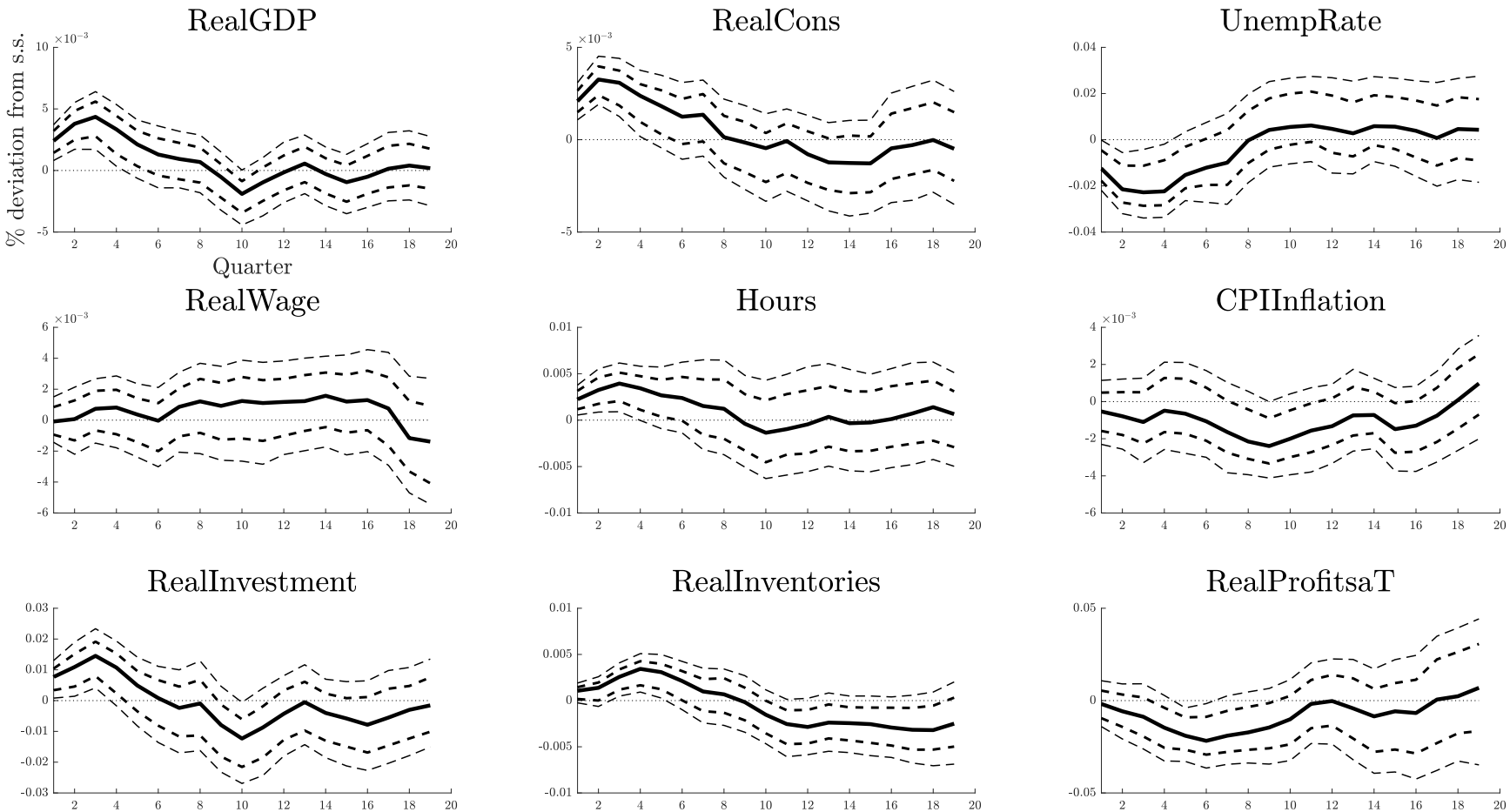
- $h = 1, 2, \ldots, H$ represent the forecast horizon
- C is a constant parameter
- T_t is a linear time trend
- X_t is a vector of control variables at $t-1$: TFP, PC, ...

$\Theta_1^Y,\ \Theta_2^Y,\ \ldots,\ \Theta_H^Y$ represent the path of the impulse response function of Y_t to a unit deviation of $\tilde{Z}_t$.

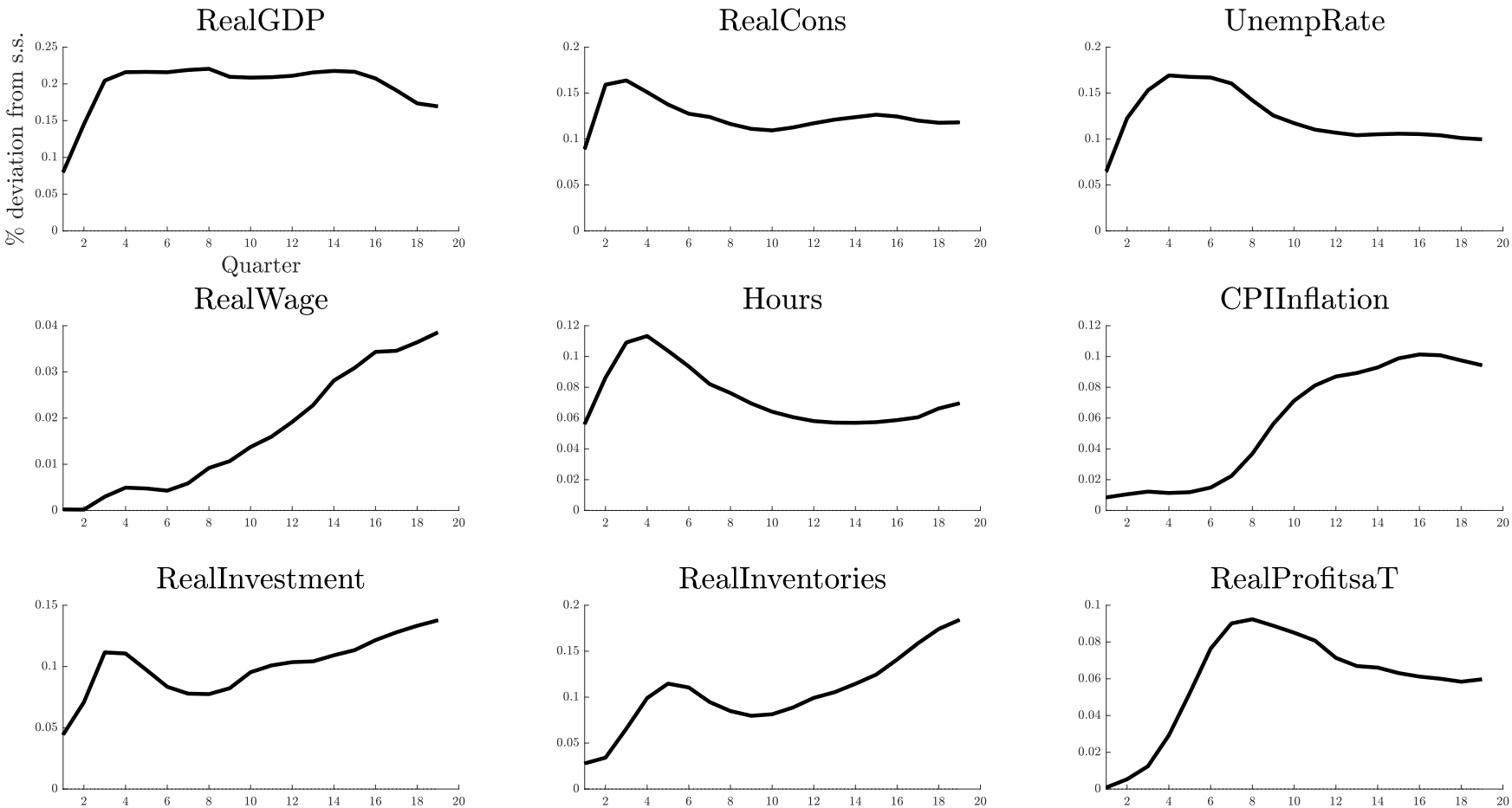
Bootstrapping Techniques

1. Consider the tuple $\Gamma_h^Y = \{Y_{t+h},\ T_t,\ \tilde{Z}_t,\ X_{t-1}\}$.
2. Divide Γ_h^Y over time t in smaller blocks and randomly reorder these blocks in order to form a new tuple $\Gamma_{h,Boot1}^Y$ of the same size of the previous one.
3. Estimate $\Theta_{h,Boot1}$ from $\Gamma_{h,Boot1}^Y$ using standards OLS techniques.
4. Redo (1)-(3) 2000 times and select confidence intervals.

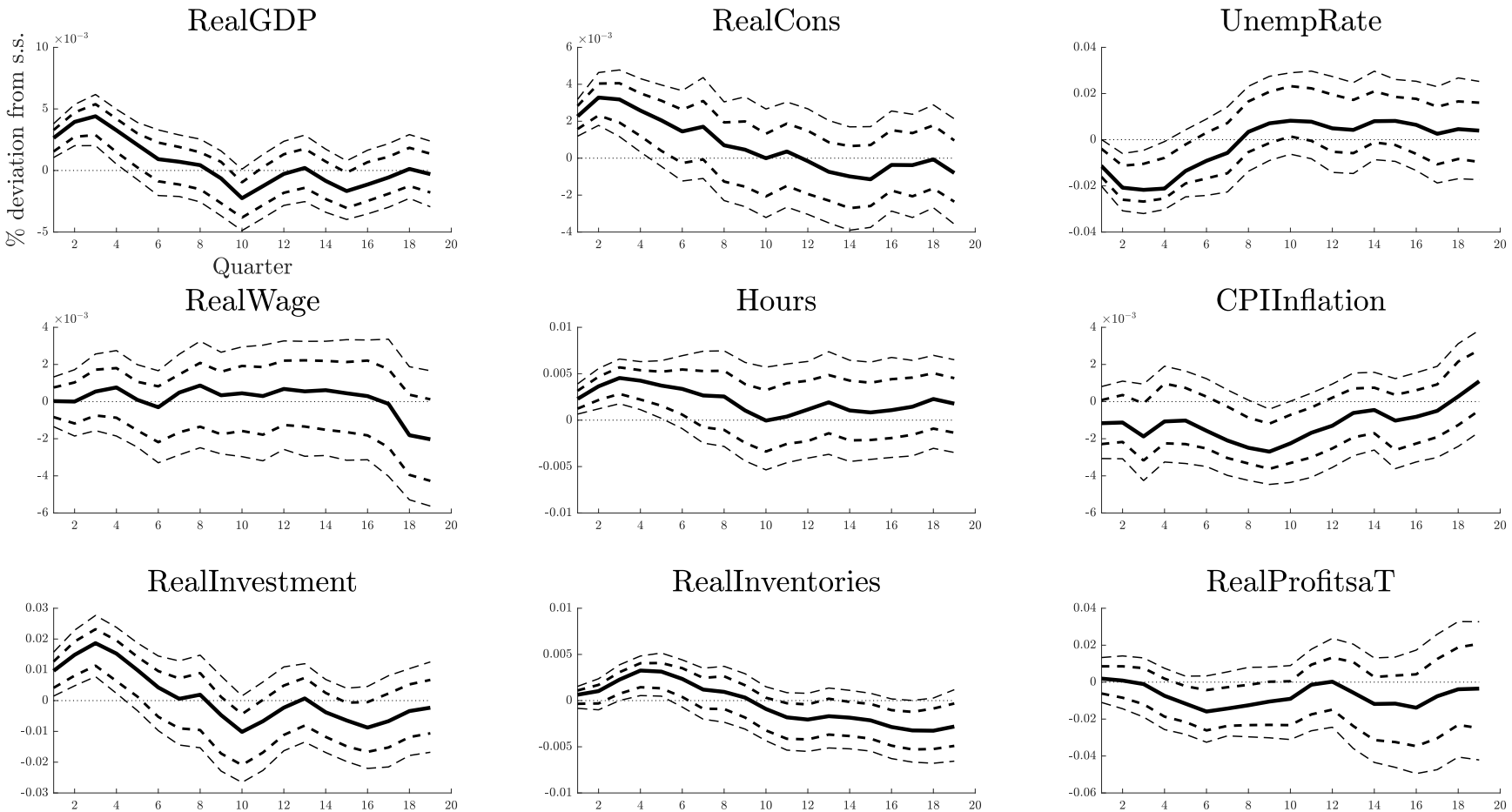
Local Projection - Confidence Interval 68% and 90%



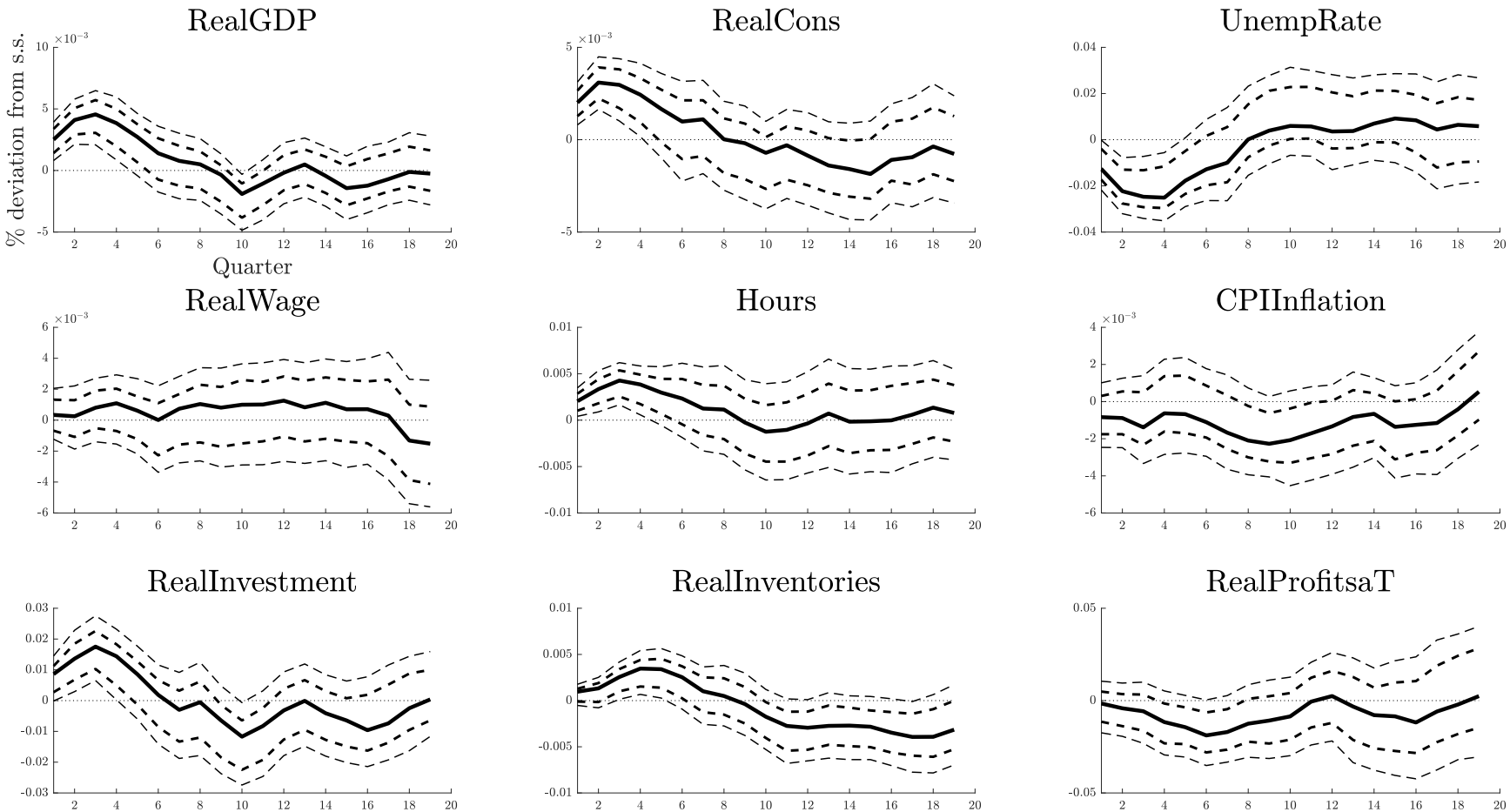
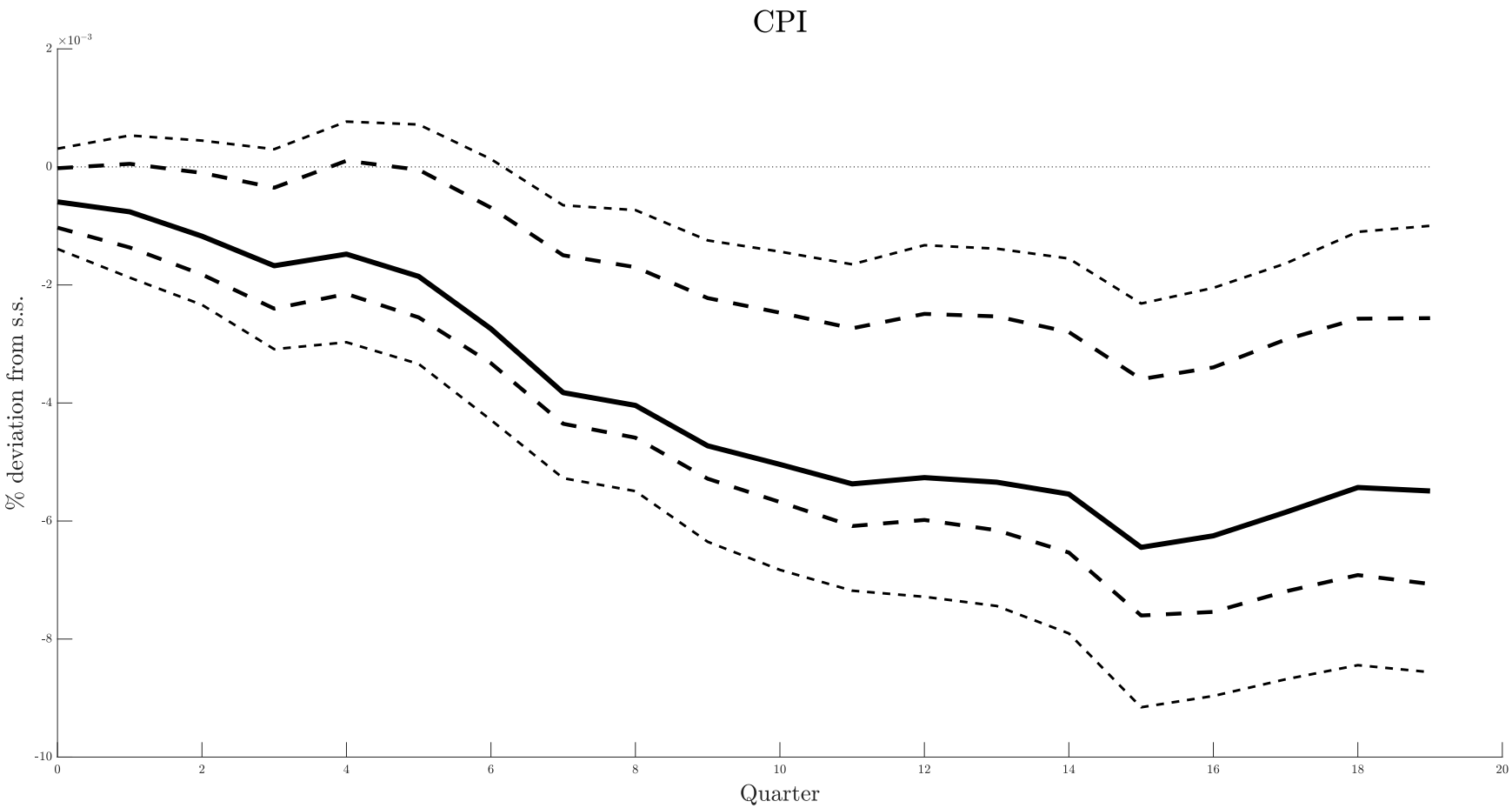
Variance Explained



Robustness Check 1 - Adding PCs and lags in both steps



Robustness Check 2 - Adding PCs and lags in both steps



Consumer Price Index