Noise over the Business Cycle

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Research Question

The key empirical question is how the effect of **noise** varies over the **business cycle**

We employ a **regime switching** econometric model where transitions across states (recession and expansion) are **smooth** to answer this question

Econometric Procedure - Overview

We use a 2-step procedure

1. Estimate series of noise shocks orthogonal to any other exogenous source of fluctuations
2. Estimate a Smooth Transition Local Projection model (hereafter STLP) to estimate dynamic responses of key macroeconomic variables

Step 1 - Overview

We estimate a noise shock as a change in the expected 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

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

where

- C is the constant
- TFP_t is total factor productivity at time t
- SS_t is a vector of structural shocks at time t
- PC_{t-1} is a vector of principal component at time $t-1$

$\tilde{Z}_t$ represents a change expectation which is not related to any source of fundamental fluctuations, i.e. a **noise shock**.

Step 2 - Smooth Transition Local Projection

Following Auerbach and Gorodnichenko (2012), our basic specification is

$$Y_{t+k} = [1 - F(\eta_{t-1})]\Pi_E \tilde{Z}_t + F(\eta_{t-1})\Pi_R \tilde{Z}_t + u_t$$

where

$$F(\eta_t) = \frac{\exp(-\gamma\eta_t)}{1 + \exp(-\gamma\eta_t)}, \quad \gamma > 0$$

and variables η_t is an index (normalized to have zero mean and unit variance) of the business cycle. [$\eta_t > 0 \Rightarrow$ expansion.]

Note. We date the index η by $t - 1$ to avoid contemporaneous feedbacks of $\tilde{Z}_t$ on the underlying state.

Details

Results

Details on η_t and STPL procedure

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