Fiscal Policy Uncertainty and the Business Cycle: Time Series Evidence from Italy

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What is the impact of uncertainty stemming from fiscal policy on Italian economic activity?

While there is a huge literature on the effects of fiscal policy, only recently economists concentrated on second moment shocks and mainly focusing on the US.

How does uncertainty impact macroeconomic variables?

- When uncertainty increases: **firms** tend to cut investment; **households** increase their propensity to save; **banks** are more reluctant to lend.
- Uncertainty can have **several sources**: macroeconomic uncertainty, economic policy uncertainty, financial markets uncertainty, geopolitical uncertainty.
- We focus on the policy uncertainty, in particular the one stemming from fiscal policy (FPU, from now on).

Level shocks: Keynesian vs non-Keynesian effects

- On the effects of level shocks on economic activity there is a **wide range of interpretations**.
- From very high Keynesian multipliers (Romer and Romer, 2012)...
- ... to non-Keynesian effects: "expansionary fiscal austerity" (Alesina and Ardagna, 2013).
- We do not directly contribute to this debate, however, by showing that second moment shocks are important we incidentally show that an important piece of the story might be missing.

Macroeconomic Uncertainty: Jurado et al. (AER, 2015)

- They take 132 macro series and estimate forecasting equations regressing each series onto past linear and squared common factors (principal components).
- The residuals are assumed to evolve with a **stochastic volatility model**.
- The macro uncertainty measure is constructed as an average of the 132 stochastic volatility series.

Economic policy uncertainty: Baker et al. (QJE, 2016)

- They look at newspaper articles, and **measure the frequency** of three categories of terms: (i) "economic" or "economy", (ii) "uncertain" or "uncertainty", and (iii) "Congress", "deficit", "Federal Reserve", "legislation", "regulation", ""White house". To be included in the index, an article must include at least one term for each category.
- Using a VAR, where their index is ordered first, they find that it has an negative impact on aggregate economic activity.

Economic policy uncertainty index: the website

Baker and coauthors also regularly update and release a more encompassing **Economic policy uncertainty** index, made up of three components (http://www.policyuncertainty.com):

1. The first component is the above-mentioned Becker et al. (2016) news-based index
2. The second component reflects the number of federal tax code provisions set to expire over the next 10 years, using information from the Congressional Budget Office.
3. The third component is an index of forecasters' disagreement, based on the dispersion of the predictions about future levels of inflation and government expenditures.

Fiscal policy uncertainty: Villaverde et al. (AER, 2015)

- They estimate a **policy reaction function with stochastic volatility** for some budgetary component, to proxy fiscal policy uncertainty.
- They use the recovered policy index as a first variable in a VAR with US macro variables.
- They build a **DSGE** model to replicate the IRF obtained from the VAR.

Our contribution

- We focus on **Italy**, looking at quarterly data from 1980 to 2014.
- Differently from Villaverde et al. , we look at the **overall (cyclically-adjusted) fiscal stance**, not just at some of its components.
- We follow Giordano et al. (2007) by looking at **cash data**, instead of accruals.
- Cash data have several advantages: long time series; available on a quarterly basis; public debt is only computed on a cash basis.
- Cash data, contrary to accrual data, are available to the decision maker in **real time**.
- We have shocks to both the **level and the volatility** of the fiscal stance, Giordano et al. (2007) only have level shocks.

Our contribution

- Giordano et al. (2007) include more than one fiscal variable in their VAR: current spending on good and services, public wages, net taxes.
- It turns out that our level shock series, although recovered in a completely different framework, correlates significantly with those in Giordano et al (2007). In particular, and as expected, it **correlates positively** with their **tax shock** series and **negatively** with their **expenditure shocks** series.
- The GDP response to an increase in the fiscal level shock in our VAR is not statistically different to what Giordano et al. (2007) find for a government purchases shock (the fiscal variable which is more influential in their VAR).

What do we do operationally

- We **estimate a fiscal policy rule** which encompasses shocks to both the level and the volatility.
- We recover the time series of the **two shocks**.
- We estimate a **VARX and a VAR** model where the two series of the shocks previously recovered enter as exogenous variables in the former and as endogenous in the latter.
- Finally, we obtain the **impulse response functions** to a shock in the level and in the volatility of the CAPB.

The state-space model of the fiscal rule

We estimate the following two-equations **state-space model**:

$$fis_t = \beta_1 debt_{t-1} + \beta_2 gap_{t-1} + \beta_3 fis_{t-1} + e^{h_t} u_t \quad u_t \sim N(0,1)$$

$$h_t = \alpha_0 + \rho h_{t-1} + \gamma \varepsilon_t \quad \varepsilon_t \sim N(0,1)$$

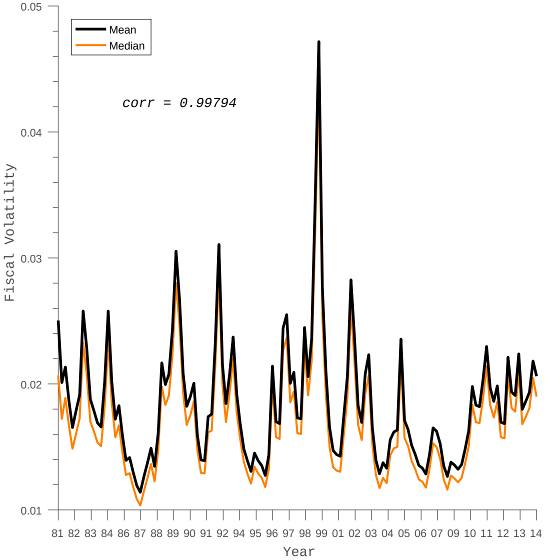
The **non-linearity in the observation equation** forces us to use non linear methods. Among those available we pick the **particle filter**.

Why a Particle Filter?

The measurement equation has a **non-linear component** that *precludes* using the Kalman Filter, which requires linearity.
Alternatives:

- **Particle Filter**
  - Relatively easy to implement.
  - Flexible, can estimate almost any kind of non-linear specification.
- **Extended Kalman Filter**
  - Easy to implement.
  - Closed form.
  - Much worse performances in tracking the hidden state than the particle filter.
- **MCMC**
  - Not easy to implement.
  - DGP-specific algorithms (i.e. rigid).

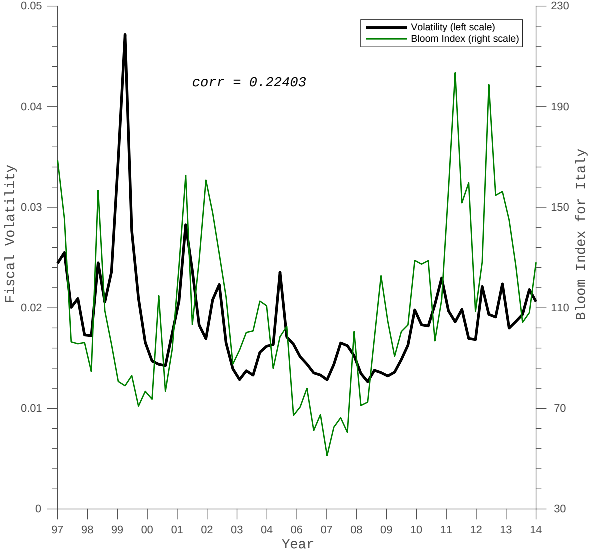
Our volatility series



Our volatility series

- **1980s**: two well-known episodes of turbulence related to public finances: at the end of **1982** the Bank of Italy **refused to buy government securities** unsold on the primary market; in **1985** (summer), a State entity **struggled to repay** a dollar-denominated loan.
- **1990s**: in the second half of **1992**, the **twin crisis** materialized (balance-of-payments and sovereign debt crisis); in the first half of 1999, the launch of the **EMU**, the introduction of the **Stability and Growth Pact**, the uncertain rebate of the **eurotax**.
- **2000s**: a significant turning-point in fiscal policy, as the Parliament approved the first expansionary budget in years.

Our volatility series VS Baker et al.



Our volatility series vs Baker et al.

- The **correlation** between the two is equal to about 27%.
- The **main differences** between the two indices are related with two episodes: between 2011 and 2013, during the most acute phase of the Euro area sovereign debt crisis, the Baker et al. (2016) index records a larger increase in uncertainty than our FPU index; on the contrary, in 1999, corresponding to the launch of the Euro, the increase in FPU is more pronounced.
- The uncertainty shock we identify is a pure FPU shock, while the one recovered in Baker et al. (2016) **mixes** uncertainty stemming from fiscal policy with a generic economic policy uncertainty stemming from several other sources.

The VARX and the VAR

We estimate a VAR with the same macro variables used in Giordano et al. (2007).

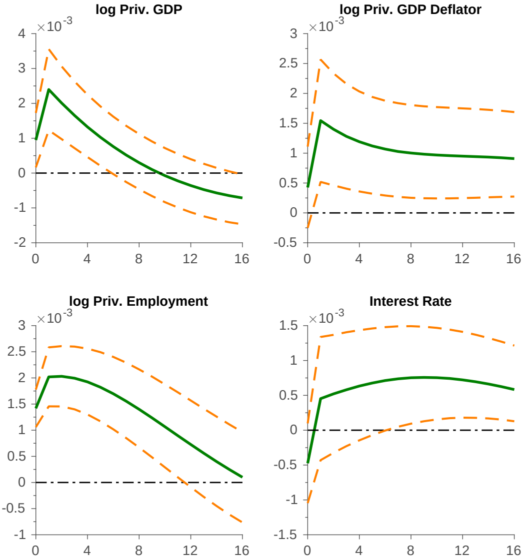
$$Y_t = \delta_0 + \delta_1 t + \delta_2 t^2 + A(L)Y_{t-1} + b(L)\chi_t + c(L)\mu_t + \upsilon_t$$

where the vector Y_t contains the log of real private GDP, the log of the private GDP deflator, log private employment and the 10 years Government bond yields. The variables χ_t and μ_t are respectively the fiscal level shock and the FPU determined outside the system of the equations. δ_0, δ_1 and δ_2 are vectors of coefficients, while $A(L)$ is a polynomial matrix in the lag operator and $B(L)$ and $C(L)$ are finite-order polynomials in the lag operator L.

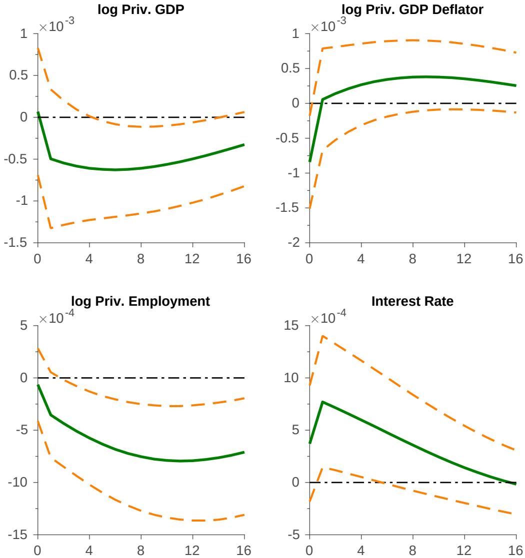
The VARX and the VAR

- Our system is estimated using standard **Bayesian techniques**. In particular, we use a **non-informative prior** (Jeffrey's prior) distribution on the parameter space and an **inverse Wishart** distribution as the conjugate prior for the covariance matrix. Antithetic acceleration is then used to improve convergence of the **Monte Carlo draws**.
- We feed the estimated model with a **one-standard-deviation shock** on the unexpected variations in the cyclically adjusted primary balance (as a fraction of GDP) or, alternatively, a shock in unexpected FPU (i.e. the shocks to the log-volatility of the innovations to the budget balance).

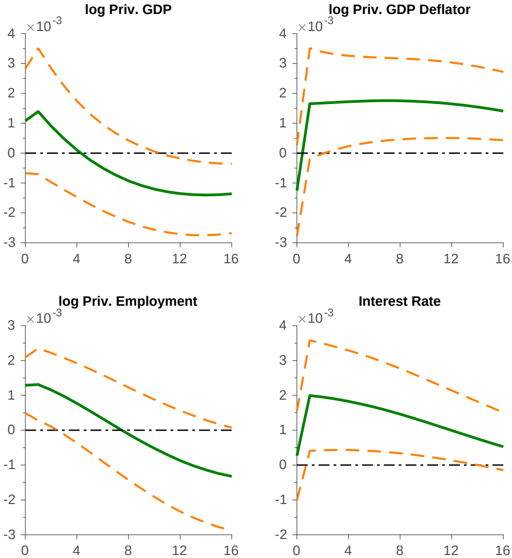
The VARX IRF: the level shock



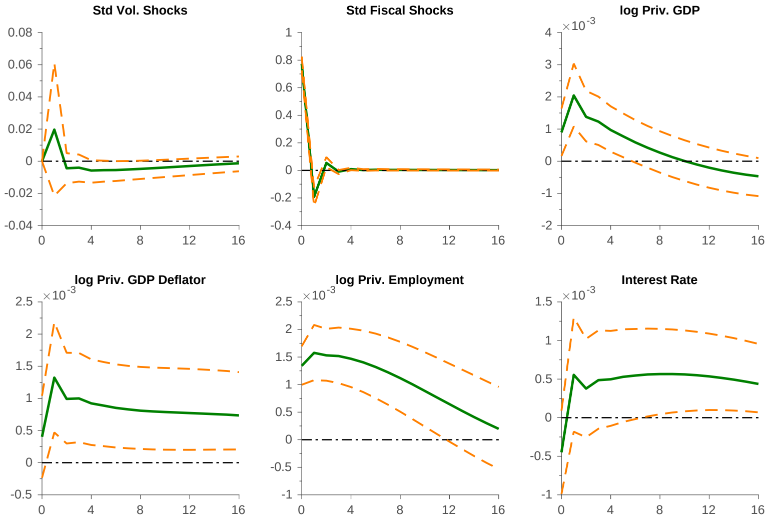
The VARX IRF: the volatility shock



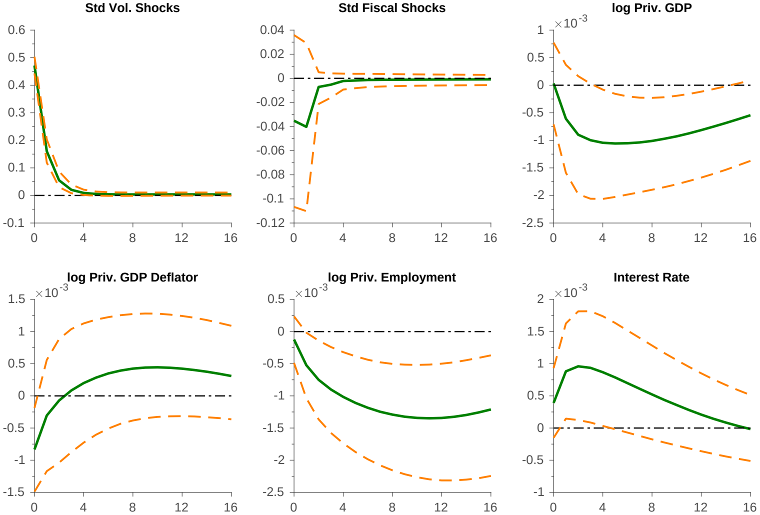
The VARX IRF: joint shocks



The VAR IRF: the level shock



The VAR IRF: the volatility shock



ROBUSTNESS: Ordering

- **Ordering of the variables. -** We checked that changing the order of the variables in the VAR does not change the results.

ROBUSTNESS: Subsample

- **Subsample stability**. - We run the same empirical model excluding the **pre-EMU** period (the eighties and the nineties). Empirical results are virtually unchanged although the statistical significance is reduced due to the loss of degrees of freedom.

ROBUSTNESS: Different measure

- **Different measures of fiscal stance**. - We estimated the fiscal rule with different measures of budget deficit (a similar ”eclectic” approach can be found in Fatàs and Mihov, 2012). In particular, volatility estimates are robust to using the following dependent variables instead of the cyclically adjusted primary balance: total balance (i.e. including interest outlays), change in the total balance, change in the CAPB, cyclically-*un*adjusted primary balance, change in the cyclically-*un*adjusted primary balance.

ROBUSTNESS: Different specification

- **Different specifications of the fiscal reaction function. -** We augmented our fiscal rule including a dummy series for **regular and one for snap election** and found that none of the two is significant. Our fiscal volatility measure was not affected either.

ROBUSTNESS: Egarch

- **EGARCH approach. -** Using a simple EGARCH approach, we find that the time profile of the two volatility series is not completely dissimilar but the EGARCH model is **unable to disentangle** the shock to the level from the shock to the volatility.

Work in progress: a new measure of FPU

- Our aim is to construct a forward looking measure of fiscal policy uncertainty.
- We calculate the standard deviation σ_t of the Budget Balance *monthly* forecasts taken from **Consensus Economics** (CE).
- We use the residuals of the below regression as fiscal policy uncertainty shock.

$$\log(\sigma_t) = \beta_0 + \sum_{k=1}^{p} \beta_k \log(\sigma_{t-1}) + \beta_{p+1} \left| \mathbb{E}_{t-1|t-2}(b) \right| + \eta_t$$

- The correlation with FPU is about 10%; it increases to 33% if one only considers the EMU period.
- New estimates forthcoming.

Thank you!