A non-admitted role of central banks: Debt-dependent quantitative monetary policies

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  - fiscal policy instruments react to public debt
  - monetary (nominal interest rate) policy reacts to inflation
  - typically, this policy mix ensures stability and determinacy.

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- It seems that the politically unpleasant task of debt sustainability has fallen on Central Banks.

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- We explore the possibility that quantitative monetary policies can substitute tax-spending debt stabilization policies when it comes to stability and determinacy.

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- We explore the possibility that quantitative monetary policies can substitute tax-spending debt stabilization policies when it comes to stability and determinacy.
- We do so in the context of a rather standard New Keynesian general equilibrium model solved using common parameter values and data from the EZ.

How we work

- Step A: We shock the initial steady state by assuming an adverse supply shock (to mimic an economic disaster) and, at the same time, an increase in government transfers (to mimic the usual fiscal stimulus that counters economic disasters) - see Hall and Sargent (2021).

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    - A policy instrument needs to react to outstanding public debt to restore stability.
- Step B: We experiment with different debt-contingent policy instruments, both fiscal and (quantitative) monetary.

Literature on fiscal-monetary policy interactions

- Leeper (1991)
- Reis (2016, 2017)
- Coenen et al (2018, 2020)
- Masuch et al (2018)
- Sims and Wu (2020)
- Bassetto and Sargent (2020)
- Hall and Sargent (2021)

Our model

- **Households**

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  - consume, hold currency and can keep deposits at private banks. They also own the private firms and banks and so receive their profits. They face a cash-in-advance constraint. ▸ households

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    - which means that market segmentation and costly financial intermediation give rise to asset pricing wedges and imperfect substitutability that break Wallace's (1981) neutrality proposition and give a real role to quantitative monetary policies (Walsh, 2017, chapter 11, for a review)

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  - In simple words, the issuance of liabilities is used to finance, via loans to private banks, loans to private companies and national governments, via government bonds purchases in the secondary market.

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  - The end-of-period government bonds follow residually to close the Treasury's budget constraint.

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  - The lack of "fiscal backing" in the EZ implies that the CB's dividends to Treasury, n_t, is an exogenous policy instrument (see Del Negro and Sims (2015), Hall and Reis (2017)). Also, the lack of "fiscal support" in the EZ, implies the non-negativity constraint: $n_t \geq 0$.

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  - To the extent that currency held by the non-bank public and reserves, as well as central bank loans held by private banks are demand determined, the central bank's budget constraint can provide an extra equation to determine the inflation rate or the price level.

Fiscal policy rules

- We adopt a rule-like approach to policy where the exogenous policy instruments, in addition to a conventional exogenous $AR(1)$ component, can also react to debt imbalances.
- The rules of the tax-spending instruments are:

$$s_t = \rho^s s_{t-1} + (1 - \rho^s)\, s - \gamma^s \left(\frac{b_t}{y_t} - \frac{b}{y} \right)$$

$$\tau_t = \rho^\tau \tau_t + (1 - \rho^\tau)\, \tau_{t-1} + \gamma^\tau \left(\frac{b_t}{y_t} - \frac{b}{y} \right)$$

Monetary policy rules

- The policy rates, i_t^z and i_t^r, follow Taylor type rules of the form:

$$\log(1+i_t) = (1-\rho)\log(1+i) + \rho\log(1+i_{t-1}) + \gamma^{\pi}\log(\pi_t/\pi)$$

- The central bank purchases in the secondary market the fraction $(1-\Lambda_t)$ of outstanding government bonds, at a constant price Φ_t, where $(1-\Lambda_t)$ satisfies:

$$\Phi_t(1-\Lambda_t)\frac{p_{t-1}}{p_t}b_{t-1} = B_t y_t$$

and

$$B_t = \rho^B B_{t-1} + \gamma^B\left(\frac{b_t}{y_t} - \frac{b}{y}\right)$$

Monetary policy rules (cont'ed)

- The CB pays out to Treasury its non-negative net income every period (see e.g. Reis, 2016, 2017):

$$n_t = \left(m_{h,t} - \frac{p_{t-1}}{p_t} m_{t-1} \right) + i_t^z \frac{p_{t-1}}{p_t} z_{p,t-1} + \\ + i_t^b (1 - \Lambda_t) \frac{p_{t-1}}{p_t} b_{t-1} - i_t^r \frac{p_{t-1}}{p_t} m_{p,t-1}$$

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- Compute long-run output multipliers.
- Deterministic (perfect foresight equilibrium); non-linear dynamics; use dynare toolbox.

The impact of economic policy

- To quantify the impact of the different policies on the economy, we plot of the Impulse Response Functions (IRFs) of the main macroeconomic variables and calculate a "multiplier" (close to Uhlig's, 2010, multipliers), φ_t, which is given by:

$$\varphi_t = \sum_{s=0}^{t} \frac{y_s - y}{(1 + i_b)^s}$$

- We have experimented with other criteria, like the discounted lifetime utility in terms of consumption equivalents (see e.g. Lucas (1990)) and the the welafre losses (see e.g. Schmitt-Grohé and Uribe (2007)), and the results are quantitatively close.

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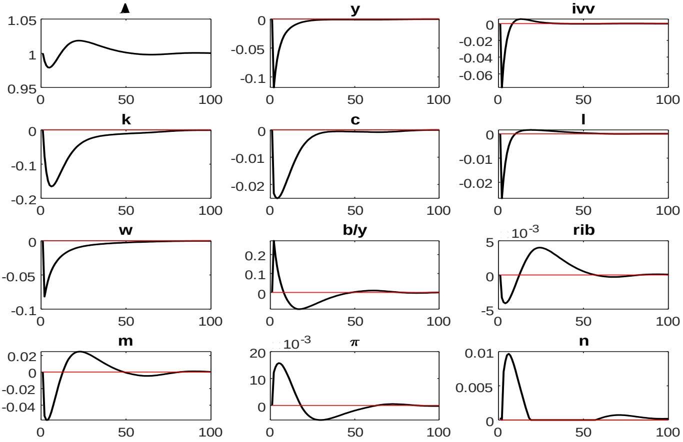
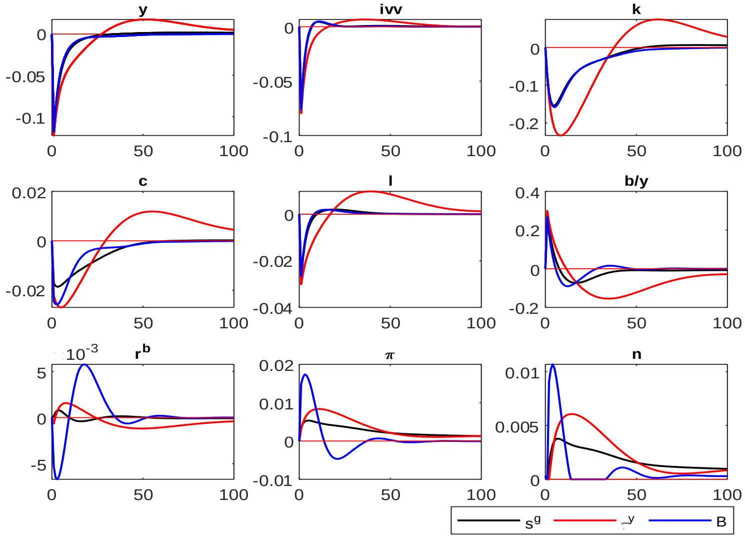
    - we switch off fiscal reaction to debt and allow CB's government bonds' purchases in the secondary market to react to debt imbalances.
- For all policy rules considered we set the persistence parameter $\rho = 0.8$, while we set the feedback parameter, γ, to the lowest possible value that ensures dynamic stability.

CB's government bond purchases



Fiscal and monetary policy instruments



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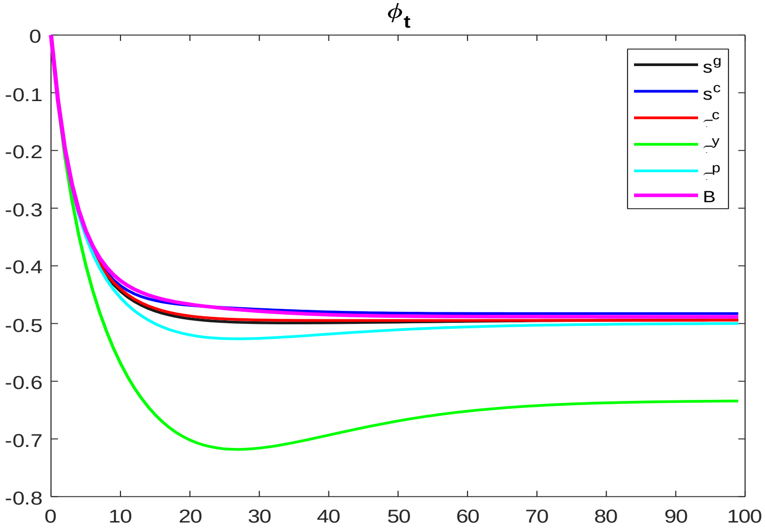

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- But this:
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  - makes debt-to-GDP ratio more volatile: the ratio de-escalates quickly in the short-run but increases again in the medium-run when the CB sells government bonds
  - comes at a cost of higher inflation.

Possible extensions

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- Thank you for your attention

Budget constraint:

$$(1+\tau_t^c)c_{h,t} + j_{h,t} + m_{h,t} =$$
$$= (1-\tau_t^y)w_t l_{h,t} + (1+i_t^d)\frac{p_{t-1}}{p_t} j_{h,t-1} + \frac{p_{t-1}}{p_t} m_{h,t-1} + \pi_{h,t} + g_t^t$$

Cash-in-advance constraint:

$$m_{h,t} \geq (1+\tau_t^c)c_{h,t}$$

households

Final good firms

Standard Dixit-Stiglitz technology:

$$y_{f,t} = \left[\sum_{i=1}^{N} \frac{1}{N} (y_{i,t})^{\theta} \right]^{\frac{1}{\theta}}$$

Real profits:

$$\pi_{f,t} = y_{f,t} - \sum_{i=1}^{N} \frac{1}{N} \frac{p_{i,t}}{p_t} y_{i,t}$$

private firms

Intermediate good firms

Net profit:

$$\pi_{i,t} = (1-\tau_t^{\pi})[\frac{p_{i,t}}{p_t}y_{i,t} - w_t l_{i,t}] - x_{i,t} -$$

$$-\frac{\xi^p}{2}\left(\frac{p_{i,t}}{p_{i,t-1}} - 1\right)^2 \overline{y}_{i,t}^h + \left(L_{i,t}^h - [1 + i_t^l(1-\tau_t^{\pi})]\frac{p_{t-1}}{p_t}L_{i,t-1}^h\right)$$

Production function:

$$y_{i,t} = A\left(k_{t-1}^g\right)^{\sigma}\left(k_{i,t-1}^{\alpha} l_{i,t}^{1-\alpha}\right)^{1-\sigma}$$

Intermediate good firms

The law of motion of the firm's capital stock:

$$k_{i,t} = x_{i,t} + (1 - \delta)\, k_{i,t-1}$$

Borrowing constraint:

$$L_{i,t} \geq \eta w_t l_{i,t}$$

Demand for product:

$$p_{i,t} = p_t \left(\frac{y_{i,t}}{y_{f,t}} \right)^{\theta - 1}$$

private firms

Private banks

The budget constraint of each bank that connects changes in its assets and liabilities is:

$$\pi_{p,t} = (1-\tau_t^{\pi})\left[(1+i_t^l)\frac{p_{t-1}}{p_t}L_{p,t-1} + (1+i_t^r)\frac{p_{t-1}}{p_t}m_{p,t-1} + (1+i_t^b)\frac{p_{t-1}}{p_t}\Lambda_t b_{p}\right.$$

$$\left. + \Phi_t\frac{p_{t-1}}{p_t}(1-\Lambda_t)b_{p,t-1} - (1+i_t^d)\frac{p_{t-1}}{p_t}j_{p,t-1} - (1+i_t^z)\frac{p_{t-1}}{p_t}z_{p,t-1} - \Xi_t\right] -$$

$$- L_{p,t} - b_{p,t} - m_{p,t} + j_{p,t} + z_{p,t}$$

where

$$\Xi_t = \frac{\xi^l}{2}(L_{p,t-1})^2 + \frac{\xi^b}{2}(\Lambda_t b_{p,t-1})^2 +$$
$$+ \frac{\xi^m}{2}\left(m_{p,t-1} + \Phi_t(1-\Lambda_t)b_{p,t-1}\right)^{-2} + \frac{\xi^z}{2}(z_{p,t-1})^2$$

private banks

The Government budget constraint

The flow budget constraint of the government written in per capita and real terms is:

$$g_t^c + g_t^g + g_t^t + (1 + i_t^b)\frac{p_{t-1}}{p_t} b_{t-1} = b_t + \frac{T_t}{N} + n_t$$

Total tax revenues in real terms are defined as:

$$\frac{T_t}{N} \equiv \tau_t^c c_{h,t} + +\tau_t^y w_t l_{h,t} + \tau_t^\pi (y_{i,t} - w_t l_{i,t}) +$$

$$+\tau_t^\pi [(1 + i_t^l)\frac{p_{t-1}}{p_t} L_{p,t-1} + (1 + i_t^r)\frac{p_{t-1}}{p_t} m_{p,t-1} +$$

$$+(1 + i_t^b)\frac{p_{t-1}}{p_t} \Lambda_t b_{p,t-1} + \Phi_t \frac{p_{t-1}}{p_t} (1 - \Lambda_t) b_{p,t-1} -$$

$$-(1 + i_t^d)\frac{p_{t-1}}{p_t} j_{p,t-1} - (1 + i_t^z)\frac{p_{t-1}}{p_t} z_{p,t-1} - \frac{p_t^h}{p_t} \Xi_t]$$

▸ treasury

The central bank

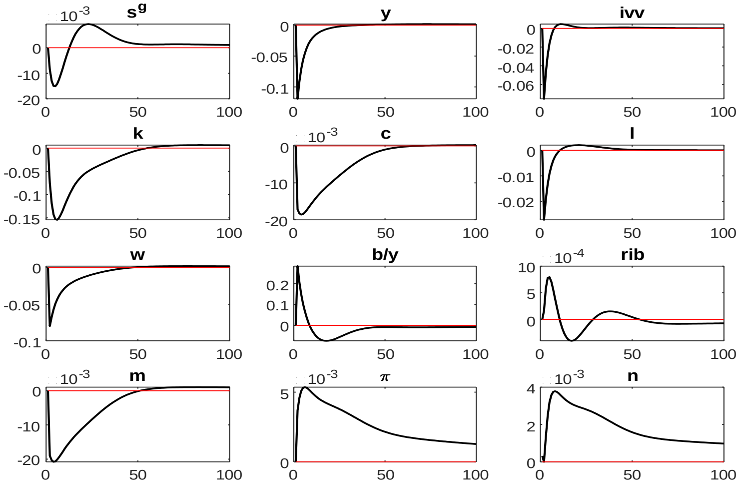
The budget constraint of the CB linking changes in assets and liabilities is (written in real and per capita terms):

$$\Phi_t(1-\Lambda_t)\frac{p_{t-1}}{p_t}b_{t-1} + z_{p,t} + i_t^r\frac{p_{t-1}}{p_t}m_{p,t-1} + n_t \equiv$$

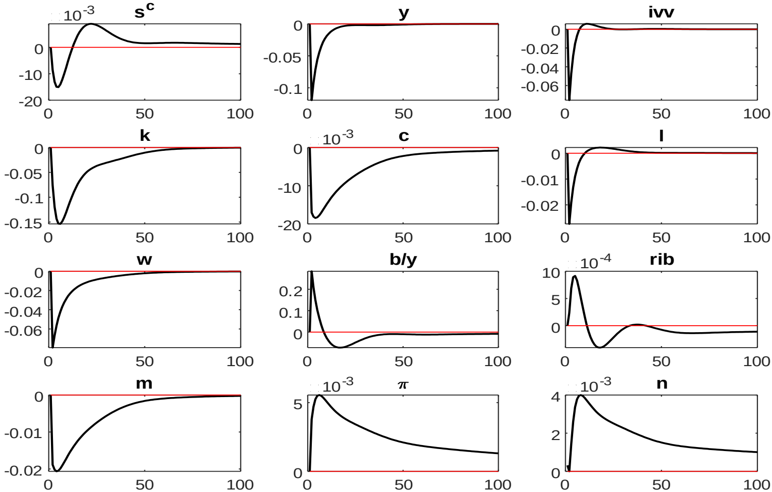
$$\equiv (1-\Lambda_t)(1+i_t^b)\frac{p_{t-1}}{p_t}b_{t-1} + (1+i_t^z)\frac{p_{t-1}}{p_t}z_{p,t-1} + m_t - \frac{p_{t-1}}{p_t}m_{t-1}$$

▸ central bank

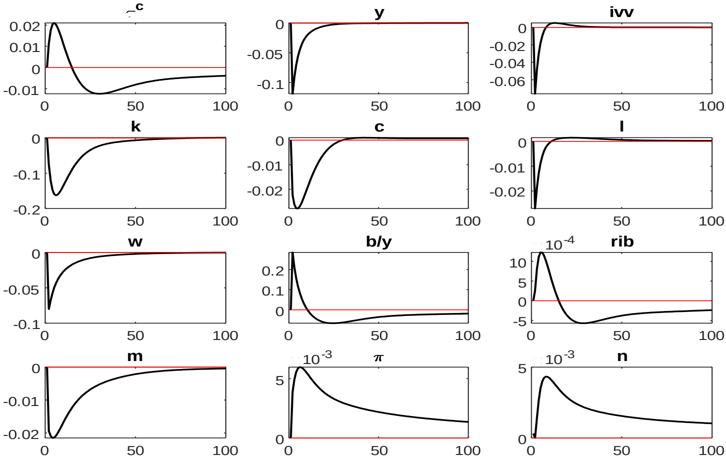
Government investment



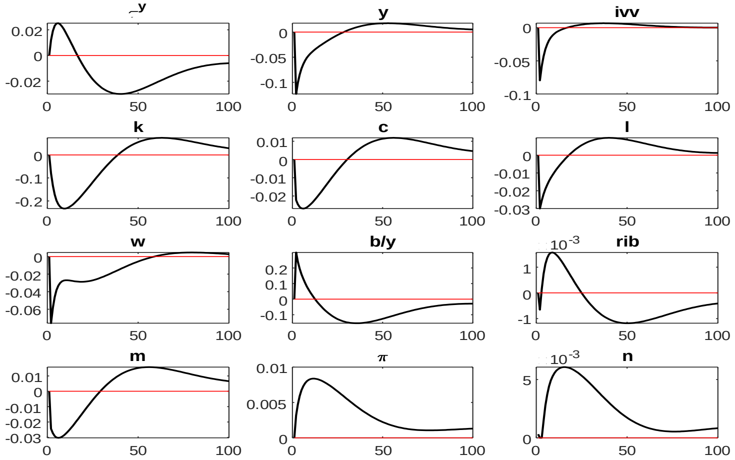
Government consumption



Consumption tax rate



Income tax rate



Profit tax rate