

Fiscal Shocks and Helicopter Money in Open Economy

Giorgio Di Giorgio

(LUISS and CASMEF)

Guido Traficante

(European University of Rome and CASMEF)

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Introduction and Motivations

- After the crisis, central banks followed conventional and unconventional policies
- In the same time expansionary fiscal policy (higher structural deficits and public debts)
- These policies, however, were not always successful in helping a rapid recovery in aggregate demand
- The Federal Reserve reacted to the subprime mortgage crisis by creating innovative facilities to provide liquidity to financial markets and institutions, before starting a long series of quantitative easing programs that quintupled its balance sheet with respect to the 2007 level
- The European Central Bank moved first by simply modifying the technical features of some of its instruments before undertaking a true cultural revolution in 2015 with the adoption of a quantitative easing policy

Introduction and Motivations

- During the Great Recession many governments also relied on fiscal policies in order to sustain aggregate demand
- Such interventions increased structural deficits and, in turn, public debts (at the end of 2014 issuances of government debt were about eighty percent higher at a global level with respect to 2007)
- Such policies, however, were not always successful in helping a rapid recovery in aggregate demand: output, employment and inflation have not reached their target level for a long time on both sides of the Atlantic
- Revived interest in policy measures that may stimulate the economy without using the nominal interest rates and without inducing further increases in government debt
- The idea of a Friedman “helicopter drop”, i.e. a money-financed fiscal stimulus was suggested by Lord Turner and considered by Buiter (2014), Reichlin, Turner and Woodford (2013) and Galí (2017)

- Analysis of money-financed fiscal stimuli in open economy: international dimension of this unconventional policy
- Two-country model where domestic country only is allowed to conduct helicopter drops of money
- Perpetual youth structure of the demand side: fiscal policy produces relevant wealth effects

Our main results

- The increase in public spending is more expansionary under monetary financing
- Sticky prices and the degree of openness are crucial in determining the size of expansionary effect on output
- Similarly, a tax cut is more expansionary if it is money-financed rather than debt-financed

- The model
- The equilibrium
- The different financing schemes of fiscal policies
- Simulation
- Concluding comments

A two-country New-Keynesian DSGE model

- Perpetual youth structure of the demand side
- A constant share γ of traders in the financial markets are randomly replaced by newcomers with zero-financial wealth
- From that period onward, these newcomers start trading in the financial markets and face a constant probability γ of being replaced as the next period begins
- Each domestic household belonging to cohort j supplies labor inputs to firms, demands consumption goods and real money balances in order to maximize

$$E_0 \sum_{t=0}^{\infty} \beta^t (1 - \gamma)^t \left[\log C_t(j) + \delta \log(1 - L_t(j)) + \chi \log \left(\frac{M_t(j)}{P_t} \right) \right]$$

- Home bias in private consumption implies endogenous fluctuations in the real exchange rate
- For a household belonging to cohort j , the consumption index is a bundle of domestic and imported goods:

$$C(j) = \left[\kappa^{\frac{1}{\theta}} C_H(j)^{\frac{\theta-1}{\theta}} + (1 - \kappa)^{\frac{1}{\theta}} C_F(j)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$
$$C^*(j) = \left[(1 - \kappa)^{\frac{1}{\theta}} C_H^*(j)^{\frac{\theta-1}{\theta}} + \kappa^{\frac{1}{\theta}} C_F^*(j)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

- The CPI will be

$$P = \left[\kappa P_H^{1-\theta} + (1-\kappa) P_F^{1-\theta} \right]^{\frac{1}{1-\theta}} \quad P^* = \left[(1-\kappa) P_H^{*1-\theta} + \kappa P_F^{*1-\theta} \right]^{\frac{1}{1-\theta}}$$

- The Law of One Price holds and the real exchange rate $Q \equiv \mathcal{E} P^* / P$ measures the deviations from PPP
- We define the Terms of Trade as the relative price of foreign goods in terms of home goods ($\mathcal{S} \equiv P_F / P_H = P_F^* / P_H^*$).

- Households allocate savings among a full set of domestic state-contingent private securities and two one-period riskless bonds issued by the governments

$$P_t C_t(j) + E_t \{ \mathcal{F}_{t,t+1}^H Q_{H,t}(j) \} + B_{H,t}(j) + \mathcal{E}_t B_{F,t}(j) + M_t(j) \leq$$

$$\frac{1}{1-\gamma} \left[(1 + i_{t-1}) B_{H,t-1}(j) + \mathcal{E}_t (1 + i_{t-1}^*) B_{F,t-1}(j) + Q_{H,t-1}(j) + M_{t-1}(j) \right] + W_t L_t(j) + P_t D_t(j) - P_t T_t(j)$$

- In equilibrium

$$C_t = \sigma E_t \{ \mathcal{F}_{t,t+1} \Omega_{t+1} \} + \frac{1}{\beta} E_t \{ \mathcal{F}_{t,t+1} (1 + \pi_{t+1}) C_{t+1} \}$$

The government

- The government consumes an exogenously given amount of domestic goods

$$G_H(h) = \left(\frac{P_H(h)}{P_H} \right)^{-\epsilon} G$$

$$G_F^*(f) = \left(\frac{P_F^*(f)}{P_F^*} \right)^{-\epsilon} G^*$$

Government's consolidated budget constraint and the supply side

- Government consumption can be financed by levying lump-sum taxes to domestic households, by seigniorage and by issuing one-period nominal debt denominated in local currency:

$$B_t + M_t - M_{t-1} = (1 + i_{t-1})B_{t-1} + P_t Z_t$$
$$Z_t \equiv \frac{P_{H,t}}{P_t} G_t - T_t$$

- Each firm producing brand h and f has access to a linear technology:

$$Y_{H,t}(h) = N_t(h), \quad Y_{F,t}^*(f) = N_t^*(f).$$

- Sticky prices à la Calvo, with the probability ϑ to charge last period's price

The equilibrium

The linear model

- The model is linearized around zero inflation and zero deficit symmetric steady state

- Aggregate consumption

$$c_t = E_t c_{t+1} - \alpha(r_t - E_t \pi_{t+1} - \rho) + \sigma E_t \omega_{t+1}$$

- Net foreign asset position

$$nfa_t = \frac{1}{\beta} nfa_{t-1} + \frac{1}{2}(y_t^R - g_t^R - c_t^R) - \alpha(1 - \kappa)s_t$$

- NKPC $\pi_{H,t} = \beta E_t \pi_{H,t+1} + \lambda mc_t$

- Real marginal cost $mc_t = \frac{1}{\alpha} c_t + \varphi y_{H,t} + (1 - \kappa)s_t$

- Demand $y_{H,t} = 2\alpha\theta\kappa(1 - \kappa)s_t + \kappa c_t + (1 - \kappa)c_t^* + g_t$

- Two policy makers: a central bank and a fiscal authority

The linear model

- Equilibrium dynamics of public debt and definition of primary deficit

$$b_t + m_t - m_{t-1} = \beta^{-1} b_{t-1} + z_t$$
$$z_t = g_t - \tau_t - (1 - \alpha)(1 - \kappa)s_t$$

- When country H uses debt to finance fiscal policy, monetary policy follows a Taylor rule

$$i_t = \rho + \phi_\pi \pi_{H,t} + \phi_x x_t + u_{m,t}$$

- Fiscal policy is characterized by an exogenous autoregressive tax rule

$$\tau_t = \zeta_b b_{t-1} + u_{z,t}$$

- In the case of an helicopter drop in country H

$$\frac{\Delta M_t}{P_t} = Z_t \quad \text{or} \quad \Delta m_t = V z_t$$

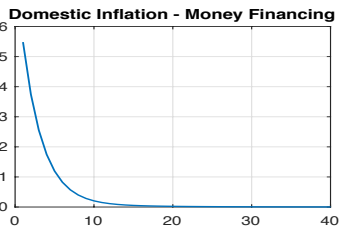
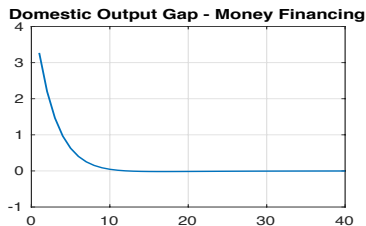
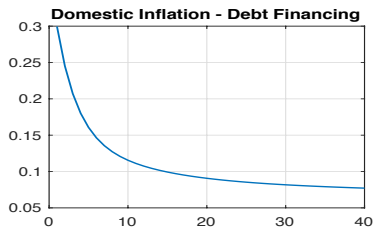
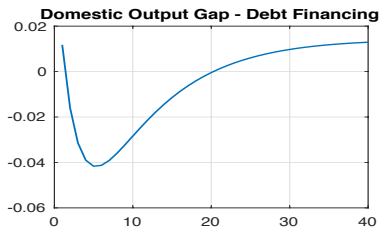
where $m_t \equiv \log M_t$, and $V = PY/M$ is the steady state income velocity of money. In this regime, the interest rate adjusts accordingly and taxes are irrelevant

- Quarterly frequency, based on previous studies and convention
- $V = 3$ as in Galí (2017). This value corresponds approximatively to the average income velocity in the U.S. and the Euro Area over the period 1960–2015, taking values referred to the monetary base
- Taylor rule coefficients (absent monetary financing): $\phi_\pi = \phi_\pi^* = 2$, $\phi_x = \phi_x^* = 0.1$, $\sigma_m = \sigma_m^* = 0.0016$ as in Smets and Wouters (2003, 2007)
- Country F runs balanced budget, the response to lagged real debt $\xi_b = \varrho$, to guarantee fiscal solvency

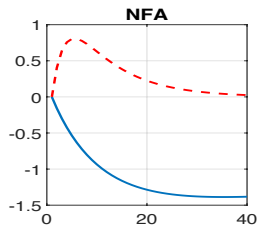
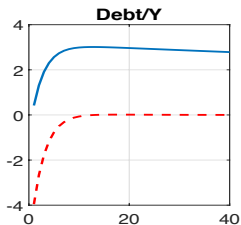
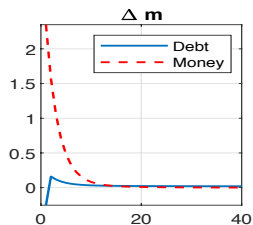
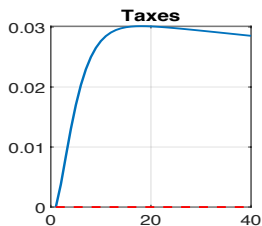
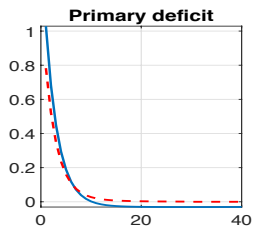
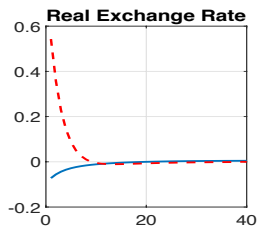
We consider different fiscal experiments

- 1 Debt-financed increase in public spending;
- 2 Money-financed increase in public spending;
- 3 Debt-financed tax cut;
- 4 Money-financed tax cut;

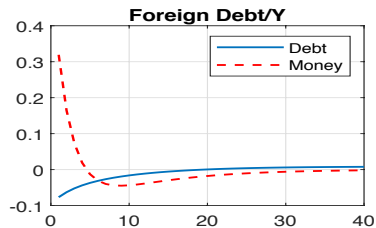
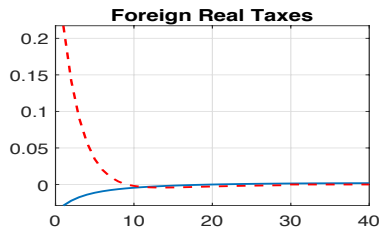
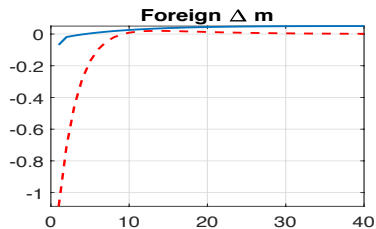
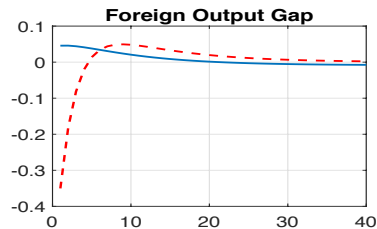
Increase in public spending: money versus debt financing



Increase in public spending: money versus debt financing



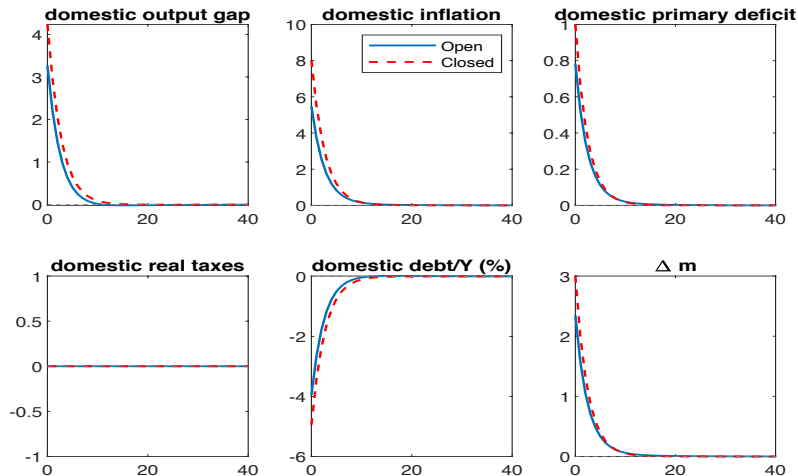
Transmission to Foreign country



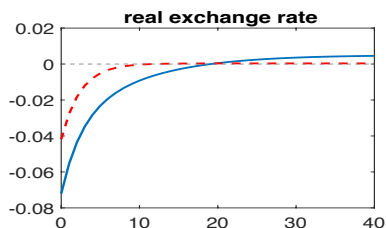
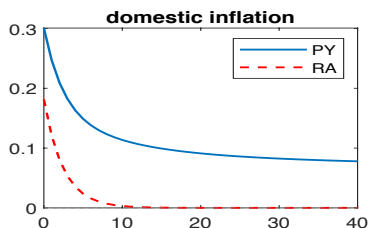
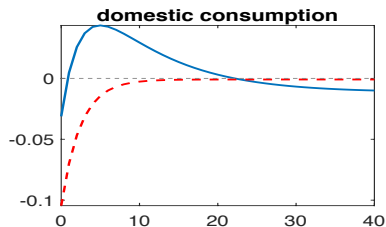
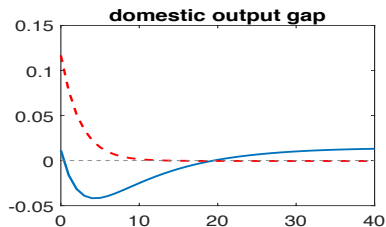
Differences between the two financing schemes

- With debt, the real exchange rate appreciates on impact and limits the expansionary effect of the fiscal shock
- The persistent decline in the NFA position depends on the lower competitiveness and on the weak response to the stock of public debt
- With money, the pressure towards the real appreciation is more than offset by the increase in money supply
- Even if domestic inflation increases, the nominal depreciation is much stronger and induces a depreciation also in the real exchange rate
- The surplus in the trade balance is coupled with an improvement in the NFA position

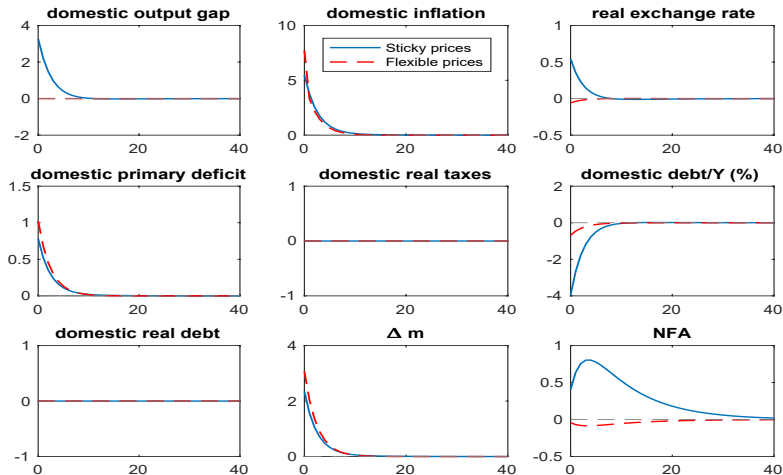
Money-financed increase in public spending: open versus closed economy



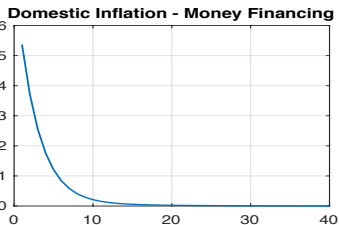
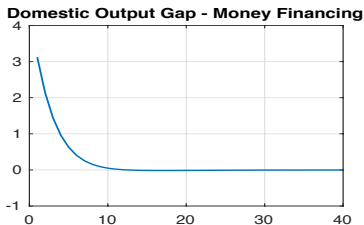
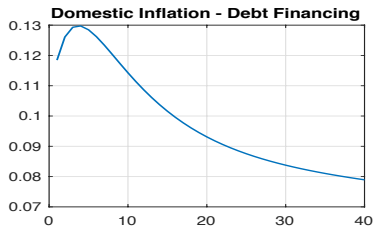
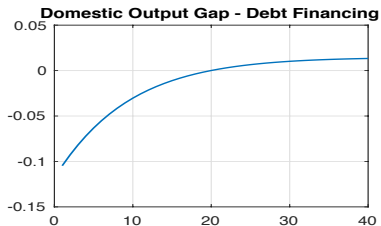
Debt-financed increase in public spending: perpetual youth vs representative agent



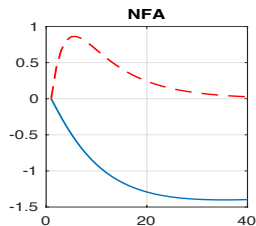
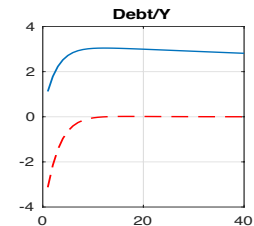
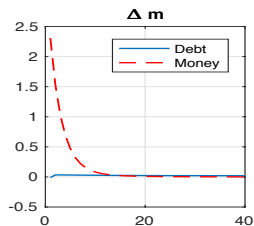
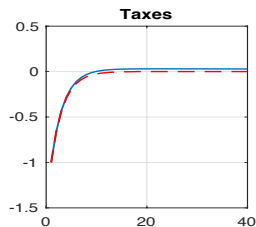
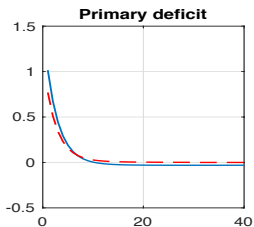
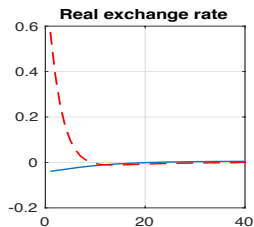
Money-financed increase in public spending: the role of price rigidity



Tax cut: money versus debt financing



Tax cut: money versus debt financing



Summary of the results

- An increase in public spending is more expansionary when it is money financed
- This happens because, compared to the case of a debt-financing, the increase in money supply offsets the appreciation of the real exchange rate induced by the fiscal shock
- For the foreign country, on the other hand, we observe an output expansion in the case of debt-financed fiscal stimulus at Home and a recession in the case of monetary financing
- The expansion of output is larger on impact in a closed economy and when prices are sticky

Extensions (work in progress...)

- The use of unconventional policies is particularly relevant with the zero lower bound on nominal interest rates
- We simulate the model assuming that the natural interest rate drops to -2% for five quarters, inducing negative values for i_t
- We have a negative demand shock whose effect is amplified by the impossibility of lowering the interest rate in negative territory
- Preliminary results show that a money-financed fiscal stimulus is more effective at dampening the negative effects of the natural rate shock on output and inflation.