Macroeconomics

Fiscal and Monetary Policy Interdependence

Nicola Viegi

September 2017

Introduction

- Fiscal Policy back at the centre of policy discussions
- Theory of Fiscal Policy not well developed
  - Ricardian Equivalence (fiscal policy irrelevant) – very present in current debates
  - Old Keynesian (Static Multipliers) do not consider potential effects of expected fiscal and monetary policy response to future fiscal imbalances (Perrotti – Fiscal Policy in Good and Bad Times)
- Modern macro emphasize Inter-temporal Relationships
- Monetary and Fiscal Policy are not independent as long as one effect expectations about the other

Introduction

- This Lecture
  - Sargent Wallace Unpleasant Monetarist Arithmetic (first example of studying intertemporal relationship between policy instruments)
  - New Fiscal Theory of Price Determination - The government budget constraint is not a constraint but an equilibrium relationship

Sargent Wallace Unpleasant Monetarist Arithmetic

The main objective of the paper was to show that, even in a pure monetarist framework, unbounded fiscal policy produces negative spillover effects on monetary policy, and ultimately it can undermine the ability of monetary policy to control inflation.

This conclusion largely based on the "assumption" that permanent budget deficits must be monetized.

Not surprisingly, with an exogenous stream of budget deficits, there is only one integral of money creation that is consistent with long run equilibrium, and the only choice in the hand of the monetary authority is the time profile of money creation.

Very Simple Model

Together with a Cagan type model of inflation can explain a lot of Hyperinflation experiences (and their persistence)

Sargent Wallace Unpleasant Monetarist Arithmetic

Very Simple Model

Quantity Theory of Money

$$P_t = \frac{1}{k} M_t$$

Government Budget Constraintfi..

$$D_{t+1} = (1+r)D_t + G_t - \frac{M_{t+1} - M_t}{P_t}$$

...in term of Growth Rate of Money $\frac{M_t - M_{t-1}}{P_t} = \frac{M_t - M_{t-1}}{M_t} \frac{M_t}{P_t} = \mu_t \frac{M_t}{P_t}$

$$D_{t+1} = (1+r)D_t + G_t - k\mu_t$$

Sargent Wallace Unpleasant Monetarist Arithmetic

Integrating Forward

$$D_t + \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} G_t = \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} (k\mu_s)$$

that, given a constant level of budget deficits and the constant real interest rate , can be rewritten as :

$$D_t + \frac{1+r}{r} G = \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} (k\mu_s)$$

The Choice of the Central Bank: choose the time profile of money growth

Sargent Wallace Unpleasant Monetarist Arithmetic

Central Bank Problem $$L_{CB} = \sum_{s=t}^{\infty} \beta^{s-t} (\mu_s)^2$$

Solution: constant inflation rate : $$\mu = \frac{1}{k}\left(\frac{r}{1+r} D_t + G\right)$$

Any other path would be suboptimal.

Consider for example a bank wanting to maintain zero inflation up to time T.
At time T Debt would be equal to

$$D_T = (1+r)^{T-1} D_t + \sum_{s=t}^{T} (1+r)^{s-t-1} G$$

And inflation equal to $$\mu = \frac{1}{k}\left(\frac{r}{1+r} D_T + G\right) = \frac{1}{k}\left\{\frac{r}{1+r}\left[(1+r)^{T-1} D_t + \sum_{s=t}^{T} (1+r)^{s-t-1} G\right] + G\right\}$$

Sargent Wallace Unpleasant Monetarist Arithmetic

"Without help from the fiscal authorities, fighting current inflation with tight monetary policy must eventually lead to higher future inflation".

The introduction of rational expectations has the effect of anticipating the inflationary pressure at time zero, then eliminating even the possibility to choose the desired time profile of inflation consistent with long run solvency of the public sector

Highly influential Results

Fiscal Criteria born from this analysis

The policy conflict between fiscal and monetary policy can be resolved simply assigning policy leadership to the Central Bank.

Problem

This analysis comes from a Ricardian view of fiscal policy. If Fiscal policy is ineffective, it should be put under control

The crisis shows that fiscal policy have an important part to play – expecially when monetary policy has lost centrality (zero lower bound)

But fiscal policy is complex (many different taxes and spending instruments, issues of debt management, dynamic behaviour central and uncertain, beliefs matter, effects are very long)

Fiscal Policy is political (taxes and spending have direct distributional effects) – need to separate political decisions from the non-political part of fiscal policy

Attempt to a new theory of fiscal and monetary policy interaction (Woodford, Leeper among many others)

Fiscal Theory of the price level

The government budget constraint as an equilibrium condition

$$\frac{B_t}{P_t} = \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} (\tau_s - g_s) + \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} (k\mu_s)$$

There is nothing that force the government to adjust taxes or money growth to satisfy the relation. If anything else will, prices will.

Two regimes

Monetary regimes – monetary policy target prices and fiscal policy target budget

Fiscal regime – fiscal policy determine prices and monetary policy maintains value of debt

Fiscal Theory of the price level

Introducing the idea in a normal consumer problem (Sims 2000)

$$\max_{C_t, B} U(C) = E_{t-1}\left[\sum_{t=0}^{\infty} \beta^t \left(\log C_t + \mu \log \frac{M_t}{P_t} \right)\right]$$

Subject to

$$C_t + \frac{B_t}{P_t} + \frac{M_t}{P_t} = \left(1 + i_{t-1}\right)\frac{B_{t-1}}{P_t} + \frac{M_{t-1}}{P_t} + Y_t - \tau_t$$

Nominal Government Budget Constraint

$$B_t + P_t \tau_t = \left(1 + i_t\right) B_{t-1} - \left(M_t - M_{t-1}\right)$$

Government must determine two of the five variables: the others will be determine by private sector first order conditions

Fiscal Theory of the price level

FOC

$$\frac{\delta U}{\delta C}: \quad \frac{1}{C_t} = \lambda_t$$

$$\frac{\delta U}{\delta B}: \quad \frac{1}{P_t C_t} = \beta(1+i_t)E\frac{1}{P_{t+1}C_{t+1}}$$

$$\frac{\delta U}{\delta M}: \quad \frac{M_t}{P_t} = \mu\frac{1+i_t}{1+i_{t-1}}C_t$$

Fiscal Theory of the price level

Suppose government follows a policy of nominal interest rate targeting and fixes i and the level of taxes. Then the government budget constraint divided by P_tC_t is given by:

$$\frac{B_t}{P_tC_t} = (1+i_t)\frac{P_{t-1}C_{t-1}}{P_tC_t}\left((1+i_t)\frac{B_{t-1}}{P_{t-1}C_{t-1}} + \frac{M_{t-1}}{P_{t-1}C_{t-1}}\right) - \frac{M_t}{P_tC_t} - \frac{\tau}{C_t}$$

Taking the expectations and using the private sector FOC and the fact that in equilibrium is C=Y, we have:

$$E_{t-1}\left(\frac{B_t}{P_tY_t}\right) = \beta^{-1}\frac{B_{t-1}}{P_{t-1}Y_{t-1}} - \tau E_{t-1}\left(Y_{-1t}^{-1}\right) - \mu\left[E_{t-1}(Y_t) - \beta^{-1}Y_{t-1}\right]$$

Unstable difference equation if the growth of income is not big enough to increase the demand of real monetary balance so much to wipe out the debt. Otherwise the only stable solution is:

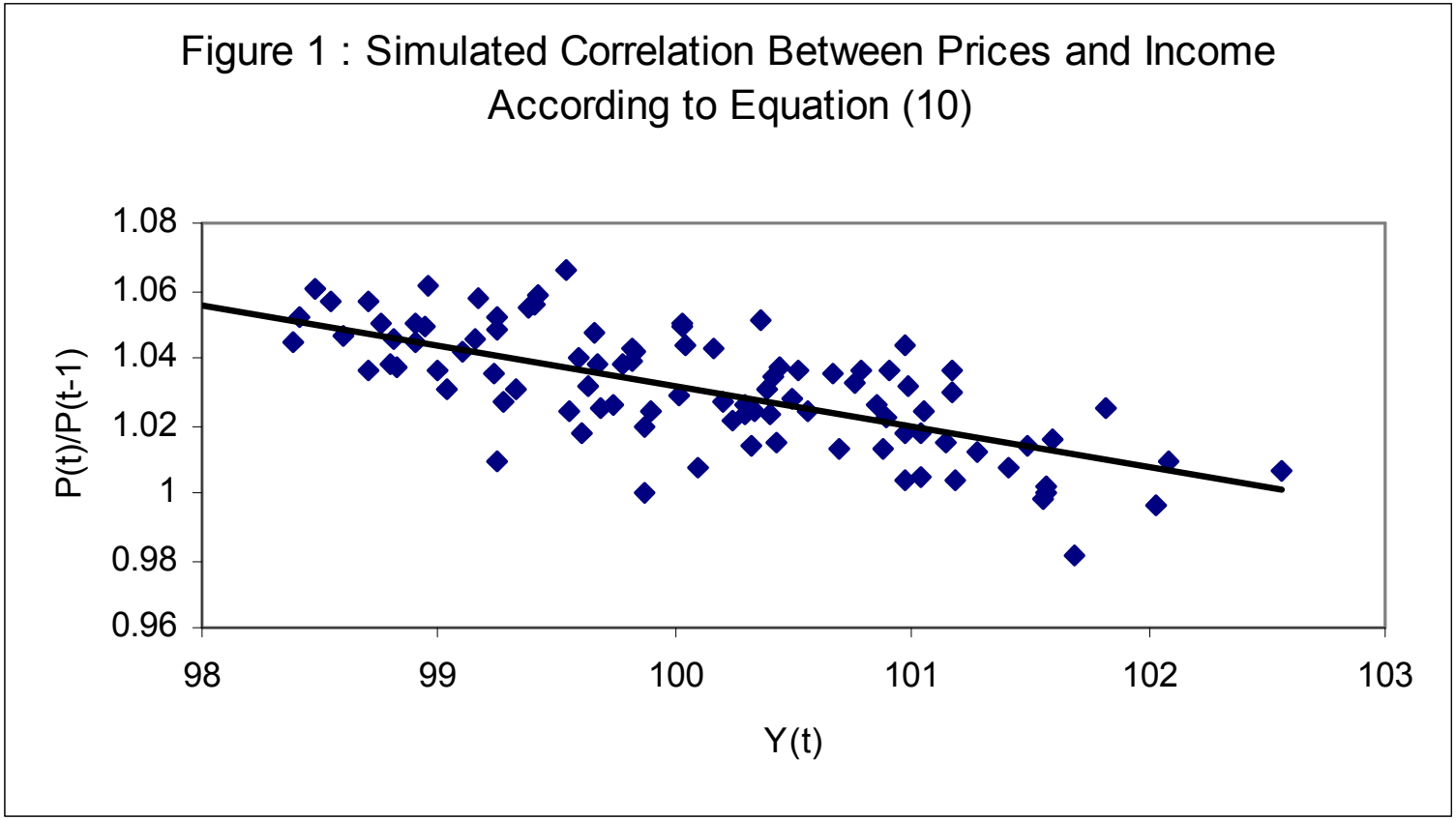
$$\frac{B}{PY} = \frac{\beta}{1-\beta}\left[\tau E_{t-1}\left(Y_t^{-1}\right) + \mu E_{t-1}\left(Y_t\right) - \beta^{-1}\mu Y_{t-1}\right]$$

Fiscal Theory of the price level

Given the level of taxes and the nominal interest rate, there is only one level of real debt compatible with the solvency of the public sector. Substituting this equilibrium value, called Φ, it is possible to express the movement in prices respect the other real variable in the model:

$$\frac{P_t}{P_{t-1}} = \frac{\left(1+i_t\right)Y_{t-1}\Phi}{\Phi Y_t + \tau + \left(\mu Y_t - \beta\mu Y_{t-1}\right)}$$

Fiscal Theory of the price level



With a fix interest rate (zero lower bound) only growth can guarantee the control of prices in the face of fiscal uncertainty

Application : Fiscal Policy and Asset Prices

Hypothesis

- Balance Budget Rule = Pro-cyclical Policies

  Automatic Stabilizer effect of taxes and expenditure reverted. Increases variability which affect asset valuation

- Balance Sheet Approach to Fiscal Policy Effects

  Budget Surpluses affect private sector portfolio choices.

- See Schmitt-Grohe and Uribe (2000) for analysis of real and nominal stability under balance budget rule

Balance Budget Rule and Permanent Surpluses

How is Balance Budget Achieved

- Classical Public Finance allows deficit spending only in cases of emergency (War) – no relation with business cycles

  but dimension of the government was small, business cycle effects were small as well
- Prudential Behaviour (collect before spending)
- Surplus Bias

Ex Ante Balance Budget Rule

Ignoring seignorage, with income taxes, Nominal Gov. Budget is equal to

$$B_t + \tau_t P_t Y_t = P_t G_t + (1 + i_t) B_{t-1}$$

Balance budget rule

$$B_t \leq B_{t-1} \qquad \tau_t = \frac{G_t}{Y_t} + (i_t)\frac{B_{t-1}}{P_t Y_t}$$

But at the beginning of the period G and Y are unknown, therefore

$$\tau_t = E_{t-1}\left[\frac{G_t}{Y_t} + (i_t)\frac{B_{t-1}}{P_t Y_t}\right] = E_{t-1}\left[\frac{G_t}{Y_t} + (r_t)\frac{b_{t-1}}{Y_t}\right]$$

Ex Ante Balance Budget Rule

If

$$G_t \cong \left(\overline{G}, \sigma_G^2\right), Y_t \cong \left(\overline{Y}, \sigma_Y^2\right)$$

$$\operatorname{cov}(G, Y) = \sigma_{GY} < 0$$

Than

$$\tau_t = E_{t-1}\left[\frac{G_t}{Y_t} + (r_{t-1})\frac{b_{t-1}}{Y_t}\right] = \left[\frac{\overline{G}}{\overline{Y}} + (r_{t-1})\frac{b_{t-1}}{\overline{Y}}\right] - \left[\frac{\overline{G}}{\overline{Y}^2}\right]\sigma_{GY} + \left[\frac{\overline{G}}{\overline{Y}^3} + (r_{t-1})\frac{b_{t-1}}{\overline{Y}^3}\right]\sigma_Y^2$$

$$\tau_t = \left[\frac{\overline{G}}{\overline{Y}} + (r_{t-1})\frac{b_{t-1}}{\overline{Y}}\right] + \Omega$$

Ω Size of the fiscal surplus necessary to guarantee fiscal stability (and monetary dominance), which is a function of the output uncertainty and the sensitivity of fiscal policy to the cycle

Ex Ante Balance Budget Rule

Government (Expected) Budget Dynamics

$$\frac{B_t}{P_t} = \pi_t^{-1} \frac{B_{t-1}}{P_{t-1}} - \Omega E_{t-1}(Y_t)$$

Tendency for the Government to accumulate surpluses

Hypothesis:

In the FTPD (or any non Ricardian fiscal theory) this policy puts downward pressure on prices

Given the monetary regime, this reduces the real interest rate (Expected inflation does not change) and boosts output

Positive effects on Asset Prices multiplied if downward pressure on prices persistent

Calibrating Fiscal –Monetary Policy and Asset Prices

Woodford 1996 – Control of Public Debt: A Requirement for Price Stability?

$$\pi_t = \beta E_t \pi_{t+1} + \kappa y_t + u_t \tag{43}$$

$$m_t = \chi \left[\sigma^{-1} y_t - (\beta/(1-\beta))\, i_t \right] \tag{44}$$

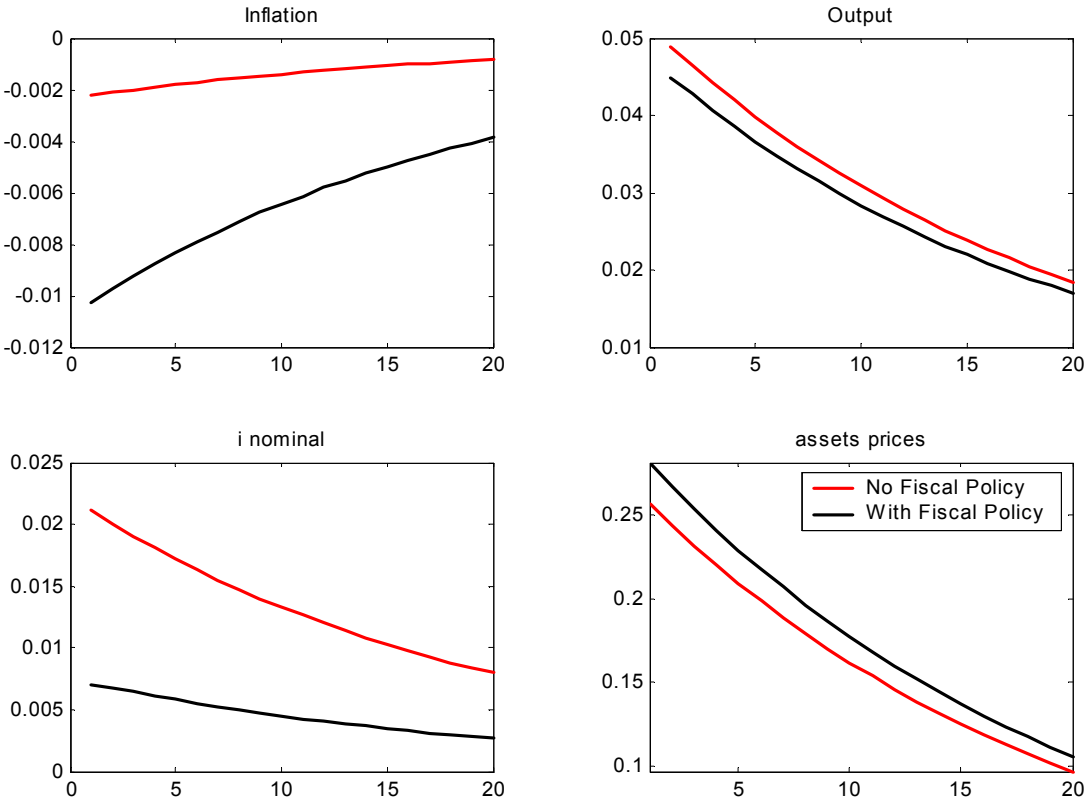
$$y_t = E_t y_{t+1} - \sigma \left(i_t - E_t \pi_{t+1} \right) + \theta_1 d_t + \theta_2 q_t \tag{45}$$

$$i = \phi_1 y_t + \phi_2 \pi_t + \phi_3 q_t \tag{46}$$

$$q_t = E_t q_{t+1} - \varphi_0 \left(i_t - E_t \pi_{t+1} \right) + \varphi_1 y_t + v_t \tag{47}$$

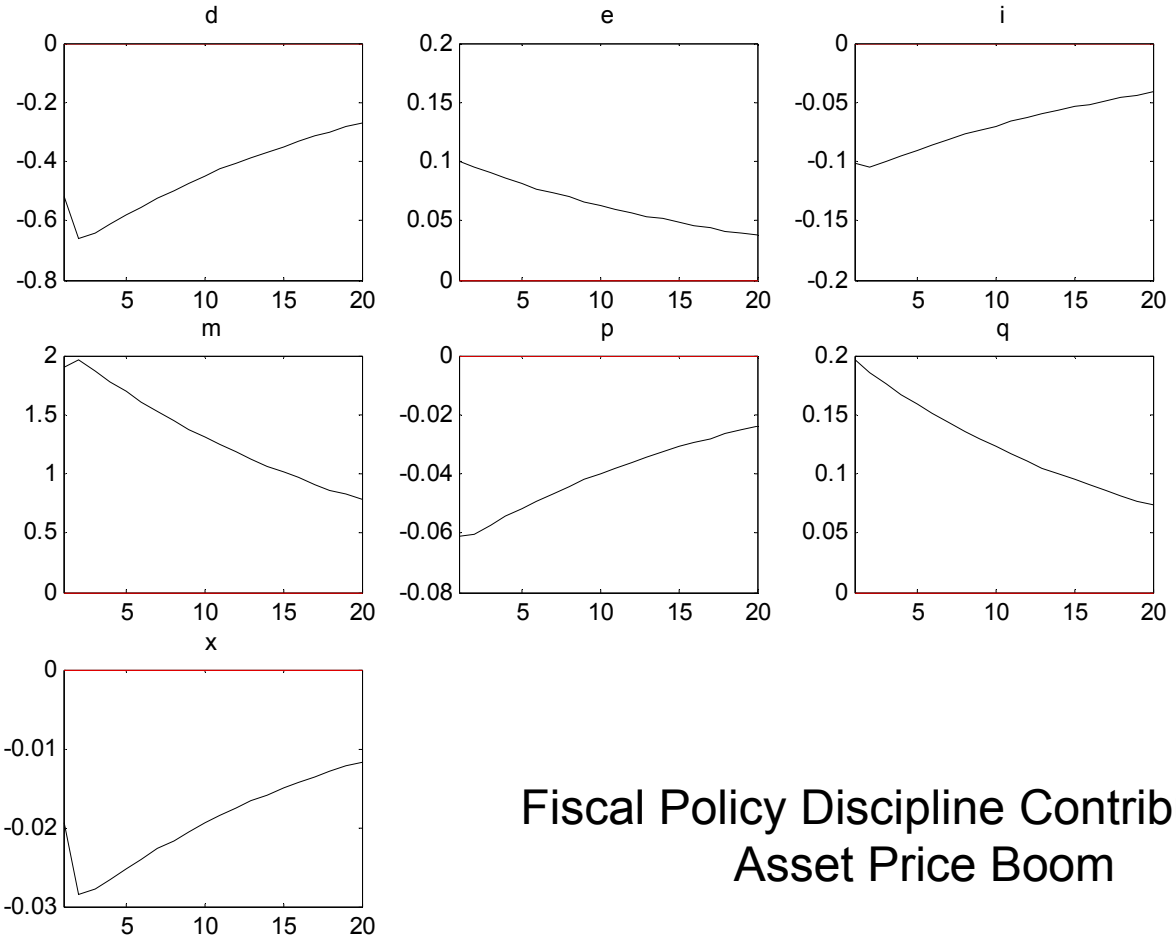
$$d_{t+1} = i + (1/\beta) \left(d_t - \pi_t \right) + \gamma \left(m_{t-1} - m_t - \pi_t \right) \tag{48}$$

Fiscal and Monetary Policy Interaction in a FTPD model



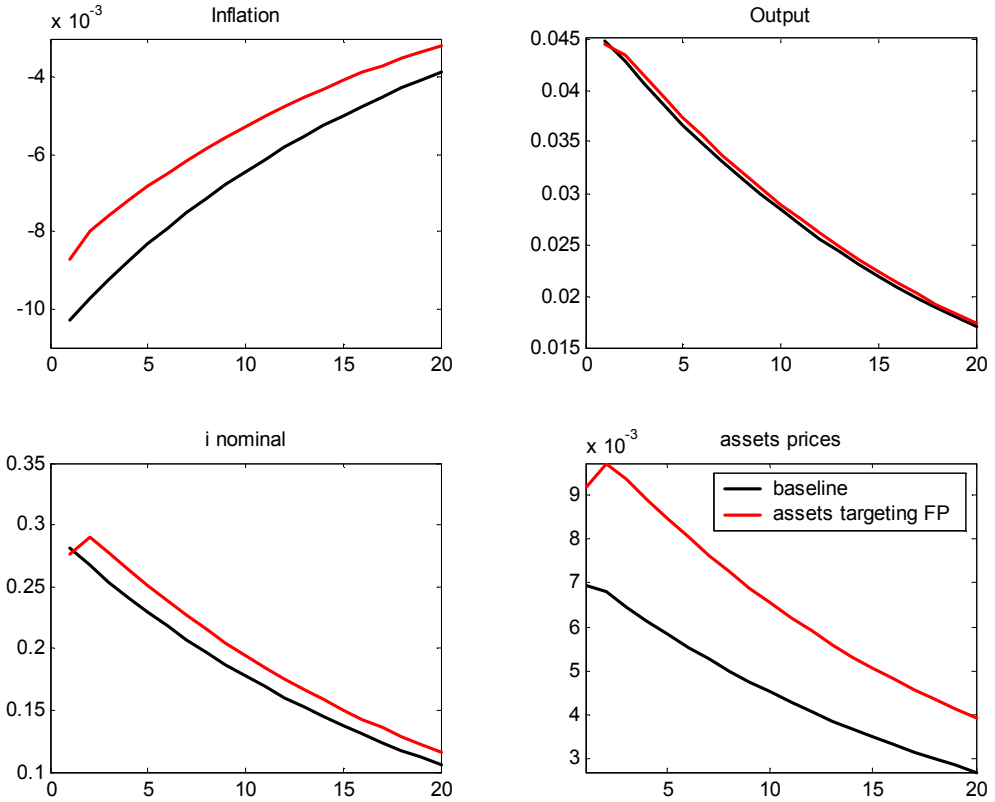
Response to a Productivity Shock with and without Fiscal Channel –
Fiscal Policy adjustment increases volatility of asset prices and inflation

Fiscal Policy Stabilization Effect



Fiscal Policy Discipline Contributes to Asset Price Boom

Is Fiscal Policy the Second Instrument?



Not likely – Fiscal Response too slow
It introduces too much variability in prices and budget processes

Conclusions

- Fiscal Policy Central in Policy Mix
- Theory lagging behind
- Traditional Inter-temporal approach too restrictive
- Interesting new developments – Fiscal Theory of the Price Level