Fiscal Sustainability in a New Keynesian Model

Campbell Leith
Simon Wren-Lewis

Madrid 2010

Introduction

- Recent increases in government debt have prompted debate over the optimal speed of debt stabilisation.
- Benigno and Woodford (2003) and Schmitt-Grohe and Uribe (2004) argue that debt should follow a random walk, largely accommodating the fiscal consequences of shocks.
- Both results assume commitment.
- Do fiscal authorities possess the credibility required to commit?
- This paper looks at discretionary (time consistent) policy.

Introduction

- Outline Model
- Explore commitment policy and its inherent time inconsistency.
- Contrast with discretionary solution.
- An example computing the credibility of commitment policy.
- Conclusions

Closed economy model

- Infinitely lived, representative consumer

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\sigma} \xi_t^{-\sigma}}{1-\sigma} + \chi \frac{G_t^{1-\sigma} \xi_t^{-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi} \xi_t^{-\sigma} \xi_t^{N}}{1+\varphi} \right)$$

- Supplies labour to imperfectly competitive firms subject to Calvo contracts, giving a NKPC:

$$\pi_t = \beta E_t \pi_{t+1} + \gamma \left(\widehat{mc}_t + \hat{\mu}_t \right)$$

- Marginal cost from labour supply (labour income taxed)

$$\widehat{mc}_t = -a_t + \hat{w}_t = \frac{\tau}{1-\tau} \hat{\tau}_t + \varphi \hat{N}_t + \sigma \hat{C}_t + \hat{\xi}_t^{N} - a_t$$

Closed economy model

- Intertemporal allocation of consumption is influenced by monetary policy in presence of sticky prices,

$$\beta R_t E_t\{(\frac{C_t}{C_{t+1}})^{\sigma}(\frac{\xi_t}{\xi_{t+1}})^{\sigma}(\frac{P_t}{P_{t+1}})\} = 1$$

- Government provides public goods, financed through distortionary labour income taxes, and satisfies intertemporal budget constraint,

$$D_t = -\sum_{T=t}^{\infty} E_t[Q_{t,T}(P_T G_T - W_T N_T \tau_T)]$$

- Monetary policy affects debt service costs too.

Welfare derivations

- Focus is on distortion caused by nominal inertia and debt stabilisation.
- Abstract from monopolistic competition and steady state tax distortions using output subsidy that achieves efficient equilibrium in steady state
- Lump-sum tax to finance subsidy in initial steady state only. Outside of this steady state, taxes are distortionary.
- Assume throughout that monetary and fiscal policy are determined co-operatively

Social Welfare

- Derived from second order Taylor expansion of utility of representative agent.

$$\Gamma = -\overline{N}^{1+\varphi}\frac{1}{2}E_0\sum_{t=0}^{\infty}\beta^t\{\sigma\theta(\hat{C}_t-\hat{C}_t^*)^2+\sigma(1-\theta)(\hat{G}_t-\hat{G}_t^*)^2$$
$$+\varphi(\hat{Y}_t-\hat{Y}_t^*)^2+\frac{\epsilon_t}{\gamma}\pi_t^2\}+tip+O[2]$$

- '^' denotes log deviation from steady-state.
- '*' denotes efficient level of variable.
- tip=terms independent of policy.
- O[2]=terms greater than order 2.

Monetary policy and shocks

- If nominal inertia only occurs in price setting, then in the absence of debt, monetary policy can achieve the efficient allocation in the face of taste and technology shocks .
- If we add taxes as a fiscal instrument, then these can be used to offset cost-push shocks too (we define the tax gap as net of these shocks).
- So, in this model, welfare costs only arise because of the presence of debt, and the absence of lump sum taxes for debt stabilisation purposes.

Optimal policy under commitment

$$L_t = E_t \sum_{s=0}^{\infty} \beta^s [\sigma\theta(c^g_{t+s})^2 + \sigma(1-\theta)(g^g_{t+s})^2 + \varphi(y^g_{t+s})^2 + \frac{\epsilon}{\gamma}\pi^2_{t+s}$$

$$+ \lambda^{\pi}_{t+s}(\pi_{t+s} - \beta\pi_{t+s+1} - \gamma(\varphi y^g_{t+s} + \sigma c^g_{t+s} + \frac{\bar{\tau}}{1-\bar{\tau}}\tau^g_{t+s})$$

$$+ \lambda^{y}_{t+s}(y^g_{t+s} - (1-\theta)g^g_{t+s} - \theta c^g_{t+s})$$

$$+ \lambda^{b}_{t+s}(\hat{b}_{t+s} - \pi_{t+s} - \sigma c^g_{t+s} - \beta(\hat{b}_{t+s+1} - \pi_{t+s+1} - \sigma c^g_{t+s+1}) + \frac{\bar{G}}{\bar{b}} g^g_{t+s}$$

$$- \frac{\bar{w}\bar{N}\bar{\tau}}{\bar{b}}[(1+\varphi)(y^g_{t+s}) + \frac{1}{1-\bar{\tau}}(\hat{\tau}^g_{t+s}) + \sigma c^g_{t+s}] + f_{t+s} + \sigma(1-\beta)c^g_{t+s})]$$

- The variable f captures the impact of shocks

Some first order conditions (s>0)

- Debt $E_t \lambda^b_{t+s} - \lambda^b_t = 0$
- Inflation $2\frac{\epsilon}{\gamma}\pi_{t+s} + \Delta\lambda^{\pi}_{t+s} - \Delta\lambda^b_{t+s} = 0$
- Taxation $-\frac{\overline{\tau}}{1-\overline{\tau}}\gamma\lambda^{\pi}_{t+s} - \frac{\overline{w}\overline{N}}{\overline{b}}\frac{\overline{\tau}}{1-\overline{\tau}}\lambda^b_{t+s} = 0$

- For s>0, inflation is zero. Can show all other variables (y, g and c) are functions of debt LM, which is constant such that y, g and c fall, while taxes (typically) rise in the new steady-state.
- Implies debt does not return to steady state, but instead follows a random walk

Intuition behind random walk result

- Welfare involves inflation, gaps in output, consumption and public spending, and taxes are distortionary. Welfare does not depend directly on debt.
- Random walk debt implies permanent changes in spending and taxes to finance change in debt, but these costs are discounted.
- The alternative of returning debt to its original level involves short term, but much larger, changes in taxes and spending, and these will impact on output and inflation, even with optimal monetary policy

Commitment policy: time inconsistency

$$2\epsilon\pi_t = \left(\frac{\overline{w}\overline{N}}{\overline{b}} + \gamma\right)\tilde{\lambda}_t^{b,j}$$

$$y_t^g = \left(\frac{\sigma\beta}{2(\varphi+\sigma)} - a_1\right)\tilde{\lambda}_t^{b.j}$$

$$c_t^g = \left(\frac{(\varphi(1-\theta)+\sigma)\beta}{2(\varphi+\sigma)} - a_2\right)\tilde{\lambda}_t^{b.j}$$

$$g_t^g = -\left(\frac{\varphi\beta}{2(\varphi+\sigma)} + a_3\right)\tilde{\lambda}_t^{b.j}$$

- Initial term in each expression defines difference between initial and subsequent periods.

Commitment policy: time inconsistency

- Steady state debt under commitment policy is given by (where Ψ is a complex combination of parameters)

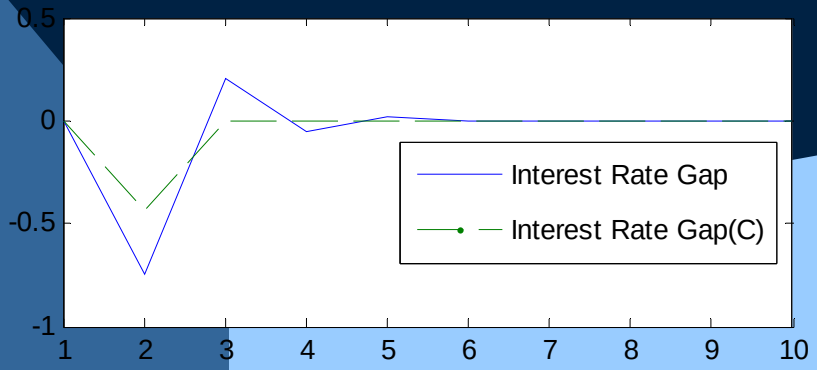
$$\overline{b}^{C,nom} = \left(\frac{\Psi}{1-\beta}\right)\tilde{\lambda}_t^{b,nom}$$

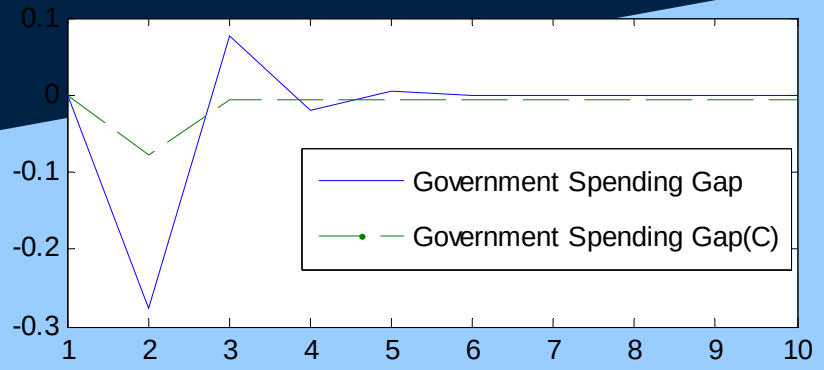
$$< \overline{b}^{C,real} = \left(\frac{\Psi}{1-\beta}\right)\tilde{\lambda}_t^{b,real}$$

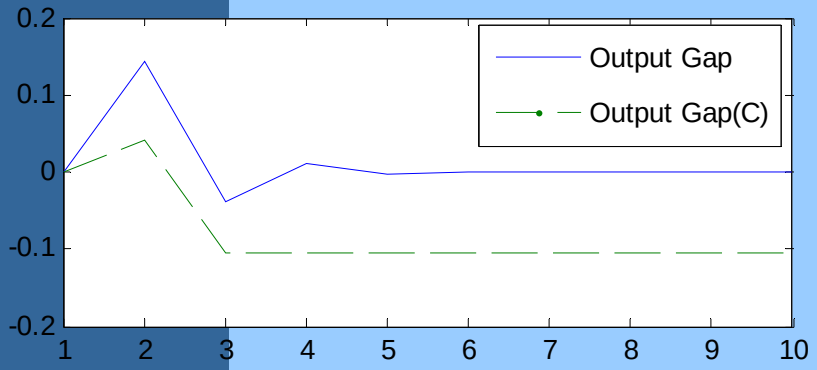
$$< \hat{b}_t + E_t \sum_{s=0}^{\infty} \beta^s f_{t+s}$$

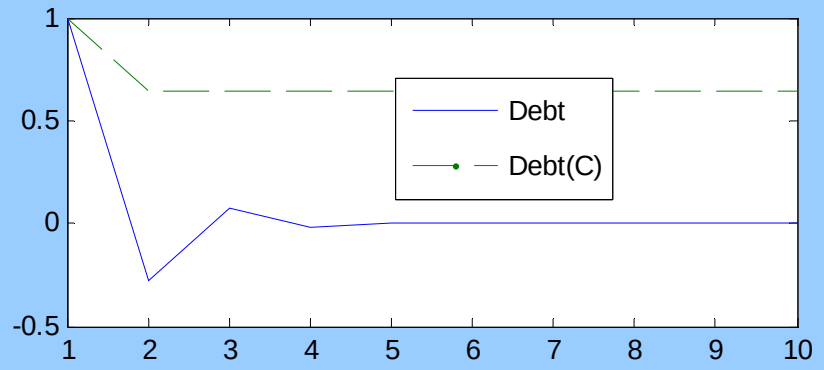
- RHS is full accommodation. So policy does make some attempt to reduce debt in the initial period. This is true even if debt is real.

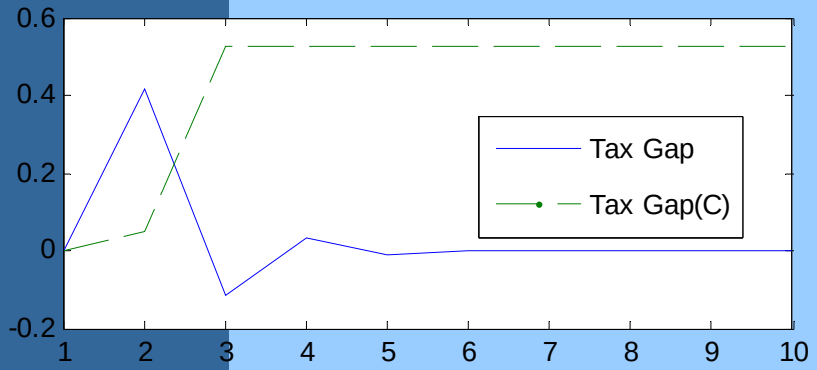
Debt Shocks Under Commitment and Discretion

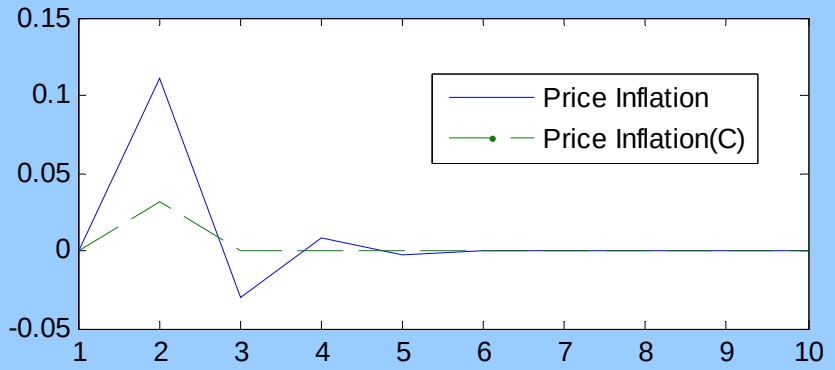








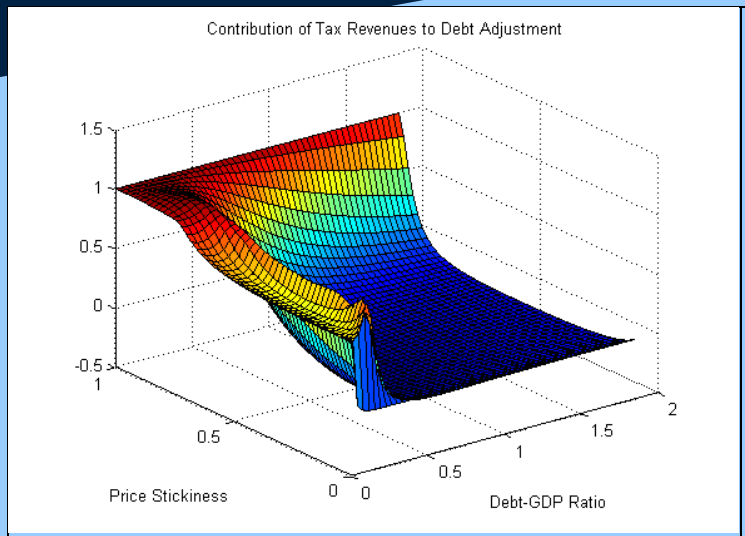


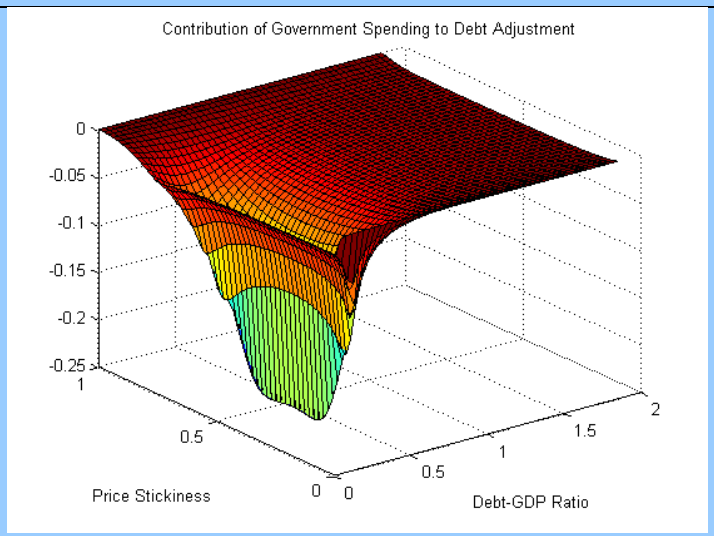


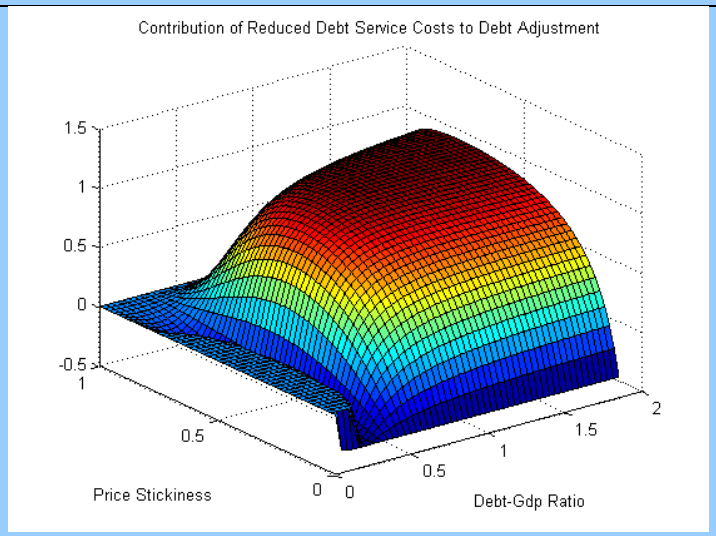
Intuition: discretion

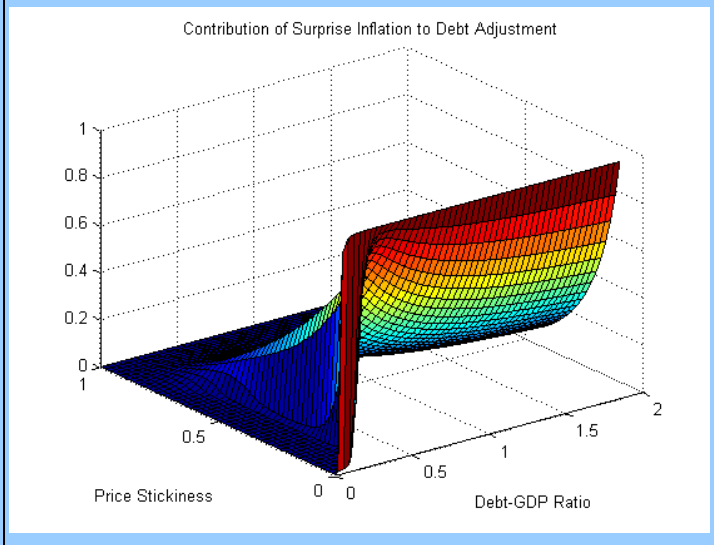
- Under commitment, govt loosens monetary policy and raises taxes in the first period by a small amount, which raises inflation, but because expectations are given, there is no knock on impact on future inflation.
- If govt re-optimises each period, then economic agents will form expectations recognising the incentive to introduce policy surprises to stabilise debt, such that govt is forced to implement a policy free from surprises.
- This 'debt stabilisation bias' is only removed once debt has returned to its original (efficient) level.

Which Instrument Stabilises Debt under Discretion?









When can we ignore debt?

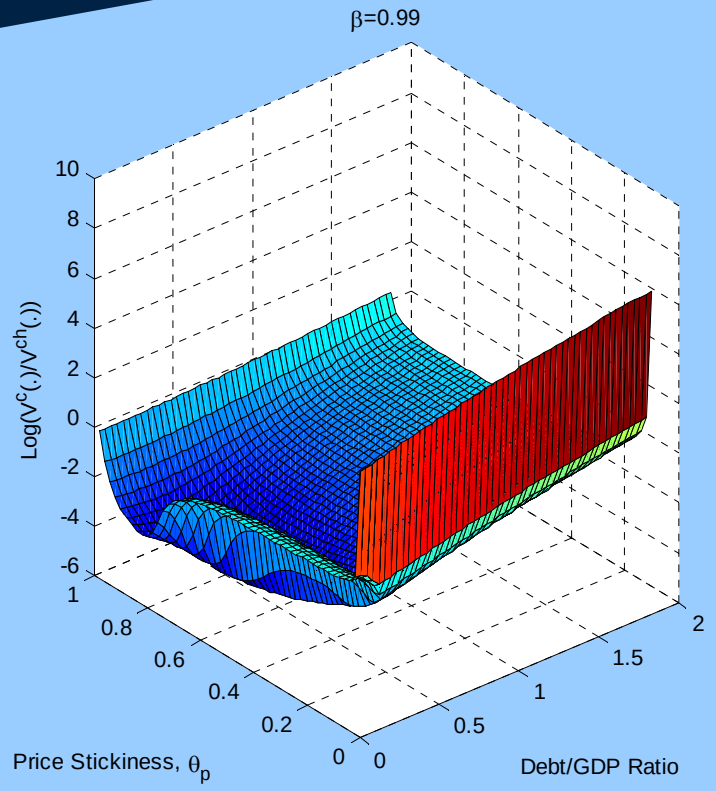
	Discretion	Commitment
Technology	0.3645	0.0085
Labour Supply	0.0910	0.0021
Mark-Up (iid)	0.1032	0.0024
Taste	0.3620	0.0085

- Figures above are percent of steady state consumption
- Random walk result under commitment implies consequences of financing consequences of shock are relatively small
- Under discretion, however, returning debt to steady state requires larger consumption costs

The Credibility of Commitment

- An Example:
- We compute the benefits of 'cheating' by reducing debt through policy surprises, after allowing for a punishment strategy where the public never trust the government again.
- We contrast this with the welfare that would have been generated by the government keeping its promise to commit.
- Note temptation is different from the usual inflationary bias literature – there is an immediate cost in cheating, and a subsequent benefit from the lower debt that emerges.

The Credibility of Commitment.



Vertical Axis – (logged) ratio of losses under commitment vs cheating (and punishment).

Main results

- The optimal commitment policy involves a (modest) attempt in the first period to reduce long run debt, which is time inconsistent
- This incentive can only be removed by eventually returning debt to its initial level
- As a result, discretionary policy does not involve random walk debt, but (typically) rapid debt stabilisation.
- The stabilisation of debt under discretion involves significant welfare costs.
- In contrast to inflation targets, debt targets would lock us into the discretionary solution.