The sacrifice ratio and active fiscal policy*

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Abstract

We compare the sacrifice ratio for a disinflation under an active monetary and passive fiscal policy mix to the sacrifice ratio under passive monetary and active fiscal policy, holding all else equal. The sacrifice ratio may be higher or lower in the active fiscal policy regime depending on the fiscal rule and the design of the disinflation policy. Fiscal led disinflations may be less costly than monetary led ones when they are anticipated. However, they may generate larger sacrifice ratios than monetary led ones when implemented "cold turkey." Overall, the variance of the sacrifice ratio under fiscal led policies is much higher than that under monetary led policies.

JEL Classifications: E31; E52; E63;

Key Words: Sacrifice ratio; monetary policy; fiscal policy; inflation; disinflation

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1 Introduction

New Keynesian models typically assume active monetary policy and passive fiscal policy (monetary dominance). Policymakers aggressively responds to deviations of inflation from target, while surpluses adjust to balance the government's budget. Under this policy mix, policymakers stabilize inflation and, assuming non-distortionary taxation, choices for government debt play no role in inflation dynamics. Ascari and Ropele (2012,b, 2013), and Gibbs and Kulish (2017) show that this policy mix, along with the typical frictions assumed in medium-scale structural models, predict sacrifice ratios consistent with actual disinflation episodes in developed economies.

However, Cochrane (2023) argues that the true policy mix in many advanced economies is active fiscal and passive monetary policy (fiscal dominance). Recent empirical studies such as Jacobson, Leeper and Preston (2019) and Bianchi, Faccini and Melosi (2023) show a fiscal led policy mix leads to different inflation dynamics and policy conclusions. We build on these works by studying the sacrifice ratio for fiscal led disinflation.

We study both simple and medium-scale New Keynesian models closed with fiscal policy rules that adjust lump sum taxation in response to debt and inflation. We ask 1) how costly is it to decrease the inflation target, $\bar{\pi}$, under a fiscal led regime relative to a monetary led regime and 2) does tying fiscal surpluses to inflation lower or raise the cost.

We find that changing the policy mix in a simple New Keynesian environment with Rotemberg (1982) pricing frictions has small effects on the sacrifice ratio.[1] Disinflation is costless under either policy mix when done "cold turkey" – announcing the policy and implementing it simultaneously. However, if the policy's announcement and its implementation are done sequentially, as with an expected change in government, then costs for fiscal led disinflation decrease relative to the monetary led case.

We consider two scenarios for anticipated policy:

1. Anticipation of a change in $\bar{\pi}$ in j periods under a pegged interest rate that reverts to an interest rate rule in $j+1$.

[1] We assume Rotemberg pricing to remove the welfare effects of price dispersion. Ascari and Rossi (2012) and Ascari, Bonomolo and Haque (2023) shows that there are additional channels under Calvo pricing that may be relevant for the sacrifice ratio, which we leave to future research.

2. Anticipation of a change in $\bar{\pi}$ in j periods under an interest rate rule for all t.

The first case simulates fixing the policy rate before the new target is implemented. The second case assumes that the central bank defends the old target rate in the interim period.[2]

Anticipated fiscal led disinflations generate negative sacrifice ratios (benefit ratios) in the simple model that are uniformly lower than comparable monetary led ones. Increasing the commitment to increase surpluses in response to positive inflation misses raises the sacrifice ratio in the first scenario and has no effect in the second.

These conclusions change, however, in the medium-scale model of Smets and Wouters (2007). Policy interacts with wage and investment frictions increasing the sacrifice ratio in some cases and lowering it in others. Cold turkey policies generate positive sacrifice ratios for both policy mixes with monetary led disinflations generating the lowest average sacrifice ratios. Anticipated policies, however, may still generate benefit ratios with fiscal led disinflations delivering the lowest average cost. Although, the posterior variance of the sacrifice ratio is higher both for any given policy, and between different types of policies, for fiscal led disinflations compared to monetary led ones.

2 Disinflation in a Simple Model

Consider the New Keynesian model log-linearized around the inflation steady state $\bar{\pi}$:

$$\begin{aligned} x_t &= \mathbb{E}_t x_{t+1} - \sigma(i_t - \mathbb{E}_t \pi_{t+1} - \bar{r}) \\ \pi_t &= (1-\beta)\bar{\pi} + \beta \mathbb{E}_t \pi_{t+1} + \kappa x_t \end{aligned}$$

where x_t is the output gap, π_t is inflation, i_t is the interest rate, $\bar{r}$ is the steady state real interest rate, β measures impatience, σ measures intertemporal elasticity of substitution, and κ measures the cost of price adjustment. We assume that monetary policy follows a standard interest rate rule

$$i_t = \bar{r} + \bar{\pi} + \phi_\pi(\pi_t - \bar{\pi}). \tag{1}$$

[2]We follow Kulish and Pagan (2017) to construct the anticipated solutions.

Fiscal policy is given by a surplus rule

$$s_t = \bar{r} + \delta b_{t-1} + \phi_s(\pi_t - \bar{\pi}) \tag{2}$$

and a debt valuation equation

$$\beta b_t = b_{t-1} + i_t - \pi_t - s_t \tag{3}$$

where b_t is one period real debt, s_t is surpluses raised by the government through lump sum taxation, δ is responsiveness of lump sum taxes to debt, and ϕ_s is the response of surpluses to deviations in inflation from target.

Credible cold turkey disinflation are costless under either monetary or fiscal dominance. Equilibrium output, inflation, and debt dynamics for a fixed target may be expressed as

$$y_t = \bar{a} + \bar{c} y_{t-1}, \tag{4}$$

where $y_t = (x_t, \pi_t, b_t)'$ and

$$\bar{c} = \begin{bmatrix} 0 & 0 & c_{13} \\ 0 & 0 & c_{23} \\ 0 & 0 & c_{33} \end{bmatrix}.$$

When $\phi_\pi > 1$ and $1 - \beta < \delta < 1 + \beta$, as in Leeper (1991), monetary policy is active and fiscal policy is passive such that $c_{13} = c_{23} = 0$ and $c_{33} = \beta^{-1}(1 - \delta)$. When $0 < \phi_\pi < 1$ and $0 \leq \delta < (1 - \beta)$, fiscal policy is active and monetary policy is passive such that $c_{13} \neq 0$, $c_{23} \neq 0$, and $0 < c_{33} < 1$. The response to inflation, ϕ_s, plays no role in equilibrium selection. Therefore, in the latter case, there are fiscal effects on inflation, while in the former there are not. However, the fiscal effects of inflation don't extend to the inflation target, which can be changed without cost because $\bar{a} = (0, \bar{\pi}, 0)'$ in both equilibria. Anticipation of a change in policy though does generate costs.

Table 1 reports the sacrifice ratio for a disinflation from $\bar{\pi} = 8\%$ to 2% for the baseline model. The sacrifice ratio is calculated as

$$SR = -\frac{1}{\Delta\bar{\pi}} \sum_{i=1}^{150} x_i. \tag{5}$$

Table 1: Sacrifice Ratios - Simple New Keynesian Model

6% Disinflation	Monetary		Fiscal					
	w/ peg	*w/o peg*	*w/ peg*			*w/o peg*		
	$\phi_\pi = 0, \phi_\pi 0.5$ $\phi_s = 0.5$	$\phi_\pi = 1.5$ $\phi_s = 0.5$	$\phi_\pi = 0, \phi_\pi 0.5$ $\phi_s = 0.0$	$\phi_\pi = 0, \phi_\pi 0.5$ $\phi_s = 0.5$	$\phi_\pi = 0, \phi_\pi 1.5$ $\phi_s = 1.5$	$\phi_\pi = 0.5$ $\phi_s = 0.0$	$\phi_\pi = 0.5$ $\phi_s = 0.5$	$\phi_\pi = 0.5$ $\phi_s = 1.5$
w/ short-term debt								
Cold-turkey	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Announced (j = 1)	0.25	-0.11	**-0.64**	-0.48	-0.38	-0.37	-0.37	-0.37
Announced (j = 2)	0.77	-0.30	**-1.03**	-0.78	-0.63	-0.65	-0.65	-0.65
w/ long-term debt								
Cold-turkey	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Announced (j = 1)	0.25	-0.11	-0.43	-0.37	-0.33	**-0.47**	-0.43	-0.40
Announced (j = 2)	0.77	-0.30	-0.75	-0.63	-0.55	**-0.84**	-0.76	-0.71

Notes: The *w/ peg* columns show the sequence of ϕ_π coefficients assumed. The lowest sacrifice ratio in each row is bolded. The shared parameters are $\beta = 0.995$, $\sigma = 1$, $\kappa = 0.1$. Under the monetary led regime, we set $\delta = 0.35$. Under the fiscal led regime, we set $\delta = 0.0$. For the long-debt specification, we set $\rho = 0.85$.

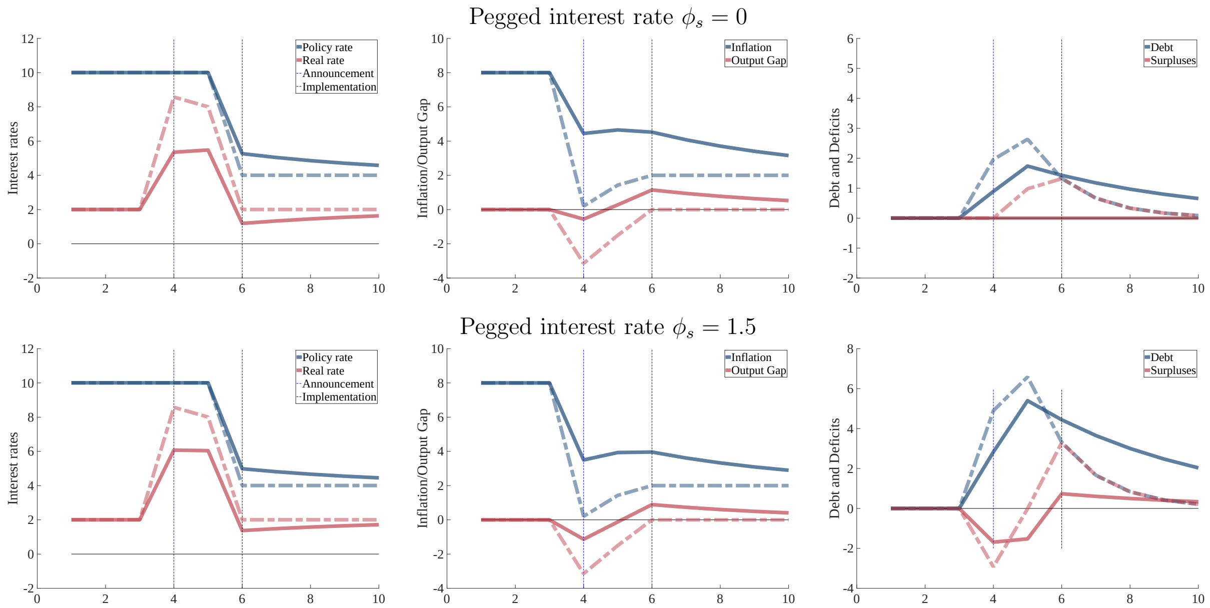
Negative sacrifice ratios indicate a gain in output for lowering inflation. In scenario 1, we find a positive sacrifice ratio for the monetary led disinflation but negative sacrifice ratios (benefit ratios) for fiscal led disinflation. In scenario 2, we find the Ball (1994) result that anticipated disinflation creates booms under a monetary led disinflation.

Figure 1 shows the dynamics for monetary (dashed lines) versus fiscal (solid lines) led disinflation for scenario 1 when $j = 2$. Under a monetary led regime, the fall in inflation expectations that results due to anticipation of the policy implies higher real interest rates, which contracts output. Under a fiscal led disinflation, the initial rise in the real rate is offset by a boom that follows after the policy is implemented. The boom occurs because the stock of real debt increases for a time, which increases output but slows inflation's falls to the new target.

Figure 2 compares monetary versus fiscal led disinflations under scenario 2. We see the boom caused by anticipation of the policy in the monetary led case. Fiscal led disinflations, in contrast, have a downturn followed by a boom when the new inflation target is implemented leading to lower sacrifice ratios overall. The size of the boom in a fiscal led disinflation, and speed at which the new target is obtained, does not depend on ϕ_s. Debt and surplus dynamics are, of course, different in these cases. The stimulating effect of inflation through fiscal policy is perfectly offset here by the expectations of future fiscal policy.

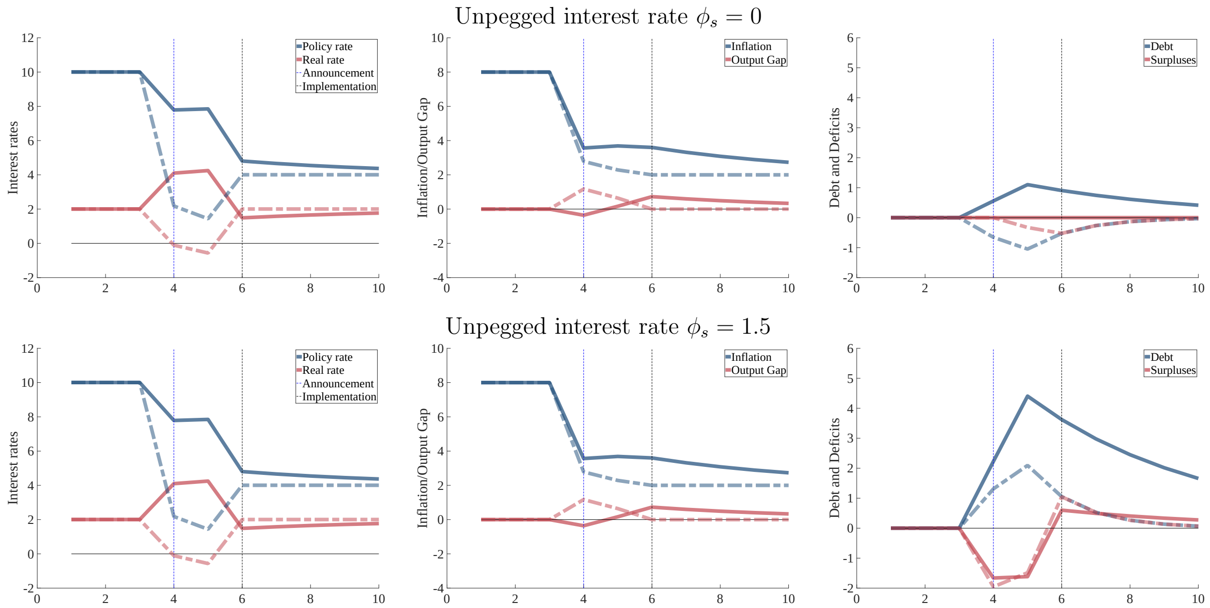
In bottom panel of Table 1, we report the results for a long-term debt specification. Following Cochrane (2023), we assume that household may invest in a portfolio of bonds, v_t, with

Figure 1: Disinflations - Simple New Keynesian Model



Notes: Solid lines: active fiscal policy and passive monetary policy. Dashed lines: passive fiscal policy and active monetary policy. The pathscorrespond to the first, third and fifth columns of Table 1.

Figure 2: Disinflations - Simple New Keynesian Model



Notes: Solid lines: active fiscal policy and passive monetary policy. Dashed lines: passive fiscal policy and active monetary policy. The paths correspond to the second, sixth, and eighth columns of Table 1.

different maturities. The average maturity is governed by $0 < \rho < 1$. Debt follows

$$\begin{aligned}\beta v_t &= v_{t-1} + r_t^n - \pi_t - s_t &(6)\\ \mathbb{E}_t r_{t+1}^n &= i_t &(7)\\ r_t^n - \bar{r} &= \rho q_t - q_{t-1}, &(8)\end{aligned}$$

where r_t^n is the nominal return on the portfolio and q_t is the bond price. Long-term debt has no effect on the cost of monetary led disinflation. However, its introduction breaks the irrelevance result for the surplus rule in scenario 2. Tying fiscal policy more strictly to inflation outcomes increases the costs (lowers the benefit) of the disinflation policy.

3 Medium-Scale Model

We now turn to quantitative model of Smets and Wouters (2007). We use the posterior estimates of the parameters and shocks from the authors' original estimation on data from the United States. We add to the model either equations (2) and (3) or equations (6) - (8), depending on the whether we assume short-term or long-term debt. We also implicitly assume that wages and price frictions are from a Rotemberg type menu cost and do not consider the effects of price dispersion for non-zero inflation rates.

Table 2 reports the mean and standard deviation of the sacrifice ratios.[3] Cold turkey disinflation are no longer costless regardless of whether they are monetary led or fiscal led. All cold turkey disinflation imply a sacrifice ratio that is positive on average with monetary led disinflation the least costly policy option. For anticipated disinflations, however, the relationship is flipped. Fiscal led disinflations are less costly on average compared to the same anticipated monetary led policy with the only one exception when $j = 2$, $\phi_s = 0$, and debt is short-term.

The cost of disinflation varies with the fiscal rule depending on type of disinflation policy. Under cold turkey policies, the sacrifice ratio is monotonically decreasing as ϕ_s increases. For the anticipated cases, we find the same positive relationship between the sacrifice ratio and ϕ_s in the unpegged case as before, but the opposite relationship when rates are pegged. In the online appendix, we show that the explanation for the change in the relationship between the

[3] The magnitude and variance of the sacrifice ratios coincide well with the cross-country estimates in Gibbs and Kulish (2017).

Table 2: Sacrifice Ratios - Medium-scale model

6% Disinflation	**Monetary**		**Fiscal**					
	w/ peg	*w/o peg*	*w/ peg*			*w/o peg*		
	$\phi_\pi = 0, \phi_\pi 0.5$ $\phi_s = 0.5$	$\phi_\pi = 1.5$ $\phi_s = 0.5$	$\phi_\pi = 0, \phi_\pi 0.5$ $\phi_s = 0.0$	$\phi_\pi = 0, \phi_\pi 0.5$ $\phi_s = 0.5$	$\phi_\pi = 0, \phi_\pi 1.5$ $\phi_s = 1.5$	$\phi_\pi = 0.5$ $\phi_s = 0.0$	$\phi_\pi = 0.5$ $\phi_s = 0.5$	$\phi_\pi = 0.5$ $\phi_s = 1.5$
w/ short-term debt								
Cold-turkey	**0.67**	**0.67**	1.75	0.91	0.75	1.75	0.91	0.75
	(0.24)	(0.24)	(0.94)	(0.35)	(0.28)	(0.94)	(0.35)	(0.28)
Announced (j = 1)	2.44	-0.33	2.12	0.84	0.66	**-1.25**	-0.64	-0.52
	(1.12)	(0.28)	(2.11)	(0.76)	(0.59)	(0.93)	(0.40)	(0.33)
Announced (j = 2)	3.25	-1.30	3.36	0.77	0.57	**-3.84**	-1.97	-1.61
	(1.44)	(0.44)	(5.50)	(1.13)	(0.83)	(1.81)	(0.62)	(0.50)
w/ long-term debt								
Cold-turkey	**0.67**	**0.67**	1.29	0.88	0.75	1.29	0.88	0.75
	(0.24)	(0.24)	(0.60)	(0.33)	(0.28)	(0.60)	(0.33)	(0.28)
Announced (j = 1)	2.44	-0.33	1.64	0.90	0.70	**-1.00**	-0.65	-0.53
	(1.12)	(0.28)	(1.24)	(0.71)	(0.58)	(0.65)	(0.39)	(0.32)
Announced (j = 2)	3.25	-1.33	2.06	0.90	0.64	**-3.06**	-1.99	-1.65
	(1.44)	(0.44)	(2.14)	(1.04)	(0.82)	(1.27)	(0.62)	(0.51)

Notes: Mean and standard deviation of sacrifice ratios for disinflation policies drawing from the estimated posterior of Smets and Wouters (2007).

sacrifice ratio and ϕ_s, relative to the simple model, is the addition of sticky wages. Lowering the wage friction restores the relationship for anticipated policies we found in the simple model. In contrast, the monetary led disinflations show the same pattern as in the simple model.

4 Conclusion

We show that a fiscal led disinflation generates different costs when compared to a monetary led one. The cost varies both with policy design and the assumed frictions in the economy. Cold turkey disinflations deliver the lowest sacrifice ratios when monetary led in the quantitative model. Anticipated policies are least costly, on average, when fiscally led. However, the variance of fiscal led sacrifice ratios is high and depends on both coordination with monetary policy and the design of the surplus rule.

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