



What matters most for the sacrifice ratio?

Lynne Evans^a and Anamaria Nicolae^b

^aNewcastle University Business School, NE1 7RU, Newcastle upon Tyne, UK.

^bDepartment of Economics, Durham University, Durham DH1 3HY, UK.

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Lynne Evans^a

Anamaria Nicolae^b

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a Corresponding Author.

Newcastle University Business School, 5 Barrack Road, Newcastle upon Tyne NE1 4SE, UK
Lynne.Evans@ncl.ac.uk Tel: +44 (0)191 208 1701

b Department of Economics, Durham University, 23-6 Old Elvet, Durham DH1 3HY, UK.

Anamaria.Nicolae@durham.ac.uk Tel: +44(0)191 334 6358

Abstract

Despite its having high policy relevance, and despite extensive empirical work, little is known about the relative impact of the main drivers of the sacrifice ratio: initial inflation, speed of disinflation and imperfect credibility. To shed some light on this important matter, we employ a New Keynesian DSGE model with imperfect credibility to analyse model-generated sacrifice ratios and the quantitative relevance of their main drivers. First, we show that the model can account for the output sacrifice of both the Thatcher and Volcker disinflations. Second, we find that 75% of the sacrifice ratio is attributable to the initial inflation rate, 14% to the initial lack of credibility and 11% to the speed of disinflation.

Keywords

Sacrifice ratio; Imperfect credibility; Disinflation speed.

JEL classification

E31; E5

1. Introduction

There is general consensus that sacrifices in output are needed to reduce inflation. These sacrifices are captured in the short-run output response to a disinflation and are the focus of extensive empirical literature on the sacrifice ratio (the cumulative percentage output loss *per inflation point* decline). However, despite this substantive empirical work, there is no consensus on the size of the sacrifice ratio even for a single disinflation in one country and certainly not across countries. For example, estimates of the sacrifice ratio for the famous Volcker disinflation range from around 1.8 (Ball, 1994a) to 2.8 (Zhang, 2005); and, for episodes across all G7 countries, Zhang's study reports estimates of 0.2 (1970s, Japan) up to 11.9 (1990s, France).

That estimates of the sacrifice ratio vary is not surprising. In part, this reflects the application of different empirical approaches, but, more importantly, it reflects episode specifics. It is well understood that the cost of a disinflation depends on the credibility of the disinflation policy, the speed of the disinflation and the size of the initial inflation; yet the empirical literature provides little information on the relative importance of these matters. Economists continue to puzzle over what matters most. The high policy relevance of the issue ensures that work continues; however, there are many intractable challenges for the empirical estimation work. Among these are the fundamental problems of identification, the extent to which it is appropriate to treat disinflation as exogenous, and measuring the cumulative output loss. Against this background, a theoretical approach – which permits control over the specification of the disinflation – has obvious appeal.

The aim of this paper is to quantitatively assess the importance of different characteristics of a disinflation in determining the size of the sacrifice ratio. We use a theoretical framework and run numerous disinflation experiments, each defined by the specific characteristics of speed of disinflation, initial inflation, and degree of imperfect credibility. We calculate the sacrifice ratio for each experiment and use these model-generated sacrifice ratios to extract the relative impact of each characteristic.

The framework we choose is a New Keynesian DSGE model with sticky prices, monopolistic competition and imperfect credibility (Nicolae and Nolan, 2006; henceforth, NN). The model nests a ground-breaking model which reconciles opposing views on disinflation speed by combining both state-dependent and time-dependent pricing strategies (Ireland, 1997).

The model has a number of other highly desirable features. Firstly, it allows policymakers to choose the speed of the disinflation, announce their monetarist disinflation policy, and unwaveringly implement it. Secondly, the setup allows for temporary imperfect credibility in that agents take time to fully believe the announced policy, having started from different degrees of initial credibility. Thirdly, the model is solved using a nonlinear method. (Ascari and Merkl, 2009 have shown that taking the non-linearities into account has important qualitative and quantitative implications when studying disinflations.)

2. Model Performance

It is well known that New Keynesian DSGE models assuming perfect foresight are largely unsuccessful in replicating a costly disinflation, and that implementing imperfect credibility in those models may correct this shortcoming.¹ First, we establish that the imperfect credibility model employed here explains the output gap experienced during two famous disinflation episodes: those of Thatcher and Volcker. These two episodes were attempts to put ‘monetarism’ into practice in the early 1980s. Broadly speaking, UK inflation fell from 15% to 3% and US inflation from 10% to 4%. Both countries experienced a deep economic recession. Figures 1 and 2 show the OECD output gap (the solid line) alongside the model output gap and reveal the model’s ability to replicate the output sacrifice in these two monetarist experiments.²

The model calibration is as in NN. To back out the model output gap for each disinflation episode, we have used UK and US OECD data to calibrate the learning process. The model-calculated sacrifice ratio³ for the Thatcher disinflation is 1.9 and for Volcker 1.8, both values within the range of estimates in the empirical literature.

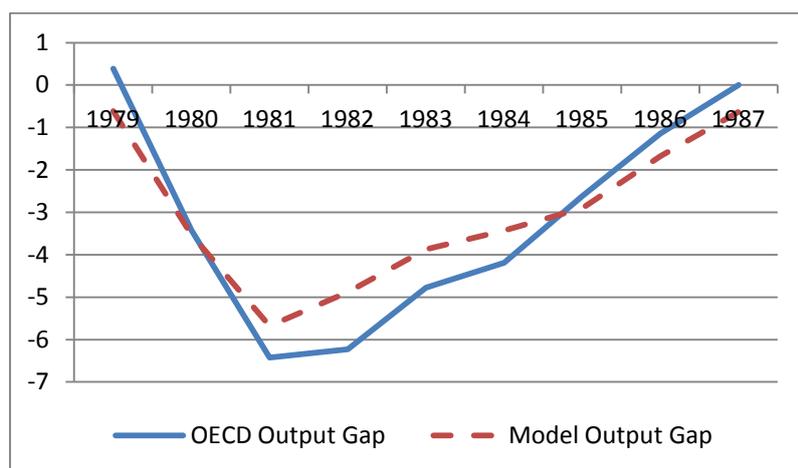


Figure 1. Thatcher Disinflation: OECD and Model Output Gaps.

¹ See the extensive literature stemming from Ball (1994b).

² Both of these disinflations pre-date explicit inflation targeting. At the time, the focus was on reducing inflation to ‘a low level’. Here, we assume a target of 1% (2%) was in place (reflecting average UK (US) inflation of the late 1950s). We use the currency component of M1 from 1979 until 1986 (1984) as the path for the UK (US) money stock during the disinflation.

³ We define the sacrifice ratio as per Ball (1994a) – see Section 3 below.

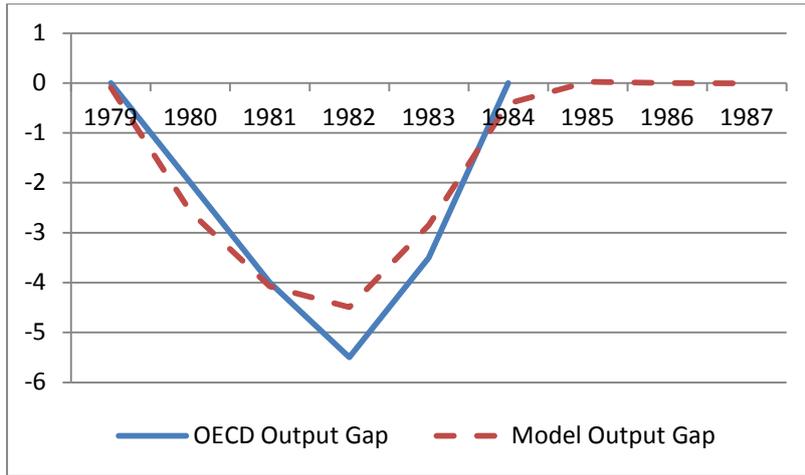


Figure 2. Volcker Disinflation: OECD and Model Output Gaps.

3. Sacrifice Ratios

Next, to explore the impact of different disinflation characteristics on the cost of a disinflation, we use the model to calculate sacrifice ratios for numerous disinflation experiments.⁴

Each experiment specifies particular characteristics of a disinflation: the initial rate of inflation (a range of initial (low) inflation rates up to 7%); the speed of disinflation (immediate and, at half-year intervals, up to a five-year gradual disinflation); and the degree of initial credibility (full credibility, high, medium, low, absolute lack of credibility).⁵

We define the sacrifice ratio as in Ball (1994a, p. 160):

$SR = 1/(\pi_{peak} - \pi_{trough}) \sum_{t=0}^T (y_t - y_{trend})$, where: π is inflation; y_t is output at time t ; y_{trend} is initial steady state output, and T is the time horizon over which output is below initial output.

To give a flavour of our findings, we report in Table 1 a selection of the computed sacrifice ratios for disinflation experiments from low initial inflation rates to price stability.

Disinflation from an initial inflation rate of 3% is typical of ‘low inflation’ experiments in this literature; and the three initial inflation rates shown are the central three points of the

⁴ Having emphasised the importance of developing theoretical models capable of accounting for the cost of a disinflation, Ascari and Ropele (2012) calculate a model sacrifice ratio in a New Keynesian framework. However, their analysis only considers cold-turkey disinflation. Developments of their work, together with the approach taken in this paper, should prove useful for identifying features of New Keynesian frameworks salient for replicating disinflation costs.

⁵ The learning process is calibrated to match the Thatcher disinflation - concave learning for 3.5 years before achieving full credibility. The different degrees of initial credibility $\{0, 0.3, 0.5, 0.7, 1\}$ correspond to $\rho_0 = \{0, 0.3, 0.5, 0.7, 1\}$ in NN, equation (18).

wider range of initial inflation rates considered in this paper. A three-year gradual disinflation is representative of a gradual disinflation in this literature, although many theoretical studies only consider immediate disinflations.⁶

Table 1. Model sacrifice ratios for immediate and gradual (three-year) disinflation from 3%, 4% and 5% initial inflation.

<i>Length of disinflation</i>	<i>Degree of initial credibility</i>	<i>Initial inflation</i>		
		<i>3%</i>	<i>4%</i>	<i>5%</i>
<i>Immediate</i>	Full credibility (0)	0.777	0.742	0.715
	High (0.3)	0.937	0.901	0.870
	Medium (0.5)	1.037	0.998	0.966
	Low (0.7)	1.130	1.087	1.053
	Absolute lack of credibility (1)	1.260	1.210	1.165
<i>Gradual (three-year)</i>	Full credibility (0)	0.071	0.069	0.067
	High (0.3)	0.083	0.082	0.080
	Medium (0.5)	0.106	0.103	0.100
	Low (0.7)	0.172	0.154	0.138
	Absolute lack of credibility (1)	0.286	0.259	0.237

Table 1 shows sacrifice ratios that are (consistently) higher, the lower is initial inflation: the overall size of the disinflation matters (as in Zhang, 2005). Each inflation point decline is much more costly as inflation nears target, whether disinflation is immediate or gradual; and ‘cold-turkey’ is always the more costly. Unsurprisingly, the more agents believe the policy at the outset (the higher the degree of initial credibility), the less costly is the disinflation.

Perhaps more interesting than these qualitative observations, is the quantitative. For example, the sacrifice ratio is as much as 11% higher when gradually disinflating from 3% than when disinflating from 4%. However, while these tabled results convey some information about the impact of different characteristics on the cost of a disinflation, there is more we can learn from the systematic exploration of our model-generated sacrifice ratios. The experiment reveals that of the three disinflation characteristics specified, it is the initial inflation rate that has by far the most impact on the size of the sacrifice ratio, contributing

⁶ The analysis of gradual disinflation experiments is warranted since, according to Ireland, (1997) and Nicolae and Nolan (2006), gradual disinflation is preferable when initial inflation is small. In our setup, policymakers are allowed to choose the speed at which they disinflate.

approximately 75% to it. The next biggest contributor is imperfect credibility, making a 14% contribution while the speed of the disinflation makes a relatively modest 11% contribution. Certainly, lack of credibility makes a difference to the real effects of a disinflation, as does the gradualness of the disinflation; however, what really matters is the monetary authority's resolve to disinflate. In all experiments here, the authorities are resolute in the implementation of their monetarist disinflation and the real effects captured in the sacrifice ratios are predominantly attributable to this contractionary monetary policy action.

This result is not insignificant. The scale of the task facing policymakers, measured by the deviation of initial inflation from target, matters far more than the speed at which they disinflate; and this is the case however much the disinflation policy announcement is believed. For policymakers wanting to minimise the cost of disinflation, the theoretical framework employed in this paper can be used to provide valuable policy guidance. Given the initial inflation and the level of credibility, policymakers could infer the extent to which a desired speed of disinflation – the only policy variable available here – could reduce the cost of the disinflation.

4. Conclusion

This paper uses a New Keynesian DSGE model with imperfect credibility which is shown to quantitatively account for the output sacrifice in both the Thatcher and Volcker disinflations. The model is employed to conduct a number of disinflation experiments with the objective of learning about the relative importance of different factors that drive the sacrifice ratio – a matter of high policy relevance, yet about which little is known. We find that, for the range of inflation rates considered here, what matters most for the sacrifice ratio is the scale of the disinflation, followed by the degree of credibility and the speed of disinflation.

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