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Optimal monetary policy with distinct core and headline inflation rates ☆

Martin Bodenstein, Christopher J. Erceg, Luca Guerrieri *

Federal Reserve Board, Washington, DC 20551, USA

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ABSTRACT

In a stylized DSGE model with an energy sector, the optimal policy response to an adverse energy supply shock implies a rise in core inflation, a larger rise in headline inflation, and a decline in wage inflation. The optimal policy is well approximated by policies that stabilize the output gap, but also by a wide array of "dual mandate" policies that are not overly aggressive in stabilizing core inflation. Finally, policies that react to a forecast of headline inflation following a temporary energy shock imply markedly different effects than policies that react to a forecast of core, with the former inducing greater volatility in core inflation and the output gap.

1. Introduction

The pronounced divergence between headline and core inflation rates in response to the substantial energy price hikes of the past few years has intensified debate over which inflation measure is the more appropriate focus of policy. Some central banks, such as the Bank of England and European Central Bank, focus on headline inflation both in framing objectives, and as an operational guide to policy; while others appear relatively more concerned with the behavior of core inflation, at least in describing the basis for policy decisions.[1]

This paper uses a stylized optimization-based DSGE model to assess the implications of alternative monetary policies in response to energy shocks, as well as to compare such policies to the "optimal" policy that maximizes the utility of households. The model economy is formulated to allow a distinction between core and headline inflation, as in recent work

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* Corresponding author. Tel.: +1 202 452 2550.
E-mail address: Luca.Guerrieri@frb.gov (L. Guerrieri).

[1] For example, the Bank of England has a target of 2% that is expressed in terms of headline inflation. It describes operational policy as adjusting interest rates so that its forecast of headline inflation reverts to target within a reasonable time frame without inducing undue instability in real activity (see http://www.bankofengland.co.uk/monetarypolicy/framework.htm). By contrast, the U.S. Federal Reserve has emphasized a measure of core inflation that excludes energy in guiding its operational decisions, even while acknowledging that it may be sensible to express longer-run objectives in terms of headline inflation (for a very useful discussion, see Mishkin, 2007).

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by Blanchard and Galí (2007).[2] In particular, goods comprising the core basket are produced by monopolistically competitive retailers that set prices in staggered Calvo-style contracts, so that core prices are sticky. By contrast, energy prices are flexible, and determined to equate the sum of household and firm demand to the available supply (a stochastic endowment process). Because wages are sticky, shocks that depress energy supply raise marginal cost even for a policy that keeps output at potential, pushing up both core and headline price inflation; thus, monetary policy faces a stabilization tradeoff.

We derive a quadratic approximation to welfare following the seminal analysis of Rotemberg and Woodford (1997). As in the model of Erceg et al. (2000), the deviation of welfare from its Pareto-optimal level depends on the variance of price inflation, wage inflation, and the employment (or output) gap. But corroborating the insight of Goodfriend and King (1997), King and Wolman (1998), and Aoki (2001), it is core price inflation that matters for welfare, since the price of energy is assumed to be completely flexible.[3] Welfare also turns out to depend on the price markup, which affects the intratemporal allocation of energy across households and firms.

Given that the supply block of our model also parallels Erceg et al. (2000) quite closely, some key prescriptions about optimal policy derived in that setting for technology shocks carry over to energy supply shocks. In particular, in the case of a contractionary supply shock that pushes up the energy price, it is optimal for the required fall in the real wage to occur through a combination of a temporary rise in core inflation, and fall in wage inflation (with headline inflation increasing by more than core). Policies that keep output close to potential turn out to be nearly optimal even though the output gap receives a small weight in the welfare function, reflecting that such policies perform well in achieving the wage and price adjustment that occurs under the optimal policy.

Perhaps surprisingly, "dual mandate" objective functions that simply penalize volatility in core inflation and the employment gap also perform remarkably well compared to the welfare-maximizing policy for a wide range of relative weights on these objectives, unless the policymaker only cares about stabilizing inflation. Following the seminal approach of Taylor (1979), this reflects that the variance tradeoff frontier (or "Taylor Curve") implies that the cost of reducing inflation volatility in terms of employment gap volatility is very high. As a result, even a policymaker with a strong aversion to inflation variation does not find it worthwhile to bear the high cost of reducing inflation volatility, and chooses a policy that keeps employment close to potential.

Finally, the performance of simple policy rules that respond to a *forecast* of either headline or core inflation is examined. This analysis is useful because many central banks describe their policy as aimed at adjusting policy rates so that a forecast of inflation reverts to target over a "medium-term" horizon of roughly two or three years, with most focusing on a forecast of headline inflation. Our model implies that forecasts of headline and core inflation can diverge markedly following a temporary shock to energy supply: as documented in Section 2, Federal Reserve Greenbook forecasts suggest numerous episodes in which such divergence occurred following large but temporary shocks to energy prices. Under such conditions, the particular inflation forecast measure (headline or core) to which the central bank chooses to react can have sizeable macroeconomic implications for the implied response to an energy price shock.

Model simulations illustrate how a temporary rise in the energy price induces a much more accommodative policy response under the rule that responds to a headline inflation forecast, as expected headline inflation falls well below core due to predicted mean reversion in the energy price. As a result, a policy of responding to a forecast of headline inflation fuels a much larger rise in core inflation and the output gap than a policy of stabilizing a forecast of core (which more closely resembles the optimal policy). In the presence of uncertainty about the persistence of the shock, focusing on headline inflation may even contribute to greater volatility in realized headline inflation than the alternative of focusing on core.

This paper is organized as follows. Section 2 provides some empirical motivation. Section 3 describes the workhorse model, Section 4 the model's log-linearized behavioral equations, and Section 5 the calibration. Section 6 describes the derivation of the welfare function, while Section 7 analyzes optimal policy and various simple rules. Section 8 concludes.

2. Headline and core inflation data and forecasts

Fig. 1 reports the evolution of headline CPI inflation and core CPI inflation between 1990 and the second quarter of 2007 (both series are reported as four quarter changes). The core inflation measure excludes food and energy prices.[4] Headline inflation is clearly more volatile than the core CPI inflation rate. Despite the higher weight on food compared with energy in

[2] Leduc and Sill (2004) and Dhawan and Jeske (2007) analyzed the implications of alternative policy responses to oil shocks in a DSGE setting with nominal rigidities, but did not consider the optimal policy using a utility-based welfare metric.

[3] Goodfriend and King (1997) and King and Wolman (1998) argued that monetary policy should be concerned with stabilizing the components of the price index that are sticky, rather than the overall index. Aoki (2001) formalized this insight by constructing a model with both a flexible price sector, and a sticky price sector. Because the welfare losses depend exclusively on the variance of the sticky price components, the optimal policy consists of stabilizing those components. Our model is similar to Aoki's insofar as it can also be regarded as including a flexible price sector and sticky price sector; however, it differs mainly by introducing energy as an input into the demand functions of firms and households, and because wages are assumed to be sticky.

[4] There is an extensive literature analyzing the properties of some alternative measures of core inflation derived from various statistical procedures; a nice overview is provided in Aucremanne and Wouters (1999). Some notable early contributions include Bryan and Pike (1991), Bryan and Cecchetti (1994), and Quah and Vehey (1995).