

Contents lists available at [ScienceDirect](#)

Journal of International Money and Finance

journal homepage: www.elsevier.com/locate/jimf

Does US monetary policy respond to oil and food prices? ☆



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ARTICLE INFO

Article history:

Available online 7 January 2017

JEL classification:

E10

E30

Keywords:

DSGE models

Multiple Calvo

Taylor rules

Sector-specific shocks

Core inflation

ABSTRACT

A common view is that US monetary policy does not respond to changes in volatile energy and food prices. Despite this view, the popular New Keynesian models assume Taylor-type rules under which the short-term interest rates react to headline inflation. This paper evaluates the fit of alternative Taylor rules within an estimated New Keynesian model. A main finding is that the US central bank includes energy and food prices in its policy rule, although the weight assigned to these prices is much smaller than their share in the economy.

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1. Introduction

It is often noted that the US central bank puts lots of emphasis on core inflation (see, for example, [Blinder and Reis, 2005](#); [Mishkin, 2007](#)). [Mishkin \(2007\)](#) explicitly notes that “The Federal Reserve, for example, pays particular attention to the rate of growth of the core personal consumption expenditure (PCE) deflator, which excludes food and energy prices”.

Despite this insight, the standard models (e.g. [Smets and Wouters, 2007](#) (SW)) assume Taylor-type rules under which the short-term interest rates react to changes in headline inflation (i.e. GDP deflator). As the discussion between [Taylor \(2007\)](#) and [Bernanke \(2015\)](#) indicates, the choice of inflation measure matters significantly for the interest rate implied by the rule. Using the Taylor rule with a measure of headline inflation (i.e. the GDP deflator), Taylor argues that the US monetary policy was too easy, relative to what the rule suggests, during the period from 2002 to 2005. Based on this observation, Taylor argues that this loose monetary policy leads to the 2008 financial crisis. On the other hand, Bernanke changes the measure of inflation used by Taylor with a measure of core inflation (i.e. core PCE), which excludes the volatile energy and food prices. He finds that during the 2002–2005 period US monetary policy is consistent with the predictions of his version of the Taylor rule.

Given the fact that new Keynesian models are used for monetary policy analysis at central banks around the world and that policy prescription of the rule is affected by the choice of inflation measure, it is important to evaluate the fit of alternative Taylor rules with different measures of inflation within a New Keynesian model. This is the challenge this paper takes up. I consider two different rules. One of the rules is the same as that in the SW model. Under this rule, the central bank adjusts the short-term interest rate according to changes in headline inflation as well as the output gap and the change in the output gap. The second rule is the same as the SW rule but reacts to changes in an inflation index, rather than headline inflation. The inflation index is an appropriately weighted average of core inflation and energy and food prices.

☆ I would like to thank Joshua Aizenman (the editor) and two anonymous referees for insightful comments and suggestions.
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The main finding of this paper is that the Taylor rule under which the central bank reacts to changes in core inflation but does not ignore changes in energy and oil prices fits the data better than the rule employed in the SW model. The share of core inflation in the inflation index is around 90%, whilst the share of energy and food prices in the index is 10%. The weight energy and food prices receives in the inflation index is small, relative to its share in the economy. The share of energy and food prices in the economy is 34%. This rule performs significantly better than both the rule that targets core inflation only and the rule that targets headline inflation.

Whilst there are studies (e.g. [Cúrdia et al., 2015](#)) that replace GDP deflator data with core inflation data in the SW model, to the best of my knowledge, this is the first paper that compares the empirical performance of the two rules within the same model. A possible reason for the lack of such studies may be that, as has been emphasised by [Boivin and Giannoni \(2006\)](#), the existing macroeconomic modelling approach tends to favour simplicity and only one price index is used in estimation.

To overcome this issue, I use a multi-sector version of the SW model (Multiple Calvo-SW), as proposed by [Kara \(2015\)](#). I consider a special case of the MC-SW model in which there are two sectors and the sectors differ in their contract length, in their share in the economy and in the variances of sector-specific shocks. In one of the sectors, prices are relatively flexible, whilst in the other they are sticky. Following the literature (e.g. [Aoki, 2001](#); [Woodford, 2003](#)), core inflation is defined as inflation in the sticky-price sector, whilst inflation in the flexible-price sector represents energy and food prices. The latter assumption is consistent with the micro evidence on prices (see [Klenow and Malin \(2011\)](#) for a survey). As I will discuss in more detail later in the text, the series for flexible-price inflation is very similar to that for energy and food prices. Thus, in the model there are two sectoral price indices and an aggregate price index. Data for three price indices along with the other macroeconomic data commonly used to estimate new Keynesian models are used to estimate the model. Sectoral price data are compiled by [Bils et al. \(2012\)](#). The data are based on the US CPI data and are grouped into two sub-groups according to how frequently prices change. Consistent with the conventional wisdom and the empirical findings reported in [Boivin et al. \(2009\)](#), estimation results show that in the flexible sector standard deviation of the sector-specific shocks are much larger than those in the sticky sector.

This paper is closely related to the paper by [Blinder and Reis \(2005\)](#). Blinder and Reis estimate the Taylor rule in a univariate setting from 1987 to 2005 and find that a Taylor rule with core inflation fits the data better than a Taylor rule with headline inflation. My results are consistent with theirs. However, I find that a Taylor rule that includes energy and food prices as an additional targeting variable fits the data better than a Taylor rule with core inflation.

The remainder of the paper is organised as follows. Section 2 presents the model. Section 3 discusses the data used in the estimation and the methodology for the estimation. Section 4 compares the models, presents estimation results and, finally, explores the robustness of the conclusions to alternative specifications. Section 5 concludes the paper.

2. The model

The model is based on [Kara \(2015\)](#). [Kara \(2015\)](#) incorporates heterogeneity in price stickiness into the SW model, along the lines suggested by [Carvalho \(2006\)](#). The model is referred to as MC-SW. Here I allow for the possibility that sectors are hit by sector-specific shocks. Due to data limitations, a special version of the model with two sectors is considered. In this section, the equations describing price setting in the model are presented, which are, apart from the assumption of sector-specific shocks are exactly the same as those in [Kara \(2015\)](#).¹ The remaining equations are the same as those in the SW and are listed in [Appendix A](#).

In the model there is a continuum of monopolistically competitive firms indexed by $f \in [0, 1]$, each producing a differentiated good $Y_t(f)$. The unit interval of firms is divided into N sectors, $i = 1 \dots N$. In this paper, it is assumed that $N = 2$. The share of each sector is α_i . Within each sector, there is a Calvo-style contract. In sector i , the hazard rate is given by ω_i . The pricing rule for the firms in sector i (in logs) is given by

$$\bar{x}_{it} = \omega_i \frac{\bar{m}c_t}{\zeta \epsilon_p + 1} + (1 - \omega_i)(E_t \bar{x}_{it+1} + E_t \pi_{t+1}) + \varepsilon_{it}^p \quad (1)$$

where $\bar{m}c_t = (1 - \alpha)w_t + \alpha r_t^k - \varepsilon_t^a$ is the marginal cost. w_t is wages, r_t^k is the rental rate of capital and ε_t^a is the total factor productivity. ε_{it}^p denotes the sector-specific price shocks, $\bar{x}_{it} = x_{it} - p_t$ is the real reset price in sector i , x_{it} is the nominal reset price, p_t is the general price level and π_t is inflation. ϵ_p is the percentage change in the elasticity of demand due to a one percent change in the relative price at the steady state and ζ is the steady state price-markup and is related to the fixed costs in production. These two terms determine how responsive the firms are to changes in real marginal cost. In each sector i relative prices are related to the reset prices in that sector as follows:

$$\bar{p}_{it} = \omega_i \bar{x}_{it} + (1 - \omega_i)(\bar{p}_{it-1} - \pi_t) \quad (2)$$

where $\bar{p}_{it} = p_{it} - p_t$ denotes the logarithmic deviation of the aggregate price in sector i (p_{it}) from the aggregate price level. The nominal aggregate price level in the economy is simply the weighted average of all ongoing prices. This relation implies that

¹ In [Kara \(2016\)](#), I use the same model to test whether the model can match the empirical findings from factor models that sectoral prices adjust faster to sector-specific shocks than to monetary policy shocks. The results suggest that it can, making a stronger case for the model.

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