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Do expected future marginal costs drive inflation dynamics?

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Abstract

This article discusses a more general interpretation of the two-step minimum distance estimation procedure proposed in Sbordone (2002). The estimator is again applied to a version of the New Keynesian Phillips curve, where inflation dynamics are driven by the expected evolution of marginal costs. The article clarifies econometric issues, addresses concerns about uncertainty and model misspecification raised in recent studies, and assesses the robustness of previous results. While confirming the importance of forward-looking terms in accounting for inflation dynamics, it suggests how the methodology can be applied to extend the analysis of inflation to a multivariate setting.
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1. Introduction

The standard pricing assumption in real business cycle models implies a constant markup of prices over marginal cost, and hence an inflation rate equal to the rate of growth of average nominal marginal cost. These predictions are at odd with the data: in particular, US inflation is less volatile than marginal costs. However, by introducing

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nominal price rigidities it is possible to explain cyclical markup variations, and hence to generate an inflation path whose volatility is like that observed in the data.

The widely used Calvo model of staggered pricing (Calvo, 1983) implies an equilibrium pricing condition that, in log-linearized form, links current inflation to expected future inflation and current real marginal cost[2]

$$\pi_t = \beta \mathrm{E}_t \pi_{t+1} + \zeta s_t + \eta_t. \tag{1.1}$$

Here s_t is the (log of) average real marginal cost in the economy, the parameter β is a discount factor, and ζ is a nonlinear function of the relevant structural parameters: $\zeta = (1-\alpha)(1-\alpha\beta)/\alpha(1+\theta\omega)$. θ is the elasticity of substitution among differentiated goods, ω is the elasticity of firms' marginal costs to their own output,[3] and α is the percentage of prices that are not reset optimally at time t. The degree of price inertia is measured by $1/1-\alpha$.[4] The error term η_t is included to account for fluctuations in the desired mark-up, or for other forms of misspecification of the equation;[5] throughout this article it is assumed to be a mean zero, serially uncorrelated stochastic process.[6]

This model has been generalized in a number of ways to be able to generate additional inflation inertia. Here I follow Christiano et al. (2005) by assuming that firms that are not selected to reset prices through the Calvo random drawing are nonetheless allowed to index their current price to past inflation, and I assume that they do so by some fraction $\varrho \in [0,1]$. The solution of the model in this case[7] is

$$\pi_t - \varrho\pi_{t-1} = \beta(\mathrm{E}_t\pi_{t+1} - \varrho\pi_t) + \zeta s_t + \eta_t, \tag{1.2}$$

which nests Eq. (1.1) (the case of $\varrho = 0$), and, in the opposite case of full indexation ($\varrho = 1$), as considered in Christiano et al. (2005), implies an expectational equation in the *rate of growth* of inflation. This generalized equation has the same form as the 'hybrid model' of Gali and Gertler (1999), when rewritten as

$$\pi_t = \frac{\varrho}{1+\beta\varrho}\pi_{t-1} + \frac{\beta}{1+\beta\varrho}\mathrm{E}_t\pi_{t+1} + \frac{\zeta}{1+\beta\varrho}s_t + \widetilde{\eta}_t, \tag{1.3}$$

or

$$\pi_t = \gamma^b \pi_{t-1} + \gamma^f \mathrm{E}_t \pi_{t+1} + \overline{\zeta} s_t + \widetilde{\eta}_t. \tag{1.4}$$

In this expression γ^b and γ^f can be interpreted as the weights, respectively, on 'backward-' and 'forward-looking' components of inflation. Iterating forward, Eq. (1.2) gives a present

[2]A detailed derivation of this equation can be found in Woodford (2002, ch. 3).

[3]The presence of this term is due to the further assumption of firm-specific capital. This term alters the mapping between the parameter ζ and the frequency of price adjustment, as discussed in Sbordone (2002), making a low estimate of ζ consistent with a reasonable degrees of price stickiness.

[4]The variables are expressed in log deviation from steady state values. If the log-linearization is around a zero steady state inflation, the log deviation of inflation can be measured by its actual value. Under the assumption that real wage and productivity share the same long run trend, the log deviation of the labor share can also be measured by its actual value. In the data, we will see below that stationarity may require a slight transformation of the share.

[5]This was suggested by Rotemberg and Woodford (1999). In Steinsson (2002) the error represents exogenous variations in the elasticity of substitution; in Giannoni (2000) it represents time varying tax distorsions.

[6]In my (2002) paper, I examined the degree to which the data could be fit by a model with no error term. Here, instead, an explicit hypothesis about the nature of the error term allows to address various issues such as a possible simultaneous-equations bias.

[7]A detailed derivation of this expression can be found in Woodford (2003, ch.3).

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