Journal of Monetary Economics 56 (2009) 1101–1108

Contents lists available at ScienceDirect

Journal of Monetary Economics

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

Inflation determination with Taylor rules: Is new-Keynesian analysis critically flawed?

Bennett T. McCallum *

Carnegie Mellon University and NBER, Tepper School 256, Pittsburgh, PA 15213, USA

ARTICLE INFO

Article history:
Received 12 February 2009
Received in revised form
19 October 2009
Accepted 20 October 2009
Available online 1 November 2009

Keywords:
Determinacy
Transversality
Learnability
New Keynesian
Explosive

ABSTRACT

Cochrane (2007) has strongly questioned the basic economic logic of current monetary policy analysis, arguing that New Keynesian (NK) models imply rational expectations paths with explosive inflation that do not imply explosions in real variables relevant for transversality conditions. Consequently, the usual logic does not rule out solutions with explosive inflation. That result does not, however, justify negative conclusions about NK analysis, for a different criterion is logically satisfactory. It is that, to be plausible, a RE solution must satisfy the property of least-squares learnability. Adoption of this criterion serves to justify in principle the bulk of current mainstream analysis.

1. Introduction

There are several significant reasons for concern regarding various aspects of current mainstream monetary policy analysis as widely practiced and described by Clarida et al., (2000), King (2000), Svensson and Woodford (2005), Taylor (1999), Woodford (2003a), and other prominent writers.[1] Among these are the absence of any significant role for monetary aggregates, the failure to distinguish various interest rates important in the transmission mechanism, the non-observability of crucial policy variables such as the natural rate of output, and possible empirical weaknesses of key behavioral relationships including the "expectational IS function" and the usual Calvo-style price adjustment mechanism.[2]

There are also theoretical issues regarding the role of "determinacy"—defined in this literature as the existence of a single rational expectations (RE) solution that is dynamically stable—in the mainstream approach, issues that have been raised by, e.g., Bullard (2006), Bullard and Mitra (2002), and McCallum (2003). In this regard, Cochrane (2007) has recently expressed a new concern regarding the mainstream approach, which includes as a central ingredient the assumption that monetary policy is conducted by means of a central-bank policy rule for period-by-period adjustment of a short-term nominal interest rate. To achieve determinacy, it is typically specified that this rule will call for adjustments of the policy interest rate by more than one-for-one in response to incipient movements in inflation—thereby satisfying a condition that is widely referred to as the Taylor Principle.[3] Cochrane's contention is that the standard notion—i.e., that determinacy

* Corresponding author. Tel.: +1 412 268 2347, fax: +1 412 268 6830
E-mail address: bmccallum@cmu.edu

[1] Some other notable items in the literature include Taylor (1993), Clarida et al. (1999), Goodfriend and King (1997), King and Wolman (1996), and Rotemberg and Woodford (1997). Goodfriend (2007) presents an overview that links formal analysis and actual central bank practice.

[2] Several of these issues have been studied in the July 2006 issue of the Journal of Monetary Economics.

[3] The principle is often extended to cases in which policy responds also to incipient movements in the output gap. See, e.g., Woodford (2003a, pp. 90–94, 252–261), Taylor (1999).

0304-3932/$ - see front matter © 2009 Elsevier B.V. All rights reserved.
doi:10.1016/j.jmoneco.2009.10.003

serves to guarantee that stable inflation behavior around target will be generated—is incorrect. His basic reasoning is expressed in the following quote:

> I argue that the Taylor principle, in the context of new-Keynesian models, does not, in fact, determine inflation or the price level. Nothing in economics rules out explosive or "non-local" nominal paths. Transversality conditions can rule out real explosions, but not nominal ones (Cochrane, 2007, p. 2).

Consideration of Cochrane's argument indicates that there is much merit in this point. Specifically, the equations of the mainstream's New Keynesian (NK)[4] models are typically consistent with the existence of RE solutions with explosive inflation rates, in addition to one or more stable paths. These imply "nominal explosions" that bring about paths along which real money balances tend to decrease in magnitude, in contrast to ones along which real balances grow without limit. More generally, explosive paths for inflation rates—or nominal interest rates—do not normally imply explosions in real variables relevant for transversality conditions, which are crucial for individual agent optimization. Consequently, the usual logic, in the usual models, does not imply the absence of explosive inflation.

It is argued below that this point of Cochrane's is itself correct. The point as just stated does not, however, justify negative conclusions about NK analysis.[5] For there is a different criterion—in many (but not all) cases implied by determinacy and not generally implying determinacy—that is logically satisfactory for the purpose at hand. This is the requirement that, to be plausible, a RE solution should satisfy the property of learnability, of the type made prominent in the work of Evans and Honkapohja (E&H) (1999, 2001).[6] Adoption of this criterion, which should arguably be attractive to analysts concerned with actual monetary policy issues, serves to justify the bulk of current mainstream analysis in principle. Indeed, as argued in McCallum (2003, 2007), it eliminates some other problematic aspects of the NK analysis.

2. Cochrane's critique

Let us begin by outlining the central aspects of the argument developed by Cochrane (2007) in the context of the basic NK model that is used for his main presentation. It is common, in the NK literature, to utilize a three-equation structure that includes an expectational IS function,[7] a Calvo-type price adjustment relation, and a Taylor-style policy rule in a system that could be written as

$$y_t = b_0 + b_1(R_t - E_t\pi_{t+1}) + E_t y_{t+1} + v_t \quad b_1 < 0 \tag{1}$$

$$\pi_t = \beta E_t \pi_{t+1} + \kappa(y_t - \bar{y}_t) \quad \kappa > 0 \tag{2}$$

$$R_t = \mu_0 + (1+\mu_1)\pi_t + \mu_2(y_t - \bar{y}_t) + e_t \tag{3}$$

where y_t represents output/consumption, $\bar{y}_t$ is its "natural rate" flexible-price value, π_t is inflation, and R_t is the one-period (nominal) rate of interest.[8] Here v_t and e_t are preference and policy shocks while $\bar{y}_t$ is exogenously generated by a (possibly) autocorrelated technology process. In his initial exposition, Cochrane simplifies by assuming full price flexibility so that $y_t = \bar{y}_t$ in each period, which eliminates the Calvo Eq. (2) and the output-gap term in (3).[9] If we also let $\bar{y}_t$ be a constant, then the IS relation (1) becomes

$$0 = b_0 + b_1(R_t - E_t\pi_{t+1}) + v_t \tag{4}$$

Then if the shock term is neglected and $r = -b_0/b_1$ is recognized as a constant real rate of interest, we have the relation that is often termed a "Fisher equation." From the perspective of monetary policy, I think better to describe it as is done here, but there is no substantive difference.[10] Thus, the system at hand reduces to (3) and (4), identical to Cochrane's (1) and (2) if we delete the shock v_t from ours while also setting $\mu_0 = r$ in the policy rule, as a sensible central bank would do.

To solve this simple system we combine (3) and (4) to obtain

$$0 = b_0 + b_1[\mu_0 + (1+\mu_1)\pi_t + e_t - E_t\pi_{t+1}] + v_t \tag{5}$$

[4] New-Keynesian (NK) models are basically the same as those referred to by Goodfriend and King (1997) as "New Neoclassical Synthesis" (NNS) models. Some would consider the latter label to be more apt, from a historical perspective. Nevertheless, in what follows I will use the more standard label NK to refer to the models of current mainstream analysis.

[5] It should be said that the term "critically flawed" that appears in the present paper's title is my own. I would think, however, that most exponents of NK analysis would regard a model/policy-rule combination, that does not rule out explosive inflation, to be critically flawed.

[6] More precisely, the requirement is least-squares (LS) learnability, as a necessary condition for a RE solution to be plausible and therefore of potential economic relevance. A similar learning process is featured in an influential early contribution by Marcet and Sargent (1989).

[7] This function represents a consumption Euler equation together with the economy's overall resource constraint.

[8] The rule is written assuming a zero target rate of inflation. If it were non-zero, then a non-zero constant term would appear in the solution Eq. (7) below.

[9] Later in the paper, Cochrane (2007, pp. 23–27) extends his argument to a more standard NK model with Calvo-style price adjustments.

[10] My preference is to think of the "Fisher equation" as an identity, one which defines the one-period real rate of interest as a nominal rate minus expected inflation. The construct under discussion here is a model of individual saving behavior together with a market-clearing condition that consumption equals output in the aggregate plus the assumption that output is constant.