



Monetary policy and stock price dynamics with limited asset market participation

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ARTICLE INFO

Article history:

Received 14 March 2012

Accepted 12 January 2013

Available online 1 March 2013

JEL classifications:

E4

E5

Keywords:

Stock prices

Rule of thumb consumers

Limited asset markets participation

Learning

Expectational stability

Interest rate rules

Multiple equilibria

Determinacy

ABSTRACT

We study a New-Keynesian DSGE model subject to limited asset market participation (LAMP) and assess whether monetary policy should respond to stock prices for what concerns the determinacy and the learnability (E-stability) of the Rational Expectations Equilibrium (REE). We find that interest rate rules granting a positive response to stock prices facilitate both the determinacy and the E-stability of the fundamental REE when the degree of LAMP is sufficiently large to generate an inverted aggregate demand channel of monetary policy transmission. Moreover, according to our analysis, policy rules responding to stock prices appear to perform better than more standard rules responding to output with respect to both equilibrium determinacy and aggregate welfare.

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1. Introduction

Since the burst of the dot.com bubble in early 2000, a lively discussion started in the literature aimed at defining the appropriate response of monetary policy to large swings in asset prices. In particular, economists and policy-makers have been debating whether central banks should counteract sustained increases in stock prices by raising the short-term nominal interest rate, the monetary policy instrument.¹ As stock prices presumably reflect market expectations on future profits and hence future aggregate activity, central banks targeting inflation might decide to adopt a “leaning against the wind” policy and raise the policy rate in response to higher stock prices to better shield the economy against anticipated inflationary pressure.

Carlstrom and Fuerst (2007) challenge this view, showing that the introduction of an explicit response to stock prices in Taylor-type interest rate rules increases the scope for (local) equilibrium indeterminacy in a benchmark New-Keynesian model. By allowing endogenous variables to be driven by belief shocks, equilibrium indeterminacy introduces non-fundamental excess volatility in the model, thus lowering aggregate welfare. In their framework, higher inflation increases marginal costs, which in turn lower firm’s profits and stock prices. As a result, an interest rate rule augmented with an explicit

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¹ The debate between Bernanke and Gertler (1999, 2001) and Cecchetti et al. (2000, 2002) is the most prominent. Lansing (2003, 2008) provides an overview of the various arguments.

positive response to stock prices implies an overall lower response to inflation, which might induce a decrease (rather than an increase) in the real interest rate. If that is the case, aggregate demand expands and an initial belief-driven increase in inflation can become self-fulfilling. The Taylor principle – i.e., the fact that the interest rate should respond more than proportionally to inflation (an *active* policy rule) – may then be insufficient to guarantee a unique Rational Expectations Equilibrium (REE) if the policy rule also responds to stock prices. As the authors show, determinacy requires instead a reinforced Taylor principle: the larger the explicit policy response to stock prices, the more active the policy rule should be towards inflation. This result leads them to conclude that, from the perspective of equilibrium determinacy, such augmented monetary policy rules should not be pursued.²

In this paper, we assess the desirability of Taylor-type rules responding to stock prices in a New-Keynesian model subject to limited asset market participation (NK-LAMP). Namely, we assume that a fraction of agents in the economy has no access to financial markets such that consumption can only be financed through labor income. This assumption is supported by the extensive empirical literature on consumption behavior in the US showing that for a large fraction of the population individual consumption moves almost one-to-one with current income. In their seminal work, [Campbell and Mankiw \(1989\)](#) find this fraction to correspond, roughly, to 40–50% of the entire US population. Using PSID and SCF data, other studies document that, depending on the definition of wealth, about 20–70% of the US population can be classified as asset-poor.³ As shown by [Gali et al. \(2004\)](#) and [Bilbiie \(2008\)](#), if the share of non-asset-holder is sufficiently large, the NK-LAMP economy features an *inverted aggregate demand logic* (IADL), in the sense that a decrease in the real interest rate determines a contraction (rather than an expansion) of current real activity. Under these circumstances, equilibrium determinacy requires the nominal interest rate to respond *passively* to inflation under a forward-looking Taylor rule ([Bilbiie, 2008](#)), and either very *actively* or very *passively* under a contemporaneous Taylor rule ([Gali et al., 2004](#)).

Our main criteria of policy evaluation are (1) the (local) determinacy of REE, and (2) the stability under adaptive learning (or learnability) of the Minimum State Variable (MSV) representation of the fundamental REE (from now on, the MSV-REE). The determinacy analysis will allow us to directly compare our results to those obtained by [Carlstrom and Fuerst \(2007\)](#) for the case of a fully Ricardian New-Keynesian framework, and hence to evaluate the role played by LAMP for the (un)desirability of stock-price-augmented Taylor rules.

The learnability analysis is instead motivated by the results of [Evans and Honkapohja \(2001\)](#), according to which there is no guarantee that the fundamental REE (even if determinate) can be attained if agents are not endowed with rational expectations at the outset, but instead make forecasts using simple adaptive rules, like least squares learning. As stated by [McCallum \(2009a\)](#), “... for any RE solution to be considered plausible, and thereby relevant for policy analysis, it should be learnable”, in the sense that, economic agents should be able to learn the quantitative relevance of all fundamental disturbances for the equilibrium dynamics.⁴ In particular, our learnability analysis focuses on the concept of E-stability defined in [Evans and Honkapohja \(2001\)](#): namely, a REE is said to be E-stable if the recursive least-squares forecasts of economic agents eventually converge to the true rational expectations solution.⁵ Making use of some results by [Evans and McGough \(2005\)](#), we also assess the E-stability of (Common Factor, CF, representations of) sunspot equilibria for parameterizations leading to equilibrium indeterminacy.

Our main finding is the following. For an economy where the degree of LAMP is sufficiently large to imply a IADL, introducing an explicit positive response to stock prices in the policy rule enlarges the region where the equilibrium is locally determinate and its MSV representation is E-stable. In particular, it can restore the Taylor principle as good guidance for monetary policy design. This result – which holds true both under forward-looking and contemporaneous interest rate rules – can be explained as follows. Irrespective of the degree of LAMP, a permanent increase in inflation still implies a permanent drop in profits, and hence in stock prices, similar to [Carlstrom and Fuerst \(2007\)](#). This implies that, following an initial (sunspot-driven) increase in inflation, a rule that responds positively to stock prices is more likely to induce a decrease in the real interest rate, with respect to one which does not. However, this is exactly what is needed to induce equilibrium determinacy in a IADL economy.

On the contrary, if, despite the presence of LAMP, the economy still features a SADL, the results by [Carlstrom and Fuerst \(2007\)](#) hold: a policy response to stock prices enhances the possibility of equilibrium indeterminacy. Moreover, such policy is also likely to make the MSV-REE not learnable. Interestingly, we also find that for both the case of SADL and of IADL there exists a significant range of policy parameterizations for which the (CF representation of) sunspot equilibria is E-stable.

² The modeling framework studied by [Bernanke and Gertler \(1999, 2001\)](#) and [Cecchetti et al. \(2000, 2002\)](#) hinges instead on a financial accelerator mechanism. Because of the existence of asymmetric information in borrower-lender relationships, firms need to pledge their wealth as collateral in order to obtain loans from financial intermediaries. By the easing borrowing constraints, asset price booms can gauge consumption and production. Through a higher short-term interest rate, central banks can reduce the present discounted value of expected future dividend payments, which will then deflate asset prices and slow down aggregate activity.

³ See [Caner and Wolf \(2002\)](#) and [Vissing-Jorgensen \(2002\)](#), among others. [Gali et al. \(2007\)](#) use a NK-LAMP model to solve the so-called government spending puzzle, that is, the fact that standard DSGE models predict that a positive shock to government spending has a contractionary effect on private consumption, while the opposite seems to be true in the data (see [Blanchard and Perotti, 2002](#)). [Colciago \(2011\)](#) shows that the introduction of non-Ricardian agents does not necessarily lead to an expansionary effect of government spending if the economy features nominal wage rigidities.

⁴ [McCallum \(2009a,b\)](#) and [Cochrane \(2009, 2011\)](#) discuss on whether equilibrium determinacy or the learnability of the fundamental REE should be the main criterion for equilibrium selection in policy analysis. In this paper, we do not take a stand on this issue, and present detailed results for both the determinacy and the learnability of the REE.

⁵ Although “learnability” is a more general concept of “E-stability”, in a wide variety of macroeconomic models they are essentially identical. Hence, in the paper, we will use the two terms interchangeably.

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