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Short and long interest rate targets

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ABSTRACT

Can both short and long-term interest rates be targeted independently? Can the target of the term structure help solve the problem of multiplicity of equilibria that occurs when only the short rate is targeted? Both questions are addressed, and the answer is yes to both.

1. Introduction

The low targets for short-term nominal interest rates during the recent financial crisis, very close to zero, prompted again the policy question of whether a central bank can target both short and long-term rates, with the hope of lowering the latter, given that the former cannot be lowered. The recent crisis has provided empirical support for this ability of a central bank, to target rates at different maturities. The Federal Reserve may have been able to influence the long-term rates, through the Quantitative Easing 1, 2 and 3 programs in 2008–2009, late 2010 and 2012.[1] In 2009, the European Central Bank (ECB) conducted 1 week, 3 and 6 months, and 1 year, liquidity providing operations at fixed rates. In 2011, the ECB started to lend at fixed rates at even longer horizons.[2] And there is further historical evidence that "…a sufficiently determined Fed can peg or cap Treasury bond prices and yields at other than the shortest maturities".[3] In the 1940s and 1950s, before the Federal Reserve-Treasury Accord of 1951, the Fed established both the rate on the 90-day Treasury bill and a ceiling on the 12-month Treasury certificate. Operation Twist, in the 1960s, was also an attempt by the Fed to raise short rates and lower long rates.

While there is empirical evidence for the ability of a central bank to target interest rates at different maturities, there is no theoretical basis for it.[4] This is the contribution of this paper. Can both short and long-term interest rates be targeted

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[1] See Hamilton and Wu (2012), D'Amico and King (2010) and Krishnamurthy and Vissing-Jorgensen (2011).

[2] The 1 week operations are the main refinancing operations (MROs). The operations at long horizons are the long term and very long term refinancing operations, LTROs and VLTROs (3 years).

[3] From a speech by Ben Bernanke to the National Economists Club in 2002. See Bernanke (2002).

[4] Recent, independent work by Magill and Quinzzi (2014) has results similar to ours. The focus is different: we focus on the ability of the central bank to target both short and long rates. They focus on the possibility of using the term structure to anchor expectations.

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independently? Can the target of the term structure help solve the problem of multiplicity of equilibria that occurs when only the short rate is targeted? We address both questions, and the answer is yes to both.

The problem of multiplicity of equilibria when the monetary policy instrument is the short-term, nominal interest rate was first formally addressed by Sargent and Wallace (1975). They consider an ad hoc macro model with rational expectations, assume that the policy rate responds to historical values of exogenous and endogenous variables, and show that the price level is indeterminate. Nakajima and Polemarchakis (2003) take an approach closer to ours. They consider a cash-in-advance model with uncertainty and assume that policy is a target for the interest rate on one period nominal bonds. They compute the degrees of multiplicity. In the deterministic model there is one degree of multiplicity, say, the initial price level. Instead, when uncertainty is taken into account, there is one degree for each possible history.

This multiplicity of equilibria under uncertainty, when policy targets the short rates, is the reason for our results. It is, indeed, because there are multiple equilibrium values for the price level under a target for the short rate, that there are also multiple equilibrium values for the long-term nominal interest rates. For this reason, short and long rates are independent monetary policy instruments.

A target of both short and long rates is equivalent, under general conditions, to a target of the returns on state-contingent nominal assets. If policy were to target those rates of return, it would be able to pin down the price level in every state, for a given initial price level.[5]

Sargent and Wallace (1975) and Nakajima and Polemarchakis (2003) do not consider interest rate feedback rules in which the policy rate can respond to contemporaneous endogenous variables or expectations of future variables. But considering those feedback rules, in general, does not solve the multiplicity problem (see Loisel, 2009; Adão et al., 2011, for exceptions). While it is possible to design Taylor-type rules to ensure local determinacy, globally there are still many equilibria. The conditions for local determinacy may in fact be conditions for global indeterminacy, as shown by Benhabib et al. (2001), among others.

Eggertsson and Woodford (2003) also address the question of whether it is possible, or useful, for policy to affect long-term rates. In their model, for each equilibrium in prices and quantities, there are multiple portfolio compositions that support the equilibrium. This implies that changes in the relative supply of bonds of different maturities do not necessarily affect the set of equilibria. But it does not mean that the target of the prices on those assets will not affect the particular equilibrium that is implemented, as we show it does.

We start by illustrating, using a simple flexible price monetary model (described in Section 2), that targeting the return on noncontingent short-term bonds cannot pin down the distribution of realized inflation across states (Section 3.2). The nominal interest rate is a noncontingent return and, therefore, it only imposes restrictions on a conditional expectation of inflation. Realized inflation affects the marginal utility of money, and term premia are a function of the covariance between that marginal utility and the price of the noncontingent nominal assets. Since realized inflation is not pinned down, those covariances are not either, and nominal term premia are not uniquely determined.

We show that the target of the short and long-term interest rates can solve the multiplicity of equilibria associated with uncertainty (Section 3.4). The intuition is simple: the targeting of the term structure imposes restrictions on the term premia and therefore on the distribution of prices across states. If there were as many contingencies as restrictions, the distribution of price levels would be uniquely pinned down, for a given initial price level. An alternative intuition uses an equivalence between targeting the prices of one-period-ahead, state-contingent nominal assets and the prices of the noncontingent nominal assets of different maturities. If monetary policy were to target the prices of the state-contingent nominal assets, then given an initial price level, it would be able to pin down the price level in every date and state (Section 3.3).

In order to target the nominal term structure, the government or central bank stands ready to buy and sell any quantity of bonds of different maturities at fixed rates. While both short and long rates can be used to determine uniquely the equilibrium for the price level and the real allocations, the supply of bonds of different maturities is not uniquely pinned down. In particular, the actual supply of noncontingent bonds of different maturities can be zero in equilibrium (Section 4.1). Combinations of contingent assets and taxes can play the same role of the supply of bonds of different maturities.

In Sections 4.3, the results are interpreted by discussing the role of nonfundamental uncertainty for policy, and in Section 4.4, the results are compared to the ones in the literature on local and global determinacy. There is also a discussion of the role of the cash-in-advance constraint in Section 4.2. The results are extended to an environment with sticky prices in Section 5. In Section 6 we provide a simple example with a cashless economy.

2. A model with flexible prices

The economy consists of a representative household, a representative firm behaving competitively, and a government. The uncertainty in period $t \geq 0$ is described by the random variable $s_t \in S_t$, where S_t is the set of possible events at t, and the history of its realizations up to period t (state or node at t), $(s_0, s_1, \ldots, s_t)$, is denoted by $s^t \in S^t$. The distribution of s_t is discrete.

[5] This result is in a model with flexible prices. Instead, under sticky prices, the multiplicity is for both allocations and prices, and a target for the state contingent interest rates pins down a unique equilibrium given an initial allocation.