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Stabilizing expectations at the zero lower bound: Experimental evidence

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ABSTRACT

Our study demonstrates how agents' expectations can interact dynamically with monetary and fiscal policy at the zero lower bound. We study expectation formation near the zero lower bound using a learning-to-forecast laboratory experiment under alternative policy regimes. In our experimental economy, monetary policy targets inflation around a constant or state-dependent target. We find that subjects' expectations significantly over-react to stochastic aggregate demand shocks and historical information, leading many economies to experience severe deflationary traps. Neither quantitatively nor qualitatively communicating the state-dependent inflation targets reduce the duration or severity of economic crises. Introducing anticipated and persistent fiscal stimulus at the zero lower bound reduces the severity of the recessions. When the recovery of fundamentals is sufficiently slow, participants' expectations become highly pessimistic and neither monetary nor fiscal policy are effective at stabilizing the economy.

1. Introduction

How should monetary and fiscal policy be conducted when nominal interest rates are close to zero? This question is important because once interest rates reach zero and cannot be reduced further — the *zero lower bound (ZLB)* — central banks lose an important tool for stimulating the economy. In an economy already in recession and close to the ZLB, a further negative demand shock could make for a dire situation, in which case a central bank may not be able to lower interest rates sufficiently to stimulate the economy. If the recession is persistent and severe, households and firms are likely to be pessimistic about the ability of the central bank to provide the stimulus needed to turn the situation around. The appearance of the ZLB has the potential to generate a prolonged self-fulfilling macroeconomic crisis, often referred to as a *liquidity trap*.

Macroeconomists and policy makers generally agree that policies which create an expectation of inflation would alleviate the severity and duration of liquidity traps. For example, Eggertsson and Woodford (2003, 2004) show that creating expectations for inflation by promising to keep nominal interest rates low by way of increased inflation targets, even after the

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economy has recovered, can reduce the duration of a liquidity trap.[1] In order to reinforce the central bank's commitment to higher future inflation, the communicated state-dependent inflation target would be adjusted upward when inflation fails to achieve past targets. Such policy combined with forward guidance has the potential to successfully alleviate recessions if agents form rational expectations and if the central bank can credibly commit to a long-run price-level target. However, previous work (e.g., Evans et al., 2008) has shown that fiscal stimulus at the ZLB can stimulate particular forms of adaptive expectations.

The goal of this paper is to identify the ways in which alternative monetary and fiscal policies can influence individual and aggregate expectation formation at the ZLB. This is an empirically challenging task given that some of the policies and communication strategies we are interested in studying have never been implemented by central banks. Even if such policies were found to have been implemented, it would be difficult to disentangle the actual effects of contemporaneous policies on the economy from the effects of past policy.

In order to circumvent the limitations of observational data, we design a series of learning-to-forecast laboratory experiments so that we can gain a better understanding of the extent to which state-dependent inflation targeting and expansionary fiscal policy are effective in stimulating expectations at the ZLB. The laboratory provides a convenient testbed to explore the robustness of policy and central bank communication on the expectations of "real" people in an environment where we can have precise control over the structure of the economy, the information available to individuals, and the implementation and communication of policy. This controlled environment enables us to more readily identify the effects of economic disturbances, policies, and communication strategies on individual and aggregate expectations as well as the overall economy.

Our experimental macroeconomy follows a linearized New Keynesian data-generating process whereby output and inflation evolve in response to subjects' incentivized reported expectations and exogenous observed disturbances. We exogenously impose large, persistent, and unanticipated negative demand shocks to drive the economy down to the ZLB in order to examine the process whereby expectations are formed, and to experiment with alternative stabilization strategies. In our baseline treatment, the automated central bank follows a conventional Taylor rule with a constant inflation target.

In two additional treatments, we implement a state-dependent inflation target that rises when lagged inflation levels are below target. The inflation target is communicated either quantitatively, as a numerical target, or qualitatively, as a reference to its trajectory (e.g., "positive" or "negative"). Our fourth and final treatment extends the baseline environment to explore the stabilizing effects of fiscal stimulus at the ZLB. The expansionary government expenditure is implemented at the outset of the negative demand shock and dissipates as fundamentals return to the steady state.

We observe that expectations become negative in the face of a large negative demand shock, and often remain negative despite fundamentals steadily recovering. These pessimistic expectations lead to persistent recessions at the ZLB. In many cases, the decline in expectations accelerates even as fundamentals return to their steady-state values. We find that neither quantitative nor qualitative forms of communication of state-dependent inflation targets leads to a significant reduction in the severity or duration of liquidity traps. By contrast, fiscal stimulus at the onset of the large negative demand shock reduces the duration of economic crises and significantly reduces their severity. However, in the face of very slow recovering fundamentals, neither monetary nor fiscal policy is effective at stabilizing expectations.

2. Policy and communication: theory and evidence

Our research investigates whether monetary and fiscal policy can stabilize expectations at the ZLB. Recent work suggests that, even when the ZLB on interest rates binds, central banks are still able to influence the economy by affecting expectations with respect to future policy.[2] Inflation targeting policies can reduce crises at the ZLB if accompanied by a credible promise of future inflation. Eggertsson and Woodford (2003) show that an optimal commitment policy would involve a moving price-level target that would increase in response to historical inability to achieve its target. Because of the state-dependent nature of the target, interest rates would remain at zero even as the economy improves. This, in turn, should provide a signal to agents that the central bank is willing to accept higher inflation in the future, and thereby generate rational expectations of inflation. However, the authors acknowledge that the credibility of the central bank might suffer if the private sector sees the central bank failing to reach its target while continually raising it for the following period. Nakov (2008) applies global solution methods to study a standard dynamic stochastic sticky-price model with an occasionally binding ZLB on interest rates. He compares alternative non-optimal instrument rules to optimal policy under commitment and discretion and finds that price-level targeting proposed by Eggertsson and Woodford's framework performs better than simple Taylor rules.[3] Our paper makes an important contribution by providing insight into how expectations respond and evolve in response to moving inflation targets.

A good deal of theoretical work has demonstrated that expansionary fiscal policy can stabilize expectations at the ZLB. In the event that monetary authority lacks credibility in generating inflation, Krugman (1998) and Eggertsson (2011) argue that

[1] The other policy option is quantitative easing. Note that the effect of quantitative easing could, in part, go through expectations as well.

[2] See Walsh (2009) for a detailed discussion on the ability of inflation promises to stabilize expectations.

[3] These state-dependent rules are also consistent with the policy advice given (though not taken) to Japan when it faced the ZLB — e.g., Krugman (1998), McCallum (2000) and Auerbach and Obstfeld (2005). Price-level targeting policies achieve relatively greater economic stability than inflation targeting policies in environments where central banks mistakenly see the expectations of private agents as rational (e.g., Preston, 2008).