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Optimal long-run inflation with occasionally binding financial constraints

Salem Abo-Zaid

248 Holden Hall, Department of Economics, Texas Tech University, Lubbock, TX 79409, United States

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ABSTRACT

This paper studies the optimal long-run inflation rate in a simple New Keynesian model with occasionally binding collateral constraints that intermediate-good firms face on hiring labor. The paper finds that the optimal long-run annual inflation rate is around 1.5% if the economy is hit by a total factor productivity (TFP) shock and nearly 2.5% if the economy is subject to a markup shock. The shadow value of the collateral constraint is akin to an endogenous cost-push shock. Differently from usual cost-push shocks, however, this shock is asymmetric as it takes non-negative values only. Since the mean of this asymmetric endogenous cost-push shock is positive, inflation is also positive on average. In addition, a binding collateral constraint resembles a time-varying tax on labor, which the monetary authority can smooth by setting a positive inflation rate. More generally, the basic result is related to standard Ramsey theory in that optimal policy smoothes distortions over time.

1. Introduction

The economic events of the past few years have revived interest in the optimal long-run inflation rate. This paper studies the optimal long-run inflation rate in a simple calibrated New Keynesian (NK) framework with occasionally binding financial constraints. For empirically plausible sizes of exogenous shocks, optimal monetary policy entails a strictly positive inflation rate in the long run. In particular, the optimal annual long-run inflation rate in the benchmark calibration of the model is about 1.5% when the economy is only subject to TFP shocks and about 2.5% when the economy is hit only by markup shocks. The optimality of positive inflation is robust to introducing a motive for holding money.

The baseline setup assumes three types of agents in the economy: households, entrepreneurs (or intermediate-good firms) and sticky-price firms that produce final goods. Financial frictions arise because hiring labor services by each entrepreneur is constrained by the level of her net worth. The collateral constraint is motivated by a type of the hold-up problem. Prior to supplying their labor services, households require the entrepreneur to show collateral that can be seized if needed (this setup is similar to a model in which the entrepreneur borrows at the beginning of each period to pay wages ahead of production, and borrowing is constrained by collateral). The accumulation of net worth is via purchases of shares that are claims on the profits of final-good firms. These shares pay out the profits of final-good firms as dividends to shareholders.

E-mail address: salem.abozaid@ttu.edu

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There are two main differences between this paper and typical papers that study optimal monetary policy within a New Keynesian framework featuring financial frictions. First, this paper assumes an occasionally binding collateral constraint rather than always-binding collateral constraints as usually assumed in this literature. The assumption of an occasionally binding collateral constraint not only renders the environment more realistic, but it also generates asymmetry in the behavior of the economy in response to favorable vs. adverse shocks. Second, this paper focuses on the optimal long-run inflation rate (i.e. the mean of the inflation rate in the "stochastic steady state" of the model), whereas the focus of most existing literature on monetary policy and financial frictions is mainly on the short-run dynamics of inflation around the deterministic steady state.

When the collateral constraint binds, the shadow value of relaxing the collateral constraint is akin to a cost-push shock that generates inflation. The reason for that is straightforward: other things equal, a binding collateral constraint implies increases in the marginal costs of final-good firms which they accommodate by increasing prices. The inflation rate is positive on average due to the nature of this endogenous cost-push shock; it is asymmetric as it takes only non-negative values. Since the shadow value of the collateral constraint is positive on average, the inflation rate is, accordingly, positive on average. This result holds for both TFP shocks and exogenous markup shocks.

This result is important in the literature on the optimal inflation rate within the New Keynesian model. In the basic NK model that abstracts from cost-push shocks, inflation does not respond to exogenous TFP shocks and the monetary authority can stabilize inflation and the output gap simultaneously (Blanchard and Gali, 2007 refer to this result as the "Divine Coincidence"). When a cost-push disturbance is introduced, inflation becomes responsive but it has a zero long-run mean, which results from the symmetric nature of the cost-push shock (namely, since this shock has a zero mean, the corresponding mean of inflation is zero). In this regard, I show here that relaxing this assumption can significantly change the key conclusion about the mean of the (optimal) inflation rate.

The results of this paper also highlight the role of inflation in mitigating the impact of adverse shocks on the economy. A binding collateral constraint distorts the choice of labor by entrepreneurs, and thus it magnifies the wedge between the marginal rate of substitution between labor and consumption and the marginal product of labor (which exists due to the monopolistic competition in the final-good sector). This implies a deviation from the first-best level of output. The wedge, to which I refer as the "labor wedge", resembles a labor-income tax, and it increases with the shadow value of relaxing the collateral constraint. The analyses show that, under optimal policy, the monetary authority counteracts the effects of a binding collateral constraint, and it thus smoothes the "tax rate" on labor. In particular, I derive the labor wedge for this model and show that appropriate setting of inflation can reduce the size and volatility of this "tax rate". Since the collateral constraint is more likely to bind during downturns, monetary policy makers aim for, at least, avoiding excessive increase in this "tax rate" during such episodes.

This paper contributes to the recent literature on the optimal inflation rate, which was fueled by the suggestion of Blanchard et al. (2010) to consider raising inflation targets around the world. Using a New Keynesian model, Coibion et al. (2012) study the optimal inflation rate with the zero lower bound (ZLB) on the nominal interest rate and non-zero steady-state inflation rate. The authors derive the utility-based welfare criterion taking into account the effects of trend inflation. They find that the optimal inflation rate is low (less than 2% a year) and that this result is robust to a wide range of parameter values and model specifications. Billi (2011) shows that the optimal annual inflation rate with the ZLB is below 1% under commitment and it reaches 17% if the government re-optimizes each period. Williams (2009) uses a simple NK model and finds that an inflation target of 2% a year maybe be insufficient to buffer the economy from the effects of the ZLB, suggesting that possibly a higher inflation rate is desirable in the presence of the ZLB. Walsh (2009) also utilizes a version of the basic NK model to study the role of monetary policy in stabilizing real economic activity. His study also addresses the effects of ZLB on the optimal inflation rate and concludes that a promise of (higher) future inflation can help in boosting the economy through its effects on inflation expectations and, hence, the real interest rate.

The study of Coibion et al. (2012) differs from Billi (2011) and Walsh (2009) in that it considers the effects of trend inflation on the steady state, the dynamics of the model and the implied loss function, while the latter studies consider only a zero steady-state inflation rate. It also differs from these two studies and the work of Williams (2009) as it relies on a micro-founded model as opposed to the canonical reduced-form NK framework. In this respect, the present paper is in line with former study as it also relies on a micro-founded setup.

The literature also points out to other factors that justify the setting of positive inflation rates. Related to this study, Antinolfi et al. (2015) discuss the role of positive inflation in deepening asset markets and loosening debt contracts. Kim and Ruge-Murcia (2009) show, assuming a neoclassical labor market environment, that the optimal long-run inflation rate is positive (around 0.4% annually) in the presence of downward nominal wage rigidity (DNWR). Abo-Zaid (2013) reports a significantly higher optimal long-run inflation rate (around 2% annually) in a labor search and matching framework when nominal wages are downwardly rigid. Fagan and Messina (2009) suggest that the optimal inflation rate for the U.S. ranges between 2% and 5% in the presence of DNWR.

Importantly, most of the above-mentioned studies find that the optimal inflation rate is positive when the economy is subject to shocks, but the deterministic steady-state inflation rate is zero. Therefore, the combination of uncertainty and asymmetries in the economy have been keys to the main findings of these studies. Uncertainty introduces a motive for holding positive inflation rates in the presence of the ZLB, DNWR (and, in this paper, occasionally binding collateral constraints) to mitigate the effects of shocks on the economy. In the absence of shocks, optimal policy calls for setting the inflation rate to its deterministic steady-state level, whether zero or not. Some existing studies, however, show that