# Welfare costs of inflation in a dynamic economy with search unemployment

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**Abstract**

We present a monetary general equilibrium model with labor market frictions in the form of search unemployment which is calibrated for the US economy. Interestingly, both employment and output may even increase with the rate of inflation depending on the elasticity of labor supply. Considering the transition dynamics following a change in the monetary policy, the optimal quarterly inflation rate is found to amount to approximately −0.6% in the benchmark case. A reduction of the inflation rate from its current level to its optimal value only results in small welfare gains equal to 0.08% of total consumption.
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## 1. Introduction

Lucas (2000) argues that the money holding behavior at very low interest rate is central for estimating welfare costs of inflation. Furthermore, he provides estimates of the welfare costs of inflation. A reduction in the inflation rate from 10% to zero implies steady-state welfare gains of approximately 1% percent of real income. In order to derive his results, he calibrates both the Sidrauski model and the McCallum–Goodfriend model with the help of observations from the US economy. He concludes that the optimal monetary policy in these two models consists of a deflation consistent with a zero or near-zero nominal interest rate as advocated by Friedman (1969).

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In a variety of recent studies on the optimal quantity of money and the optimality of the Friedman rule, the use of cash has been motivated with a cash-in-advance constraint provided in Lucas and Stokey (1983, 1987).[1] In the presence of a cash-in-advance constraint, higher inflation reduces the return from working as income earned in the previous period cannot be spent on the cash good until the next period. As a consequence, households substitute leisure for labor and employment and output decline. In the cash-in-advance economy of Cooley and Hansen (1989), the optimal growth rate of money entails a zero nominal interest rate so that the cash-in-advance constraint does not bind. They estimate the welfare costs of a reduction from an annual inflation rate of 10% to the optimal rate to amount to approximately 0.1–0.4% of GNP, depending on the measurement of money by either the monetary base or M1.

Over the last decade, two different questions with regard to the welfare costs of inflation have been extensively analyzed in the general equilibrium model with a cash-in-advance constraint based on Lucas and Stokey (1983, 1987): (i) is the Friedman rule of a zero nominal interest rate still optimal in economies with distorting taxes, and (ii) what is the (quantitative) effect of inflation on welfare if monetary policy affects the growth rate of the economy. The first question is answered using standard results from public finance (as in Diamond and Mirrless, 1971a, b), e.g. in the studies of Cooley and Hansen (1991), Gillman (1993), or Chari et al. (1996). The second question is examined in models of endogenous growth where inflation reduces the growth rate. In Gomme (1993), endogenous growth arises through human capital accumulation as in Lucas (1988, 1990). A 10% money growth rate (8.5% inflation rate) results in welfare costs of no more than 0.03% of income. Wu and Zhang (1998) analyze a monetary endogenous growth model based on Romer (1986). They find significant welfare costs of inflation in the range from half to 5% points for an annual monetary growth of 10%. Different from Gomme (1993), the growth rate effect is important in their model.

In the present paper, we also analyze the welfare costs of inflation in a monetary general equilibrium model with a cash-in-advance constraint. However, our direction of research is different from the above studies which all assume Walrasian labor markets. Our model is based on Pissarides (1990). Unemployment results from time-consuming and costly matching of vacancies with searching agents. The presence of search unemployment and wage bargaining is shown to have an impact on optimal monetary policy. We find that inflation may help to increase employment. Furthermore, even though the Friedman rule may not be optimal, the resulting welfare losses from such a deflationary monetary policy are of small magnitude.

At first glance, this result is surprising. Following a rise in the inflation rate, agents substitute search for leisure, similar to the leisure-labor substitution effect in Cooley and Hansen (1989) or in the endogenous growth models of Gomme (1993) and Wu and Zhang (1998). The reduction in search effort reduces the probability of firms to fill a job and tends to decrease employment. However, in our model, there is also an opposing

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[1] Two other popular frameworks for the analysis of the optimality of the Friedman rule are the shopping time model and the money-in-the-utility model. See e.g. Woodford (1990), Guidotti and Végh (1993), Correia and Teles (1996, 1997), or Chari et al. (1996).