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Optimal monetary policy in the generalized Taylor economy

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ABSTRACT

In this paper, we use the generalized Taylor economy (*GTE*) framework to examine the optimal choice of inflation index. In this otherwise standard dynamic stochastic general equilibrium (DSGE) model, there can be many sectors, each with a different contract length. In the *GTE* framework with an empirically relevant contract structure, a simple rule under which the interest rate responds to economy-wide inflation gives a welfare outcome nearly identical to the optimal policy. This finding suggests that it may not be necessary for a well-designed monetary policy to respond to sector-specific inflations.

1. Introduction

The optimal choice of an inflation-index is an important question for policy makers. This paper aims to address this issue in a model that accounts for the heterogeneity in contract lengths we observe in empirical data. To accomplish this we have used the generalized Taylor economy (*GTE*) (Dixon and Kara, 2007, 2010). The *GTE* generalizes the simple Taylor model to allow for a distribution of contract lengths in different sectors.[1] An additional advantage of the *GTE* framework is that it is general enough to represent any distribution of contract lengths, including the one generated by the Calvo model. Dixon and Kara (2007) find that the *GTE* with a distribution of contract lengths based on the data set of Bils and Klenow (2004) tracks the US data well.

In this paper, we extend the *GTE* framework by assuming that each sector is subject to sector-specific productivity shocks. We then consider the design of welfare-maximizing inflation-targeting monetary policy rules in a setting where there are multiple sectors, each with a different contract length. We examine the monetary policy implications of alternative assumptions regarding the distribution of contract lengths and explore how to assign weights to different sectors in an optimal inflation index for a central bank to target (i.e. sectoral inflation-targeting). We then compare the performance of the aggregate inflation targeting relative to the sectoral inflation-targeting rule and ask if it is really necessary for a well-designed monetary policy to respond to sector-specific inflation rates.

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[1] Other papers that emphasize the importance of heterogeneity in inflation and output dynamics include Carvalho (2006), Mash (2004), Sheedy (2007) and Wolman (1999). Carvalho (2006) uses a multiple Calvo (MC) model. In the MC model, there are many sectors, each with a Calvo style contract (see Dixon and Kara, 2007 for a comparison between the MC and the *GTE*). Mash (2004), Sheedy (2007) and Wolman (1999) use a generalized Calvo (GC) model. The GC generalizes the Calvo model to allow the reset probability to vary with the age of the contract. Thus, in this model the hazard rate is duration dependent, rather than constant, as in the Calvo model.

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For this purpose, in our model we derive a utility-based objective function of a central bank by following the procedure described in Rotemberg and Woodford (1998). In doing so, we illustrate the challenge facing the central bank in an environment in which there are many sectors. In particular, we show that welfare in the *GTE* depends on the variances of the output gap and on the cross-sectional price dispersion. We find that in the *GTE* framework, in the presence of sector-specific shocks and nominal rigidities, it is impossible for the central bank to simultaneously stabilize all the objectives; as a result, the first-best allocation cannot be achieved. We then employ Lagrangian methods to determine the optimal policy and use it as a benchmark to evaluate the performance of alternative simple rules.

A main finding of this paper is that in a model with an empirically relevant distribution of contract lengths, a simple rule under which the interest rate responds to economy-wide inflation gives a welfare outcome close to the optimum, which suggests that it may not be necessary for a well-designed monetary policy to respond to sector-specific inflations.

Before we turn to a description of the *GTE* model, we briefly review the literature on this topic. A rapidly growing literature assesses the question of which inflation index a central bank should target in models that allow for two sectors, such as those studied by Woodford (2003, pp. 435–443) and Aoki (2001), or with two countries such as that studied by Benigno (2004). These studies find that targeting economy-wide inflation is not optimal. Instead, they suggest a sectoral inflation targeting rule that puts more weight on the sector in which there is a longer contract. Benigno (2004, p. 295) evaluates the gains from pursuing a sectoral inflation targeting rule at around 0.02% of consumption. This result is consistent with the one we obtain with simple two-sector *GTE*s. We suggest, however, there is a limitation in studies like these which use models that have only two sectors. Clearly, generating a more realistic case requires going beyond the simple case of two-sector economies. Indeed, we find that in the *GTE* with an empirically relevant distribution of contract lengths the gains from pursuing sectoral inflation targeting are smaller than what two sector-economies suggest and are virtually zero. In general, we believe that the *GTE* may be better at capturing the environment facing a central bank.

The remainder of the paper is organized as follows. Section 2 presents the model and Section 3 describes equilibrium dynamics. Section 4 derives a welfare function for a central bank based on the representative household's utility function. Section 5 characterizes the optimal policy and Section 6 analyses the implications of various assumptions regarding the distribution of contract lengths and compares the performance of alternative simple inflation-targeting rules. Section 7 summarizes our conclusions.

2. The model

The model we use is the *GTE* framework of Dixon and Kara (2007). In this otherwise standard DSGE model, there can be many sectors, each with a different contract length. An advantage of the *GTE* approach is that it is general enough that the model can represent any distribution of contract lengths, including the one generated by the Calvo model. When all the contracts have the same duration in the economy, the model reduces to a standard Taylor model. The exposition here aims to outline the basic building blocks of the model. We first describe the structure of the economy, the behavior of firms (which is standard), the wage-setting decision and monetary policy.

2.1. Structure of the economy

In the model economy, there is a continuum of firms $f \in [0,1]$. Corresponding to the continuum of firms f, there is a unit interval of household-unions ($h \in [0,1]$). The economy is divided into N sectors, indexed by $i=1\ldots N$. The share of each sector is given by α_i with $\sum_{i=1}^{N} \alpha_i = 1$. Within each sector i, each firm is matched with a firm-specific union ($f=h$): there are i equally sized cohorts $j=1\ldots i$ of unions and firms.[2,3] Each cohort sets the wage which lasts for T_i periods: one cohort moves each period. The share of each cohort j within the sector i is given by $\lambda_{ij} = 1/T_i$ where $\sum_{j=1}^{T_i} \lambda_{ij} = 1$. The longest contracts in the economy are N periods.

All other basic elements of the model are standard New Keynesian. A typical firm produces a single differentiated good. The production of intermediate goods requires labor as the only input. The final consumption good is a constant elasticity of substitution (CES) aggregate over the differentiated intermediate goods. The representative household derives utility from consumption and leisure. The government conducts monetary policy and provides subsidies that offset any distortions in the steady state. The subsides are financed by lump-sum taxes.

[2] This assumption means that there is a firm-specific labor market. The implications of the firm-specific labor market assumption on inflation dynamics are well known (see for example Woodford, 2003, pp. 163–178; Dixon and Kara, 2007; Edge, 2002).

[3] In this model, a firm and a household can be thought of as the same entity, as each household h is matched with firm f. Thus, if we were to assume that wages are flexible while goods prices are sticky, the equilibrium conditions would be the same as the case in which wages are sticky while goods prices are flexible.