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Optimal capital taxation and consumer uncertainty

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ABSTRACT

This paper analyzes the impact of consumer uncertainty on optimal fiscal policy in a model with capital. The consumers lack confidence about the probability model that characterizes the stochastic environment and so apply a max–min operator to their optimization problem. An altruistic fiscal authority does not face this Knightian uncertainty. We show analytically that, in responding to consumer uncertainty, the government no longer sets the expected capital tax rate exactly equal to zero, as is the case in the full-confidence benchmark model. Rather, our numerical results indicate that the government chooses to subsidize capital income, albeit at a modest rate. We also show that the government responds to consumer uncertainty by smoothing the labor tax across states and by making the labor tax persistent.

1. Introduction

In the typical public finance model with rational expectations, fiscal policy can influence consumer behavior by manipulating the consumers' expectations. That is, by committing to future policy, the government shapes the consumers' beliefs about the possible paths of the endogenous variables, which then affects the consumers' behavior in earlier periods. The assumption of rational expectations helps facilitate this pathway, enabling the consumers to correctly forecast both the state-contingent values of the endogenous variables and the probability model over these variables.

Rational expectations, though, might exaggerate the ability of consumers to understand the stochastic equilibrium. This exaggeration could be costly in that it might mean that the typical fiscal policy model overemphasizes how precisely consumers respond to future policy commitments of the government. If instead consumers face uncertainty about the economy's true probability model, their expectations and behavior might be quite different than those predicted in a rational expectations model. As a consequence, the fiscal authority might find it optimal to implement a different set of fiscal policies knowing that the consumers face model uncertainty.

Karantounias (2013) and Svec (2012) are two examples that introduce consumer uncertainty in an optimal fiscal policy model. In these models without capital, the authors show that the consumers' uncertainty does indeed alter the government's policy decisions. This is because fiscal policy must mitigate the welfare costs associated with both linear taxes and consumer uncertainty. Depending on the specific type of altruism exhibited by the planner, the optimal policy involves

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either more or less reliance on the labor income tax to finance public spending than is optimal under the baseline model in which consumers do not face model uncertainty.

Although these results are suggestive, the impact of consumer uncertainty on optimal fiscal policy should be most salient in a model with capital, as the consumers' expectations are of primary importance in the design of optimal policy. To this end, this paper introduces consumer uncertainty into the neoclassical growth model of Chari et al. (1994). We formalize the consumers' uncertainty and their resulting behavior by following Hansen and Sargent (2001, 2005, 2007) and the robust control literature. In this approach, consumers are unsure which probability model characterizes the random shocks to government expenditure. They believe that the true probability model lies somewhere within a range of alternative probability models. Each alternative model is represented as a martingale perturbing the approximating probability model. With this type of uncertainty, the robust control literature assumes that the consumers optimize according to max–min preferences, choosing the allocation that maximizes their expected utility, where the expectation is taken with respect to the probability model that minimizes their welfare. The resulting allocation is labeled the robustly optimal allocation, and the worst-case probability model is labeled the consumers' subjective probability model. This behavior helps ensure that the consumers' utility never falls too far, regardless of which probability model happens to be correct.

Although it is assumed that the consumers are uncertain as to the correct probability model, the opposite assumption is made for the fiscal authority: the government is fully confident that the approximating probability model truly characterizes the stochastic environment. This confidence might be due to the fact that the economy's only source of randomness is a shock to the government's own spending, a process that the government supposes it knows well. To be clear, the consumers and the government are both endowed with the same approximating model, a model that specifies the probability model associated with the exogenous and endogenous variables. But, only the government trusts that this approximating model correctly describes the economy's randomness. The consumers, on the other hand, doubt the accuracy of this model and, perhaps due to a lack of trust in political institutions, cannot be convinced by the government about its accuracy.[2,3]

Critically, this confidence dichotomy reveals a number of possible objective functions for an altruistic government. These objective functions differ as to which expectation they use to calculate the consumers' expected utility. That is, the government could optimize with respect to the approximating probability model or it could optimize according to any one of the alternative probability models that the consumers believe could describe the economy, including the subjective probability model. As the consumers distrust the government's confidence in the approximating probability model, it is not clear which model an altruistic government should use in its optimization problem.

Given this multiplicity of possible objective functions, the assumption made in this paper is that the fiscal authority maximizes the consumers' expected utility under the consumers' own subjective expectation. This choice can be justified for political economy reasons: because the consumers would ex-ante prefer a government that optimizes according to the same probability model that they use, any government chosen by the consumers must design its policies to maximize the consumers' expected utility under their subjective probability model. That is, even though the government believes that the approximating model is correct, the consumers do not trust the government's belief. As such, the consumers would choose a government that optimizes according to the consumers' subjective probability model. One additional benefit of this choice of objective function is that it allows for a one-step deviation from the rational expectations framework, since both the consumers and the planner optimize with respect to the same expectation.

Arguably, a similar combination of preferences was on display in the United States during the recent financial crisis. Under this interpretation, Americans faced uncertainty about whether the US government's budget was sustainable. Assuming that Americans are uncertainty-averse, they responded to this uncertainty by fearing that, with large probability, the government's budget was not sustainable. This altered subjective expectation then affected their behavior, leading among other things to investors purchasing assets that hold their value even in times of budget crisis (gold, for example). Continuing with this analogy, the American government understood that the true probability of default was lower than that feared by its citizens (as the government could borrow at historically low interest rates and it could always finance the debt by printing more money). Despite knowing this, however, the government felt pressured by the American people to take actions *as if* the probability of a budget crisis was large. It was perhaps this pressure that led Congressional Republicans to refuse to raise the debt ceiling in 2011, resulting in the sequester.

With this setup, the optimal policy implemented by the fiscal authority involves one period of transition. During that period, the government subsidizes labor with a negative tax on labor income and implements a large tax on capital income, as in Chari et al. (1994). From that period forward, there are three main properties of the time-invariant optimal policies. First, it can be shown analytically that, under one condition, the expected capital tax rate is non-zero even in the case of log utility preferences, breaking the rational expectations result. To derive the magnitude and direction of this deviation from zero, we numerically solve the model. We find numerically that the government chooses to subsidize the consumers' capital income, on average, at a modest rate.

[2] The fact that the consumers do not trust any announcement made by the government describing what it believes to be the true probability model is particularly relevant because, as discussed in Woodford (2010), the fiscal authority might have the incentive to misrepresent the true probability model in order to manipulate the consumers' behavior. Understanding this, the consumers are skeptical about any government announcement.

[3] While it seems reasonable that the government has more confidence about the stochastic nature of government spending than do the consumers, an interesting alternative would be to assume the government is also uncertain about the shock process. We leave this extension for future work.