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Closing small open economy models

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Abstract

The small open economy model with incomplete asset markets features a steady-state that depends on initial conditions and equilibrium dynamics that possess a random walk component. A number of modifications to the standard model have been proposed to induce stationarity. This paper presents a quantitative comparison of these alternative approaches. Five different specifications are considered: (1) A model with an endogenous discount factor (Uzawa-type preferences); (2) a model with a debt-elastic interest-rate premium; (3) a model with convex portfolio adjustment costs; (4) a model with complete asset markets; and (5) a model without stationarity-inducing features. The main finding of the paper is that all models deliver virtually identical dynamics at business-cycle frequencies, as measured by unconditional second moments and impulse response functions. The only noticeable difference among the alternative specifications is that the complete-asset-market model induces smoother consumption dynamics.

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1. Introduction

Computing business-cycle dynamics in the standard small open economy model is problematic. In this model, domestic residents have only access to a risk-free

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bond whose rate of return is exogenously determined abroad. As a consequence, the steady-state of the model depends on initial conditions. In particular, it depends upon the country's initial net foreign asset position.¹ Put differently, transient shocks have long-run effects on the state of the economy. That is, the equilibrium dynamics possess a random walk component. The random walk property of the dynamics implies that the unconditional variance of variables such as asset holdings and consumption is infinite. Thus, endogenous variables in general wander around an infinitely large region in response to bounded shocks. This introduces serious computational difficulties because all available techniques are valid locally around a given stationary path.

To resolve this problem, researchers resort to a number of modifications to the standard model that have no other purpose than to induce stationarity of the equilibrium dynamics. Obviously, because these modifications basically remove the built-in random walk property of the canonical model, they all necessarily alter the low-frequency properties of the model. The focus of the present study is to assess the extent to which these stationarity-inducing techniques affect the equilibrium dynamics at business-cycle frequencies.

We compare the business-cycle properties of five variations of the small open economy. In Section 2 we consider a model with an endogenous discount factor (Uzawa, 1968 type preferences). Recent papers using this type of preferences include Obstfeld (1990), Mendoza (1991), Schmitt-Grohé (1998), and Uribe (1997). In this model, the subjective discount factor, typically denoted by β , is assumed to be decreasing in consumption. Agents become more impatient the more they consume. The reason why this modification makes the steady-state independent of initial conditions becomes clear from inspection of the Euler equation $\lambda_t = \beta(c_t)(1+r)\lambda_{t+1}$. Here, λ_t denotes the marginal utility of wealth, and r denotes the world interest rate. In the steady-state, this equation reduces to $\beta(c)(1+r) = 1$, which pins down the steady-state level of consumption solely as a function of r and the parameters defining the function $\beta(\cdot)$. Kim and Kose (2001) compare the business-cycle implications of this model to those implied by a model with a constant discount factor. They find that both models feature similar comovements of macroeconomic aggregates. We also consider a simplified specification of Uzawa preferences where the discount factor is assumed to be a function of aggregate per capita consumption rather than individual consumption. This specification is arguably no more arbitrary than the original Uzawa specification and has a number of advantages. First, it also induces stationarity since the above Euler equation still holds. Second, the modified Uzawa preferences result in a model that is computationally much simpler than the standard Uzawa model, for it contains one less Euler equation and one less Lagrange multiplier.

¹If the real rate of return on the foreign bond exceeds (is less than) the subjective rate of discount, the model displays perpetual positive (negative) growth. It is standard to eliminate this source of dynamics by assuming that the subjective discount rate equals the (average) real interest rate.

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