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A business cycle model with variable capacity utilization and demand disturbances

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Abstract

We develop a dynamic general-equilibrium model with demand (preference) shocks, estimated using Hall's (J. Labour Economics 15 (1997) 223) residual, that replicates U.S. business cycles well, at least compared to the real business cycle models. The key factor is cyclical capital utilization, which is based on imperfect competition, slow adjustments in capital stock, and fixed requirement of labor input. We also demonstrate theoretically that a representative-agent economy with preference shocks could be viewed as the reduced form of a heterogeneous-agents economy with incomplete markets. Specifically, a heterogeneous-agents economy with incomplete markets is aggregated into a representative-agent economy with preference shocks. This result would provide a microeconomic foundation for preference shock models. It is also shown that a shock to marginal utility of consumption and a shock to marginal disutility of labor have different effects.

JEL classification: E22; E32

Keywords: Aggregation; Preference shocks; Capacity utilization; Business cycles

1. Introduction

The aim of this paper is to show that business cycles could be accounted for by "demand (preference) shocks," together with variation in capital utilization. There are two theoretical contributions. First, we show that a representative-agent economy with stochastic preferences can be interpreted as a reduced form of a heterogeneous-agents

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economy with incomplete markets. This result provides a microeconomic foundation for preference shock models. Second, we offer a model that generates variations in capital utilization. The simulation results show that the model can reproduce U.S. business cycles relatively well.

The real business cycle (RBC) theory has been among the most influential theories of business cycles. The main result of the RBC theory is that as long as one identifies the Solow–Prescott residual as exogenous technology shocks, business fluctuations are explained quite well by the simple optimal growth model.[1] Recent empirical evidence shows, however, that, after correcting for factor utilization, fluctuations in the productivity growth rate are not only small, but also have nearly zero correlation with fluctuations in output.[2] If the true productivity growth rate is acyclical, it would be very difficult to accept the RBC hypothesis.[3]

In this paper, we examine demand (preference) shocks, identified as the difference between the "observable" component of the marginal rate of substitution and marginal product of labor, which we call Hall's residual (Hall, 1997) following Galí et al. (2002). The importance of this residual in accounting for fluctuations in labor has been emphasized by Hall (1997) for the U.S. Holland and Scott (1998) obtain a similar finding for the U.K., using a one-sector growth model with technology and preference shocks. Here, we examine if it can account for other macro variables as well. However, there are (at least) two problems with the use of a preference-shock model.

The first problem is its interpretation. Taken literally, preference-shock models assume that everyone's marginal utility fluctuates similarly over time, which does not sound very plausible. Furthermore, as Galí et al. (2002) show, Hall's residual responds endogenously to a monetary policy shock, and hence, cannot be totally due to exogenous preference shifts. Based on the theoretical result in Section 2, we interpret a representative-agent economy with preference shocks as a reduced form of a heterogeneous-agents economy with incomplete markets. According to this interpretation, Hall's residual does not represent exogenous shocks. It is the result of more fundamental shocks (such as monetary shocks, oil-price shocks, etc.). We do not ask what the driving forces of Hall's residual are. Instead, our hypothesis is that, whatever the driving forces of business cycles are, they work through Hall's residual. To examine this, we take Hall's residual as given, feed it into the model, and see the extent to which the observed sequence of Hall's residual accounts for U.S. business cycles.

The second problem of preference shock models is that they tend to generate counterfactual behavior such as countercyclical wage rates, and countercyclical investment (Baxter and King, 1991). This problem remains as long as the standard CRS technology is used. Hence, for example, if we simulate the models of Hall (1997) or Holland and Scott (1998) only with preference shocks, we would obtain such counterfactual behavior. We avoid this problem by considering a model with cyclical capital

[1] For example, Hansen (1985) and Prescott (1986).

[2] For example, Basu and Fernald (1995), Burnside et al. (1995a, b) and Shapiro (1996).

[3] Note that introducing cyclical factor utilization into the RBC model, as done, for example, by Burnside and Eichenbaum (1996), does not solve the problem. Such a model could reproduce business cycles with smaller disturbances, but the problem of correlation remains.