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Fluctuations in convex models of endogenous growth, I: Growth effects

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Abstract

Is there a trade-off between fluctuations and growth? The empirical evidence is mixed, with some studies finding a positive relationship, while others find a negative one. Our objectives are to understand how fundamental uncertainty affects the long run growth rate and to identify important factors determining this relationship in a convex endogenous growth model. Qualitatively, we show that the relationship between volatility in fundamentals (or policies) and mean growth can be either positive or negative. The curvature of the utility function is a key parameter that determines the sign of the relationship. Quantitatively, an increase in uncertainty always increases the growth rate in our calibrated models. Though the changes we find are nontrivial, they are not large enough by themselves to account for the large differences in growth rates observed in the data. We also find that differences in the curvature of preferences have very substantial effects on the estimated variability of stationary objects like the consumption–output ratio and hours worked. For this reason, we expect that the models considered in this paper will provide the basis of sharp estimates of the curvature parameter.

JEL classification: E00; E01; E32; O11; O21

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1. Introduction

In his celebrated 1987 book, "Models of Business Cycles," Robert Lucas presented some simple calculations to argue that the trade-off between fluctuations and growth is such that a representative agent's willingness to pay for a more stable environment, in terms of growth rates, is almost zero. Lucas' conclusion has been challenged by studying models that relax some of the details in his basic environment.[1] However, none of these analyses question a fundamental implicit assumption: that the factors that affect fluctuations do not affect long run growth.[2]

Is there any evidence that the volatility of shocks—both policy and productivity shocks—has an impact on long run growth? Since it is difficult at best to directly measure volatility in fundamentals, most analyses study the relationship between some measure of variability of the growth rate of output and mean, or average, growth. In an early study, Kormendi and Meguire (1985) find that variability is positively related to mean growth in a cross section of countries. More recently, Ramey and Ramey (1995) find that higher volatility decreases growth, also in a cross section of countries. Empirical work that relates policy variability (mostly inflation variability) and growth also seems to point to a negative relationship (see Judson and Orphanides, 1996). Simple regressions of mean growth rates on measures of volatility of growth rates in cross section from the Penn World Table suggest a U-shape relationship, with an "upward sloping" segment only at very high levels of volatility.[3]

Our objective in this paper is to evaluate the proposition that differential levels of volatility in fundamentals can account for the observed cross-sectional differences in growth rates. To this end we study a class of models in the neoclassical tradition, in which fundamental uncertainty can affect the long run growth rate.[4] Our analysis includes both theoretical and numerical results. Qualitatively, if shocks are i.i.d. and depreciation is full, we show that the relationship between mean growth and volatility in fundamentals and policies can be either positive or negative. The key factor is the curvature of the utility function. If utility is more concave than the log case, an increase in shock volatility increases the savings rate and the average growth rate. If it is less concave than the log, the opposite occurs. This is in keeping with findings in earlier papers (see Phelps, 1962; Levhari and Srinivasan, 1969; Rothschild and Stiglitz, 1971; Leland, 1974; and de Hek,

[1] These range from the specification of preferences to the details of the market structure. For the former see Manuelli and Sargent (1988), and for the latter, Imhoroğlu (1989) and Atkeson and Phelan (1994).

[2] The current standard in the real business cycle literature, is to view long run growth as exogenous and, hence, independent of the fundamental shocks. For an explicit discussion see Cooley and Prescott (1995). The recent paper by Barlevy (2004) studies the relationship between growth and cyclical fluctuations in an endogenous growth model and obtains an estimate of the welfare costs of business cycles that is larger than that of Lucas.

[3] More recent work seems to suggest that even the results in Ramey and Ramey are not robust. They seem to depend on both the sample period as well as the collection of countries included. See Chaterjee and Shukayev (2004).

[4] Although we emphasize a "technology shock" interpretation of the type used in the real business cycle literature in our model (see Cooley, 1995, for a good survey of this literature), the shocks that we model can also be interpreted as random fiscal policies; for an equivalence result, see Jones and Manuelli (1999).