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ELSEVIER Journal of Economic Dynamics & Control 30 (2006) 243–278
JOURNAL OF Economic Dynamics & Control
www.elsevier.com/locate/econbase

Equilibrium consumption and precautionary savings in a stochastically growing economy ☆

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Received 2 June 2004; accepted 20 October 2004
Available online 26 February 2005

Abstract

The derivation of a closed-form solution for consumption based on the constant elasticity utility function in the presence of stochastic labor income has proved to be intractable. This paper derives a closed-form *equilibrium* relationship between consumption and wealth, one that holds along a balanced growth path in a stochastic Romer endogenous growth model. By employing more general recursive preferences, we can disentangle the coefficient of relative risk aversion from the intertemporal elasticity of substitution. The effects of key structural parameters on equilibrium consumption and its tradeoff with leisure are analyzed. A significant aspect of our analysis concerns the extent to which current risk in the economy is shared between labor and capital. This plays an important role in determining the impact of risk on the economy in general, and on consumption in particular. Formal analysis is supplemented with extensive numerical simulations.

JEL classification: E21; O40

Keywords: Consumption; Precautionary savings; Stochastic growth

☆This research was supported in part by the Castor endowment at the University of Washington. We are grateful to the constructive comments of two anonymous referees.
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doi:10.1016/j.jedc.2004.10.006

1. Introduction

The effect of risk and uncertainty on consumption and savings has been extensively studied in economics. The earliest models typically assumed either a one period, or two period horizon, essentially making them static; see e.g., Leland (1968), Levhari and Srinivasan (1969), Sandmo (1970), Turnovsky (1971), Drèze and Modigliani (1972). One of the main conclusions of this early literature is that the effects of (future) income uncertainty on consumption and savings behavior depend upon the sign of the third moment of the utility function. Accordingly, the hitherto widely used quadratic utility function, with its 'certainty equivalence' implications for income uncertainty, is incapable of generating a precautionary demand for savings, despite having served as a cornerstone of the earlier mean-variance portfolio analysis. In addition, the quadratic function has two undesirable features, first that utility is subject to a saturation level, and second that it may yield an eventual negative consumption level.

Subsequent research has analyzed the relationship between risk, consumption, and precautionary savings in greater depth. In order to generate a more central role for income risk in the consumption/savings decision, the focus has moved toward more general utility functions, free of the limitations of the quadratic functional form. In particular, authors such as Kimball (1990a, b) have sought to characterize precautionary savings behavior in terms of the concept of 'prudence', and this has been further refined by Gollier (2001).

Much research has also been devoted to analyzing the relationships employing an intertemporal framework.[1] But unfortunately, relatively few functional forms turn out to be analytically tractable. One formulation that is tractable is the exponential utility function, assumed by Kimball (1990b) and Caballero (1990, 1991), with its property of constant *absolute* risk aversion. While this represents an important advance, the exponential function has its own limitations. For example, it implies that income risk simply leads to a constant downward shift in the level of consumption, and has no impact on the marginal propensity to consume. As a more important consequence, this form of preferences cannot sustain a long-run equilibrium of constant balanced growth. The exponential function imposes a constraint between the constant elasticity of intertemporal substitution and the constant coefficient of absolute risk aversion, and Weil (1993) introduces a generalization that disentangles these two parameters.

Recently, economists have increasingly adopted the constant elasticity utility function. This has at least two desirable characteristics. First, because it yields a constant equilibrium consumption to capital ratio, it is compatible with an equilibrium balanced growth path, and thus has become the most widely adopted

[1]A recent paper by Huggett and Ospina (2001) is an important contribution to this literature. It examines the importance of the third derivative, the key element in the early literature, in explaining precautionary savings. The authors conclude that in the presence of idiosyncratic shocks and a liquidity constraint, this characteristic becomes irrelevant insofar as determining the occurrence of precautionary savings is concerned.