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Journal of Monetary Economics 54 (2007) 1882–1904

Journal of MONETARY ECONOMICS

www.elsevier.com/locate/jme

An equilibrium model of wealth distribution ☆

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Received 24 February 2006; received in revised form 7 November 2006; accepted 14 November 2006
Available online 12 February 2007

Abstract

I present an explicitly solved equilibrium model for the distribution of wealth and income in an incomplete-markets economy. I first propose a self-insurance model with an inter-temporally dependent preference [Uzawa, H. 1968. Time preference, the consumption function, and optimal asset holdings. In: Wolfe, J.N. (Ed.), Value, Capital, and Growth: Papers in Honour of Sir John Hicks. Edinburgh University Press, Edinburgh, pp. 485–504]. I then derive an analytical consumption rule which captures stochastic precautionary saving motive and generates stationary wealth accumulation. Finally, I provide a complete characterization for the equilibrium cross-sectional distribution of wealth and income in closed form by developing a recursive formulation for the moments of the distribution of wealth and income. Using this recursive formulation, I show that income persistence and the degree of wealth mean reversion are the main determinants of wealth-income correlation and relative dispersions of wealth to income, such as skewness and kurtosis ratios between wealth and income.

JEL classification: D91; E21

Keywords: Precautionary savings; Wealth distribution; Bewley models; Affine process; Recursive utility; Stochastic discounting

☆I am deeply indebted to Darrell Duffie, Tom Sargent, and Ken Singleton for their numerous stimulating conversations and advising. I would like to thank Bob Hall for his encouragement and support. I benefited from helpful discussions with Fernando Alvarez, Orazio Attanasio, Steve Davis, Marjorie Flavin, Lars Hansen, Dirk Krueger, Felix Kubler, Yingcong Lan, Greg Mankiw, Rody Manuelli, Luigi Pistaferri, Charlie Plosser, Costis Skiadas, Paul Willen, Steve Zeldes, and seminar participants at Chicago GSB, Columbia, Duke (Fuqua), Kellogg, Rochester, Texas Austin, UCLA, and UCSD. I am particularly thankful to the anonymous referee for useful and insightful comments.

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0304-3932/$ - see front matter
doi:10.1016/j.jmoneco.2006.11.005

1. Introduction

Empirically, labor income and financial wealth are cross-sectionally positively skewed and fattailed. Furthermore, wealth is even more skewed and fat-tailed than income. For example, the 1992 Survey of Consumer Finance reports that the top 1% of U.S. households make 15% of total income, but hold 30% of total wealth. Building on Bewley (1986), Aiyagari (1994) and Huggett (1993) provide a framework to analyze the cross-sectional wealth distribution in an equilibrium setting, based on agents' inter-temporal optimal consumption-saving decisions. These incomplete-markets models, often referred to as Bewley models, have a large number of ex ante identical, but ex post heterogeneous infinitely lived agents who trade a single risk-free asset to partially smooth their consumption over time against stochastic uninsurable labor income shocks. Both goods and asset markets clear. The different realizations of income shocks for different agents imply that the cross-sectional asset holdings and income levels are different for agents. While realizations are different, the cross-sectional distribution of wealth and income remains stable over time. The Bewley model has become the workhorse to understand the equilibrium cross-sectional wealth distribution. Quadrini and Ríos-Rull (1997) summarize both dynastic (infinite horizon) and life-cycle versions of these Bewley models up to late 1990s. Recently, significant progress has been made on generalizing these quantitative Bewley-style models by incorporating more realistic features in order to better explain the highly skewed and fat-tailed empirical wealth distribution. Cagetti and De Nardi (2005b) provide a comprehensive and up-to-date summary of this literature including both the key empirical facts and the performance of various economic models.

In order to characterize the equilibrium wealth distribution, I first construct and then explicitly solve an incomplete-markets consumption-saving model. I follow Uzawa (1968), Lucas and Stokey (1984), and Obstfeld (1990) to assume that the agent whose past consumption is higher has a larger discount rate for his future consumption. This is a convenient and also intuitive way to link the past consumption path with current consumption via inter-temporal dependence. A higher discount rate for the agent when he is richer helps to deliver a stationary wealth process. These are precisely the insights of Uzawa (1968), Epstein (1983), and Obstfeld (1990) in their work on endogenous discounting and growth in deterministic settings. I extend their analysis to a stochastic setting under incomplete markets. The second key assumption is that the agent has constant absolute risk aversion (CARA) utility, following precautionary saving models such as Caballero (1990), Kimball and Mankiw (1989), Merton (1971) and Wang (2003). These modeling choices are partly motivated by analytical tractability. Zeldes (1989) noted in his abstract "no one has derived closed-form solutions for consumption with stochastic labor income and constant relative risk aversion utility." Schroder and Skiadas (2003, 2005) analyze the agent's demand problem with non-tradeable income for a broad class of recursive utilities defined in terms of a translation-invariance property. The latter implies exponentially discounted exponential utility in the additive case, but also includes Uzawa utility used here.

Unlike typical CARA-utility-based, incomplete-markets consumption models such as Caballero (1991), the newly proposed model generates a *stochastic* precautionary savings demand. This feature comes from the conditional *heteroskedasticity* of the income process, which has rich implications. For example, the process implies that a higher level of income implies a more volatile stream of future incomes (in levels). Therefore, his precautionary