

Dissertation Proposal

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Three Essays in the Stochastic Overlapping Generations Models

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“Singular Invariant Markovian Equilibrium in Stochastic Overlapping Generations Models”

In chapter 1, this paper examines the invariant Markov distribution associated with the rational expectations equilibrium in a multiperiod stochastic overlapping generations model. It is well known that such models must include lagged endogenous state variables, so that the support of the invariant distribution must include the so-called "self-justified" set, in the language of the Duffie-Geanakoplos-Mas-Colell-McLennan paper (1994), generated by the model. We show in this paper that the invariant distribution for the versions of the model we examine is singular with respect to Lebesgue measure and the support of the measure exhibits self-similarity feature. We prove that this distribution can be generated by a simple linear iterated function system. This paper also studies a realistically long-period stochastic overlapping generations model with within-generation heterogeneity under an arbitrary discrete shock. In this generalized model, we show the existence of the linear iterated function system as well. The theoretical result implies that an algorithm based on the simple structure of a linear iterated function system will be more time-efficient in computing equilibria with less approximating errors in stochastic overlapping generations models than existing algorithms. Finally, the generalized model generates high-dimensional and long-memory equilibria, and thus it can explain the stylized facts in financial time-series data: high-dimensional self-similar structures and long-memory dependence.

“Computing Stochastic Overlapping Generations Models with Production Based on the Theory of Linear Iterated Function System”

In chapter 2, we develop an efficient and accurate algorithm for long-period lived overlapping generation (OLG) models with stochastic production. We have proved that the recursive Markovian equilibria can be generated by a linear iterated function system in the stochastic OLG model with production as long as there is a small aggregate shock. The implication of this analytical result in computing equilibria is policy functions (the law of motion) for endogenous state variables can be approximated by very-low-order polynomials without any interaction terms. Therefore, it requires only a small number of grid points to compute the equilibrium policy functions which cuts off the computation time dramatically. This analytical result is quite strong in the sense that it holds for any random processes of an aggregate shock, with any types of household preference and under any government fiscal policies. Based on the analytical result, we develop a projection type algorithm. To accelerate the computation, we avoid solving the system of nonlinear equations by transforming it into the system of linear equations in terms of the coefficients of basis functions. As the support of an aggregate shock gets larger, the true equilibrium function becomes non-linear. To improve the accuracy, we simulate the linear iterated function system to obtain the ergodic set and re-approximate the policy functions with the realized equilibrium as new grid points.

“Strategically Interacted Incomplete Market in Stochastic Overlapping Generations Models”

In chapter 3, this paper studies the welfare implication of the incomplete market with the strategically interacted good markets in stochastic overlapping generations models. We inspect how the imperfect competition gives a rise to the consumption/income parallel over the life-cycle. The literature on the Permanent Income Hypothesis explains the consumption/income parallel mostly based on capital market imperfections such as liquidity constraints. We, in this paper, provide a distinctive explanation for the stylized fact with the market power of agents. Under the strategic interaction in the good market, agents transfer wealth to the period when they exercise larger market power on the price of good and thus buy the good cheaper. This mechanism implies agents intentionally consume parallel to income rather than unintentionally doing it due to the capital market imperfections. Thus, we will examine how policies or market reforms should be shaped under this different mechanism.