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Socio-dynamic discrete choice: Theory and application

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Part II

MEAN FIELD ANALYSIS

The past two decades have seen noteworthy examples of concepts from statistical physics applied to further the understanding of complex socioeconomic systems, particularly with respect to non-market interactions in the sense of conventions, network externalities, neighborhood or group effects, or interactive agents. Our starting point in considering interdependence of various decision makers' choices is a series of papers by economists Aoki (1995), Brock and Durlauf (2001a) and Blume and Durlauf (2003). Social interactions are introduced in binary logit choice models by allowing a given decision maker's choice for a particular alternative to be dependent on the overall share of decision makers that choose that alternative. Such a specification is interesting because of the inherent dynamic that could arise if the choice model were to be applied repeatedly in successive time steps with the shares of decision makers continuously updated as a result of the choice in the previous time step. The specification namely captures feedback between decision makers that can potentially be reinforcing over the course of time depending on parameters. Brock and Durlauf (2002, 2006) show that multiple steady state equilibria exist in the multinomial logit model with social interactions if the value of the utility parameter determining the level of the feedback is beyond a certain threshold. Part II of this thesis reviews Aoki's ground breaking binary logit results, makes Brock and Durlauf's general multinomial choice model of neighborhood effects precise for the case of trinary multinomial choice, and extends the results for the case of trinary nested logit to allow for unobserved preference heterogeneity between choice alternatives. The analysis in this thesis reveals an intuitively logical but previously unnoticed hysteresis regime in midrange parameter space for the utility of the feedback effect in the sociodynamic multinomial logit model when there are more than two choice alternatives. The sociodynamic nested logit analysis further yields rich bifurcation patterns with several major additional new steady state regimes where symmetry is broken by the lower level nest scale parameter determining the level of correlation between alternatives.