Significance of Heterogeneity in Financial Markets : Empirical Study from simple few-type model

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Abstract

It has been long asked whether agent-based model can be a useful tool for forecasting, instead of just replicating or growing the stylized facts. In other words, in addition to provide a bottom-up mechanism to explain the stylized fact as an emergent outcome, interests are further drawn to the estimation and prediction power of the same mechanism. The recent research trend seems to indicate that one can be cautiously optimistic about this possibility. This is particular so given the recent contribution by de Jong et al. (2006) and Manzan and Westerhoff (2007).

This paper is devoted to an econometric study of the simple agent-based financial markets, which are based on the few-type designs.In particular, we follow the essential spirit of the adaptive belief system proposed by Brock and Hommes (1997) and Brock and Hommes (1998) in the context of fundamentalists-momentum trader and fundamentalists-momentum trader-contrarians formulation.The general question which concerns us is the significance of the number of types of agents, in particular, its contribution to replicating financial time series.A related issue, and a core issue, concerns the minimum number of types (clusters) required to replicate financial dynamics (Aoki, 2002).We are still uncertain of the general formulation of the issue because each type of financial agent can be designed in different ways.Hence, narrow the issue down to the comparison between fundamentalist-chartist models and fundamentalist-chartist-contrarian models seems to be necessary at this stage.

In this paper, we use financial data from 10 stock markets and 21 foreign exchange markets.Our econometric estimation of the simple agent-based financial markets can be related to Boswijk et al. (2007) and Amilon (2008).However, since the settings of the model are not exactly the same, our estimation method and technique are different from theirs. We estimates several parameters related to financial agents' behavior which are emphasized in literature of heterogeneous agent financial model. Some of the parameters we try to estimates are discrete variables; these parameters lead to a complex and nonlinear objective function (sum of squared error). Given this nature, the common numerical algorithms, which depend

on the derivative of the objective function, is not available. Dorsey and Mayer (1995) suggest the use of genetic algorithms to deal with situations like this, in this paper, we follow this recommendation.

One of our main findings, based on limited experiments, is that given fundamentalists and chartists, additional contribution from contrarians is insignificant or not evident. Besides, we are asking what kind of questions and how much we can learn from the agent-based financial markets with empirical data.Some specific questions asked in this paper may be considered as a special case of what can be more generally proposed.Some specific questions asked in this paper may be considered as a special case of what can be more generally proposed.So, for example, we may consider the role of trading mechanism in the observed financial time series.The realistic time horizon perceived by the financial agents, and the influence of risks in agents' decision.While we do not have evidence in support of the 3-type model, the inclusion of the contrarians does destabilize our estimation in many ways.