

Referee Report on MS 370

"Transaction Taxes and Traders with Heterogeneous Investment Horizons in an Agent-Based Financial Market Model"

Overview

The paper provides an agent-based model of currency exchange markets populated by traders with heterogeneous trading horizons and trading strategies. The traders can have either short-term (daily) or long-term (monthly, 30 day) investment horizons and follow either chartist or fundamentalist trading strategies for each horizon. The stated goals of the paper are to study the implications for exchange rate dynamics in agent-based models of longer term investment horizons and to provide an artificial laboratory for analyzing the implications of currency transaction taxes on the market dynamics: bubbles and crashes, excess volatility, excess kurtosis, and volatility clustering.

Building from the work of Westerhoff (2006) by adding traders who can have longer investment horizons, the model is validated to exchange rate return data from 5 country-pairs using criteria set forth by Westerhoff (2006) and Lux (2009). The results of the artificial laboratory experiment yield that under low taxation rates, traders switch away from short-term horizons to either long-term horizons or being inactive in the market leading to less excess volatility and diminishing volatility clustering. As the tax rate is increased beyond a certain threshold, longer-term fundamentalist trading becomes unpopular relative to longer-term chartist strategies or being inactive in the market leading to increased excess volatility and misalignments, consistent with the work of Westerhoff (2003).

Strengths and Concerns

Agent-based models are an appropriate methodology for conducting policy experiments where they would otherwise be impractical, if not impossible to undertake. The agent-based model allows a much wider range of experimental values that are replicated at low-cost. They provide a complementary approach to human-subject experiments and empirical studies, both of which often have limited data. Further, the agent-based model has very explicit and precise control over how variables are defined and measured and allows for heterogeneity in the specification of the agents. For these reasons (and others clearly and thoroughly presented in the paper), the approach taken in this paper (and the literature it builds upon) provide a natural mechanism for exploring the potential impacts of policy changes.

The model constructs the long-term horizon rules by extending the short-term horizon rules in a very clean and intuitive manner. The long-term rules collapse to the short-term rules if the horizon is set to 1 and random noise is added. The model uses a very straightforward evolutionary process to allow traders to adapt their currently used rule to the current conditions in the market. The experimental design is carefully constructed by choosing parameters that validate against real-world data and using the same random seeds across policy parameter changes. The sample size of 100 runs for each

policy parameter should be sufficient to average out fluctuations due to the random components of the model.

I have two more substantial concerns and one minor concern with the paper. The two more substantial concerns related to the manner in which the market is constructed and validated.

First, the model abstracts away from any possible liquidity issues for individual agents or for the market. The heterogeneous agents express their excess demand using one of five strategies (rules) each day: short-term chartist, short-term fundamentalist, long-term chartist, long-term fundamentalist, or inactive. Each of these rules (except inactive) use straightforward and intuitive expressions of the underlying behavioral rule without accounting for the motivations and budget constraints of each individual. Individual variation in the short-term rules are modeled through normally distributed random error terms while there is no variation in excess demand among either the long-term chartists or among the long-term fundamentalists. Thus, in the model, as low rates of taxation drive traders away from using short-term chartists rules they switch to a long-term horizon rule or to the inactive rule. The number of agents is large enough, at the assumed parameter values, that there is implicitly sufficient market liquidity; the number of traders using an inactive rule only goes as high as 45% of the traders. The implication is that the policy experiment does not address one of the concerns in the literature about the transaction taxes.

Second, the model validates against real-world data using criteria developed in Westerhoff (2006) and Lux (2009). The criteria are drawn from the stylized facts of financial markets. In particular the criteria specify that, under the assumed parameter values, the base no-tax model should generate bubbles and crashes, that asset prices should be more volatile than their fundamental values (excess volatility), the return distribution should have excess kurtosis, that the raw returns should have an absence of autocorrelations, and there should be volatility clustering as evidenced by hyperbolically decaying autocorrelations of absolute returns. The concern is that the policy experiments are done for a single set of parameter values that meet these criteria and that there may be other, reasonable values of the assumed parameters that meet the criteria but lead to different conclusions when conducting the policy experiments.

The minor concern with the paper is that the notation used is sometimes confusing or appears to be changing. In particular, Table 1 of parameter calibrations reports an assumed value for beta of 1, yet beta could be referring to the standard deviation of the normally distributed error in the short-term chartist rule or to the price adjustment factor in the long-term chartist rule. But, a value of beta of one in the long-term chartist rule would imply that the length of the horizon doesn't matter and that there would be no adjustment because equation 3 would become undefined. Table 1 also reports assumed standard deviations using notation that does not match any other notation in the model. Understanding what was actually assumed would be considerably easier if the notation and language about the notation was clarified and made consistent throughout the paper.

Overall, the paper makes a solid contribution to a developing literature that I believe is a fruitful approach to understanding the potential implications of alternative policy regimes. Agent-based modeling provides a natural environment for conducting artificial laboratory experiments. The policy question addressed is both relevant and timely. The motivation for and the construction of the model is, with a minor exception, clearly and thoroughly explained. The conclusions follow directly from the evidence presented from the simulation runs.

References

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