Sharp Rises in Commodity Prices

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Abstract

Commodity prices have profound effects on both economies and individuals. They are determined through their complex interdependencies with supply and demand, reserves and accessibility. Understanding the drivers of tipping points in prices is of broad interest, both academically and commercially, and is a considerable challenge. We investigate trading networks by employing an agent-based model to identify conditions that give rise to the onset of turning points and validate the new understanding using real data.

In previous studies, few attempts have been made to gain insights into the phenomena through modelling and principled analyses. We devised a model consisting of a network of traders that is amenable to analysis [1]. The major components of the model are identified to be the uneven distribution of resources, the market interactions that lead to states that maximize the utility of agents, and the role played by inventory kept by each agent to guarantee the smooth running of their business. Prices rise sharply at a turning point when producers with excess resources disappear (Fig. 1). This establishes the link between macroscopic price behaviors and underlying resource distributions among the agents, reminiscent of phase transitions in statistical physics. By reducing noises in market data of commodities, we revealed evidence of turning points for essential commodities (Fig. 2).

The new approach helps explain the driving forces behind sharp price rises and will potentially lead to forecasting tools through further modelling and new insights in other trading network models.

References

[1] B. Li, K. Y. M. Wong, A. H. M. Chan, T. Y. So, H. Heimonen, and D. Saad, “What Drives Commodity Price to Rise Sharply at Turning Points?”, arXiv:1508.03677 (2015).

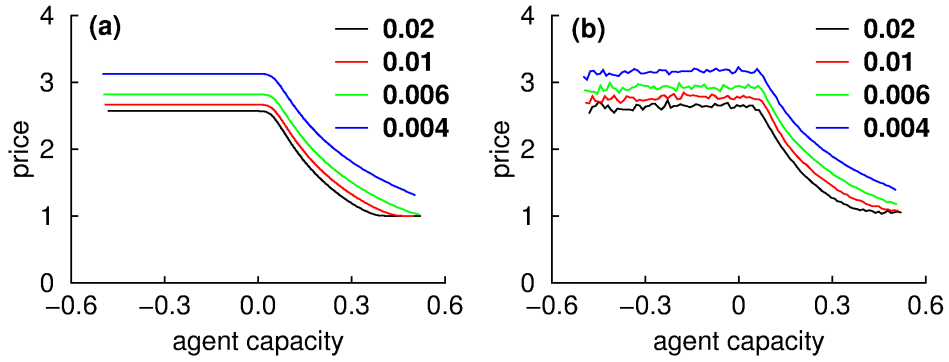

Figure 1. (a) The analytical result of our agent-based model, showing the dependence of the price on agent capacity at different average capacities. Note that when the average capacity drops below 0.006, prices rise sharply. (b) The simulations results have an excellent agreement with the model.

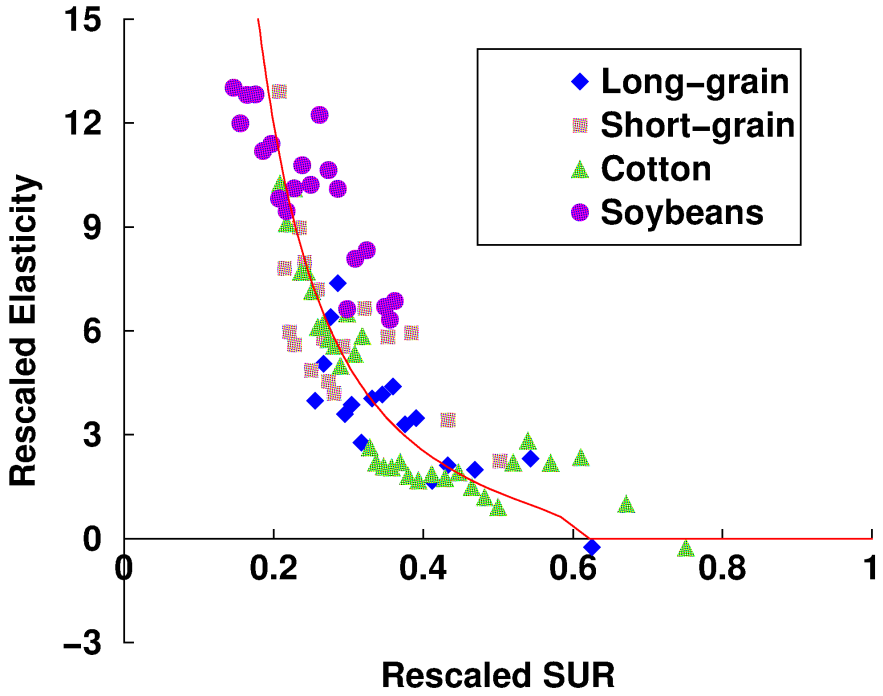

Figure 2. The rescaled elasticity defined in our paper versus the rescaled stock-to-use ratio (SUR) for long-grain rice, short-grain rice, cotton and soybeans. The solid curve is the prediction of our model.