Modelling price pressure in financial markets

Elena Asparouhova\textsuperscript{a,\*}, Peter Bossaerts\textsuperscript{b,1}

\textsuperscript{a} University of Utah, David Eccles School of Business, 1645 E. Campus Center Dr., Salt Lake City, UT 84112, United States of America
\textsuperscript{b} Caltech, EPFL and CEPR, M/S 5, EPFL, Lausanne, Switzerland

\textbf{Abstract}

We present experimental evidence that, unlike traditional assumptions in economic theory, security prices do not respond to pressure from their own excess demand. Instead, prices respond to excess demand of all securities, despite the absence of a direct link between markets. We propose a model of price pressure that explains these findings. In our model, agents set order prices that reflect the marginal valuation of desired future holdings, called "aspiration levels." In the short run, as agents encounter difficulties executing their orders, they scale back their aspiration levels. Marginal valuations, order prices, and hence, transaction prices change correspondingly. The resulting price adjustment process coincides with the Global Newton Method. The assumptions of the model as well as its empirical implications are fully borne out by the data. Our model thus provides an economic foundation for why markets appear to search for equilibrium according to Newton's procedure.

\textsuperscript{\*}Corresponding author. Tel.: +1 801 587 3975; fax: +1 801 581 3956.
E-mail addresses: e.asparouhova@utah.edu (E. Asparouhova), peter.bossaerts@epfl.ch (P. Bossaerts).
\textsuperscript{1}Tel.: +41 21 693 0081; fax: +41 21 693 0020.

\textbf{1. Introduction}

Economists have generally focused on the equilibrium implications of their models, leaving little time to consider how markets attain equilibrium. This focus is motivated by the claim that prices "move in accord with the excess demand (demand minus supply) in each market" (Negishi, 1962, 638). If excess demand is positive (there is more demand than supply), prices tend to increase. Conversely, if excess demand is negative (supply outstrips demand), then prices tend to decrease. As a result, price adjustment only stops at the point where excess demand equals zero, the equilibrium.

The above process is what Walras first developed in his Elements d'Économie Politique Pure (1874) and what has subsequently remained one of the most studied price-adjustment processes. As Gode and Sunder (1993, 120) proclaim, "Standard economic theory is built on two specific assumptions: utility-maximizing behavior and the institution of Walrasian tatonnement."

The Walrasian tatonnement theory builds on the intuitive premise that prices react to the demand in their own market only. Since the demand for a given asset already incorporates the substitution and complementarity effects between this and the other traded assets, there is no compelling reason why prices should react to anything but own excess demand. Unfortunately, if it is true that prices adjust only in the direction of own excess demand, the adjustment process may not converge. It is easy to construct counterexamples (see, e.g., Scarf, 1960). The counterexamples exploit the fact that
 Evidence is presented here that markets do adjust differently. We study the outcomes in financial markets experiments where up to 70 (human) subjects traded four (three risky and one risk-free) securities for real money. Prices of none of the risky securities correlate significantly to their own excess demand, contrary to the tatonnement theory. The lack of correlation is caused by the presence of excess demand in other securities. Evidently, prices in one market react to excess demand of all markets, not only their own market, even if there is no direct link between markets.

We recognize that the scope of the model is limited. It deals only with the mechanics of the direction in which prices change given unattainable aspiration levels. That is, ours is not a model of equilibration, but it could be embedded in a model of equilibration. One possibility is the following. As aspiration levels are scaled back and marginal valuations change, the
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