MARKET IMBALANCES AND STOCK RETURNS: HETEROGENEITY OF ORDER SIZES AT THE LONDON STOCK EXCHANGE

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In this paper we show evidence that the heterogeneity of trade order sizes plays a role in price formation, in addition to the signed order flow. Using tick data from the London Stock Exchange (LSE) we show that the daily and hourly price returns are in part determined by the composition of orders on the sell and buy side of the market at the time. If the buy (sell) volume is concentrated in a few large orders, and unmatched by a concentrated sell (buy) volume, the price return is positive (negative). In a market where buy and sell sides are similarly concentrated or similarly diluted, the price impact is small. We examine the heterogeneity effects for both markets of the LSE (a quotation off-book market, and an order-book market) and show that the off-book market limits the price impact associated with large orders. We also show elements of the interaction between the two markets in price discovery.

The heterogeneity of order sizes on one side of the market is measured using the entropy

$$E = \sum_{i=1}^{n} w_i \log(1/w_i), \quad i \in \text{firms}, \tag{1}$$

where n is the number of firms on either the sell or buy side of the market and w_i is the fraction of the total volume contained in order i. The imbalance between the two sides is formed as the difference of entropies (assigning to the sell side the positive sign and the buy side the negative sign)

$$\delta E = E_s - E_b. \tag{2}$$

The heterogeneity imbalance is then used in addition to the imbalances in the signed order flow (signed volume, number of trades, number of traders) as explanatory variables for the price returns. The imbalances of the order flow variables are constructed as $\delta X = (X_b - X_s)/(X_b + X_s)$ where X stands for any one of the order flow variables. The correlations of the variables are summarized in the left panel of the figure.

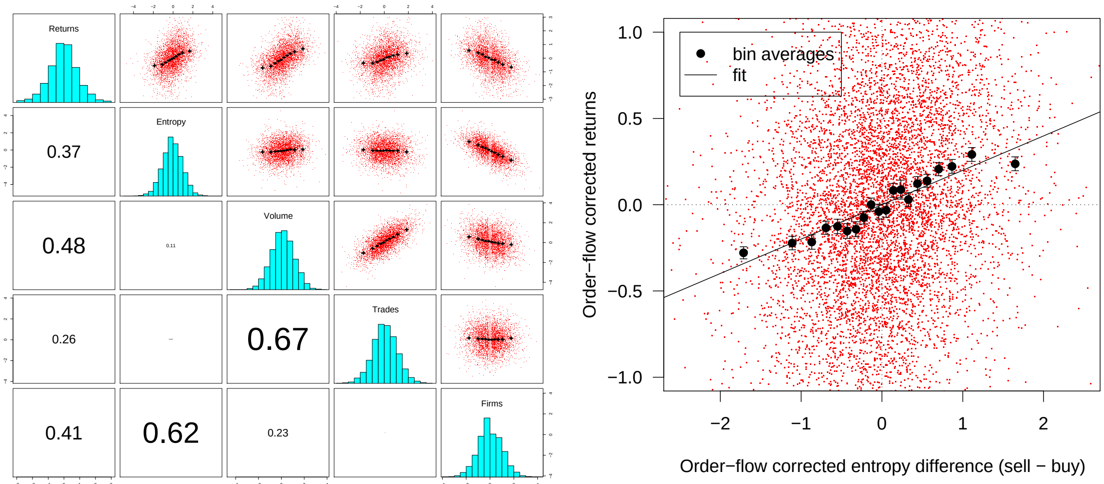

Figure 1: *Left panel:* Correlations, cross-dependencies and histograms of the four market imbalance variables and price returns. The diagonal shows the histogram. Values in the matrix below the diagonal are the absolute values of the correlation coefficients between the corresponding variables. The font size is proportional to the value of the coefficient. In the plots above the diagonal, we show scatter plots (tiny dots) as well as binned averages of the tiny dots (large points). *Right panel:* The effect of entropy imbalance and heterogeneity of order sizes in excess of the order flow effect on price returns.

Using regression analysis we show that the entropy imbalance variable is significant in addition to the order flow and discuss the stylized facts stemming from the analysis. In the right panel of the figure we show the dependence of the price returns on order heterogeneity once the signed orderflow variables are taken into account.

Keywords financial market microstructure, agent heterogeneity, London Stock Exchange tick data, price returns, asymmetric information, liquidity

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