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Statistical identification with hidden Markov models of large order splitting strategies in an equity market

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Large trades in a financial market are usually split into smaller parts and traded incrementally over extended periods of time. We address these large trades as hidden orders. In order to identify and characterize hidden orders we fit hidden Markov models to the time series of the sign of the tick by tick inventory variation of market members of the Spanish Stock Exchange. Our methodology probabilistically detects trading sequences, which are characterized by a net majority of buy or sell transactions. We interpret these patches of sequential buying or selling transactions as proxies of the traded hidden orders. We find that the time, volume and number of transactions size distributions of these patches are fat tailed. Long patches are characterized by a high fraction of market orders and a low participation rate, while short patches have a large fraction of limit orders and a high participation rate. We observe the existence of a buy-sell asymmetry in the number, average length, average fraction of market orders and average participation rate of the detected patches. The detected asymmetry is clearly depending on the local market trend. We also compare the hidden Markov models patches with those obtained with the segmentation method used in Vaglica *et al.* (2008) and we conclude that the former ones can be interpreted as a partition of the latter ones.

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