Navigating the Oil Bubble: A Non-linear Heterogeneous-agent Dynamic Model of Futures Oil Pricing.

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Focusing on the 2003–2019 period, our paper combines the LPPL methodology to test for the presence of speculative bubbles with the Heterogeneous Agent Model approach to modelling oil prices. In particular, we focus on the bubble-like dynamics, which characterizes the 2007–2009 years according to a large body of recent literature. In view of this aim, our modelling choice may be justified as follows. Under normal conditions, chartists tend to destabilize the market, whereas fundamentalists and hedgers have the opposite effect. This reflects in the presence of constant oscillations in log-differenced prices typical of martingale processes. These oscillations are larger and more persistent if chartists prevail over fundamentalists and hedgers. On rare occasions, however, a different pattern may emerge, with prices moving along explosive trajectories. In our view, this can be related to incorrect interpretation of market signals (or to the inability of trading against the market), especially by fundamentalist speculators, combined with imitation across different categories of heterogeneous agents. When this occurs, positive feedback reactions emerge along with self-reinforced herding of the kind best detected by the LPPL methodology. Based on these considerations, our paper obtains two main results. First, between 2003 and 2019 we detect only one period consistent with the presence of a speculative bubble, between 2007 and 2008. Second, this bubble is set off by fundamentalist speculators who seem to lose confidence in market signals and in their ability to stop the bubble. This reaction reinforces the standard price destabilizing effect caused by chartists over the entire sample period, which hedgers are unable to offset. Our analysis, which controls also for exchange rate and equity market risk perception, confirms that speculation plays a clear-cut destabilizing role over the entire sample period, due to the joint reaction of chartists and fundamentalists. Our results are thus in line with Zhang et al. (2017) and Zhang and Wu (2019) among others.

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