TP ABM 1
Physique des marchés

January 17, 2023

pas de besoin de rendre ce TP

Chiarella model revisited

Chiarella's model has been improved (and calibrated) by Majewski *et al.* (2020) [link]. Log-price returns are defined as follows

$$\begin{aligned} r_{t+1} &= \kappa(v_t - p_t) + \beta \tanh(\gamma m_t) + \epsilon_t \\ m_t &= (1-\alpha) m_{t-1} + \alpha r_t \\ v_t &= v_{t-1} + g + \eta_t, \end{aligned} \tag{1}$$

where

r_t	:	log return
p_t	:	log price
v_t	:	log value (fundamental price)
m_t	:	trend, estimated with Eq. (1)
κ	:	mean-reversion speed
β	:	relative importance of trend followers
γ	:	reaction of trend followers to a change of trend
α	:	trend update rate
g	:	growth rate of the fundamental price
η_t	:	fluctuations of g
ϵ_t	:	unexplainable fluctuations

The model sometimes has an additional cubic mean-reversion term

$$\kappa_3 (v_t - p_t)^3$$

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1. Implement this model. Be inspired by the parameters calibrated by Majewski *et al.* for monthly data. Have also a look at a calibration for intraday data [Gao et al. 2022].
2. Using your code from TP1, check that the basic stylized facts are reproduced, or possibly which ones are ($P(|r|)$ (including its tail exponent), negligible autocorrelation of r_t, long-memory for $|r_t|$.
3. If one of these stylized facts is not reproduced by the model, try to find parameters that improve on the ones given by the above authors.
4. The composition of the population is fixed. Propose a way for the agents to switch from one type of strategy to the other.
5. What are the timescales in this model? How to include several of them?