

Krasii, N. P. (DSTU, Rostov-on-Don, Russia). **On coupled pairs of regime switching diffusions.**

We consider in [1], coupled pairs of processes defined by SDE with regimes and thresholds given—with $(B_t^1)_{t \geq 0}$ and $(B_t^2)_{t \geq 0}$ Brownian processes with a given correlation matrix—by:

$$\begin{cases} dS_t = \mu(t, S_t, \boldsymbol{\theta})dt + \sigma(t, S_t, \boldsymbol{\theta})dB_t^1, & S_0 \in \mathbb{R}^+ \\ dL_t = \nu(t, L_t, \boldsymbol{\lambda})dt + \eta(t, L_t, \boldsymbol{\lambda})dB_t^2, & L_0 \in \mathbb{R}^+ \end{cases}$$

For $(S_t)_{t \geq 0}$, the interplay regime—thresholds, m and M , is given—with similar relations for the price volatility coefficient and for the process $(L_t)_{t \geq 0}$ —by:

$$\boldsymbol{\theta} = \begin{cases} \boldsymbol{\theta}^h & \text{if } L_t > L_M \\ \boldsymbol{\theta}^s & \text{if } L_m \leq L_t \leq L_M \\ \boldsymbol{\theta}^d & \text{if } L_t < L_m \end{cases}, \quad \mu(t, S_t, \boldsymbol{\theta}) = \begin{cases} \mu(t, S_t, \boldsymbol{\theta}^h) & \text{if } L_t > L_M \\ \mu(t, S_t, \boldsymbol{\theta}^s) & \text{if } L_m \leq L_t \leq L_M \\ \mu(t, S_t, \boldsymbol{\theta}^d) & \text{if } L_t < L_m, \end{cases}$$

Theorem [Regime switching solutions to SDE] *Consider a finite set $\Theta = \{\boldsymbol{\theta}_1, \boldsymbol{\theta}_2, \dots, \boldsymbol{\theta}_m\}$ as the parameters of the different regimes. Let the functions $\mu(t, x, \boldsymbol{\theta})$ and $\sigma(t, x, \boldsymbol{\theta})$ satisfy regularity hypothesis. Suppose that \mathcal{T} the increasing sequence of \mathbb{F} -stopping times $0 \equiv \tau_0 < \tau_1 < \tau_2 < \dots < \tau_n < \dots$ where the components cross the respective thresholds do not accumulate in any compact time interval. There exists a process $(X_t)_{t \geq 0}$, with continuous trajectories, which is an unique in law **regime switching** process associated with the parameter space Θ together with the increasing sequence of \mathbb{F} -stopping times \mathcal{T} .*

We present an application with an estimation parameter method to real data.

REFERENCES

- [1] M. L. Esquível, N. P. Krasii, P. P. Mota and V. V. Shamraeva (2023) On a coupled Price-Volume equity model with auto-induced regime switching. (*Submitted*).