Review of: "A connection between Gompertz diffusion model and Vasicek Interest Rate model"

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Potential competing interests: No potential competing interests to declare.

"A connection between Gompertz diffusion model and Vasicek interest rate model"

by Abdenbi El Azri

Basic content of paper.

In this paper, Eq.(2.1) belongs to the class of general Ornstein-Uhlenbeck processes with SDE: $dX_t = [a(t)X_t + b(t)[\ dt + \sigma(t)dW_t, \qquad X_0 = x_0, \qquad (1$

where W_t is the Wiener process. Obviously, the corresponding transition probability density $P(x,t \mid x_0,0)$ (i.e., solving the Fokker-Planck equation) is a Gaussian law, since a linear transformation of the (Gaussian) Wiener process is obviously a Gaussian law. Then the author introduces a nonlinear change of variable of the type $x \rightarrow g(x)$ leading to the associated diffusion process:

$$dg(X_t) = [a(t)g(X_t) + b(t)]\ dt + \sigma(t)dW_t. \qquad \text{(Stratonovich calculus)} \qquad (2)$$

In the submitted manuscript, the authors focus on the special case $g(x) := \ln(x)$ as expressed by Eq.(3.6) of this manuscript. Obviously, the transition probability law associated with the diffusion process Eq.(2) reads as $P[g(x),t|g(x_0),0]dg(x)$ (i.e., again a Gaussian up to a $g(x)$ change of variable). In particular, the associated Fokker-Planck operators of both processes Eqs.(1) and (2) share an identical spectrum, implying in particular that the evolution time-scales are identical.

Finally, the core content of the paper, (according to the given title), is that the author "discovers" that both Eqs. (1) and (2) already have a name in the available literature, namely VIR and SGDP, (and indeed they both since long have been abundantly discussed!) .

Conclusion: Truly, this manuscript does not offer anything new. It is a basic (and perfectly known) exercise which, to my sincere opinion, does not deserve an additional publication.

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