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.

This paper by Abdenbi El Azri explores the connection between the Vasicek Interest Rate (VIR) model and the Gompertz diffusion process (SGDP) using stochastic calculus. Here's a breakdown of the key points:

Main Goal:

- Establish a new link between the VIR model (used in interest rate modeling) and the SGDP (used in various growth modeling applications).

Strengths:

- The paper provides a new mathematical connection between the VIR and SGDP models using Ito's calculus.
- The analysis is well-executed, and the mathematical derivations are clear.

Weaknesses:

- The core argument may lack substantial novelty. The relationship between the VIR model, the Ornstein-Uhlenbeck process, and the Black-Karasinski model via logarithmic transformation is an established concept.
- The paper could delve deeper into the connection between these models and explore their historical context.
- The paper does not discuss the broader implications or potential applications of the connection.
- There is a lack of information about any simulations conducted.

Recommendations for Improvement:

- The publishability of the paper depends on whether the author can significantly strengthen its contribution. Here are two options:
    - **Rejection:** If the focus remains solely on the basic VIR-SGDP connection, the paper might not be suitable for publication due to the lack of novelty.
    - **Revision for potential publication:** The author can revise the paper to demonstrate a more impactful contribution by:
        - Highlighting the novelty: Emphasize the specific value of the VIR-SGDP connection. This could involve:
            - Discussing how the connection addresses limitations in existing approaches for modeling interest rates or

growth processes.
    - Exploring potential applications of the connection in financial modeling, biological growth analysis, or other relevant fields.
    - Investigating extensions or generalizations of the framework that build upon existing knowledge (e.g., incorporating additional factors or complexities).

- Exploring deeper connections: Analyze the formal equivalence between the Gompertz and Black-Karasinski models and the underlying Ornstein-Uhlenbeck process.
- Discussing historical context (optional): Briefly discuss the historical development of these models and how the VIR-SGDP connection sheds light on their relationships.
- Expanding the discussion and conclusion: Discuss the broader implications of the established connection. How can it be applied in practical scenarios? How does it inform existing research? Briefly address potential limitations of the study. Suggest future research directions that could build upon this work.
- Including a simulation study (optional): If the paper incorporates a simulation study to demonstrate the practical implications of the connection, ensure it includes details about:
    - The specific goals of the simulation.
    - The methodology for generating samples from the VIR and SGDP models.
    - The results of the simulation and how they support the paper's conclusions.

Overall:

This paper offers a mathematically sound connection between the VIR and SGDP models. However, to be publishable in a research journal, the author needs to demonstrate a more significant contribution beyond the basic transformation. The author can choose to revise the paper for potential publication by highlighting the connection's novelty, applications, deeper mathematical analysis, and potentially its historical context. Alternatively, they can focus on the pedagogical value for an audience unfamiliar with these concepts.