Interest rate modelling via SPDE's (STK 4530)

1. Definition of conditional expectations + properties (manuscript: Def. 2.1.10 or Lamberton, Lapeyre: Th. A2.1)

2. Definition of a martingale (manuscript: Def. 2.1.13 or Lamberton, Lapeyre: Def. 3.3.1) ⟶ Example: Brownian motion

3. Definition of the Brownian motion (manuscript: Def. 2.1.14 or Lamberton: Def. 3.2.1)

4. Properties of a stochastic integral w.r.t. a Brownian motion (e.g. martingale,Itô-isometry,...) (manuscript: (i),...(v) Rem. 2.2.3 or Lamberton or Øksendal)

5. Content (i.e. statement) of Girsanov's theorem (man.: Th. 2.2.8 or Lamberton: Th. 4.2.2)

6. Definition of a self-financing strategy (man.: Def. 3.2.4 or Lamberton: Def. 6.1.5)

7. Content of the "bond pricing formula" (man.: Th. 3.2.8 + Rem. 3.2.10 or Lamberton: Prop. 6.1.6)

8. Main ideas (in rather few lines) for the calculation of the present value of a zero-coupon bond w.r.t. the Vasicek-model (man.: Section 3.3 or Lamberton: Section 6.2.1)

9. Definition of the HJM-model (man.: Section 3.3: Relation (3.3.12) + (3..3.13) or Lamberton: Section 6.2.3). In addition: Content of the "HJM-no-arbitrage condition" and the " risk-neutral yield curve evolution" (man.: Th. 3.3.12 + Th. 3.3.13 or Lamberton: Th. 6.2.6).

10. Definition of forward LIBOR rates and T-forward measures (man.: Relation (3.4.1.1) + (3.4.1.2), Def. 3.4.2.1 or Brigo, Mercurio: page 7 + Section 2.5)

11. Content of the "Evolution of LIBOR rates $L(t,T)$ under the $T-$forward measure (man.: Th. 3.4.2.3 or Brigo, Mercurio: Section 6) ⟶ Advantage of the LIBOR model compared to the HJM-model: computations are easier (Black-Caplet-formula !)

12. Definition of the generalized model for discounted bond prices (without all details!) (man.: Def. 4.3.1, Relation (4.3.3) or Carmona, Tehranchi: Def. 6.4) ⟶ Advantage compared to finite-rank models: hedging strategies are more intuitive (See Rem. 4.3.7 (ii) in the manuscript).

13. Calculation details of Exercises 1, Problem 3.

14. Calculation details of Exercises 1, Problem 4.

15. Main ideas of the calibration of the HJM-model. See e.g. Exercises 5, Problem 1 or the manuscript.