

Certificate in Quantitative Finance  
Final Project

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### **Abstract**

Work on this topic must focus on the end result: pricing of bonds, caps and floors (working and pricing vanilla and Bermudan swaptions is an extra), as opposed to the calibration of HJM or BGM (LMM) model *per se*. Both models impose the no-arbitrage restriction: the drift cannot be random and depends on volatility of forward rates. The distinction is how this key input is estimated: from interest rates data (historic) or market instruments (forward-looking).

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# 1 Fair Spread for Basket CDS

## 1.1 Summary

Numerical Methods Pricing by the market model is preferable but the data requirements can be an obstacle and calibration process of correlated variables is done via semi-denied optimisation. Pricing by HJM framework helps to learn about risk factors of yield curve evolution and numerical methods associated with estimation and analysis of covariance matrices (i.e., Principal Component Analysis). In the LIBOR Market Model the reference volatility structure is calibrated by time-homogeneous tting to caplet (or swaption) data; [FRAi; FRAj] covariances have an explicit solution. Volatility tting to explicit functional forms (calibration) and requirement to use quasi-random numbers are present for both models.

Discounting is an intimate part of pricing because IR derivatives are decomposable into cash-flows. Usage of OIS or SONIA rates to construct discount factors is compatible with the market model that relies on shifting numerarie  $Q(m)$  (an account for which rate is xed every night). Discounting that is based on unsecured overnight rates generates higher cost of funding than is practised on collateralised assets and repo transactions. Other approaches to discounting can be categorised into (a) risk-neutral with the model-generated spot rate  $r(t)$  and (b) funding premium with the customized curve built for discounting of specic cash ows (e.g., debt or multi-currency swaps). Construction of customized yield curves for discounting would require an independent study of interpolation methods that suit data and purposes (see Reading List).

## 1.2 Model Validation

xadfgsdfhsdghsghsdfg sghbs  
df gsdg  
sgsdf  
gsd  
fg  
sdf  
gsdfgdg

$$E = mc^2$$

pjllkjlkj

# 2 Interest Rate Derivatives

## 2.1 Summary

fdgsdfgdfgsdfg

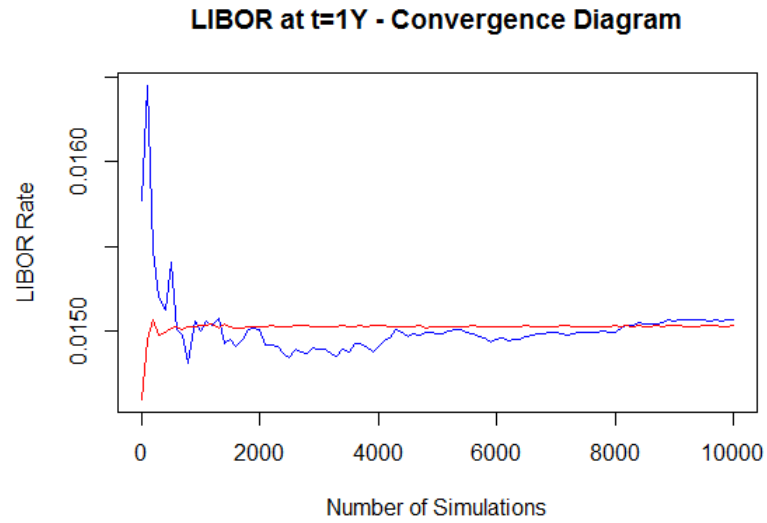


Figure 1: Sobol / Rnorm convergence diagram

## 2.2 Model Validation

shghsfghsfghfghfgh

□

## 3 Conclusion

dfgsdgdgfsdg.<sup>1</sup>

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<sup>1</sup>my first footnote in Lyx

## References

- [1] Pierre Bourdieu “La vie est belle ...”
- [2] Ophelie Winter “Dieu m’a donne la foi”