Master Thesis

Swaption Pricing Using the SABR Model

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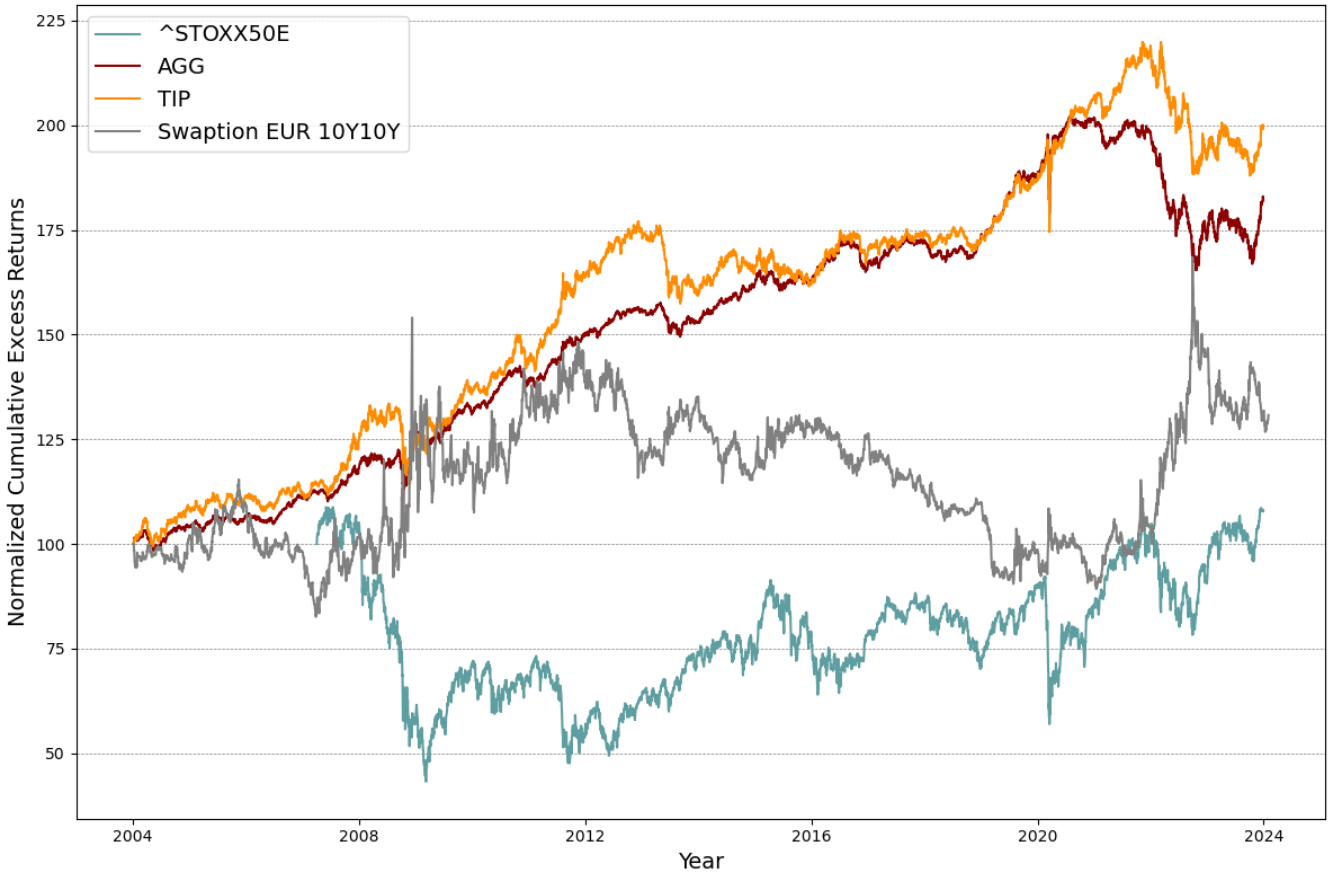
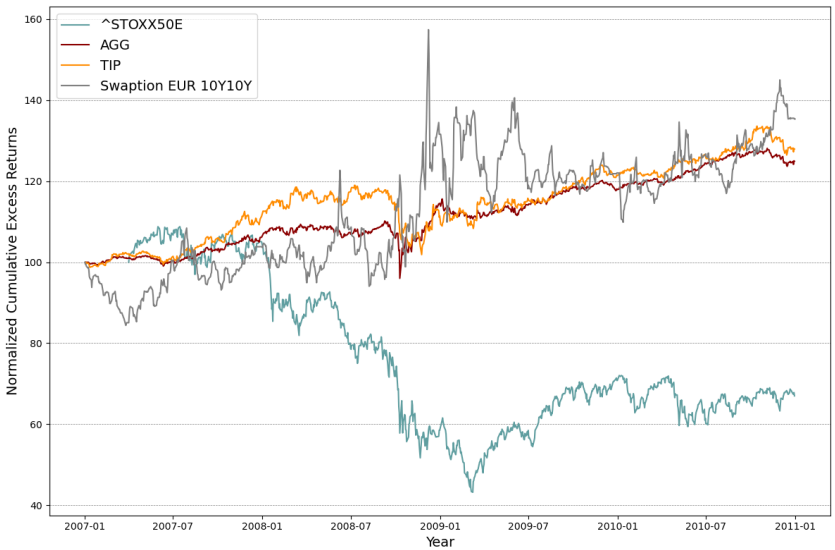
Outline

- Swaption As a Missing Link in Asset Allocation
- Mathematics of Pricing Swaptions
- One-Factor Short-Rate Model
- Constant Volatility

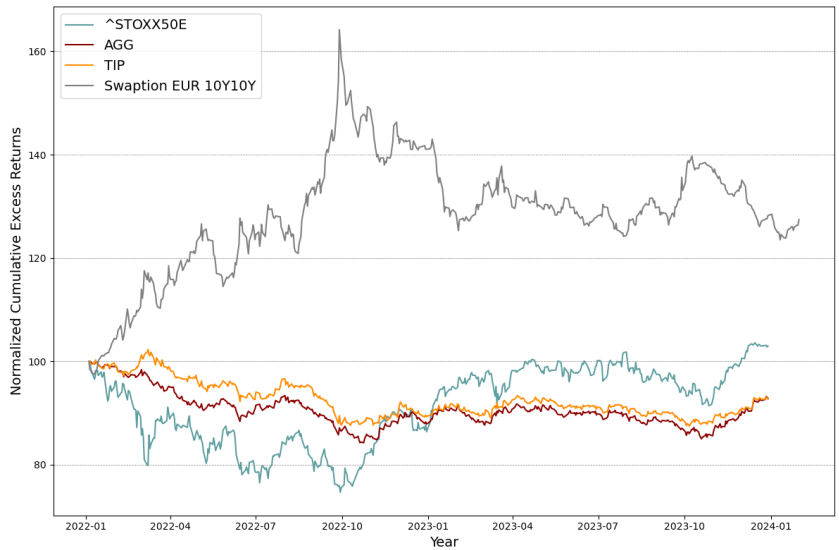
Swaption As a Missing Link in Asset Allocation



Swaption As a Missing Link in Asset Allocation



Global Financial Crisis



High inflation period

Mathematics of Pricing Swaptions

A swaption is a financial derivative that can be described as an option to exchange a fixed rate bond for floating rate bonds for a predetermined principal. There are two types of swaptions, payer swaptions and receiver swaptions. A payer swaption gives the holder the right to pay a fixed interest rate and receive a floating rate, similar to a call option in the stock market. On the other hand, a receiver swaption allows the holder to pay a floating interest rate and receive a fixed rate, resembling a put option.

Mathematics of Pricing Swaptions

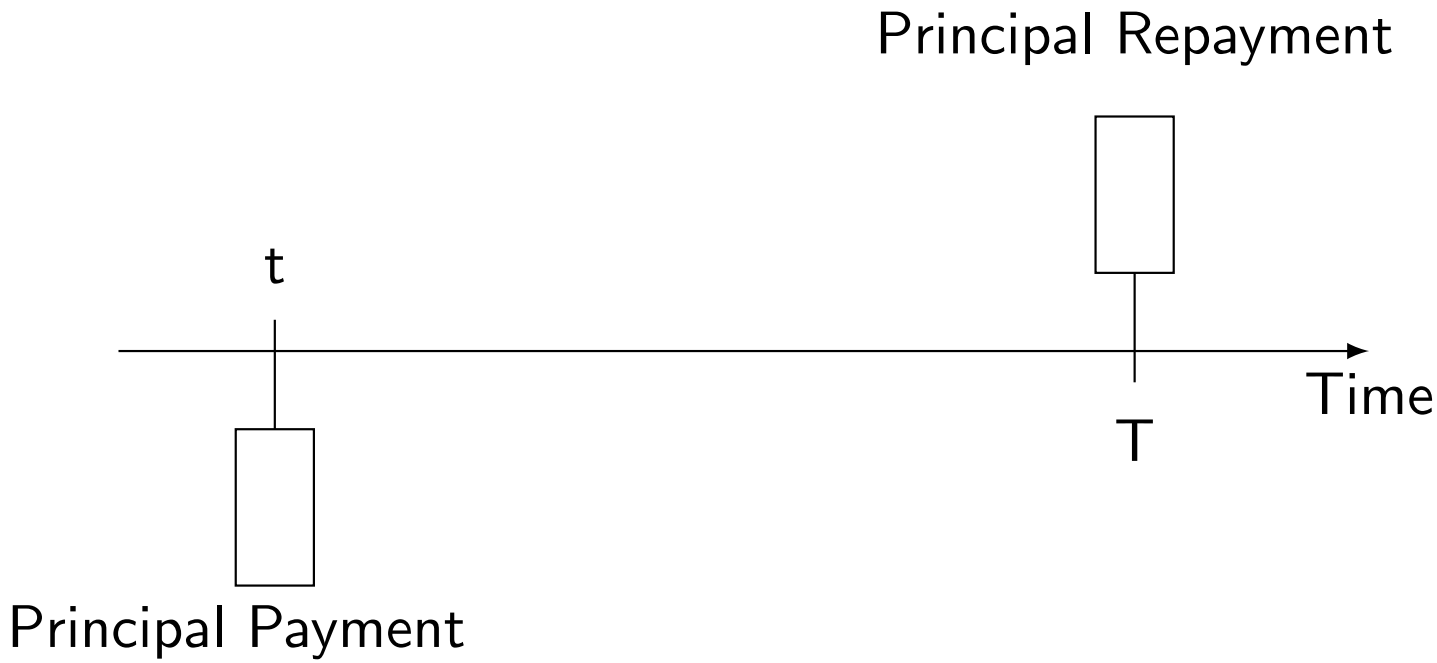


Illustration 3.1: Cashflow for a zero coupon bond

Mathematics of Pricing Swaptions

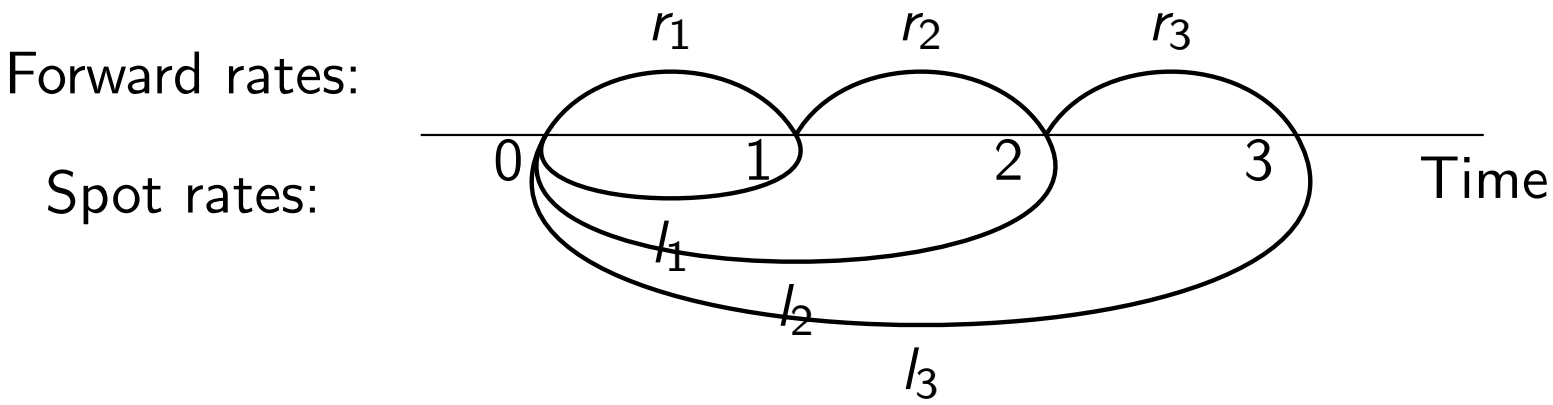


Illustration 3.3: Forward and spot rates

Mathematics of Pricing Swaptions

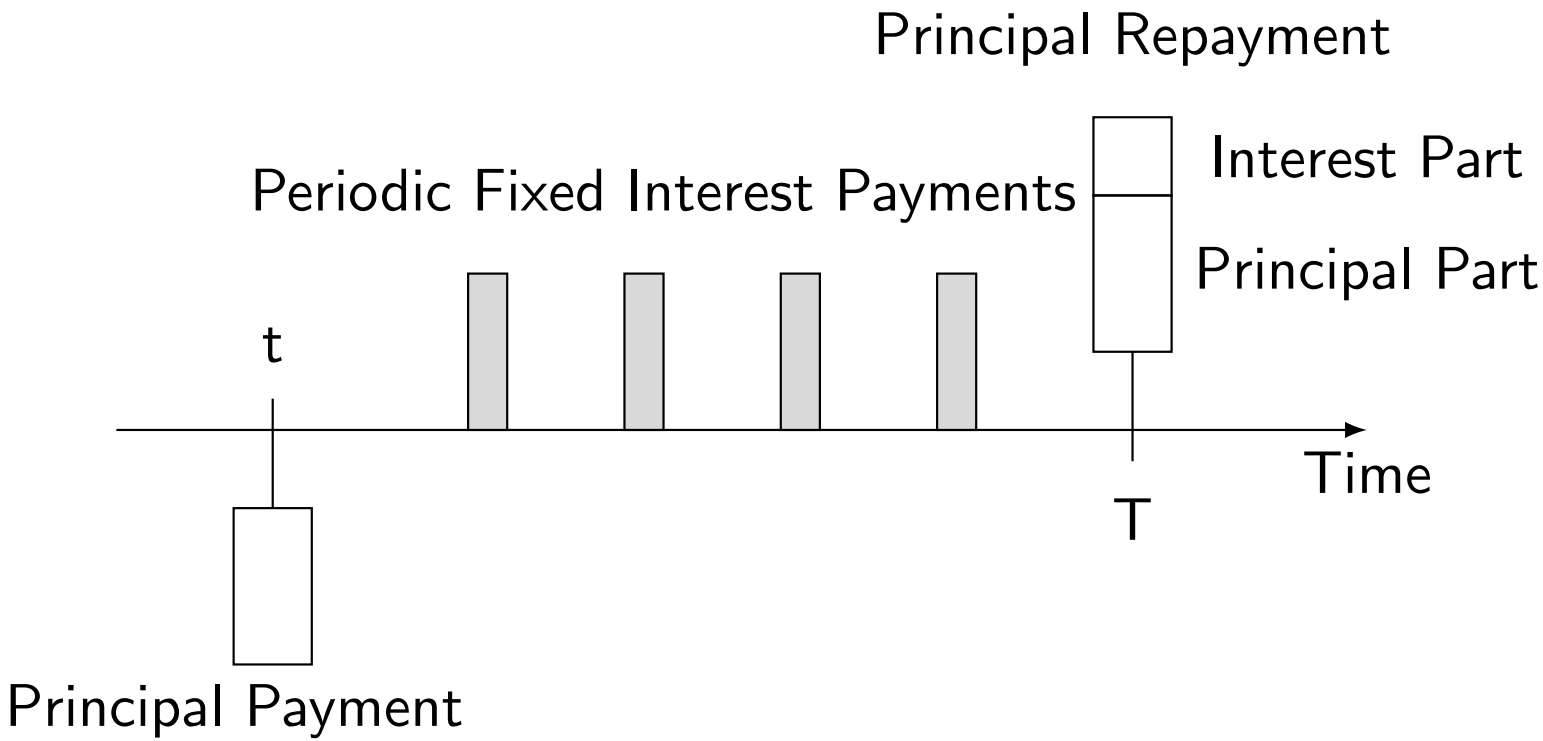


Illustration 3.4: Cashflow for a fixed coupon bond

Mathematics of Pricing Swaptions

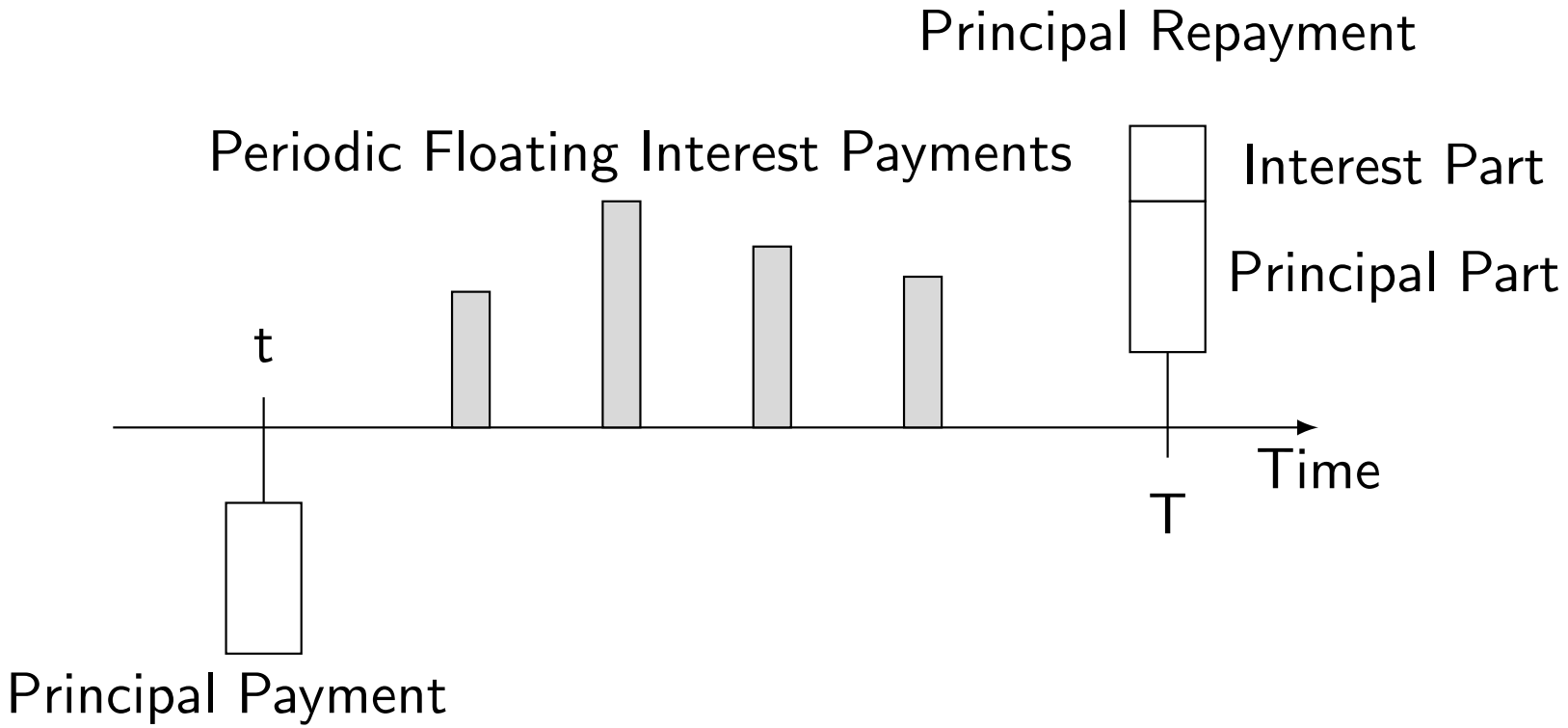


Illustration 3.5: Cashflow for a floating rate bond

Mathematics of Pricing Swaptions

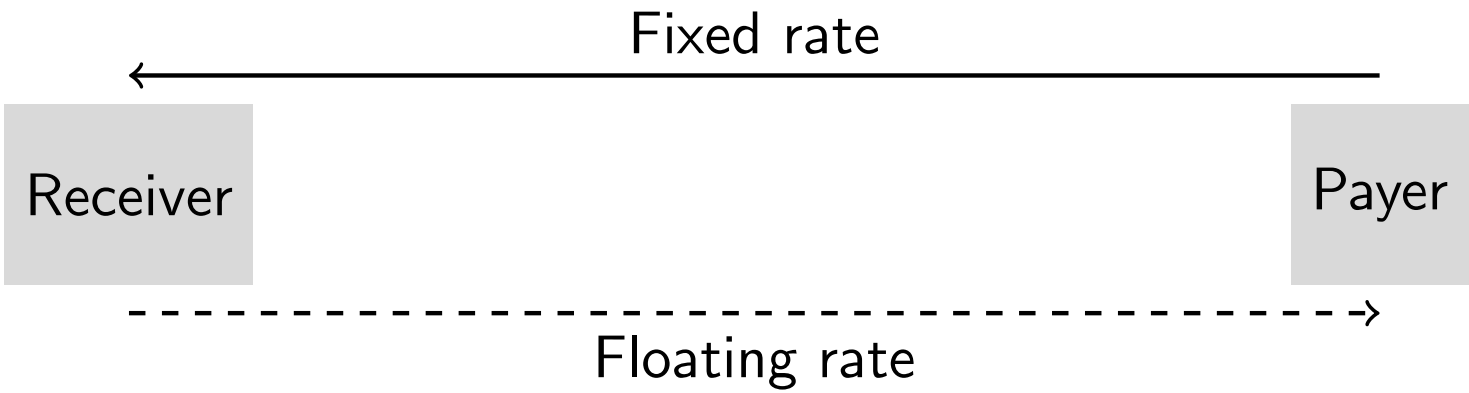


Illustration 3.6: Cashflow for fixed and floating rate exchanges

Mathematics of Pricing Swaptions

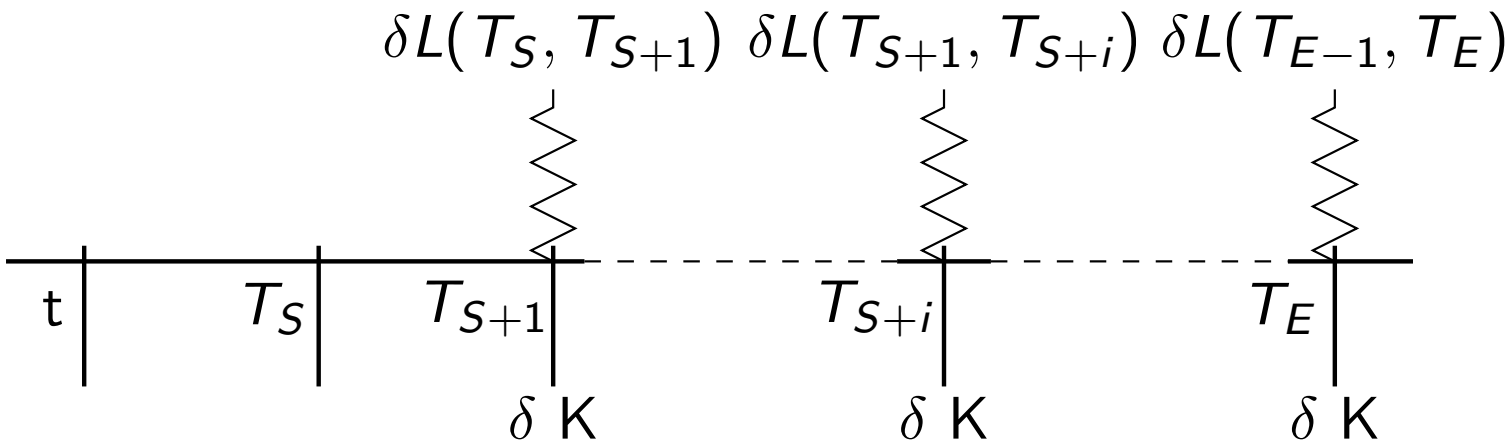


Illustration 3.7: Cashflow for a payer swap

Mathematics of Pricing Swaptions

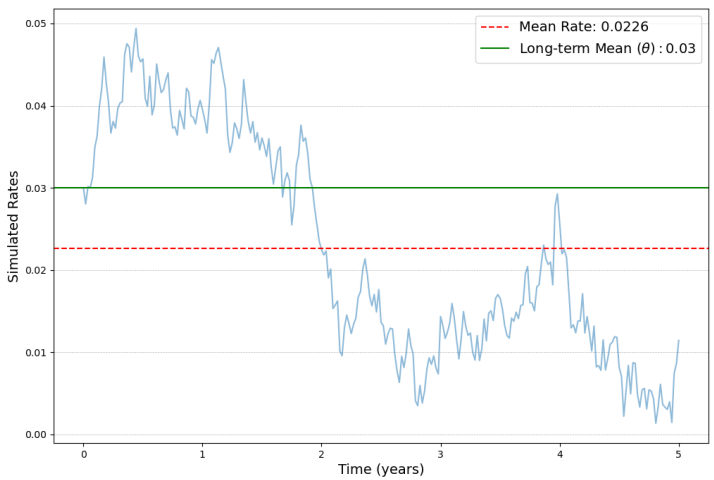
Swaption pricing

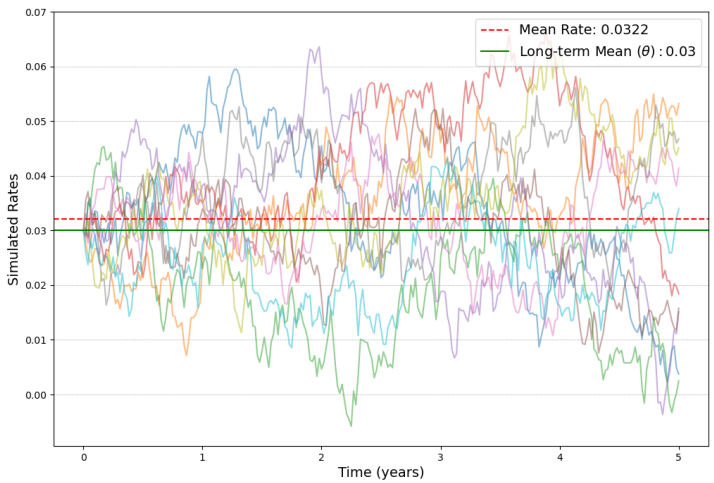
One-Factor Short-Rate Model

The Vasicek model

$$dr_t = \kappa\Big[\theta - r(t)\Big]dt + \sigma dW(t) \tag{1}$$

$$r(0) = r_0 \tag{2}$$





Constant Volatility