



Master thesis in Mathematics-Economics

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Swaptions pricing

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Abstract

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1 Introduction

In this thesis we will investigate swaptions pricing.

2 Swaptions as a missing link in asset allocation

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3 Mathematics of pricing swaptions

Look at Swaption pricing and isolating volatility exposure.

To determine swaptions prices, it is important to understand which things there affects the price of the swaption. This chapter simplifies these concepts by explaining interest rates, bonds, swaps, and options, and then shows how they come together to determine the price of a swaption.

3.1 Time value of money

Understanding the concept of interest rates begins with the fundamental idea that a dollar today holds more value than the same dollar in the future. To understand these concept, a discount factor is introduce

$$B(t, T) = \text{value at time } t \text{ of a dollar received at time } T$$

$B(t, T)$ refer to a contract that pays one dollar maturity, T , which can be illustrated as below

$$t < T \rightarrow B(t, T) < 1$$

$$t = T \rightarrow B(t, T) = 1$$

The yield is defined as the singular constant interest rate, denoted as r_y , which has an equivalent impact to the discount factor $B(t, T)$ when compounded continuously.

$$B(t, T) = e^{r_y \cdot (T-t)}$$

3.2 The yield curve

3.3 Forward rates

3.4 Bonds

3.5 Financial derivatives

3.6 Interest rate swaps

3.7 Options

3.8 Swaptions

4 SABR Implied Volatility and Option Prices

Look at The SABR model

4.1 Process for the forward rate

4.2 The SABR model

4.3 Estimating Parameters

5 Data and the Volatility Risk Premium

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5.1 Data

5.2 The volatility Risk Premium

References

- [1] Armstrong, M.A. Basic Topology. England: Editorial Board, 2000.