

Option Pricing in Discrete-time Complete and Incomplete Financial Markets

by Kit Man LEI

Thesis Supervisor:

Professor Deng DING

Department of Mathematics

University of Macau

Abstract

In this thesis, we discuss the discrete financial model for derivatives in complete and incomplete financial markets and understand the pricing theory on derivatives of both complete and incomplete markets. The pricing problem of incomplete markets will also be explored. The thesis is divided into four chapters. The first Chapter introduced the history and development of financial mathematics. There is also a brief introduction to the reason why option pricing is difficult in incomplete markets.

In Chapter 2, an introduction to the discrete-time financial markets, the martingale characterization for no-arbitrage and the definition of complete and incomplete markets are given. These are basis for getting the option pricing in complete and incomplete markets, which are discussed in Chapter 3 and 4.

In Chapter 3, we analyse the fair prices of options in complete markets and derive the Cox-Ross-Rubinstein pricing formula in complete markets by using the Cox-Ross-Rubinstein binomial model.

Finally, in Chapter 4, we study the different financial models in incomplete markets by providing examples. The ask and bid prices in incomplete markets, as well as the pricing option in incomplete markets are also discussed.