Corporate Finance, Module 21: “Option Valuation”

Readings for the Fourteenth Edition (2022) of the Brealey, Myers, Allen, and Edmans text

(The attached PDF file has better formatting.)

The sections in this posting are for the *fourteenth* edition of the Brealey, Myers, Allen, and Edmans text. You may also use the seventh through thirteenth editions; final exam problems can be answered from any edition.

{The Brealey, Myers, Allen, and Edmans textbook is excellent. We say to read certain sections and to skip others. This does not mean that certain sections are better; it means that the homework assignments and exam problems are based on the sections that you must read for this course. Some of the skipped sections are fascinating, but they are not tested.}

The introduction on page 637 has five bullet points that are tested on the final exam; be sure to know them.

Read section 22.1, “A Simple Option Valuation Model.” The option delta valuation method has two parts: (i) determining the option delta and (ii) using risk neutral valuation to price the option. The option delta is the partial derivative of the option price with respect to the stock price: *if the stock price increases by 1¢, what is the change to the option price?* We speak of this in a *two-state world*: the stock price either moves up by Y or down by Z, and we look at the change in the option value divided by the change in the stock price.

Know formula 22.1 for the option delta on the bottom of page 639 and formula 22.2 for amount of debt at the top of page 640 (repeated for put options on page 643), and the formula 22.3 for the risk-neutral probability of an increase in the stock price on page 641. The option delta is positive for a call option and negative for a put option; using a positive option delta for a put option leads to careless errors on final exam problems.

Using the option delta, we construct a risk-free portfolio, meaning that *whether the stock price moves up or moves down, the ending value of the risk-free portfolio is the same*. A risk-free portfolio earns the risk-free interest rate, and we solve for the value of the option. The textbook solves for option values several times, since readers don't always grasp the logic at first. The final section (top of page 644) shows that the call and put options satisfy the put call parity relation. The final exam gives a basic call or put option and asks for options deltas or risk-neutral probabilities of stock price increases.

Read section 22.2, “The Binomial Method for Valuing Options.” Figure 22.1 uses a two stage illustration. The practice problems on the discussion forum have examples of calls and puts, with more explanation than in the textbook.

Read the sections “The General Binomial Method” on pages 647-649 and “The Binomial Method and Decision Trees” on page 649.

The option delta and binomial tree pricing methods are straight-forward, but they take a while to grasp. One moment they seem bizarre, but once you grasp the concept, they are simple, and you can’t understand what was so hard. One way of grasping this material is to explain the procedure to another person. Study with a partner; take a problem from the Module 21 practice problems and explain the solution to your partner. After working through three or four problems, it makes sense.

The SOA places high value on option pricing, and the final exam for this course covers all three methods in the text (option delta, binomial tree, and Black-Scholes) for a variety of option types (calls, puts, one stage, two stage). Spend an hour explaining the methods to another candidate (or even explaining to the mirror)

You must know options pricing for the actuarial exams, and these pages from the text are a good introduction. Your study does double duty: for the VEE course and then for the actuarial exams.

We cover sections 22.3 and 22.4 in Module 23.

Review end of chapter problems 1, 2, 3, 4, 5, 6, 7, 8.

Illustrative test questions, problems, and homework assignments are shown separately on the discussion forum.