

Corporate Finance, Module 21: "Option Valuation"

Readings for Ninth Edition

(The attached PDF file has better formatting.)

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The page numbers here are for the *ninth* edition of Brealey and Myers. You may also use the seventh or eighth editions of this text. The page numbers for the seventh and eighth editions are in separate postings.

{The Brealey and Myers 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 588 has five bullet points that you must know for Module 23; you might as well read them now.

Read section 22.1, "A Simple Option Valuation Model," on pages 589-593. 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 moves down by Z , and we look at the change in the option value divided by the change in the stock price.

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. See the top half of page 590 and the top half of page 593. The final section (bottom of page 593) shows that the call and put options satisfy the put call parity relation.

Read section 22.2, "The Binomial Method for Valuing Options," on pages 593-597. To save space, Brealey and Myers use a two stage illustration. Most authors use a single stage example first, since the concepts are more complex in the two stage model. The practice problems have several single stage examples of both calls and puts, with more explanation than in the textbook.

Read the sections "The General Binomial Method" on pages 597-598 and "The Binomial Method and Decision Trees" on pages 598-599. Page 598 gives a formula for the upside and downside changes in terms of the volatility of the stock price. The formula says that if these are the changes, the standard deviation for a period one year is the volatility. The proof is simple, but Brealey and Myers don't show it, since most of their readers (first and second year college students) have little mathematics background. The final exam does

not test the derivation, but the problems assume this relation: the upside change is $e^{\sigma\sqrt{h}}$ and the downside change is the reciprocal of this.

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 have trouble 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 or two explaining the methods to another candidate (or even explaining to the mirror). If you are feeling cruel, you might try explaining option pricing to your spouse.

We cover sections 22.3 and 22.4 in Module 23. The summary for this section does not review the text, so it is of little help to you. Skip the appendix on dilution (pages 615-618) and skip the mini-case on pages 613-614.

Review question 1 in the quiz on page 609 and question 2 on page 610. Review questions 13a, 13b, and 13c on page 611; then answer the same questions for a put option instead of a call option. Review questions 3 and 4 in the quiz on page 610 are harder, but they are worth reviewing.