Corporate Finance, Module 9, "Capital Budgeting and Risk"

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.}

Section 10-1 "Sensitivity and Scenario Analysis explains the terms and concepts but is not directly tested on the final exam. These analyses are commonly used by actuaries for insurance pricing and the section is well worth reading.

Read section 10.2 "Break-even analysis and operating leverage." Know especially equation 10.1 on page 283 for degree of operating leverage (DOL). Know Example 10.1 "How Fixed Costs Translate Into High Operating Leverage." Fixed vs variable costs are particularly relevant for insurers. Independent agency costs were a high percentage of revenue for insurers in the early 20th century but have been replaced by online sales web sites.

Read section 10.3 "Real options and the value of flexibility." The value of flexibility is great, and options pricing allows analysts to quantify it. For instance, an insurer may believe that the value of expansion into a foreign country depends on the results of an election a year hence. It may build an agency force before the election, which will be worthless if the country remains autocratic but highly valuable if the country turns democratic.

For energy firms (nuclear power, fossil fuels, solar, windmills), profits depend on politics; green parties destroy some investments and raise the value of others. Real options are essential for pricing energy projects subject to environmental constraints. Using expected values in an NPV or IRR formula is incorrect; one must evaluate the project using options pricing.

The "option to expand" can be illustrated by test marketing. Suppose an insurer has a new insurance product with a 50% chance of giving a 20% return and a 50% chance of a 0% return. The average return is 10%. If the opportunity cost of capital is 12%, the project has a negative NPV.

But suppose the insurer might market this product in 10 locations (such as 10 cities in a state). The correlation of success between locations is 50%: success in one location does not ensure success in another location, but it is a good sign. The insurer should test the product first in one or two locations. If it fails, the insurer can decide not to market in the other locations. If it succeeds, the insurer can market in the other locations.

Question: Isn't this obvious? It is always better to test market a product to see its value.

Answer: The idea is obvious, but the mathematics of options can be difficult. One prices the choice to expand into nine other locations as an option. Given the correlations and the return in each scenario, we determine if test marketing is worthwhile.

For some products, speed in bringing the product to market is important. Test marketing sacrifices speed. For clothing, movies, and high-tech products, test marketing may cost more than its benefits. A marketing "blitz," which is sometimes used for new movies, is the opposite of test marketing. For many products, manufacturers keep their ideas secret until the product is sold.

The "option to abandon" has equally many applications. Suppose an insurer can market a life insurance product in two cities, neither of which has a resident life insurance agent. One city has a small population, but average income is high, all residents buy auto insurance from an agent in town. The chances of success for

the life insurance product are high, but if the product fails, the insurer can *not* use the agents (and sunk expenses) to market auto insurance, since all the town's residents already have auto insurance.

The other city has a larger population, but average income is low and there is no auto insurance agent in town. The chances of success for the life insurance product are lower, but if the product fails, the same agents can market auto insurance. Auto insurance by itself may not be a positive NPV project, but if sunk costs are paid for life insurance, selling auto insurance is profitable. The second city may be the better location for the new product. We use option pricing techniques to determine which city is better.

Figure 10.3 on page 289 shows complex real options in real business cases. Pharmaceutical firms may spend ten years testing a new medication in animal and clinical trials. Real option analysis is essential for knowing when to stop and when to keep going.

Review end of chapter problems 15, 16, 17, 19, 21, 23, 24.

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