

Finance 510-B
Problem Set 5

Work on individually. Due via e-mail on Saturday, February 20, at 6:00 pm Tucson time.
Submit on a spreadsheet whose name includes your name.

Northrop Grumman is considering developing the next generation of radar systems based on advances in synthetic aperture radar technology, and Northrop's own active electronically scanned array (AESA) fire control radar. David Keffer, Northrop's new CFO, is concerned that the speculative nature of the project makes it very difficult to construct a capital budget. The engineers request an initial investment in new equipment of \$222 million (a 5-year MACRS category), and an operating budget of \$15 million per year for two years for essentially a feasibility study. After the two years there is only a 40% probability that the project will appear promising. If that is the case then we would have to make another investment (at that time) of \$320 million in new equipment (in the 7-year MACRS category), and the team's expenses would increase to \$111 million per year. It would be three more years before we would know whether the plan is successful, and our best guess is that there is still only a 50% chance of success at that point.

Mr Keffer's instincts are to reject the proposal since there is only a 20% chance of it being successful. On the other hand, his boss, Northrop's CEO, Kathy Warden is intrigued by the possibility of \$1 billion in revenues in each of the ensuing five years if the project is successful and (operating expenses continue at \$111 million per year during this period). Ms Warden is on Merck's board of directors and told Mr Keffer that Merck makes decisions like this all the time using real options analysis. So Mr Keffer has asked you to use the "real options approach" to analyze this problem.

Northrop Grumman has a beta of 0.8, its 30-year debt trades at a yield to maturity that is 90 basis points higher than the benchmark 30-year US Treasury bond, which is yielding 2.2%. The book value of Northrop's debt is \$15 billion, and the market cap of its equity is \$50 billion. Its marginal tax rate is 21%. Northrop uses a 5% equity market risk premium for internal decision purposes.

This project is very small relative to Northrop's operations, so we can safely assume that we can exploit all tax shields in the year they occur (offsetting taxable income from other parts of the company). Also if we decide to pull the plug on the project then the capital goods would have no further value, but we would continue to depreciate them on their original time table, after which they would have no salvage value.

Show this project's net present value using the standard approach, and show its economic value to Northrop Grumman.

Provide an economic analysis of this decision for Mr. Keffer. Write a memo to Mr Keffer with these recommendations and provide your Excel spreadsheet as support materials.