

Introduction to Finance - II
Study Guide for Quiz 6

1. You work as a financial analyst for Applied Materials in Santa Clara, California. Thanks to some recent breakthroughs in sub-atomic engineering, the nature of integrated circuits is changing rapidly. The most recent breakthrough using photons to transmit electrical pulses has not yet been developed for large scale production. One of your chief engineers, Arvind Patel has a proposal to begin construction of a new plant that would bring this technology to that level. He has commissioned construction plans and says that a new plant could be built in one year, on land that Applied Materials already owns in Xi'an China. This land is a 50 acre site that the company just bought for \$75,000 per acre. The capital outlay for the plant is \$1 billion, which must be paid immediately. Once this plant is built Arvind projects that it will result in an annuity throwing off \$250 million per year (on a net, after-tax basis) for 8 years. (Modeled on an annual basis, the first cash inflow would be 1 year after construction is complete. If construction is complete in one year, the first payment from this annuity would be in two years.) Applied Materials' market capitalization of equity is \$60 billion, its capital structure is 92% equity and 8% debt. Its beta is 1.3 and its 30-year debt is rated A-, and trades at a 94 basis point spread to the 30-year US Treasury Bond. The yield to maturity on the 30-year US Treasury Bond is 3.75%. The stock market risk premium is 4.5%. Applied Materials' statutory tax rate is 27%.
 - (a) What is the NPV of Arvind's proposed project?
 - (b) You raise the concern that in this rapidly changing technological environment, there is a good chance that the new technology underpinning Arvind's proposed project will be obsolete in two years. To demonstrate this concern to your boss, Applied Materials' CFO, Dan Durn, you flesh out Arvind's original forecasts – retaining Arvind's expected value of the project's future cash flows – but identifying two scenarios. In Scenario 1, after 2 years, the competing technology flops so that the (net, after-tax) annuity from Arvind's project becomes \$500 million per year for 8 years following completion. In Scenario 2, after 2 years, the competing technology is successful, in which case Arvind's project becomes worthless. There is a 50% probability of each of these 2 scenarios. Show and explain the implications of your more detailed forecast for the original project.
 - (c) Dan raises a concern that by waiting 2 years Applied Materials might forego a first-mover advantage in the new technology. In particular, another Applied Materials competitor, KLA-Tencor, is also working in this broad area. Dan knows that Applied Materials is about one year ahead of KLA-Tencor, but if Applied Materials delays production for two years, it will lose its first-mover advantage to KLA-Tencor. Dan wants to know whether waiting is still preferable to proceeding immediately with production if it would result in an annual loss of \$100 million in the annual after-tax cash flows in the event that the competing technology fails.

2. Your family runs a small facility that makes specialty hazardous materials suits (hazmat suits). A buyer from Japan has written a proposal to purchase 400 suits for 495,000 yen per suit for each of the next 8 years. Currently one dollar buys 110 yen, so one yen is worth 0.91 US cents. It costs you \$3,100 to manufacture a suit. Your business' marginal tax rate is 23%. Your family business is 100% equity-financed, and your family uses 11% as the cost of capital. Your shop is currently running at capacity, so if you accept this order, you will have to add equipment at a cost of \$1 million. This equipment will be depreciated on a 3-year MACRS schedule (attached).
- (a) Since the expected future value of a foreign exchange rate is its current value, what is the net present value of this project?
 - (b) One concern that your sister raises is a major shift in trade policy. She is concerned about the possibility of a trade war and the addition of a 40% tariff on imports to Japan from the US should that occur. The contract with the buyer stipulates that your firm is responsible for any Japanese import duties that are in response to US policy. A 40% tariff would mean that you sell the suits for 353,571 yen a piece (in which case the tariff is $.4 \cdot 353,571 = 141,429$ yen) so the buyer still pays 495,000 yen. She thinks that after a year we will know whether such a tariff would be in place. You agree that there is a 30% probability of the trade war. How does this affect your optimal strategy? Your Japanese buyer is willing to wait one year before entering the agreement, but in that case the term of the agreement will only be 6 years. (With the first payment being two years from now.)

3. Your family runs a small facility that makes specialty hazardous materials suits (hazmat suits). You currently manufacture the suits for \$3,100. You received a contract from FEMA for 800 suits per year for each of the next 8 years, at a price of \$4,300 per suit. You will have to build a new plant to meet this demand. You currently use cellulose fiber in making the suits, but you have read that in two years 3M plans to market a thermoset plastic that is 50% cheaper than the cellulose fiber you currently use. Your family has discussed this with 3M sales reps, and believe that there is a 75% probability that the thermoset plastic alternative will be available after two years as described. Each suit requires \$500 worth of cellulose fiber, so you would be able to reduce the cost per suit to \$2,850 if the thermoset plastic is available and your plant can accommodate it. Your business' marginal tax rate is 23%. Your family business is 100% equity-financed, and your family uses 11% as the cost of capital.

You have two plans for a new plant. The first entails a capital outlay of \$3.5 million, and is not flexible enough to accommodate the thermoset plastic. The second has flexibility to accommodate different material, and so is more costly at \$3.75 million. Whichever plant you choose you will put it up on a 2-acre site that you already own. That land is currently vacant and appraised at \$100,000 per acre. Also you will need to maintain \$100,000 worth of inventory at the plant while it is in operation. Either plant will have a 0 salvage value after 8 years, and would be depreciated as a 7-year MACRS asset (table attached). Construction would be very quick, and production and revenues would start almost immediately.

- (a) What should the family business do?

MACRS 3-year depreciation schedule

Year	Depreciation (%)
1	33.33
2	44.45
3	14.81
4	7.41

MACRS 7-year depreciation schedule

Year	Depreciation (%)
1	14.29
2	24.49
3	17.49
4	12.49
5	8.93
6	8.92
7	8.93
8	4.46