



**National University of
Science and Technology**
Think in Other Terms



**FACULTY OF COMMERCE
DEPARTMENT OF FINANCE
MASTER OF SCIENCE IN FINANCIAL ENGINEERING DEGREE
FINAL EXAMINATION – NOVEMBER 2015
ADVANCED CAPITAL BUDGETING [CFE 5307]**

TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Answer any FOUR (4) questions.
2. Show all workings.

INFORMATION FOR CANDIDATES

1. The businesses in this question paper are intended to be fictitious.
2. This question paper contains FIVE (5) questions.
3. This paper consists of NINE (9) pages including cover page.
4. All questions carry equal marks (25 marks).

ADDITIONAL MATERIAL

1. None.

Question 1 [25marks]

(a) Dorchester Ltd., is an old-line confectioner specializing in high-quality chocolates. Through its facilities in the United Kingdom, Dorchester manufactures candies that it sells throughout Western Europe and North America (United States and Canada). With its current manufacturing facilities, Dorchester has been unable to supply the U.S. market with more than 225,000 pounds of candy per year. This supply has allowed its sales affiliate, located in Boston, to be able to penetrate the U.S. market no farther west than St. Louis and only as far south as Atlanta. Dorchester believes that a separate manufacturing facility located in the United States would allow it to supply the entire U.S. market and Canada (which presently accounts for 65,000 pounds per year). Dorchester currently estimates initial demand in the North American market at 390,000 pounds, with growth at a 5 percent annual rate. A separate manufacturing facility would, obviously, free up the amount currently shipped to the United States and Canada. But Dorchester believes that this is only a short-run problem. They believe the economic development taking place in Eastern Europe will allow it to sell there the full amount presently shipped to North America within a period of five years. Dorchester presently realizes £3.00 per pound on its North American exports. Once the U.S. manufacturing facility is operating, Dorchester expects that it will be able to initially price its product at \$7.70 per pound. This price would represent an operating profit of \$4.40 per pound. Both sales price and operating costs are expected to keep track with the U.S. price level; U.S. inflation is forecast at a rate of 3 percent for the next several years. In the U.K., long-run inflation is expected to be in the 4 to 5 percent range, depending on which economic service one follows. The current spot exchange rate is \$1.50/£1.00. Dorchester explicitly believes in PPP as the best means to forecast future exchange rate. The manufacturing facility is expected to cost \$7,000,000. Dorchester plans to finance the new project by a combination of equity capital and debt. The plant will increase Dorchester's borrowing capacity by £2,000,000, and it plans to borrow only that amount. The local community in which Dorchester has decided to build

will provide \$1,500,000 of debt financing for a period of seven years at 7.75 percent. The principal is to be repaid in equal installments over the life of the loan. At this point, Dorchester is uncertain whether to raise the remaining debt it desires through a domestic bond issue or a Eurodollar bond issue. It believes it can borrow pounds sterling at 10.75 percent per annum and dollars at 9.5 percent. Dorchester estimates its all-equity cost of capital to be 15 percent. The U.S. Internal Revenue Service will allow Dorchester to depreciate the new facility over a seven year period. After that time the confectionery equipment, which accounts for the bulk of the investment, is expected to have substantial market value. Dorchester does not expect to receive any special tax concessions. Further, because the corporate tax rates in the two countries are the same--35 percent in the U.K. and in the United States--transfer pricing strategies are ruled out.

Should Dorchester build the new manufacturing plant in the United States?

[25marks]

Question 2

[25marks]

(a) Orion Inc. is a successful manufacturer of citizens band (CB) radios. Management is considering producing a sophisticated tactical radio for sale to the Army, but is concerned because the military market is known to be quite risky. The military radio market is dominated by Milrad Inc., which holds a 60% market share. Antex Radio Corp. is another established competitor with a 20% share. Both Milrad and Antex make only military radios. Milrad's beta is 1.4 and Antex's is 2.0. Orion's beta is 1.1. The return on an average publicly traded stock (kM) is about 10%. The yield on short-term treasury bills (kRF) is currently 5%. Orion's cost of capital is 8%. The military radio project is expected to require an initial outlay of \$10 million. Subsequent cash inflows are expected to be \$3 million per year over a five-year contract.

On the basis of a five-year evaluation, should Orion undertake the project?

[7marks]

(b) The Strik-it-Rich Gold Mining Company is contemplating expanding its operations. To do so it will need to purchase land that its geologists believe is rich in gold. Strik-it-Rich's management believes that the expansion will allow it to mine and sell an additional 2,000 troy ounces of gold per year. The expansion, including the cost of the land, will cost \$500,000. The current price of gold bullion is \$425 per ounce and one-year gold futures are trading at \$450.50 = \$425(1.06). Extraction costs are \$375 per ounce. The firm's cost of capital is 10%. At the current price of gold, the expansion appears profitable: $NPV = (\$425 - 375) \times 2,000 / .10 - \$500,000 = \$500,000$. Strik-it-Rich's management is, however, concerned with the possibility that large sales of gold reserves by Russia and the United Kingdom will drive the price of gold down to \$390 for the foreseeable future. On the other hand, management believes there is some possibility that the world will soon return to a gold reserve international monetary system. In the latter event, the price of gold would increase to at least \$460 per ounce. The course of the future price of gold bullion should become clear within a year. Strik-it-Rich can postpone the expansion for a year by buying a purchase option on the land for \$25,000.

What should Strik-it-Rich's management do?

[6marks]

(c) Under what circumstances will a project evaluator use the following :

- i. Project stand-alone risk **[2marks]**
- ii. Contribution to firm risk **[2marks]**
- iii. Systematic risk **[2marks]**

(d) The Alpha Company plans to establish a subsidiary in Hungary to manufacture and sell fashion wristwatches. Alpha has total assets of \$70 million, of which \$45 million is equity financed. The remainder is financed with debt. Alpha considered

its current capital structure optimal. The construction cost of the Hungarian facility in forints is estimated at HUF2,400,000,000, of which HUF1,800,000,000 is to be financed at a below-market borrowing rate arranged by the Hungarian government. Alpha wonders what amount of debt it should use in calculating the tax shields on interest payments in its capital budgeting analysis.

Advice the company on the action to take.

[6marks]

Question 3

[25marks]

(a) Courteney-Cox, Inc., is a Texas-based manufacturer and distributor of components and replacement parts for the auto, machinery, farm, and construction equipment industries. The company is presently funding a program of capital investment that is necessary to reduce production costs and thereby meet an onslaught of competition from low-cost suppliers located in Mexico and throughout Latin America. Courteney-Cox has a limited amount of capital available and must carefully weigh both the risks and potential rewards associated with alternative investments. In particular, the company seeks to weigh the advantages and disadvantages of a new investment project, project X, in light of two other recently adopted investment projects, project Y and project Z:

Expected Cash Flows after Tax (CFAT) Per Year

Year	Project X	Project Y	Project Z
2001	\$10,000	\$20,000	\$0
2002	10,000	18,000	2,500
2003	10,000	16,000	5,000
2004	10,000	14,000	7,500
2005	10,000	12,000	10,000
2006	10,000	10,000	12,500
2007	10,000	8,000	15,000
2008	10,000	6,000	17,500
2009	10,000	4,000	20,000
2010	10,000	2,000	22,500

Investment Outlay in 2000 for each of the projects are as follows respectively:

\$60,000 \$60,000 \$50,000

- i. Using a 5% risk-free rate, calculate the present value of expected cash flows after tax (CFAT) for the ten-year life of project X. **[5marks]**
- ii. Calculate the minimum certainty equivalent adjustment factor for each projects' CFAT that would justify investment in each project. **[5marks]**
- iii. Assume that the management of Courteney-Cox is risk averse and uses the certainty equivalent method in decision making. Is project X as attractive as or more attractive than projects Y and Z? **[3marks]**
- iv. If the company would not have been willing to invest more than \$60,000 in project Y nor more than \$50,000 in project Z, should project X be undertaken? **[5marks]**

- b) 'Firms may accept projects with negative NPVs and reject projects with positive NPVs at $t=0$ '. Evaluate the practicality of this by managers. Use examples to support your argument. **[7marks]**

Question 4

- (a) Discuss the importance of the following aspects in capital budgeting and project selection:

- i. Market feasibility **[3marks]**
- ii. Technical feasibility **[3marks]**
- iii. Societal feasibility **[3marks]**

- (b) Use the APV approach to determine the NPV of a project given the following information:

Investment	= \$500,000
Cash-flow from equity	= \$25,000
Cost of equity	= 20%
Cost of Debt	= 7%
Interest on debt	= 7%
Tax	= 35%

You are also given that this is financed using 50% equity and 50% debt.

[4marks]

- (c) Explain the key limitations of the APV model in NPV analysis and how can management address this limitation when using this approach to evaluate projects? **[6marks]**

- (d) Assume that a pharmaceutical company has been approached by an entrepreneur who has patented a new drug to treat ulcers. The entrepreneur has

obtained regulatory approval and has the patent rights for the next seventeen years. Although the drug shows promise, it is still very expensive to manufacture and has a relatively small market. Assume that the initial investment to produce the drug is \$500 million and the present value of the cash flows from introducing the drug now is only \$350 million. The technology and the market is volatile, and the annualized standard deviation in the present value, estimated from a simulation is 25 percent. Although the NPV of introducing the drug is negative, the rights to this drug may still be valuable because of the variance in the present value of the cash flow. In other words, it is entirely possible that this drug may not only be viable but extremely profitable a year or two from now. A 17-year, Government bond is paying a coupon of 4%. Is there any value of waiting to roll out the project? **[6marks]**

Question 5

[25marks]

- (a) You are a small business owner considering two alternatives for your phone system.

	Plan A	Plan B
Initial cost	\$50,000	\$120,000
Annual maintenance cost	9,000	6,000
Salvage value	10,000	20,000
Life	3years	4years

Assume a discount rate of 8%.

- (i) Use finite replication to select an economically relevant project. **[4marks]**
(ii) Is there a change in your choice of project under infinite replication? **[4marks]**

- (b) You are a manager in a timber plantation. Over the years your sales revenues have been failing to cover operating costs. A market research reveals that your product sells slowly in market when compared to those of competitors. Where your product finds a buyer, the buyer is only willing to buy at a discounted price. In your initial assessment of this project, the NPV was positive and all other

evaluation approaches indicated that the project should be undertaken. You have been harvesting your timber at the age of 3 years. Revenues per hectare of timber over time t are described by:

$$f(t) = \frac{1}{30}t^4(15 - t)$$

Investigate the causes of your low sales

[6marks]

If machinery used in the timber plantation have maintenance costs which follow the following function over time :

$$g(t) = \frac{1}{2}t^2 + 2t^3 + 27t$$

The machine was purchased 6 years ago and was immediately used after purchase. Could the machine be contributing to the low sales? **[4marks]**

- (c) The timber plantation manager in (b) above has also been considering diversifying revenue streams. An ice-cream business is being sold for \$100m with cash flows generated expected to be \$1.8m at the end of year 1 and thereafter grow at 4% for 3 years and at 3% indefinitely thereafter. A comparable business in this sector has a beta of 1.1 in the first 3 years and the beta increases to 1.4 and remains unchanged thereafter. Government bonds across all maturities are paying an average of 7%. The return on a well-diversified equities portfolio on the local exchange realises an average annual return of 12%. Advise the timber manager on this possible investment. **[6marks]**

END OF EXAMINATION PAPER