Capital Budgeting, Fall 2016
Final Exam 2, Saturday, December 3rd, 2016
Writing time: 4 hours. Use of function calculators is allowed.

Exam maximum score is 80 points + 2 bonus points in Q5. 50% of the available points, 40p, in the final exam, and 50p course total, are required for a passing grade.
Avoid essay answers longer than a single page. Make sure your answers are legible.

1. Discuss briefly the main challenges in measuring the performance of previously undertaken, ongoing investments (=doing a "post audit" of a project). (**15p**)

2. a) What is the value of strategic managerial flexibility in corporate investments, i.e. of actively, rather than passively, managed projects)? Define and discuss briefly situations where such flexibility might be valuable. (**9p**)
   b) What practical challenges can be expected when attempting to assess the monetary value of managerial flexibility? (**6p**)

3. According to BMA, how should you take into account
   a. Project Synergies or Cannibalization (incidental effects)
   b. Opportunity costs
   c. Sunk costs
   d. Allocated Overhead Costs

   when estimating incremental cash flows for a project? When answering, *first define* briefly what the concept means! (**2.5p**/each, max. **10p**).

4. TBT is evaluating a new project to produce encryptors. The initial investment in plant and equipment is €500000. Sales of encryptors in year 1 are forecasted at €250000 and costs are €100000. Both are expected to increase by 5% a year in line with inflation. Profits are taxed at 25%. Working capital in each year consists of inventories of raw materials and is forecasted at 20% of sales the following year.

   The project will last five years and the equipment at the end of this period will have no further value. For tax purposes the equipment can be depreciated straight-line over these five years. If the nominal discount rate is 10%, calculate the net present value of the project in *either* nominal *or* real terms (result should be the same) of your own choice (but indicate which clearly). All intermediary steps should be clearly visible. (**18p**)

5. Founder and largest owner of Joe's Rocking Chair Co, Joe Harwington, estimates his firm's after-tax WACC at only 6%. Nevertheless he sets a 12% companywide discount rate to offset the optimistic biases of project sponsors (Joe's top managers) and to impose "discipline" on the capital budgeting process. Suppose Joe is correct about the project sponsors, who are in fact optimistic by 6% on average in their annual cash flow forecasts. Will the increase in the discount rate from 6% to 12% offset the bias? Discuss. Numerical illustration with an example gives additional points. (**10p**) (+up to +2p numerical illustration).

Turn page!

6. Project analysis. True or False?

   a. Sensitivity analysis is unnecessary for projects with asset betas that are equal to 0.

   b. Sensitivity analysis can be used to identify the variables most crucial to a project's success.

   c. If only one variable is uncertain, sensitivity analysis gives "optimistic" and "pessimistic" values for project cash flow and NPV.

NPV

   d. The break-even sales level of a project is higher when break-even is defined in terms of NPV rather than accounting income. sales level

   e. Risk is reduced when a high proportion of costs are fixed.

   f. Monte Carlo simulation can be used to help forecast cash flows.

   (+2p/point, maximum **12p**, no penalty for wrong answers).

End of exam.

FORMULAS

$$r - r_f = (r_m - r_f)\beta \qquad WACC = r_D(1-\tau_C)\frac{D}{E+D} + r_E\frac{E}{E+D} \qquad \tau_c$$ = corporate tax rate

$$\beta_A = \beta_D \cdot \frac{D}{V} + \beta_E \cdot \frac{E}{V} \qquad \beta_i = \frac{\mathrm{cov}(r_i, r_m)}{\sigma_m^2}$$ *i*=any asset *i*,

$$E[x_i] = \sum p_i x_i \qquad \mathrm{cov}(x,y) = \sum p_i (x_i - E[x_i]) \times (y_i - E[y_i]),$$

$$\mathrm{var}(x) = \sum p_i (x_i - E[x_i]) \times (x_i - E[x_i])$$

Risk-neutral probability $p = \frac{1+rf-d}{u-d} = \frac{rf-d\%}{u\%-d\%}$ (where *u* and *d* are 1+*u*% and 1+*d*%-change!). Example:

rf=1%, *u*%=+20%, *d*%= -10%, then *p*=(1.01-0.90/(1.20-0.90)=(0.01-(-0.10))/(0.20-(-0.10))=0.36667.

Call option delta = ΔCall price / ΔStock price (where Δ=change)

Put option delta = ΔCall price / ΔStock price - 1

Put-call parity $S + put = call + PV(X)$

Price of option: $\frac{[p \times option\_cash\_flow\_up + (1-p) \times option\_cash\_flow\_down]}{1+rf}$

no time value

Accounting income