Q1-2.

You want to produce a new movie in which professors of CUHKSZ will be cast. In order to produce a movie, you need to spend $5000 and some revenues from ticket sales will be generated in the following year of the movie production (Suppose there is neither additional cost nor tax associated with ticket sales; in other words, revenues themselves will represent incremental after-tax cashflows from the movie.) There is 10% chance of very high demand, 15% chance of somewhat high demand, 25% chance of somewhat low demand, and 50% chance of very low demand for the movie. The amount of revenues from ticket sales will be as follows: $7,000 in very high demand state, $6,000 in somewhat high demand state, $2000 in somewhat low demand state, and $1000 in very low demand state. The appropriate discount rate associated with the project is 10% per year.



Q1. Compute the expected NPV of this movie production project if you decide to produce the movie today. -$2636

-5000 + 7000/1.1\*0.10 + 6000/1.1\*0.15 + 2000/1.1\*0.25 + 1000/1.1\*0.50 = -$2636



Since this is a negative NPV project, you should reject it.

Q2. Instead of producing the movie today, one alternate action you can take is hiring a consultant by paying a salary of $100 today. If you decide to hire the consultant, who is an expert on movies, the consultant will do a market analysis of movies in which professors are cast. As a result, after one year of extensive market analysis on the movie industry, the consultant will tell you whether the movie you plan to produce has very high demand, somewhat high demand, somewhat low demand, or very low demand; at this point, there is no uncertainty about the degree of popularity of the movie. Compute the expected NPV of this movie production project by taking into consideration for hiring the consultant. $86



This is a real option to delay; you must hire the consultant to get the information about the popularity of the movie. You can get this information only by hiring the consultant. Thus, the hiring cost is NOT a sunk cost, you should include it in the computation of the expected NPV.

With 10% chance, you will find the movie to have very high demand.

If you decide to produce the movie in Year 1, NPV at Year 1 is -5000 + 7000/1.1 = 1364 > 0

So you should produce the movie in Year 1 if the demand is very high.

With 15% chance, you will find the movie to have somewhat high demand.

If you decide to produce the movie in Year 1, NPV at Year 1 is -5000 + 6000/1.1 = 456 > 0

So you should produce the movie in Year 1 if the demand is somewhat high.

With 25% chance, you will find the movie to have somewhat low demand.

If you decide to produce the movie in Year 1, NPV at Year 1 is -5000 + 2000/1.1 = -3182 < 0

So you should NOT produce the movie in Year 1 if the demand is somewhat low.

With 50% chance, you will find the movie to have very low demand.

If you decide to produce the movie in Year 1, NPV at Year 1 is -5000 + 1000/1.1 = -4091

So you should NOT produce the movie in Year 1 if the demand is very low.

To summarize, a) you will hire the consultant now, b) You will produce the movie in Year 1 if the demand is very high or somewhat high, c) You will not produce the movie in Year 1 if the demand is somewhat low or very low

Expected NPV = -100 + 0.1\*(-5000 + 7000/1.1)/1.1 + 0.15\*(-5000 + 6000/1.1)/1.1 = 86 > 0

Now, this is a positive NPV project when including the real option to delay. So you should take it.

Q3. The CEO of Company SZ wants to invest in a portfolio of two real investment projects, Project A and Project B. The NPV of each project has an expected NPV of $6000 and standard deviation of $6000. The correlation between the NPV of Project A and the NPV of Project B is 0.

What is the coefficient of variation of the NPV of this portfolio that consists of Project A and Project B?

(A) 0.71

(B) 0.88

(C) 1

(D) 1.23

Expected NPV of portfolio = 6000 + 6000 = 12000

Std of NPV of portfolio = sqrt(6000^2 + 6000^2) = 8485

CV of portfolio = 8485/12000 = 0.71

Note that CV of the portfolio < CV of Project A = CV of Project B = 6000/6000 = 1

Q4. Nio is a company involved in producing electric cars. The levered beta for Nio stocks is 1.4, and Nio has a debt-to-equity ratio of 2, and the tax rate is 10%. You want to start a project of selling electric cars with a debt-to-equity of 3 and you can use Nio as a proxy company for finding the systematic business risk of selling electric cars. The risk-free rate is 1% and the expected return on the market portfolio is 11%.

What is the rate of return that is demanded by equity holders in your project? 0.195

For Nio: Beta\_levered = Beta\_unlevered \* (1+2\*(1-0.1))

1.4 = Beta\_unlevered \*2.8

Beta\_unlevered = 0.5

For Project: Beta\_levered = Beta\_unlevered \* (1+3\*(1-0.1)) = 0.5\* (1+3\*(1-0.1)) = 1.85

Cost of equity in the project = 0.01 + 1.85\*(0.11-0.01) = 0.195

Q5. Firm ABC has just issued perpetual bonds to initiate a real investment project; it has issued 1000 perpetual bonds, and the price of each perpetual bond is $1000, and the annual interest payment on each bond (i.e. coupons) is $100. What is the present value of interest tax shield benefits associated with financing by debt when the corporate income tax rate is 30%?

$300,000

This is a par bond -> cost of pre-tax debt = 10%

i.e. P = coupon/discount rate = 1000 = 100/0.1 and cost of pre-tax debt = coupon rate

Annual interest payment = $100\* 1000 = $100,000

Annual tax shield benefit = $100,000\* 30% = $30,000

PV of tax shield benefit = Perpetuity of 30,000 at 10% = 30,000/0.1 = $300,000