

Corporate Finance

Question 1. (10 points) NPV and discount rates

Your friend Jeremy says, “Google should not use discount rates from Treasury securities to evaluate stand-alone risk-free projects. Google’s opportunity cost of capital is much higher than those discount rates, because it has so many valuable investment opportunities.” Convince Jeremy that he is wrong. A short paragraph is sufficient as long as it contains the correct logic.

The opportunity cost of capital for a potential project of Google is not determined by the investment opportunities available to Google. Instead, it is determined by economically-equivalent investment opportunities available in financial markets to outside investors. Investments in Treasury securities are equivalent to a risk-free investment, thus discount rates from Treasury securities are relevant for valuing Google’s risk-free projects. Jeremy apparently believes that the risk-free projects compete with Google’s other projects—if it takes on the risk-free project, it cannot take on some other, potentially more valuable, project. But Google can take on any stand-alone, positive NPV project available to it.

For full credit, a student's answer must say that discount rates are determined by outside financial opportunities, not internal opportunities. There is not a unique way to say this. For example, you could say that Google could sell off the cash flows from the project, and the value it would get in the marketplace from doing so would be the NPV evaluated at the risk-free rate, since outsiders would treat the cash flows as risk-free.

Question 2. The firm Beltway Enterprises (BE) is considering a project. The project's cash flows will be a combination of guaranteed costs and uncertain revenue. The costs are \$10MM in year zero and \$5MM in year one. After year one, the costs decline by 10%/year. Expected revenues are zero in year zero and \$8MM in year one. After year one, the expected revenues decline by 5%/year. Total annual cash flows are the sum of the costs and revenues. The risk-free interest rate is 5%/year for all maturities. The discount rate for BE's uncertain revenues is 12%/year. Assume all cash flows occur at year-end.

a.(12 points) What is the NPV of this project? Should BE adopt the project?

The key is to value the two streams of cash flows as two separate growing perpetuities with two different discount rates. Costs are the sum of the initial \$10MM and a

perpetuity, with the first payment in year 1 of \$5MM, with a growth rate of -10%. The PV of costs is therefore

$$10 + 5/(0.05 - (-0.10)) = 10 + 5/0.15 = 43.3333$$

The PV of revenues is, similarly,

$$0 + 8/(0.12 - (-0.05)) = 8/0.17 = 47.0588$$

The NPV is $47.0588 - 43.3333 = 3.7255\text{MM}$

BE should adopt the project because of the NPV decision rule.

b. (8 points) Assume that BE adopts the project. (Perhaps they are ignoring your advice in part (a)). The firm plans to sell the project, and thus all of its future cash flows, at the end of year three, just after year-three cash flows have been received. What sales price does the firm anticipate it will receive at that time?

The firm will receive the net value of two growing perpetuities. The cost perpetuity has a year-four cash flow of $5\text{MM} \cdot (1 - 0.1)^3 = 5\text{MM} \cdot 0.729 = 3.645\text{MM}$. The revenue perpetuity has a year-four cash flow of $8\text{MM} \cdot (1 - 0.05)^3 = 8\text{MM} \cdot 0.85738 = 6.859\text{MM}$. Therefore the sale price is anticipated to be

$$6.859/(0.12 - (-0.05)) - 3.645/(0.05 - (-0.10)) = 6.859/0.17 - 3.645/0.15 = 40.3471 - 24.3000 = 16.0471.$$

The price is expected to be \$16.0471MM.

Question 3. (8 points) Zombieland Amusement Park has an enterprise value of \$800MM. Zombieland has \$25MM in cash on hand and has \$400MM in debt on its balance sheet. What is Zombieland's total equity value?

$$\text{Total equity} = \text{enterprise value} + \text{cash on hand} - \text{debt} = \$800\text{MM} + \$25\text{MM} - \$400\text{MM} = \$425\text{MM}$$

(An easy one)

Question 4. For many years, earnings at Snowland Enterprises have grown at 4%/year. Snowland pays a constant 15% of its earnings in the form of dividends and uses 30% of its earnings to buy back shares. This year it just spent \$10MM on dividends and \$20MM on buying back shares. Snowland has an equity cost of capital of 12%/year.

a. (10 points) Using the total payout model, calculate Snowland's current total equity value (i.e., the price just after spending \$10MM on dividends and \$20MM on buybacks.)

$$\text{equity value} = (\text{expected earnings next year}) * (d + s) / (r_E - g)$$

Earnings this year must have been \$66 2/3 MM, because 15% of earnings equaled \$10MM in dividend payouts. ($\$10\text{MM} / 0.15 = \66 2/3 MM). Therefore expected earnings next year are $1.04 * 66\text{ 2/3 MM} = \69 1/3 MM .

$$\text{Equity value} = \$69\text{ 1/3 MM} * (0.15 + 0.30) / (0.12 - 0.04) = \$69\text{ 1/3 MM} * 0.45 / 0.08 = \$390\text{MM}.$$

b. (10 points) Snowland has 10MM shares outstanding. Calculate Snowland's current stock price per share. Also calculate the expected stock price per share of Snowland as of a year from now.

With 10MM shares, the current share price is \$39/share. The expected return to the stock is 12%/year. To get the capital gain component of this 12%, just compute the dividend component and subtract it from 12%. Expected total dividends next year are $\$10\text{MM} * 1.04 = \10.4MM . Expected dividends per share next year are therefore $\$10.4\text{MM} / 10\text{MM} = \1.04 . The dividend component of the expected return is therefore $\$1.04 / \$39 = 0.026666 = 2.666\%$. Subtract this from 12% to get an expected capital gain component of 9.3333%. Therefore the expected stock price next year must be $\$39 * 1.093333 = \42.64 .

c. (8 points) Snowland's new Chief Financial Officer estimates that Snowland's return on investment is approximately 15%/year. According to the total payout model, are there any changes to Snowland's payout policies that will make stockholders better off? Explain your reasoning.

Snowland's ROI exceeds the equity cost of capital of Snowland. Therefore Snowland can make its stockholders better off by lowering its payout rates. It would therefore have more money to invest in high-ROI projects. Snowland can give its stockholders a 15% return, while alternative investments give its stockholders only as 12% return. If we take the total payout model literally, Snowland should cut its dividend and buyback rates to close to zero. (Students do not have to make the final point in order to get full credit.)

Question 5. A firm, Cereal Inc., is considering introducing a new breakfast cereal named after successful athletes at a future Olympics. The company plans to sell the Olympic cereal at the same price it sells its other cereals. With an initial expense of \$3MM in year zero to modify production lines, the firm anticipates sales of the new cereal to be \$30MM in year 1. Because Olympic athletes fade from the public's memory, the firm also expects sales to decline to \$15MM in year 2 and \$8MM in year 3. It plans to stop selling the cereal after year 3. Of these sales, about 25 percent will come from consumers switching away from the firm's other cereal products.

The costs of goods sold for all of the firm's cereals are 40 percent of sales. The sales, general, and administrative expenses associated with this Olympic-themed product are expected to be \$5MM in year 1, \$5MM in year 2, and \$3 million in year 3. (These do not depend on the quantity of cereal sold.) Working capital must be 20 percent of sales, and is needed a year before the sales are made.

The firm's tax rate is 30%. The \$3MM initial cost is, for accounting purposes, an expense, not a capital expenditure. Assume that all revenues and expenses occur at year-ends.

a. (10 points) Calculate expected incremental after-tax income for years zero, one, two, and three, showing your work.

The table is below. Note that figures in "sales" are the figures given in the question multiplied by 0.75, to account for cannibalization.

	0	1	2	3
Sales		22.5	11.25	6
COGS		(9)	(4.5)	(2.4)
SG&A		(5)	(5)	(3)
Other expenses	(3)	0	0	0
EBIT	(3)	8.5	1.75	0.6
Taxes	0.9	(2.55)	(0.525)	(0.18)
NI	(2.1)	5.95	1.225	0.42

b. (8 points) Calculate expected incremental cash flow for years zero, one, two, and three, showing your work.

NI	(2.1)	5.95	1.225	0.42
NWC	(4.5)	2.25	1.05	1.2
Cash flow	(6.6)	8.2	2.275	1.62

c. (6 points) Is the internal rate of return rule guaranteed to give the correct go/no-go decision for this project? Explain your answer.

Yes. The IRR rule produces the correct answer when all negative cash flows precede all positive cash flows. Here there is a single negative cash flow followed by positive cash flows, thus the IRR rule works. (The IRR in this case is 56.33%.)

d. (10 points) Using the appropriate discount rate, the firm determines that the project has a positive NPV, thus it begins cereal production. However, the CFE thinks she should have also calculated the NPV of the project assuming that sales are halted after year two instead of year three. This would eliminate the year-three sales and expenses. After calculating the new NPV, she would then choose the plan with the higher NPV. But your friend Doug says that “The only difference between stopping after year two and stopping after year three is the year-three cash flow. We learned from part (b) that if sales are continued through year three, the year-three cash flow is positive. Therefore we know the NPV of selling for three years exceeds the NPV of selling for two years.” Explain to Doug why his logic is flawed. Hint: There is a single, specific reason why Doug’s logic is flawed.

Terminating the project after year two returns all of the NWC in year two instead of year three. If sales stop after year two, the year-three positive cash flow disappears, but the year-two cash flow is bigger than it is in the three-year case. The CFO therefore needs to do an explicit NPV calculation. (As an aside, the decision of whether to stop after year two depends on the discount rate.)