Chapter 10. Foundations of New Venture Valuation

Questions and Problems

1. You are considering purchasing shares of DeltaCad Inc. for $40/share. Your analysis of the company and the economy produce the following one-year scenarios with equally likely outcomes:

State of the Economy	Dividend (D_1)	Price (P_1)
Boom	$1.40	$51.00
Average	$0.75	$43.00
Bust	$0.00	$33.00

   Calculate the mean and standard deviation of the expected return.

2. Stave Four Enterprises is currently selling for $27 per share. You have an analyst report with the following forecast:

Probability	State of the Economy	Dividend (D_1)	Price (P_1)
10%	Boom	$2.00	$35.00
30%	Good	$1.25	$31.50
40%	Likely	$1.00	$29.00
20%	Poor	$0.25	$22.25

   Calculate the mean and standard deviation of the expected return. Which appears to be a better potential investment, Stave Four or DeltaCad (from Problem 1)?

3. Based on information in the text, venture capital investors who make first-stage investments would seek returns of 40-60%. Yet the realized returns to venture capital investors are much lower. Clearly, investors are overly-optimistic about what returns they can achieve, so that the realized returns are a disappointment. True, false, uncertain. Explain.

4. Suppose the risk-free rate of interest is 5%, the market risk premium is 6%, and the market standard deviation is 20%.

   a. Plot the risk-free asset and the market portfolio on coordinates with expected return on the vertical axis and total risk (standard deviation) on the horizontal axis. Plot both assets on coordinates with expected return on the vertical axis and market risk (beta) on the horizontal axis and sketch in the security market line.

   b. Suppose the CAPM is correct and that an asset with a standard deviation of holding period returns of 30% has an expected return of 12%. Plot the asset on both sets of coordinates. How much of the asset's total risk is market risk? What is the correlation of risk between the asset and the market portfolio.

c. Explain why another asset with a standard deviation of holding period returns of 30% could have an expected return of 10%. What would the asset's risk characteristics need to be?

5. Consider a wager that will pay either $55 or $20, with equal probability.
   a. Calculate the mean and standard deviation of the dollar payoff.
   b. If the cost of the wager is $35, calculate the expected percentage return and the standard deviation of holding-period returns. What if the cost of the wager is $30?
   c. Now assume the risk-free rate is 3.0%, the market risk premium is 6.5%, the standard deviation of holding-period returns of the market portfolio is 18%, and the correlation between the payoff of the bet and the return you could earn by investing in the market portfolio is 0.4. Use the CEQ approach and Equation 10.8 to compute the PV of the wager.
   d. What is the NPV of the wager if it is acquired for $30?
   e. What is the correct risk-adjusted discount rate for this wager?
6. You are considering the purchase of a nearby condominium. The unit is one bedroom with 1.5 baths and 720 square feet and has an assessed value of $575,000. Use the data below to estimate the market value of your potential condominium.

Comparable Transaction	Square Feet	Bedrooms	Baths	Assessed Value	Selling Price
Condominium A	900	2	1	$750,000	$695,000
Condominium B	675	1	2	$576,000	$565,000
Condominium C	1,100	2	2	887,500	865,000
Condominium D	845	1	1	$639,000	$605,000

How confident are you of the estimate? If there are any important factors missing from your analysis, what are they?

7. Consider the financial data shown below for Priax Consumer Reliance Inc. (PCR).

PCR Financial Data

Income Statement (000s)	2019 (act.)	2020 (fcst.)
Revenue	$2,200	$2,464
CGS	$1,350	$1,512
Gross Profit	$850	$952
Selling & Marketing	$550	$590
G & A	$125	$155
Product Development	$75	$90
Operating Expenses	$750	$835
Operating Income (EBIT)	$100	$117
Interest Expense	$10	$13
EBT	$90	$104
Taxes	$27	$31
Net Income	$63	$73
Tax Rate =	30%	30%

Balance Sheet (000s)	2019 (act.)	2020 (fcst.)
Cash	$22	$25
Accounts Receivable	$208	$228
Inventory	$316	$331
Total Current Assets	$546	$584
PP&E, Gross	$250	$290
Less: Accumulated Depreciation	$50	$65
Net PPE	$200	$225
Total Assets	$746	$809
Accounts Payable	$275	$315
Line of Credit	$70	$55
Total Current Liabilities	$345	$370
Long Term Debt	$135	$100
Total Liabilities	$480	$470
Common Stock	$200	$200
Retained Earnings	$66	$139
Total Stockholders' equity	$266	$339
Total Liabilities & Equity	$746	$809

Calculate the following for 2020:

a. Cash flow to all investors
b. Cash flow to creditors
c. Cash flow to stockholders
d. Unlevered free cash flow

What is the appropriate discount rate for calculating the PV of each cash flow?

8. You are considering investing in a new venture. Based on the business plan of the entrepreneur, if the project is successful, it is expected to generate the following cash flows for investors:

Year	Cash Flow
1	$0
2	$200,000
3	$2,000,000
4	$8,000,000

The cash flow in the fourth year includes cash flows that would be realized from selling the venture to a third party at that time. After conducting your own due diligence, you find that you agree with the entrepreneur that, if the venture is successful, the cash flow estimates are reasonable. The entrepreneur is looking for seed capital of $1 million to undertake the venture. After the initial investment, if it is successful, the venture will be self-supporting.

Using the 50% to 100% range of hurdle rates for seed and start-up investments, estimate the present value of the venture and the minimum fraction of the equity you would need to justify your investment. Also, determine the hurdle rate that would result in a zero NPV for a 100% interest in the venture.

9. Consider problem 8 again. Through your due diligence efforts, you have concluded that the probability that the venture will be successful through year 2 is about 80%, through year 3 is about 60%, and through year 4 is about 40%. If the venture fails, it will not return any cash to investors. Compute the expected cash flows of the venture and find the discount rates of the expected cash flows that would yield the same ownership fractions as the 50% hurdle rate in problem 7. In other words, given the ownership fraction you would require if a hurdle rate of 50% is used in problem 7, what discount rate of expected cash flows would yield a present value of the venture that would imply the same ownership fraction for your investment of $1 million (Note: Finding this rate may require some experimentation.)
10. Compare the present-value estimates of each of the annual cash flows between problems 8 and 9. What might you have with valuing projects using optimistic cash flow forecasts and hurdle rates, as in problem 8 instead of using expected cash flow estimates and required rates of return as in problem 9?
11. Suppose you can establish that for the each annual cash flow of the venture described in problem 8, the correlation between project cash flows and the market is 30%. You also have determined that the riskless rate of interest is 4.5%, the market risk premium is 6.5%, and the standard deviation of market returns is 20% for one year, 28% for two years, 35% for three years, and 40% for four years.

a. Use the CEQ form of the CAPM to find the certainty equivalent of each annual expected cash flow, the present value of each annual cash flow, and the present value of the project.

b. How large of an ownership fraction do you need if the CAPM is the correct valuation model?

12. You can use the result of a CEQ valuation to find the RADR and beta

a. Using Eq. (10.5) and your results from problem 10, find the risk-adjusted discount rate for each of the annual expected cash flows. Note that the RADRs you compute in this way are cumulative (compounded) rates. To find the annual rate for each cash flow you need to convert the compounded rate back to its equivalent annual rate.

b. Use Eq. (10.3) from the text to solve for the beta of each annual cash flow.

13. Usually, when people use published information to estimate beta, they assume that the beta is the same for all of the cash flows of the project they are trying to value

a. Now that you know the present value of the project (from your work on problem 10), find the single discount rate that you can apply to the expected cash flows that yields the same present value.

b. How does the single discount rate compare to the individual discount rates you determined in problem 11?

c. Compare the present values of the individual annual cash flows based on the single rate with the values using rates that are specific to each period.

d. What problems, if any, do you see with trying to value projects such as this one using a single discount rate?

14. Consider the following success-scenario income statement for the next year of operations of a privately owned small business. Figures in the statement are in thousands.

Income Statement	Success
Sales Revenue	$ 10,000
Cost of Goods Sold	$ 4,000
Gross Profit	$ 6,000
Operating Expenses	$ 4,500
Operating Profit	$ 1,500
Interest Expense	$ 700
Net Taxable Income	$ 800
Income Tax	$ 280
Net Income	$ 520

Develop a companion failure-scenario income statement under the following assumptions:

- Sales would be $6,000,000
- Cost of goods sold would be $3,000,000
- Operating expenses would be $2,500,000
- There is $5,000,000 in debt outstanding, with an interest rate of 14% per year, but in the failure scenario the venture will not pay interest beyond what is available from net income.
- The income tax rate is 35%.

Assuming that the probability of the success scenario being realized for the next year is 60%, generate an expected income statement.

Based on the following assumptions, develop success-scenario, failure-scenario, and expected measures of the cash flow definitions from Table 10.1:

- Operating expenses include $2,200,000 in depreciation expense.
- New capital expenditures will be $1,500,000 in the success scenario and nothing in the failure scenario.
- New investment in net working capital will be $250,000 in the success scenario and nothing in the failure scenario.
- In the success scenario, no debt repayment would be due and the venture would borrow an additional $1,000,000. In the failure scenario, the business assets would be liquidated and proceeds of $2,200,000 would be paid to the creditor. The balance of their $5,000,000 loan would be a write-off for the lender.

Discuss your findings for the various cash flow measures, keeping in mind that for the success scenario, the venture will continue in the future, but in the failure scenario, this will be the final year of operation.

15. Consider the following income statement of a venture that is expected to continue indefinitely but is not expected to grow. The numbers in the income statement are expected to be the same each year. New capital expenditures are expected to exactly offset depreciation expenses so that net income is equal to equity cash flow. The capital structure of the venture is expected to be constant.

Income Statement	Expected
Sales Revenue	$ 85,000
Cost of Goods Sold	$ 32,000
Gross Profit	$ 53,000
Operating Expenses	$ 32,000
Operating Profit	$ 21,000
Interest Expense	$ 7,500
Net Taxable Income	$ 13,500
Income Tax	$ 4,725
Net Income	$ 8,775

Suppose the risk-free rate of interest is 5%, the market risk premium is 6%, and the corporate tax rate is 35%. The venture's equity has a beta of 1.25 and its debt has a beta of 0.25.

a. Compute the cost of equity and the value of a perpetuity of the expected cash flows to equity (Refer to Tables 10.1 and 10.2 if needed).

b. Compute the cost of debt and the value of a perpetuity of the expected cash flows to debt.

c. Assuming that the value of total assets is equal to the value of debt plus the value of equity, compute the total value of the venture. Use the total value to compute the cost of capital for the assets and the asset beta.

d. Using total capital cash flows (cash flow to all investors) and the asset cost of capital, estimate firm value based on the perpetuity of expected earnings. How does it compare to the value you computed by adding up the debt and equity values?

e. Compute the venture's weighted average cost of capital (WACC). Compute its expected cash flows as if it were all-equity financed. What is the estimated value of the venture if you value the perpetuity of hypothetical cash flows (unlevered free cash flow) at the WACC?

f. Your value results should be consistent across all approaches. Why do you think they are? What do you think might be different if the venture were expected to grow?

16. Suppose you can acquire a 20% ownership interest in a venture for $2.5 million. You anticipate that, if the venture is successful, it will be able to go public in about three years. If so, you estimate that the public-market value of the venture will be about $75 million. However, you believe there is about a 75% chance that the venture will fail and your investment will be worthless.

    a. Based you your investment amount, what would be the standard deviation of holding period returns on your 20% interest?

    b. How does the standard deviation of holding period returns change if you can acquire the 20% interest by investing $2.0 million (assume that harvest values and probabilities are not affected by the change)?

    c. Suppose the required rate of return for the three-year holding period is 18%, the market risk premium for the holding period is 30%, the market standard deviation is 35%, and the correlation between harvest cash flows and the market is 0.2. Compute the standard deviation of cash flow returns and use Equation 10.5 to search for the equilibrium value of the investment and the equilibrium standard deviation of holding period returns.

17. A venture has equity with expected annual cash flows of $4.0 million in perpetuity and debt with expected annual before tax cash flows of $1.0 million, also in perpetuity. The cost of equity (required return) is 16% and the cost of debt is 10%. The corporate tax rate is 30%. Based on these figure, what are the value of the company, the required return on assets, and the WACC?

18. You have an opportunity to invest $500 in a venture that will pay off in one year. The expected payoff is $1000 and the standard deviation of payoff cash flows is $600. The risk-free rate is 4% per year, the required return on the market is 12%, the standard deviation of market returns is 15%, and the correlation between venture cash flows and the market is 0.2. Based on the risk-adjusted-discount-rate, what is the CAPM-based required return?

19. A venture is expected to accumulate $2000 in surplus cash over the next 5 years. Its cash flow in year 5 is expected to be $400, which is expected to continue to grow at a rate of 6% per year forever. The venture's cost of capital is estimated to be 10% per year. What is the present value of the venture, based on surplus cash and continuing value?

20. An investment will pay either $100 or $200 in one year, with equal probabilities. The expected return on the market portfolio is 12% per year, the risk-free rate is 4% per year, and the one-year standard deviation of market returns is 14%. The correlation between the investment cash flows and market returns is 0.3. Based on the certainty equivalent form of the CAPM, what is the present value of the investment?

21. Your new venture is expected to be ready for exit by IPO in five years. Revenue at that time is expected to be $10 million, net income is expected to be $200,000, and revenue is expected to be growing at a

rate of 5% per year. Below are data on four companies similar to yours that have recently gone public via IPO.

Comparable Transaction	Revenue at IPO	Net Income at IPO	Revenue Growth at IPO	Market Cap at IPO
Company A	9,000,000	400,000	3%	$5,000,000
Company B	7,500,000	450,000	5%	$5,500,000
Company C	14,000,000	200,000	8%	$7,000,000
Company D	18,000,000	150,000	10%	$4,400,000

Use the data to estimate the market cap of your company at the time of its IPO. How confident are you of the estimate? If there are any important factors missing from your analysis, what are they?