ECON 1730: Entrepreneurial Finance and Venture Capital

Final Exam

December 2022

Instructions

Please write a short memo answering the questions below. Once you are done, please upload a PDF of your memo. Please make your memo self-contained. Your memo should include supporting tables but not an appendix with all your spreadsheets. Just to be clear, we will review tables but not excel spreadsheets.

You may use all course materials but no other material. You may not communicate with others.

The exam ends four hours after you downloaded it. You may take an additional 10 minutes to review your work and upload your answers. Beyond that deadline there is a two-point-per-minute-late penalty.

Question 1 (SynCo)

Your start-up, SynCo, is developing a (patented) new method for synthesizing DNA strands. SynCo requires another three years to meet its three remaining technical milestones before it can be sold.

Its first milestone is one year after the initial investment, and there is 2/3 probability that SynCo will meet this milestone. Having met this milestone, there is also 2/3 probability that SynCo will meet its second milestone after the second year. Finally, having met this second milestone, there is 2/3 probability that SynCo will meet its third and final milestone after the third year. SynCo would be immediately sold for $600m after successfully meeting the final milestone. In contrast, SynCo would be worthless if it fails any of the three milestones. The appropriate discount rate is 15%.

a. What is the probability that SynCo meets all the technical milestones and is sold?
b. What is the PV today of the sale of SynCo for $600m?

Funding the R&D effort required to meet the technical milestones is expensive, though, and SynCo requires an initial investment of $30m to fund its R&D effort for the first milestone. If the first milestone succeeds, SynCo requires another $40m to fund the R&D for the second milestone. If the second milestone succeeds, it requires an additional $60m to fund the final R&D effort for the third milestone.

c. Assuming that SynCo raises the entire required investment of $130m initially (and if any of the milestones fail, any remaining amount is lost). What is the NPV of SynCo?

d. Assuming that SynCo raises the funding in three stages, corresponding to the three milestones. What is now the NPV of SynCo? What is the option value of staging under decision tree analysis?

e. Assuming SynCo divides the investment into three stages, what is the IRR that Series A,

B, and C earn upon a successful sale? What is the expected (annual) return on their investment?

Question 2 (BinOp)

Initially, BinOp's sole asset is a project that next year may be worth either $160M (with probability ½) or $62.5M (with probability ½). The market value of BinOp is $100M (i.e. WACC equals 11.25%). The risk-less rate is 5%. What would be the real-options value of BinOp if it had the option to abandon operations for a salvage value of $92.5M next year? Is the discount rate appropriate to the project with an abandonment option higher or lower than 11.2%? Why?

Question 3 (SDP)

SDP raised a $100M VC fund LPF. The terms SDP received from LPF specified that after ten years, SDP had to pay back LPs investment, plus a non-cumulative dividend of 8% per year. Any additional value would be shared with 80% going to LPF and 20% going to SDP. SDP received a total of $15M in management fees over the life of the fund. After 9 years, SDP had invested $75M in a variety of companies that had returned a total of $150M. The fund had $10M left and considered making one final investment. It faced two options. The first investment option was to place $10M in CSS, a waste management company that was considered very safe. It was guaranteed to double in value within a year, at which time SDP would be able to sell its stake. The second investment option was to place $10M in RCT, a highly speculative tidal wave energy investment that within a year would be worthless with 80% probability, but with 20% probability it would be worth $45M.

- **a.** If SDP wanted to maximize its own profits, which of those two investments should it choose, and why?
- **b.** How would your answer change if instead of having a 20% chance of success, RCT had a 50% chance of success?
- **c.** How would your answer change if instead of receiving a 20% profit share, SDP would receive a 30% profit share?
- **d.** How would your answer change if instead of having a return of $150M, SDP had accumulated a return of $250M by year 9?
- **e.** Describe the reasons and implications for your answers to parts 1-4. What explains these results?
- **f.** What implications does this have for risk-taking incentives in venture capital? Is this a good or a bad thing?

Question 4 (Circle)

Circle was a spectacularly successful start-up. At its most recent VC round, Circle had been valued at $600M (equivalent to $15 per share). It was planning to go public and enlisted Stanley Silver at Silver Bank to underwrite its IPO. He asked for the usual 7% fee from the proceeds of the IPO and negotiated a Greenshoe allocation of 15%. It was agreed that the company sell 10M new shares to IPO investors.

Prior to the IPO, Stanley Silver had set the mid-range price per share of $18, suggesting that this was his best guess of what the market would yield. However, the day before the IPO, he surprised the founders of Circle by reporting some anxiety in the market and recommend dropping the price per share to $12. Circle reluctantly agreed but was surprised to find the market price at the end of the first day of trading hovering around $20 per share. Stanley Silver was beaming, suggesting that the IPO has been an enormous success, with prices shooting up 67%. The founders of Circle, however, wanted to understand what had happened and why. They asked themselves a series of questions.

Part 1: Base calculations

- **a.** How many shares could Pearl Bank buy under the Greenshoe option?
- **b.** How many shares did the company have after the IPO (including the Greenshoe option)?
- **c.** What was the amount of money raised in the IPO without the Greenshoe option?
- **d.** What was the amount of money raised in the IPO with the Greenshoe option?
- **e.** How much underwriting fees did Circle have to pay to the Pearl Bank?
- **f.** How much did the underwriter make on the Greenshoe option on that first day?
- **g.** What is the net amount of money raised in the IPO (with Greenshoe and fees)?
- **h.** What was the valuation of the company at the IPO offer price?
- **i.** What was the valuation of the company at the end-of-first-day market price?
- **j.** How much did the IPO investors gain by the end of the first day?
- **k.** What ownership fraction did the founders have after the IPO?

Part 2: A higher IPO price

The founders of Circle kept wondering what would have happened if the underwriter had kept their price at the prior midrange price of $18. Specifically:

- **a.** What amount of money would they have raised in the IPO without the Greenshoe option?
- **b.** What amount of money would they have raised in the IPO with the Greenshoe option?
- **c.** How much underwriting fees would Circle have paid to the Silver bank?
- **d.** How much gains would the underwriter have made on the Greenshoe option on that first day?
- **e.** How much would the IPO investors have gained by the end of the first day?
- **f.** What is the net amount of money raised in the IPO (with Greenshoe and fees)?
- **g.** What would the valuation of the company have been at the IPO offer price?

Part 3: Underwriter's revenues and reputation

The founder of Circle thought that the underwriters had two direct sources of revenues: the underwriter fees and the Greenshoe price gains.

- **a.** How much direct revenues did the underwriters make at the offer price of $12?
- **b.** How much direct revenues did the underwriters make at the offer price of $18?
- **c.** Based on these numbers, does the Silver Bank prefer a lower or higher IPO price?
- **d.** The founders thought that investment bankers probably gained a favorable reputation among their IPO investors if the IPO price increased. What were the additional gains to the IPO investors from the lower $12 price, as opposed to the $18 price?
- **e.** Where did these gains effectively come from?

Question 5 (Ouch)

RRK paid $6 billion for Ouch – a leading platform for managing chronic pain-- exactly one-year ago. Ouch currently has $4.25 billion in debt. The table below lays out the most recent projections for Ouch if operated by RRK.

	Projected (millions)			
	12/14/2023	**12/13/2024**	**12/13/2025**	**12/13/2026**
Net Sales	5,000	5,322	5,636	5,921
Adj EBITDA	958	1,051	1,136	1,205
Depr. and Amortization	500	433	366	301
Capex	200	234	267	301

Geopolitical tensions in Europe and rising inflation around the world has led to a surge in interest in Ouch, reflected in its projections for the period 2023-2026. Unsurprisingly, investment bankers have recently approached Ouch and pitched an IPO at a 12x multiple to LTM (adjusted) EBITDA. The tentative date for the IPO is 12/13/2023. An IPO would entail a sale of 25% of RRK's stake in Ouch on 12/13/2023. RRK's remaining stake would likely be sold one year after that (at a multiple similar to the IPO one).

RRK knew that investment bankers had an incentive to overstate the IPO price to earn the mandate. In fact, RRK expected the IPO to take place at a 15% discount to the pitched IPO price. RRK was not in a hurry to sell. Some at RRK thought that their best strategy was to continue to operate Ouch, "fatten" it, and then sell it to a strategic bidder. Advocates of this strategy believed that Ouch could be sold at the end of 2026 at a 14x multiple of LTM (adjusted) EBITDA (Ouch would then have a remarkable performance record and would offer multiple synergies to a large number of potential bidders).

Q: What would you do?

You may assume that RRK promises its LPs a 25% annual return. The tax rate is 30%. Finally, debt pays an annual coupon of 4 1/8.