

Solution guide: Corporate Finance Theory Exam, December 2017 - January 2018.

Please answer all questions. Answers must be submitted in English.

You are allowed to discuss the questions with your fellow students, but you must write up your own individual answer to all questions.

Exam scripts may be checked for plagiarism. Note, in particular, that copy paste of each others' answers, or changing only a few words in sentences, etc. constitutes plagiarism.

1. Problem 1

Write 1 to 2 paragraphs for each of the following subquestions. You are welcome to use a limited number of mathematical symbols in your answers, but please do not include any explicit calculations.

- (a) Consider a takeover contest in the framework of Povel and Singh (2010). Summarize how an offer of stapled finance can affect the behavior of bidders, as well as the outcome of this takeover contest.

SOLUTION:

- *The offer of stapled finance may increase a bidder's expected value from winning the takeover contest. The reason is that the winning bidder can accept the loan offer and then strategically default.*
 - *This option is particularly valuable for weak bidders. They believe the target is likely of little value, and so are more willing to cede the target to the investment bank, which will occur in the case of default.*
 - *As a result, the offer of stapled finance causes weak bidders to bid more aggressively (while leaving the behavior of strong bidders, who would not accept the stapled loan, unchanged). This will tend to result in a higher acquisition price.*
 - *Stapled finance can also affect who wins the takeover contest, in situations where both bidders are sufficiently weak that they want to take up the loan. In this situation, both bidders will bid the same amount. In particular this means that the bidder with the lower valuation may actually win the contest.*
- (b) Explain the relationship between moral hazard and liquidity mergers in Almeida et al. (2011). Discuss, in particular, what might happen to merger activity in their framework if firms became less tempted to shirk on their projects.

SOLUTION:

- *The reason that liquidity mergers may occur in Almeida et al. (2011) is precisely because there is an issue of moral hazard, when firms must decide whether to work or shirk on their projects.*
- *Firms must retain a sufficiently high stake in project outcome, in order to give them an incentive to work. Thus, creditors are unwilling to lend up to the full net present value of the firm's project, because they realize that demanding such a high repayment will lead firms to shirk.*
- *As a result, low-asset firms may be unable to borrow enough both to start their projects and to withstand a liquidity shock. This may allow high-asset firms to take them over and complete, rather than scrap, their projects (i.e. a liquidity merger).*
- *The less tempted firms are to shirk, the more willing creditors will be to lend higher amounts, and the less need there will be for liquidity mergers. In the extreme case where moral hazard is completely absent, liquidity mergers will not occur at all.*

(c) Briefly compare and contrast how incomplete contracting (i.e. the fact that employment contracts are incomplete) affects firm activity in DeMarzo et al. (2014), relative to Fahn et al. (2014).

SOLUTION:

- *Contractual incompleteness plays a role in DeMarzo et al. (2014), because the owner cannot observe the manager's choice of project or the realized cash flows. This means that the owner cannot condition the manager's wage payments on project selection or realized cash flows.*
- *As a result, the owner may have difficulty providing the manager with the proper incentives to both choose the efficient, safe project and also to truthfully report cash flows.*
- *The owner may therefore offer a contract which leads the manager to choose the inefficient, safe project, but which leads to lower expected wage payments.*
- *Contractual incompleteness also plays a role in Fahn et al. (2014), because the worker's effort and output are observed by the firm, but are not verifiable in court. This means that the firm cannot commit to pay the manager a bonus, conditional on output.*
- *This commitment problem may push the firm towards using equity financing, rather than debt financing. The reason is that debt financing increases the firm's incentive to renege on its promise of a bonus, because some of the costs (related to bankruptcy) are passed on to creditors.*
- *Thus, incomplete contracting plays a role in both papers, in different ways. In DeMarzo et al. (2014), lack of observability can influence the firm's real activities, so which projects are started. In Fahn et al. (2014), lack of verifiability can influence the firm's financial activities, so how projects are funded.*

2. Problem 2

This problem concerns the model of Bayar and Chemmanur (2011), where an Entrepreneur must choose between two different modes of exit: IPO vs Acquisition. For a detailed description of this model, please see the article by Bayar and Chemmanur, along with the relevant lecture slides.

Throughout this question, you can assume that the Entrepreneur chooses between IPO and Acquisition without any influence from the Venture Capitalist (i.e. the Venture Capitalist plays no role, so I omit the subscript ‘E’ or ‘V’ on parameters). You can also assume that $\delta_E = \rho = 1$, $p_L = V_F = I = 0$; in particular, this implies that the project is costless to start, that the project of a type L firm always fails, and that failure generates zero cash flow. Finally, you can assume that the following conditions hold for the remaining parameters: $\alpha p_H V_S / 2 + B < p_A V_S < \alpha p_H V_S + B$ and $p_A + (1 - \alpha) p_H < 1$.

All parts of this question concern a partial pooling equilibrium where a type H firm chooses IPO with probability 1, and a type L firm plays a mixed strategy that places probability $\beta \in (0, 1)$ on IPO and $1 - \beta \in (0, 1)$ on Acquisition.

- (a) Show that, in equilibrium, the IPO share price must satisfy $P^* = \frac{p_A V_S - B}{\alpha}$.

SOLUTION: In this partial pooling equilibrium, an L firm must be indifferent between choosing IPO and Acquisition. From Bayar and Chemmanur (2011), the expected payoff for an L firm choosing IPO is $\delta(1 - \frac{I}{P})[\alpha P + (1 - \alpha)(I + p_L V_S + (1 - p_L)V_F)] + B$. This reduces to $\alpha P + B$, given the above assumptions on parameters. The expected payoff from choosing Acquisition is $\delta \rho [p_A V_S + (1 - p_A)V_F]$. This reduces to $p_A V_S$, given the above assumptions on parameters. Thus, the equilibrium price must satisfy $\alpha P^* + B = p_A V_S$, which is equivalent to $P^* = \frac{p_A V_S - B}{\alpha}$.

- (b) Show that the equilibrium mixing probability for an L firm is given by $\beta^* = \frac{\alpha p_H V_S}{p_A V_S - B} - 1$, and that it satisfies $0 < \beta^* < 1$.

SOLUTION: Investors are willing to pay a share price P that equals the expected cash flow from the project, given their beliefs about firm type. Given prior beliefs θ , and mixing probability β , Bayes’ Rule implies that the probability a firm opting for IPO is a high-type is given by $\frac{\theta}{(1-\theta)\beta + \theta}$. Thus, the equilibrium share price must satisfy $P^* = I + \left(\frac{\theta}{(1-\theta)\beta + \theta}\right) [p_H V_S + (1 - p_H)V_F] + \left(1 - \frac{\theta}{(1-\theta)\beta + \theta}\right) [p_L V_S + (1 - p_L)V_F]$. This reduces to $P^* = \left(\frac{\theta}{(1-\theta)\beta + \theta}\right) p_H V_S$, given the above assumptions on parameters. Substituting for P^* from (a) yields $\frac{p_A V_S - B}{\alpha} = \left(\frac{\theta}{(1-\theta)\beta + \theta}\right) p_H V_S$, which is equivalent to $\beta^* = \frac{\alpha p_H V_S}{p_A V_S - B} - 1$. The fact that $0 < \beta^* < 1$ follows directly from $\alpha p_H V_S / 2 + B < p_A V_S < \alpha p_H V_S + B$.

We now make one change to the model by assuming that an H firm performs better than an L firm in the product market following an acquisition. That is, hold p_A constant, and continue to assume that an L firm succeeds with probability p_A following an acquisition; but now assume that an H firm succeeds with probability $p_A + \Delta$ following an acquisition, where $0 < \Delta < 1 - p_A$.

- (c) Show that when $\Delta < (1 - \alpha)p_H$, the partial pooling equilibrium described above still exists, with the same equilibrium share price of P^* from part (a), and the same equilibrium mixing probability of β^* from part (b).

SOLUTION: In this partial pooling equilibrium, the equilibrium share price and mixing probability are jointly determined by the incentive constraint of the L firm. The value of Δ has no direct impact on the payoff of an L firm. Thus, an L firm is still indifferent between IPO and Acquisition, and is willing to mix with probability β^ , as in (b), for all values of Δ . This implies an equilibrium share price P^* as in (a). It remains to check whether an H firm now has an incentive to deviate, by choosing IPO rather than Acquisition. Following the same logic as in (a), the expected payoff for an H firm choosing IPO is $\alpha P^* + (1 - \alpha)p_H V_S + B$ and the expected payoff from choosing Acquisition is $(p_A + \Delta)V_S$. Thus, an H firm has no incentive to deviate as long as $\alpha P^* + (1 - \alpha)p_H V_S + B > (p_A + \Delta)V_S$. Substituting for P^* from (a) yields $\alpha \left(\frac{p_A V_S - B}{\alpha} \right) + (1 - \alpha)p_H V_S + B > (p_A + \Delta)V_S$, or equivalently $\Delta < (1 - \alpha)p_H$.*

- (d) Show whether or not this same partial pooling equilibrium will still exist when $\Delta > (1 - \alpha)p_H$. What might this result suggest about firm behavior in practice?

SOLUTION: By the argument above, an H firm will have an incentive to deviate from this partial pooling equilibrium when $\Delta > (1 - \alpha)p_H$. Thus, when $\Delta > (1 - \alpha)p_H$, an equilibrium no longer exists where H firms choose IPO with probability 1, L firms choose IPO with probability β^ , and the IPO share price is P^* . In practice, this result suggests that high-quality firms will tend to prefer being acquired, rather than issuing shares in an IPO, if an acquisition results in sufficiently good performance in the product market. Investors should also take this into account; i.e. they should realize that an IPO sends a relatively poor signal about firm quality, which should drive down the share price, which in turns makes an IPO less attractive.*

- (e) Based on your answers above, comment on whether Bayar and Chemmanur's assumption that H firms and L firms perform equally well in the product market following an acquisition is crucial for their analysis.

SOLUTION: Bayar and Chemmanur's assumption can be relaxed slightly without changing their results. If high-quality firms perform slightly better than low-quality firms in the product market following an acquisition, then this will still lead to the same equilibrium outcome as in their analysis. What is crucial for Bayar and Chemmanur's results is that high-quality firms should not perform much better than low-quality firms following an acquisition, since this would cause the equilibrium they focus on to break down.

3. Problem 3

Please seek out and find a news story, describing a case that relates to some of the ideas from the course. Discuss to what extent the main points from the news story relate to the different articles we have seen throughout the semester (approximately 2-3 pages). In particular, comment on both of the following:

- Which theoretical results from the articles can (or cannot) shed light on the news story?
- Which of the key modelling assumptions behind these theoretical results are realistic, when applied to this real-life situation?

Note: you are not expected to relate the news story to every single article we have seen. Rather, you should select a few articles from the course which you believe are most relevant for the news story you have chosen. Moreover, your answer should include a link to, or a copy of, the news story in question.

SOLUTION: Answers will vary, depending on the news story in question.