Written Exam Economics Winter 2018-19

Corporate Finance Theory

17 December 2018 at 10 AM to 7 January 2019 at 10.00 AM

This exam question consists of 5 pages in total

Answers only in English.

A take-home exam paper cannot exceed 10 pages – and one page is defined as 2400 keystrokes

The paper must be uploaded as <u>one PDF document</u>. The PDF document must be named with exam number only (e.g. '1234.pdf') and uploaded to Digital Exam.

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

You may 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 past 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.

1. Explain intuitively why a high-quality firm has a different incentive (compared to a low-quality firm) to opt for an acquisition, in the setting of Bayar and Chemmanur (2011). What is the key assumption in their modeling framework that leads to this result?

2. Explain the reasons for credit rationing in Almeida et al. (2011), and how credit rationing affects merger activity in their setting.

3. Consider the framework of Fahn et al. (2014), where the firm cannot commit to pay a bonus to creditors. Describe how *repeated interactions* affect firm incentives in this setting. Now choose another article we have seen during the semester, in which repeated interactions also affect incentives. Comment on the main similarity, and the main difference, in how repeated interactions affect incentives in this article, compared to in Fahn et al. (2014).

2. Problem 2

This problem considers a setting inspired by Malenko and Malenko (2015). It explores how the probability that sponsor skill is high, rather than low, affects the ex ante expected value created by acquisitions. The setting is very similar to the one described in Lectures 6 and 7, with repeated interactions and competition.

Time is discrete, with an infinite horizon, and indexed by $t = 0, 1, 2, \ldots$. Two sponsors enter the market at $t = 0$ and remain for all subsequent periods. In each period $t \geq 1$, a single target enters the market, and remains for exactly one period. Each target is associated with a project. There is also a competitive credit market, where the target/sponsor can issue debt.

Each sponsor has either high skill, q_H, or low skill, q_L, where $0 < q_L < q_H < 1$. For each sponsor, the probability of high skill is a, where $0 \leq a \leq 1$. Sponsor skill remains the same for all periods and is public information. All targets have the same skill q_T, with $q_L < q_T < q_H$.

Skill determines how likely a given project is to succeed or fail. For a stand-alone target (not acquired), the project succeeds with probability q_T and fails with probability $1 - q_T$. If the target is acquired, then the probability of project success equals the skill of the sponsor that made the acquisition. The realized value of a project will depend on whether it succeeds or fails, and also on how much debt the target/sponsor issued, as described below.

At the start of each period $t \geq 1$, a target enters the market. The two sponsors then competitively bid in an open ascending auction to acquire the target, which ends when one sponsor drops out of the bidding. The remaining sponsor makes a take-it-or-leave it offer (equal to his final auction bid) and the target decides whether to accept or reject.[1]

We assume that if the target rejects the offer and remains as a stand-alone firm, then it must issue low debt, D_L. We also assume that if the target is acquired by a low-skill sponsor, then the sponsor must issue D_L. But if the target is acquired by a high-skill sponsor, then the sponsor can choose between issuing low debt, D_L, or high debt, D_H, with $D_L < D_H$. After debt is issued, the project outcome is realized. If the project succeeds, then it generates value $X_G + g(D)$, where $g(D)$ denotes the financing benefits associated with debt D, with $g(D_H) > g(D_L) > 0$. If the project fails, then it generates value X_B, with $0 \leq X_B < X_G$.

Assume that in almost all situations, creditors must be repaid the full amount that was borrowed, and there is no possibility of diverting cash. The only exception is the case of a high-skill sponsor who makes an acquisition, issues debt D_H, and the project then fails. This sponsor can then choose between paying back the full amount borrowed, or paying back nothing (diverting cash) and keeping the entire amount borrowed for itself, thereby effectively gaining D_H. The immediate cost for the sponsor of diverting cash is that it suffers a (deadweight) loss in value equal to $(1 - \lambda)X_B$. The long-run cost for the sponsor of diverting cash is that it must issue debt D_L after making an acquisition in all later periods (punished by the credit market).

Play then moves on to period $t + 1$, which proceeds just like period t. A new target enters the market, sponsors bid competitively to acquire it, etc.

In equilibrium, we will require that creditors always correctly believe they will be paid back with probability one, and that no cash will ever be diverted. Assume that sponsors discount future payoffs with factor $\delta < 1$, which relates to the interest rate r by $\delta = 1/(1 + r)$. You can also assume that following an acquisition, i) the payoff of the target that was acquired equals the acquisition price; ii) the payoff of the sponsor making the acquisition equals the realized project value minus the acquisition price; iii) the payoff of the other sponsor, who does not make the acquisition, is zero.

(a) **Defining V**. Let V_{ij} denote the expected value per period created by acquisitions when one sponsor has skill $i \in \{q_H, q_L\}$, and the other sponsor has skill $j \in \{q_H, q_L\}$. That is, V_{ij} is the equilibrium expected value of a project, given the presence of sponsors i and j in the market that can potentially acquire the target, minus the expected project value of the target if it remained as a stand-alone firm. Explain why

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[1]Equivalently, you can think of the two sponsors participating in a sealed-bid, second-price auction, where the sponsor that makes the highest bid acquires the target, and pays a price equal to the lowest bid (i.e. that made by the 'losing' sponsor).

from an ex ante perspective (so before sponsor skill is realized), the expected value per period created by acquisitions is $V = a^2 V_{HH} + 2a(1-a)V_{HL} + (1-a)^2 V_{LL}$.

(b) **Deriving V_{LL}.** Explain informally why $V_{LL} = 0$. What is the key assumption that generates this result?

(c) **Deriving V_{HH}.** Suppose that both sponsors have high skill, and that any sponsor making a successful acquisition issues debt D_H and pays creditors back in full. Show that a sponsor can always strictly increase profits by deviating from the above strategy and diverting cash, then issuing D_L in later periods. Conclude that if both sponsors have high skill, the equilibrium debt issued in every period must be D_L, and use this information to write down an expression for V_{HH}.

(d) **Deriving V_{HL}.** Suppose that exactly one sponsor has high skill, and that when this sponsor makes a successful acquisition, it issues debt D_H and pays creditors back in full. Show that this sponsor can strictly increase profits by deviating from the above strategy and diverting cash, then issuing D_L in later periods, if and only if the following condition holds:

$$D_H - (1-\lambda)X_B > \frac{\delta}{1-\delta} q_H \Big(g(D_H) - g(D_L) \Big).$$

Conclude that there exists a critical value δ^*, such that the following holds: (i) if $\delta \in [0, \delta^*)$, then the equilibrium debt issued in every period must be D_L, and (ii) if $\delta \in [\delta^*, 1]$, then the equilibrium amount of debt issued in every period is D_H. Use this information to write down an expression for V_{HL}; explain why V_{HL} is equal than V_{HH} if $\delta < \delta^*$, and is strictly greater than V_{HH} if $\delta \geq \delta^*$.

(e) **Deriving a^*.** Note: please attempt this question even if you were unable to derive expressions for V_{HH} and V_{HL} above. Let a^* denote the value of a that maximizes V, the ex ante expected value per period created by acquisitions, from part (a). Show whether or not $a^* = 1$, and comment on whether your answer depends on the value of δ^*. Relate your answer to the idea that acquisitions can potentially create value through two different channels: providing operational benefits and providing financing benefits.

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.