Take Home Exam

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Some of these questions are open ended and there is not one "right" response. In those questions we will judge how deeply you understand the theories and their limitations, as well as what empirical estimates tell you (and cannot tell you) about the world.

The exam is open book, open notes, free internet access. However, you should not discuss the exam with your classmates or any other person.

1. Bernanke (1983) and Chodorow-Reich (2014) attempt to shed light on the aggregate effects of credit disruptions on economic conditions.

   (a) Based on Bernanke (1983), discuss what Bernanke would think of the size of the aggregate effects that arise from the shock that Chodorow-Reich (2014) considers. What would Bernanke think about the aggregate effects of cuts in the supply of lending to households? Elaborate on how you reach your conclusions.

   (b) Please explain an advantage and a disadvantage of the approach followed by Bernanke (1983) "Nonmonetary Effects of the Financial Crisis in Propagation of the Great Depression" relative to that of Chodorow-Reich (2014) "The Employment Effects of Credit Market Disruptions: Firm-Level Evidence from the 2008-9 Financial Crisis" to infer the **aggregate** effects of credit supply shocks.

   (c) Copy the exact prompt of question (b) into Chat GPT, paste the response you get in your exam solution, and then write a paragraph highlighting a **conceptual** shortfall of the answer Chat GPT gave you. When I say conceptual, I mean that you should not stress obvious mistakes like Chat GPT making up one the title of a paper.

2. You will find a Financial Times article called Seru_SVB on canvas, in which Amit Seru, a professor at the Stanford Graduate School of Business discusses the potential lessons, and wrong narratives of the bankruptcy of Silicon Valley Bank, and First Republic Bank. Please read the article and answer these two questions

   (a) Seru highlights that different banks are heterogeneous in their share of uninsured deposits, that is, the fraction of their deposits not covered by FDIC insurance (the threshold for insured deposits is 250 thousand dollars per account). How can the Diamond-Dybvig model help you understand the situation of these two banks? What limitations has this model to explain the failure of these two banks?

   (b) Seru mentions that "[...] Another popular narrative is that regulators need expanded powers to monitor mark-to-market losses." and that "Banks need to substantially increase their equity funding, thereby increasing the skin they have in the game". How can the Costly State Verification Model help you rationalize these sentences? What features is the Costly State Verification missing to make sense of the article?

3. This question is directed to help you think about adjustment costs and financial frictions simultaneously. Firm j dividends are given by

$$D_{jt} = AF(K_{jt}) - I_{jt}(1 - \zeta_{jt}) - \frac{\varphi_j}{2}\left(\frac{I_{jt}}{K_{jt}}\right)^2 K_{jt},$$

where D are dividends, $F()$ is the production function, A is firm-level productivity, ζ is the present value of depreciation allowances that firm j faces, which are firm specific since they depend on the depreciation of the capital that firm j uses as in Zwick and Mahon (2017). φ is a parameter that captures the size of convex adjustment costs, which are presumably firm-level specific. The firm owner is risk neutral, so it discounts the future with a factor β.

Firms want to maximize their value

$$\sum_{t=0}^{\infty} \beta^t D_{jt},$$

subject to a production function

$$F(K) = K^\alpha,$$

a law of motion for capital

$$K_{j,t+1} = K_{jt}(1 - \delta_j) + I_{jt},$$

and some firms j face financial constraints in period $t = 0$. The form of the financial constraint is that firms in period 0 need to guarantee their investors that they will receive dividends of at least $\underline{D}$ dollars.

$$AF(k) - I(1 - \zeta) - \frac{\varphi}{2}\left(\frac{I}{K}\right)^2 K \geq \underline{D}_j,$$

for $\underline{D}_j \geq 0$. That is, investors demand positive dividends. We assume that this constraint is feasible (if the firm invests 0, it can pay the required dividend). Notice that these constraint only applies to period 0. In principle, some firms are subject to financial constraints, while some others are not.

There is a tax policy in place only in period 0. That policy, which we will call bonus depreciation, gives firms a bonus depreciation in period 0 $\zeta_{j0} > 0$, after that period, there is no bonus depreciation in place.

(a) Derive the first order conditions for a firm that does not face financial constraints. Hint: You can ignore the inequality constraint for these firms.

(b) According to House and Shapiro (2008) (full reference in the syllabus), and the arguments developed in class, a temporary change in bonus depreciation for sufficiently patient firms that invest in sufficiently long-lived capital, does not affect marginal q of the firm. Please explain the reasoning behind that argument.

(c) If you impose that $dq/d\zeta = 0$, what is the effect of a higher bonus depreciation on investment $(dI/d\zeta)$?

(d) Derive the first order conditions for a firm that faces the financial friction. Notice that the inequality constraint will require you to write down a complementary slackness condition

(e) The capital of the firm at the beginning of period 0 is taken as given (decisions of the past). What is the optimal level of investment for a firm that faces the financial constraint? This response

should require one expression for the case when the constraint is binding, and another one when the constraint is not binding. For now you can have an implicit solution for investment.

(f) Solve for the level of investment of a firm that faces financial constraints that are binding. Your response should depend on firm-level parameters (φ_j, and ζ_{j0} for example) exogenous variables (for example A), and predetermined variables (for example K_0). It may be the case that you need to solve a quadratic equation for investment. In case there is more than one root, you should discuss why you picked one or the other

(g) What is the sensitivity of investment for financially constrained firms with binding constraints with respect to ζ? In other words, compute $dI/d\zeta$ for this group of firms.

(h) In this specific setting, can you tell whether investment reacts more to bonus depreciation among constrained or unconstrained firms?

(i) Write a couple of paragraphs interpreting your results, and one paragraph stating what you learned by doing this exercise.