ECON 4335 Economics of Banking, Fall 2017
Problem Set 1

August 29, 2017

1. Risk sharing and financial intermediation

Consider a one-good, three-date economy: there are infinitely many ex ante identical consumers, each endowed with one unit of resource at $t = 0$. Consumption takes place either at $t = 1$ or $t = 2$, while the timing preference only gets revealed at $t = 1$. With probability π a consumer is an impatient one (type 1 consumer), who only values consumption at $t = 1$, while with probability $1 - \pi$ a consumer (type 2 consumer) is a patient one, who only values consumption at $t = 2$. A consumer's type is private information.

Let c_i denote the consumption of a type $i = 1, 2$ consumer, and ex post, the utility from consumption is $u(c_i) = \frac{1}{1-\gamma} c_i^{1-\gamma}$ with $\gamma > 1$.

The economy has two technologies of transferring resources between periods: storage technology with gross return equal to 1, and a long-term investment technology with a constant gross return $R > 1$ at $t = 2$ for every per unit invested at $t = 0$. If necessary, an on-going long-term project can be liquidated, or, stopped prematurely at $t = 1$, with a return $0 < \delta < 1$.

(A) Specify the social planner's problem, who wants to maximize a consumer's expected utility at $t = 0$ by allocating her endowments between two technologies.

1. Compute the optimal allocation, and consumption for each type's consumer — denote the solution as $\left(c_1^*, c_2^* \right)$;

2. Why aren't consumption levels for two types' consumers identical? Will there be liquidation at $t = 1$?

3. What will happen to the consumers' optimal consumption when $\gamma \to +\infty$?

(B) Suppose that the economy is in autarky such that every consumer has to allocate her endowments between two technologies by herself at $t = 0$. Show that the consumer's ex post consumption is inferior to the solution in (A) 1.

(C) Suppose there is a bond market available at $t = 1$. At $t = 1$ competitive bond issuers purchase long assets from impatient consumers, issue bonds against these long assets, and sell bonds to the patient consumers (who can pay with the proceeds from their short assets). Each unit of bond bought at $t = 1$ will deliver one unit of consumption good to the bond holder at $t = 2$.

1. Compute the equilibrium bond price;

2. Show that the consumer's ex post consumption is inferior to the solution in (A) 1.

(D) Suppose there is a competitive banking sector in the economy, in which banks take consumers' endowments as deposits at $t = 0$ and allocate between the two technologies. Consumers withdraw c_i at $t = i$ according to their type i.

1. Show that banks can replicate the optimal solution achieved in (A) 1.

2. Comparing with the result in (B), how can banks improve social welfare in the economy?

☞ Diamond, D. W. and Dybvig, P. H. (1983), Bank runs, deposit insurance, and liquidity, *Journal of Political Economy* 91, 401-419.

2. Bank run and financial fragility

Consider the equilibrium with intermediation, as in Exercise 1 (D) in which banks offer consumers the deposit contracts $\left(c_1^*, c_2^*\right)$ at $t = 0$.

(A) Explain why there exist two (Nash) equilbria which are consistent with rational behaviour for all agents: one in which only the early consumers withdraw at $t = 1$, and another one in which everyone withdraws at $t = 1$ — no matter what type he or she is. What is the individual consumption level in the latter equilibrium? Does the existence of multiple equilibria depend on the value of δ?

(B) Propose a mechanism that can eliminate the bank run equilibrium. Explain how it works.

(C) During 2007-2009 crisis, several central banks purchased huge volume of securities, hoping to prevent price of long assets from falling too much. Explain why such unconventional policy helps eliminate panics in banking sector.

☞ Diamond, D. W. and Dybvig, P. H. (1983), Bank runs, deposit insurance, and liquidity, *Journal of Political Economy* 91, 401-419.