

# ECON 4335 Economics of Banking, Fall 2017

## Problem Set 8

October 19, 2017

### 1. Liquidity management

1. What is market liquidity? What is funding liquidity?
2. List a few factors that affect banks' market liquidity / funding liquidity.

### 2. Risk management, leverage cycle, and cyclical requirements

Consider an economy that extends to 2 periods: investors invest in risky projects at  $t = 0$ , and will get paid at  $t = 1$ . All information is available to public.

There are a fixed number  $S$  of ex ante identical risky projects. Each needs 1 unit of initial investment to start at  $t = 0$ , and at  $t = 1$  generates a random gross payoff  $R$  that is uniformly distributed over  $[\bar{R} - z, \bar{R} + z]$  with  $\bar{R} > 1$  and  $z > 0$ .

Entrepreneurs who run the projects issue securities to raise funding. Securities are sold at  $t = 0$  to investors at price  $P$  which is determined by the market. Suppose that funding is scarce so that investors get all the rents, should a project be successful.

There are many risk averse investors, call them passive investors, each gets  $e$  endowment at  $t = 0$ . To spend their endowments, they may buy  $y_p$  securities and lend the rest to active investors at gross interest rate equal to 1. A passive investor gets utility from her consumption  $c$  at  $t = 1$ , which contains repaid deposit and return from securities. At  $t = 0$  her expected utility is  $u(c) = E[c] - \frac{1}{2\tau} \text{var}[c]$  in which  $\tau > 0$  is a constant and  $\text{var}[c]$  is the variance in consumption.

(A) Passive investor's demand for security

1. Write down passive investors' decision problem at  $t = 0$  and derive passive investor's demand for security;
2. Delineate passive investor's demand for security in  $P - y$  space. How does such demand change with  $\tau$ ? Interpret.

There are many risk neutral investors, call them active investors or banks, each gets  $e$  endowment at  $t = 0$ . They may buy  $y_A$  securities, using their endowments and borrowing from passive investors at gross interest rate equal to 1. Active investors are subject to Value-at-Risk ( $VaR$ ) constraint, such that  $e$  should be sufficient to cover the largest possible loss.

(B) Active investor's demand for security

1. Specify active investor's  $VaR$  constraint;
2. Write down active investor's decision problem at  $t = 0$  and derive active investor's demand for security;
3. Delineate active investor's demand for security in the same  $P - y$  space, and show how equilibrium security price  $P$  is determined.

(C) Asset price and leverage in the bust

Suppose there is a shock to security return at the intermediate date, call it  $t = 0.5$ , so that both types of investors have the chance to exchange in the security market and adjust their balance sheets: It turns out that the distribution of security return is  $[\bar{R}' - z, \bar{R}' + z]$  with  $\bar{R}' < \bar{R}$ .

1. Using  $P - y$  curves, show the impact on both types' investors demand for securities and the new equilibrium security price;
2. How does the shock to security return affect active investors' balance sheet? How do they adjust the balance sheet to meet  $VaR$  constraint? What's the consequence to equilibrium asset price? Why is leverage cycle "procyclical"?
3. Explain how countercyclical capital buffer reduces volatility in this economy.