

SOLUTION

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3pm: November 28, 2013

Problem Set 7: Ramsey Model & Financial Crisis

Ramsey Model

Exercise 1. Does the steady state in the Ramsey model depend on the form of the utility function? Explain.

Solution 1 (Ramsey Model). No. In the general case,

$$\frac{u'(C_t)}{u'(C_{t+1})} = \frac{1 + \alpha A k_{t+1}^{\alpha-1}}{1 + \rho}$$

so we still get that in steady state

$$k^* = \left(\frac{\alpha A}{\rho} \right)^{\frac{1}{1-\alpha}}$$

We have the same story as usual, consumers save if the MPK exceeds the rate of time preference and vice-versa until there is equality. Since $Y_t = C_t + k_{t+1} - k_t$, we have that in steady state $C^* = Y^*$ still.

Financial Crisis

Exercise 2. What happens to banks' leverage if the ECB purchases more sovereign debt?

Solution 2 (European Sovereign Debt & Leverage). When the ECB purchases more sovereign debt, banks leverage ratio falls, which helps to stimulate lending again since the banks are less concerned about recapitalising.

Exercise 3. Suppose that a bank's asset values rise in a boom. At this point, what typically happens to their leverage ratio?

Solution 3 (Asset Values & Leverage). If asset values rise in a boom, then the leverage ratio ($\frac{\text{Assets}}{\text{Capital}}$) falls. Take a numerical example: capital is initially 10 and assets are 100, so leverage is $\frac{100}{10} = 10$. Now assets are 110 while non-capital liabilities are unchanged so capital is now 20; hence, leverage is now $\frac{110}{20} = 5.5 < 10$, i.e. leverage comes down when asset values rise. Demand for assets rises with their value.

Exercise 4. How would a reduction in the dividend tax affect a bank's capital structure and the likelihood of a crisis?

Solution 4 (Capital Structure). Reducing taxes on dividends reduces the cost of equity and so would tilt the capital structure of a bank towards equity- and away from debt-financing. Capital is how you *raise* funding, not how you *use* it. To the extent that equity shareholders have more incentive to ensure that the banks are not undertaking unduly risky lending, reducing dividend taxes might reduce the likelihood of a crisis by encouraging more equity shareholders.

Exercise 5. How could *equity* prices and *credit default swap* prices (i.e., costs of insuring assets against default) provide information what would facilitate the regulation of the financial sector?

Solution 5 (Price Information). Large CDS prices (high costs) would reflect stress in the market and encourage regulation. Similarly for equity prices.

Exercise 6. Suppose a bank just meets its leverage requirement of 10. In a recession, what typically happens to asset values and leverage, and what must the bank do to meet its capital requirement? Many claim that Basel 1 caused a *credit crunch* in the U.S. in 1991. Use your answer to explain how this would happen. Should leverage requirements vary with the business cycle?

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Solution 6 (Balance Sheet Shrinkage). Asset values usually decline in recessions so leverage rises $\frac{\text{Assets}}{\text{Capital}}$; capital falls to cover initial losses in asset values up to a point: e.g. assets decline from 100 to 95 and capital falls from 10 to 5 so leverage rises from $\frac{100}{10} = 10$ to $\frac{95}{5} = 19$. To meet its capital requirement, banks must recapitalise (raise capital), slow down the growth of their loans and sell off assets. Since these banks are essentially not lending (zombie banks) and there a lot of banks doing this (not just for one bank), there will be a lack of credit (credit crunch). This issue has to do with balance sheet shrinkage where it is the selling of assets rather than the increasing of capital that levers down, so one response is to maintain lower leverage ratios in good times than in bad times (Hanson, Kashyap & Stein) – buffer with less pressure to shrink assets. This is important not just for the microprudential aspect of protecting the deposit insurance fund but also the macroprudential objective of maintaining credit creating during recession. Challenge: regulatory capital requirement may not be a binding constraint during bad times and market may refuse to fund institutions that are not sufficiently capitalised. The regulatory maximum in good times must substantially be less than the market imposed standard in bad times.

Exercise 7. Lane (2012) mentions that higher debt levels can make default more likely. Why? What policies might help a country with high sovereign debt levels to avoid default?

Solution 7 (Risk of Multiple Equilibria when Sovereign Debt is High). Higher sovereign debt levels can make default more likely since it is vulnerable to increases in the interest rate it pays on its debt. This risk can lead to self-fulfilling speculative attacks where higher perceived default risk raises the demand for higher yields, in turn making default more likely. This is a multiple equilibria problem, since if default risk is perceived to be low, interest rates remain low and so we are in a no-default equilibrium. Lane (2012) argues that policies that discourage speculative attacks and help to avoid default include making an official safety net available to reduce the risk of a bad equilibria since a country would then be able to rollover its debt to avoid default. EFSF and ESM addressed the bailouts of Greece, Ireland and Portugal. Creating a large firewall is politically unpopular in creditor countries (fear of losses, moral hazard [debtor countries avoid reform]). Another policy to reduce the risk of being in the bad equilibrium is the ECB's purchase of sovereign bonds, providing liquidity when sovereign markets are troubled. Other policies: allow ESM borrow from ECB, ceiling to interest rates on sovereign debt of countries meeting certain fiscal criteria (steps to ensure debt declines to safe level over medium term), debt monetisation.