

14.02 Quiz 1

Time Allowed: 90 minutes

Spring 2014

NAME:

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This quiz has a total of 3 parts/questions. The first part has 10 multiple choice questions where you should select what you think is the best answer from four alternatives.

(Table for grader use only, please do not write)

Question	1	2	3	Total
Score				

Question 1: Multiple choice [3 points each]

1. Which of the following INCREASES the leverage of a bank? (d)
 - (a) Repaying part of the debt.
 - (b) Recapitalization.
 - (c) Selling off government bonds to buy more risky assets.
 - (d) Absorbing an investment loss with capital.

2. Which of the following statements is TRUE? (c)
 - (a) The major reason why the recent crisis first broke out in the U.S. was that U.S. banks had a higher leverage than European banks.
 - (b) After a crisis, banks typically need to recapitalize more than the losses they had taken. This was also the case after the recent crisis.
 - (c) During the European debt crisis, European banks found themselves in trouble because many of the “safe assets” became more risky.
 - (d) When a crisis starts, volatility increases and banks typically respond by lowering their exposure to risky assets while keeping leverage constant.

3. Consider Holmstrom and Tirole (1997). Which of the following LOWERS the pledgeable income of a project? (a)
 - (a) Increasing the chance that the project would succeed when the entrepreneur does NOT put effort.
 - (b) Reducing the entrepreneur’s private benefit.
 - (c) Lowering the monitoring cost.

(d) None of the above.

4. Consider Holmstrom and Tirole (1997). Which of the following does NOT make investment more difficult during a crisis? (d)

(a) A fall in entrepreneurs' net worth.

(b) An unexpected increase in monitoring cost.

(c) A fall in banks' capital.

(d) A reduction in entrepreneurs' private benefit.

5. In Diamond and Dybvig (1983), why may a bank improve upon the market outcome if agents want to smooth their consumption? (b)

(a) Because demand and supply of the bond in the market economy tend not to be equalized.

(b) Because it provides an insurance against the uncertainty of type.

(c) Because with a bank, agents can consume as if they knew their types at the beginning.

(d) None of the above.

6. According to Diamond and Dybvig (1983), why does a bank run happen? (d)
- (a) Because some agents are irrational and do not act in their best (economic) interest.
 - (b) Because agents do not know their types at the beginning.
 - (c) Because banks always need to borrow money to pay for the liquidity needs in period 1.
 - (d) Because banks can have a liquidity problem WITHOUT being insolvent.
7. In Tirole (2010), why may a firm want to give free equities to a bank? (c)
- (a) Because there is a monopoly in the banking sector.
 - (b) Because the government requires it.
 - (c) Because it does not require investors to finance the credit line the bank provides.
 - (d) Because uninformed capital alone may not be enough to cover its initial investment needs.
8. Which of the following is NOT true about Tirole (2010)? (a)
- (a) The paper explains why bailing out a bank always implies a loss to the government.
 - (b) The paper explains why banks have to diversify their investment.
 - (c) The paper explains why the government may have to bail out the banks.
 - (d) The paper explains how banks help solve the liquidity needs of firms by creating credit lines.

9. In Kiyotaki and Moore (1997), which of the following INCREASES the amount of money an entrepreneur can borrow? (b)
- (a) A higher interest rate.
 - (b) A higher price of capital tomorrow.
 - (c) A higher price of capital today.
 - (d) None of the above.
10. Which of the following statement best describes the amplification mechanism in Kiyotaki and Moore (1997)? (b)
- (a) Temporary shocks to asset prices can generate large, persistent fluctuations in output.
 - (b) Temporary shocks to technology or net worth can generate large, persistent fluctuations in output and asset prices.
 - (c) Borrowing constraint limits the amount of debt in this economy therefore makes the amplification less severe.
 - (d) None of the above.

Question 2: Holmstrom and Tirole 1997 [35 points]

Consider the following variant of the Holmstrom and Tirole (1997) model. As in the model we discussed in class, an entrepreneur (E) can affect p , the project's probability of success: if he puts effort into it, $p = p_H$; otherwise, $p = p_L < p_H$. Assume, differently from the model seen in class, that the project can be taken up to any scale. Namely, with an investment equal to I , the project yields a return of RI if it is successful (and 0 if not). Similarly, the private benefit of the entrepreneur is also scaled up: he receives BI if he puts no effort. As usual, we assume that investors' outside option is in the form of a government bond which has a gross return equal to γ . Entrepreneurs have a net worth of A_0 .

1. Write down the expected total payoff of a project (private benefits plus investment returns). Determine the condition(s) under which investing in the project, with E putting in effort, generates the highest total expected payoff. Does this condition say anything about the scale of the investment? (7 points)

Solution:

The expected total payoff is $Y_1(I) = p_H RI$ with effort, $Y_2(I) = p_L RI + BI$ with no effort, and $Y_3(I) = \gamma I$ when the project does not get started. The first option yields the highest total payoff if and only if the following inequalities hold:

$$\begin{aligned} p_H RI &> p_L RI + BI, \\ p_H RI &> \gamma I. \end{aligned}$$

As one can see, the I can be factored out in both inequalities. As a result, this does not say anything about the scale of the investment.

Note: some students may have not considered the option of not investing, in which case they should not write the second inequality. This is also accepted.

2. For any scale of investment I , write down the incentive compatibility constraints for E (the constraint that makes sure he puts effort into the project). Compute the corresponding plegeable income. (6 points)

Solution:

The I.C. constraint for E is

$$R_E(I) \geq \frac{BI}{\Delta p}.$$

Plegeable income is given by

$$R_S(I) = RI - \frac{BI}{\Delta p} = \left(R - \frac{B}{\Delta p}\right) I.$$

3. Show that the minimum amount of net worth, $\bar{A}(I)$, that E needs to have to start the project with scale I , is proportional to I . Assume that E wants to scale up as much as possible, determine the investment scale. (7 points)

Solution:

Investors' individual rationality constraint is

$$\gamma(I - A_0) \leq p_H R_S(I),$$

which can be re-written as

$$A_0 \geq \bar{A}(I) = \alpha I,$$

where

$$\alpha = 1 - \frac{p_H}{\gamma} \left(R - \frac{B}{\Delta p} \right).$$

If E wants to scale up as much as possible, he would choose

$$I = \frac{1}{\alpha} A_0.$$

4. Assume that there is a bank that has a monitoring technology, which, at a cost cI , can reduce E's private benefit from BI to bI (with $b < B$). Write down the bank's incentive compatibility constraint. (6 points)

Solution:

The bank's I.C. constraint is

$$R_B(I) \geq \frac{cI}{\Delta p}.$$

5. Assume that the bank has an outside option that yields β so it will participate in the project if the following holds

$$p_H R_B \geq \beta I_B.$$

Show that with the help of both bank and investors, the minimum amount of net worth, $\underline{A}(I)$, that E needs to have to start the project with scale I , is again proportional to I . (5 points)

Solution:

To have the maximum amount of investment possible, the bank will be offered just enough to have an incentive to monitor and it will be required to invest to the point where its return is exactly β . The I.R. constraint for small investors is

$$\gamma(I - I_B - A_0) \leq p_H R_S(I).$$

Injecting $I_B = \frac{p_H}{\beta} R_B$ and $R_S(I) = RI - \frac{bI}{\Delta p} - \frac{cI}{\Delta p}$ into it, we have

$$\gamma(I - I_B - A_0) \leq p_H \left(R - \frac{b+c}{\Delta p} \right) I,$$

or

$$A_0 \geq \underline{A}(I) = \alpha' I,$$

where

$$\alpha' = 1 - \frac{p_H}{\beta} \frac{c}{\Delta p} - \frac{p_H}{\gamma} \left(R - \frac{b+c}{\Delta p} \right).$$

Note: Here the assumption is a bit different from the one we made in class. Namely, the monitoring cost is not included in the consideration. Some students may think this is an error and rewrite the condition with monitoring cost in. This is also accepted as an answer.

6. When does monitoring encourage more investment? (4 points)

Solution:

Monitoring encourages more investment if and only if $\alpha' < \alpha$, or, equivalently (not required)

$$\frac{\gamma}{\beta} > \frac{b+c-B}{c}.$$

In particular, one can check that if $b+c < B$, i.e. the plegeable income increases after the bank steps in, monitoring always encourages more investment.

Question 3: IS-LM [35 points]

Consider an economy described by the following set of equations

$$\begin{aligned}C &= c_0 + c_1(Y - T) - c_2i, \\I &= b_0 + b_1Y - b_2i, \\ \frac{M^d}{P} &= C, \\G &= G_0, \\T &= T_0, \\M^S &= M_0.\end{aligned}$$

All the parameters $(b_0, b_1, b_2, c_0, c_1, c_2)$ in this model are strictly positive and $b_1 + c_1 < 1$. Note that money demand here depends on consumption, not output, as we have seen in class. For simplicity, we assume $P = 1$ and it does NOT change.

1. Find out the goods market equilibrium and draw the supply and demand for goods on a graph with output (Y) on the horizontal axis and demand for goods on the vertical axis. Derive the IS curve. (6 points)

Solution:

$$c_0 + c_1(Y - T_0) - c_2i + b_0 + b_1Y - b_2i + G_0 = Y$$

or

$$Y = \frac{1}{1 - c_1 - b_1} [(c_0 + b_0 - c_1T_0 + G_0) - (c_2 + b_2)i].$$

See your textbook for the Keynesian cross.

2. Find out the financial market equilibrium and derive the LM curve. (3 points) Draw both curves on a same graph. Call the equilibrium output Y_0 and the equilibrium interest rate i_0 . (6 points)

Solution:

$$c_0 + c_1(Y - T_0) - c_2i = M_0$$

or

$$Y = \frac{1}{c_1} [c_2i + M_0 - c_0 + c_1T_0].$$

Notice that the IS and the LM curves are straight lines here.

3. Assume that now there is a sudden drop in business confidence, modeled by an increase in b_2 . The new level is b'_2 , with $b'_2 > b_2$. Show graphically how the IS-LM curves move. (6 points)

Solution: The IS curve shifts down (with a less negative slope), the LM

curve is unchanged.

4. Now suppose that the government want to counter-balance the drop in business confidence using government spending as a policy instrument. Should it increase or decrease G_0 ? Compute the level of government spending that completely offsets the drop in business confidence. (7 points)

Solution:

From the IS equation, one can offset a change in b_2 by increasing government spending by $(b'_2 - b_2) i_0$. Graphically, this allows the IS curve to pass through the original equilibrium point (Y_0, i_0) . The IS curve still has a less steep curve compared to point 2.

5. Suppose that the U.S. Congress does not allow the government to use fiscal tools. The Central Bank then decides to use monetary policy

to restore the original equilibrium output Y_0 . Should it increase or decrease M_0 ? Draw the new IS-LM curves. (6 points)

Solution:

The central bank wants to move the LM curve rightward. The way to do so is to increase M_0 .

If you want to check out the math (not required), here's what you can do.

Equilibrium (Y_0, i_0) is defined by

$$\begin{aligned} Y_0 &= \frac{1}{1 - c_1 - b_1} [(c_0 + b_0 - c_1 T_0 + G_0) - (c_2 + b_2) i_0] \\ Y_0 &= \frac{1}{c_1} [c_2 i_0 + M_0 - c_0 + c_1 T_0] \end{aligned}$$

The new equilibrium is given by

$$\begin{aligned} Y'_0 &= \frac{1}{1 - c_1 - b_1} [(c_0 + b_0 - c_1 T_0 + G_0) - (c_2 + b'_2) i'_0] \\ Y'_0 &= \frac{1}{c_1} [c_2 i'_0 + M'_0 - c_0 + c_1 T_0] \end{aligned}$$

But notice that $Y_0 = Y'_0$, taking difference of the two pairs of equations

$$\begin{aligned} 0 &= (c_2 + b_2) i_0 - (c_2 + b'_2) i'_0, \\ 0 &= c_2 (i_0 - i'_0) + M_0 - M'_0. \end{aligned}$$

Solving for $M'_0 - M_0$:

$$M'_0 - M_0 = \frac{c_2}{c_2 + b'_2} (b'_2 - b_2) i_0 > 0.$$

Therefore, the Central Bank should increase the money supply, which

results in an outward shift of the LM curve.

And here is a third way of getting to the same conclusion. Intuitively, since the output has been contracted following the lowered business confidence, the CB should use an expansionary monetary policy, which means it should increase the money supply.

6. For each of the two previous questions, state how i and I move (compared to point 2). Which of the two policies achieves a higher level of I ? Which achieves a higher level of the interest rate, i ? (4 points)

Solution:

In the case in which the government uses the fiscal tool, neither i nor Y changes. Hence, from the investment equation, I would go down because of the lowered business confidence.

In the other case, i would go down (graphically). Since Y stays the same and b_2 goes up, if you only look at the investment equation, you may conclude that the movement in I is ambiguous. However, if you also look at the consumption equation, you realize that C has gone up, following the decrease in i . Then, via the national accounting identity, $Y = C + I + G$, since neither Y nor G changes, the increase in consumption must be offset by a fall in investment.

Policy in (5) achieves a higher level of investment (the fall in investment through b_0 is partly offset by a lowered interest rate). Policy in (4) achieves a higher level of interest rate.

Note: Some students may have understood point 2 as the second equilibrium point (part 3 of this exercise), which of course would lead to different answers. As long as their answers are correct, this should also be accepted.

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