

Problem Set

Eco 569, QEF Master

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1 The AD-AS "microfounded model"

1.1 Structural parameters and macroeconomic stabilisation (8 points)

Take the following model

$$p - p^e = \kappa(y - y_n) \text{ with } \kappa = \frac{1 - \alpha}{\alpha}(\eta + 1/\sigma)$$

$$y = \frac{1}{\kappa}(p - p^e) + y_n$$

$$y = \bar{y} + (g - \bar{g}) - \sigma [i - (\bar{p} - p)] + \sigma \ln \beta$$

$$y_n \simeq \frac{1 + \eta}{\eta + 1/\sigma} a + \frac{1/\sigma}{\eta + 1/\sigma} g - \frac{1}{\eta + 1/\sigma} \mu$$

where α is the proportion of firms that cannot reset prices each period, η is the disutility of labor, and σ is the intertemporal elasticity of substitution.

Consider 3 countries in a monetary union, that are confronted to a single interest rates. However the three countries differ as follows:

	Country A	Country B	Country C
α	0.8	2/3	0.5
η	1	1	1
σ	1/2	1	2

1.1.1 Question

Compute and compare the slopes of the Philips (AS) curve and the IS (AD) curves in the (p, y) plan across countries.

Answer

	Country A	Country B	Country C
AS			
AD			

1.1.2 Question

Assume an increase in the "mark up" $\frac{1}{\eta+1/\sigma}\mu$ of 1 in the three countries. Compare (rank using a graphical reasoning) the effects on prices and on output in the three countries.

1.1.3 question

Assume that monetary policy increases the nominal interest rate by 1 and compare (rank using a graphical reasoning) the effects across countries.

1.1.4 Question

Assume that fiscal policy authorities announce that future public spendings \bar{g} will be reduced by 1. Rank, using a graphical reasoning, the effect of this policy across the 3 countries.

1.1.5 Question

If the area of the 3 countries forms a monetary union. What structural asymmetry (differences in α or in σ) is more likely to lead to inflation differentials across countries

- If the economy is dominated by shifts in the demand curve
- If the economy is dominated by shifts in the supply curve

1.2 Structural reforms and macroeconomic adjustment in the euro area

Take the following model

$$p - p^e = \kappa(y - y_n) \text{ with } \kappa = \frac{1 - \alpha}{\alpha}(\eta + 1/\sigma)$$

$$y = \bar{y} + (g - \bar{g}) - \sigma [i - (\bar{p} - p)] + \sigma \ln \beta$$

$$y_n \simeq \frac{1 + \eta}{\eta + 1/\sigma} a + \frac{1/\sigma}{\eta + 1/\sigma} g - \frac{1}{\eta + 1/\sigma} \mu$$

where α is the proportion of firms that cannot reset prices each period, η is the disutility of labor, and σ is the intertemporal elasticity of substitution. Variables with bars are period 2.

Consider 2 countries in a monetary union, that are confronted to a single interest rates. However the three countries differ as follows:

	Country A	Country B
κ	1	1
σ	1/2	1

1.2.1 Question

Compute the equilibrium price p^* and output y^* as a function of $(y_n, \bar{p}, p^e, g - \bar{g})$ for each country.

1.2.2 Question

Recall that α is the proportion of firms that cannot adjust prices in a given period and η is the disutility of labour. What is the effect of structural reforms of the labor market that would amount to decreasing η so much so that $\kappa = 1/2$.

1. On the equilibrium (y^*, p^*) for each country
2. On the effect of a monetary policy shock that implies a 1% reduction in the interest rate i , again for each country
3. On the effect of a fiscal stimulus that increases g by 1, for country A and for country B
4. Are structural reforms desirable?

1.2.3 Question

Assume now that monetary policy follows a rule that leans against inflation with $i = 1, 5(p - p^e)$ in normal times and

$i = 0$ when the economy is at the zero lower bound.

Compare the effects of a fiscal stimulus of 1 on country B in the 2 regimes, normal times and the ZLB before and after the structural reforms of the labour market.

1.2.4 Question

Consider now structural reforms of the goods market which amounts to increase y_n by 1.

Compare the effects of a fiscal stimulus of 1 on country B in the 2 regimes, normal times and the ZLB before and after the structural reforms of the good market.

1.3 Analysing the evolution of macroeconomic developments in terms of AS and AD shocks

Describe the evolution of Euro Area inflation and GDP growth since 2006 in a series of shocks to AS and AD demand. The data can be found in December Monthly bulletins of the ECB, all available on line at www.ecb.int

1.3.1 Question

What dominates the evolution from 2006-2008 to 2009?

1.3.2 Question

What dominates the evolution from 2009 to 2010-2011?

1.3.3 Question

What dominates the evolution from 2010-2011 to 2012-2013?

1.3.4 Question

What dominates the evolution from 2012-2013 to 2014-2015?

What should the ECB try to achieve with its monetary policy in the current circumstances?

2 The consensus view on monetary policy before the 2008 crisis

3 Exercise inspired by Rudebush "Is the Fed too Timid?"

Use simulated data to compare the stabilisation properties of various Taylor rules on the variance of inflation, GDP growth and short term interest rate.

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Simulation set up in matlab, but it can also be done in XL
% create very long time series of inflation, GDP and interest rates
clear
dp=zeros(1000,1);
dy=zeros(1000,1);
i=zeros(1000,1);
dp(1)=2;
dy(1)=2;
i(1)=4;
%Create an articial economy randomly
for t=2:1000
    eps_p=0.5*randn;
    eps_y=0.3*randn;
    dp(t)=0.25+0.9*dp(t-1)+0.05*(dy(t-1)-2)+eps_p;
    dy(t)=0.4+0.8*dy(t-1)-0.1*(i(t-1)-dp(t))+eps_y;
    i(t)=RHO*i(t-1)+(1-RHO)*(4+ ALFA*(dp(t)-2)+BETA*(dy(t-1)-2));
end
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3.0.5 Question

With ALFA= 1.5 and BETA=0.5, compare simulated data (mean, standard deviation and plotted time series) for RHO=0.5 and RHO=0.9.

3.0.6 Question

With RHO= 0.5 and BETA=0.5, compare simulated data (mean, standard deviation and plotted time series) for ALFA=2 and ALFA=0.5.

3.0.7 Question

With ALFA= 1.2 and RHO=0.5, compare simulated data (mean, standard deviation and plotted time series) for BETA=0.0 and BETA=2.

4 The transmission of Monetary Policy

5 The yield curve

5.0.8 Question

Write the Taylor rule and the expectation hypothesis of long term interest rates (EHIR)

5.0.9 Question

If the inflation target is at 2% and the equilibrium real interest rate is also at 2%, at what level should the short-term interest rate should be, on average over the long run.

5.0.10 Question

The table gives the mean level of US interest rates of various maturities in months for the following 4 periods: 1980s, the 1990s, the 2000s and since 2009.

What can explain the differences in the 3 month interest rates across periods?

Would the EHIR predict that periods of lower short term interest rates should correspond to periods of lower long term interest rates? Is this the case?

5.0.11 Question

Would the EHIR predict that long term interest rates are superior to short term interest rates on average?

Why would investors request a higher level of interest rates at longer maturities?

5.0.12 Question

In what situation could you expect short-term interest rates to be superior to long-term interest rates?

5.0.13 Question

The table gives the mean level of Japanese interest rates of various maturities in months for for the following 4 periods: 1980s, the 1990s, the 2000s and since 2009.

Can the Taylor rule help understand the collapse in Japanese interest rates?

5.0.14 Question

US 3, 60, 120 months interest rates are currently at 0.0, 0.8 and 1.9 % respectively, while inflation and growth are also close to 2%. Is the level of the yield

curve unusual? Is the slope of the yield curve unusual? What does this say about the effects of the quantitative easing policy of the Federal Reserve?

5.0.15 Question

Using the Taylor rule and the EHIR, explain why forward guidance policies can influence the level of long term interest rates only if the central bank commits to in the future, deviate from its usual response to inflation.

5.1 Reading Dedola and Lippi's "Inside the black box by looking at industry level data" EER 2005

5.1.1 Questions on figure 1

What do these 25 chart represent?

Is this a money supply shock?

What is the timing of the impact of MP on economic activity, prices, asset prices?

5.1.2 Which industry should be more affected by MP and why?

Where do we have striking evidence across industry?

What is the evidence reported in Table 4 and Table 5

What does Table 7 tell about cross countries differences in the impact of MP

What is the impact of firms' size? Why?

Is the coefficient on Leverage surprising?

5.2 Reading Ciccarelli, Madaloni and Peydro's "Trusting the bankers" ECB WP

5.2.1 Question: Evidence on the role of credit demand and credit supply following monetary policy shocks

What is the BLS? See the appendix

Why is it important for central banks?

Why would you trust/distrust the BLS?

How should Figure 3A and 3B influence your judgement?

5.2.2 Question: Is monetary policy transmission dependant on bank credit?

Where do you find answers in the paper?

Are the effects larger through business, mortgage or consumer loans?

5.2.3 Question: How important have credit shocks been in the 2009 recession?

Where do you find an answer?

Comment

6 ZLB and the response of monetary policy

6.0.4 Exercise: analyse the effects of monetary policy decisions and comments on the asset prices during the 12 ECB press conferences given in 2013

The data of minute by minute market prices on various assets for the days of the ECB pres conferences will be sent by email a week before the PC.

7 Financial intermediation

7.1 Calibration of the Holmstrom-Tirole model

7.1.1 The model set up

3 agents, firms who borrow to invest in risky projects; banks who collect deposits and grant loans to firms and uninformed investors.

Firms have projects that cost $I = 1$ and return $R = 1.1$. Good firm projects have high probability p_H of generating R . bad firm project have low probability p_L of generating R .

Moral hazard: firms can choose a bad project that gives a private benefit $B = 0.05$; however, this private benefit can be reduced to $b = 0.02$ in case banks can incur a cost $C = 0.01$ of auditing the firm.

Uninformed investors can earn a risk free alternative return of $\gamma = 1.01$, while banks can earn $\beta = 1.02$.

We assume that only good projects have positive net value, i.e.

$$p_H R - \gamma I > 0 > p_L R - \gamma I + B$$

Finally, firms have more or less of their own capital A to invest in their projects.

7.1.2 Question: propose values for p_H and p_L , such that the above constraints are valid.

Direct finance (no bank involved)

Uninformed investors are offered R_u for an I_u investment. But the residual return that accrue to the firm has to be large enough, **the incentive compatibility constraint** is given by

$$\begin{aligned} p_H(R - R_u) &> p_L(R - R_u) + B \\ R_u &\leq R - \frac{B}{\Delta p}, \Delta p = p_H - p_L \end{aligned}$$

The **individual participation constraint for investors** implies

$$\begin{aligned} p_H R_u &> \gamma I_u \\ I_u &\leq \frac{p_H R_u}{\gamma} \leq \frac{p_H}{\gamma} \left[R - \frac{B}{\Delta p} \right] \end{aligned}$$

Hence, a project can be financed only if the entrepreneur can cover the $I - I_u$ gap.

$$A + I_u > I$$

$$A \geq \bar{A}(\gamma) = I - \frac{p_H}{\gamma} \left[R - \frac{B}{\Delta p} \right]$$

Assume $p_H = 0.95$ and $p_L = 0.85$, what would be admissible ranges for R_u , and at what level would $\bar{A}(\gamma)$ be?

$$R_u \leq R - \frac{B}{\Delta p}$$

$$p_H R_u > \gamma I_u$$

$$I_u \leq \frac{p_H R_u}{\gamma} \leq \frac{p_H}{\gamma} \left[R - \frac{B}{\Delta p} \right]$$

7.1.3 Indirect finance, through a financial intermediary

Assume $p_H = 0.95$ and $p_L = 0.85$, $\beta = 1.02$, what would be admissible ranges for R_m , and at what level would $\bar{A}(\gamma, \beta)$ be?

The incentive compatibility constraint of the firm:

$$p_H(R - R_m - R_u) > p_L(R - R_m - R_u) + b$$

$$R_m + R_u \leq R - \frac{b}{\Delta p}$$

The incentive compatibility constraint of the bank:

$$p_H R_m - C \geq p_L R_m$$

$$R_m \geq \frac{C}{\Delta p}$$

Assuming β is the reservation (alternative) return that the bank can have on financial markets, and firms always exhaust direct finance before turning to banks:

$$\begin{aligned}
R_m &= \frac{C}{\Delta p} \\
I_m(\beta) &= \frac{p_H R_m}{\beta} = \frac{p_H C}{\beta \Delta p} \\
R_m + R_u &\leq R - \frac{b}{\Delta p} \\
R_u &\leq R - \frac{C+b}{\Delta p} \Rightarrow I_u \leq \frac{p_H}{\gamma} \left[R - \frac{C+b}{\Delta p} \right] \\
R_u &\leq R - \frac{C+b}{\Delta p} \\
I_u &\leq \frac{p_H}{\gamma} \left[R - \frac{C+b}{\Delta p} \right]
\end{aligned}$$

Incentive compatibility constraints of the uninformed investors that lend to the banks who lend to the firms

A larger proportion of firms (with lower level of initial capital) could be in a position to see their project financed as:

$$\begin{aligned}
A + I_u + I_m &> I \\
A &\geq \underline{A}(\beta, \gamma) = I - I_m(\beta) - \frac{p_H}{\gamma} \left[R - \frac{C+b}{\Delta p} \right]
\end{aligned}$$

We hence have 3 categories of firms depending on their own level of capital A :

1. $A < \underline{A}(\beta, \gamma)$ no financing
2. $\underline{A}(\beta, \gamma) < A < \bar{A}(\gamma)$: bank financing
3. $\bar{A}(\gamma) < A$: direct finance.

Now assume that the economy is populated by 100 investors of which the wealth is distributed as described in the table and compute aggregate investment for of the following 3 cases

	Case A	Case B	Case C
1	20	0	5
0,5	20	25	5
0,3	20	25	10
0,2	20	20	30
0,1	20	50	50

What would be the effect of increasing γ to the same level as β ?

In 1984, France developed financial instruments for direct finance, facilitating the access of non financial corporation to the bond market. What parameter of the model would illustrate this reform. What would this imply on aggregate investment?

7.2 Liquidity risk

How much to engage into maturity transformation activities: choosing the amount of an **illiquid** investment I that will pay θI at time 2

The bank finances a fraction m of the investment with short term maturity than need to be rolled over at period 1 and $(1 - m)$ with long term debt, for an R . Instead, the roll over debt cost is only $R - \Delta$.

7.2.1 Question

What is the payoff of maturity transformation?

A natural feature for the competitive equilibrium to exist is that

$$R - m\Delta < \theta < R$$

The form of liquidity risk With probability p , bad state at period 1 and some banks won't be able to service (reimburse) short-term debt.

Given that the dividends are uniform, the proportion of banks in distress in the bad state is mI/K , a proxy of short term debt to capital.

Key assumption: for any bank, the deadweight costs of distress is increasing in the fraction of banks in distress (fire sale externality)

The fraction of bank in distress in the bad state will depend on \bar{I} , the average of maturity transformation across all banks. We hence assume that for each bank, the deadweight cost is $Z = \gamma\bar{I}$.

The net expected profit for each bank is:

$$\Pi = I(\theta - R + m\Delta) - \frac{pmI\gamma\bar{I}}{K}$$

7.2.2 Question

Derive the level of investment I which maximises the profit of the individual bank which ignore the effect of its decision on aggregate investment \bar{I} ?

7.2.3 Question

Taking the view of the social planner, derive the level of investment I which maximises the profit, now taking into account the effect of its decision on aggregate investment \bar{I} ? Compare with the previous level of investment and discuss.

7.2.4 Question

Consider now that the government wants to create incentives for banks to internalize the social costs of excess roll over risks. How can he proceed? Show how this policy would bring, by affecting the decision of individual banks, the level of investment to the one chosen by the social planner.

7.3 Stress tests I: List of questions on Acharya and Steffen

What is the total asset of the sample of banks studied?

How does it compare to the total assets of banks in the ECB monetary statistics (see the ECB Monthly Bulletin statistics)?

What is risk weighted asset? Why would banks manipulate RWA and in what direction? Which banks and banking systems have the most extreme RWA?

How does the unstressed capital shortfall relate to the ECB AQR?

Describe the 4 measures of capital used in the paper.

Tables 1 to 3:

which countries have the largest banking system relative to their GDP?

How large would the French banking system contribute to France GDP?

Elaborate an answer drawing on reasonable hypotheses regarding return on banks assets and costs of bank funding.

What should return on equity be for French banks with these assumptions?

Compare the market capitalization of banks in Table 3 to the euro area MFI capital in monetary statistics for the euro area?

Explain the stress tests performed in the article.

7.4 Stress tests on bank's assets, and bank's balance sheet II

In the spirit of Greenwood, Landier and Thesmar, take the euro area MFI balance sheets from the ECB Monthly bulletin statistical appendix and assess the effects of various scenarii. Assume that securities other than shares are 5 years government bonds, loans to households are also 5 year fixed interest rate contracts, deposits pay no interest rates. Ignore stocks and other assets/other liabilities.

7.4.1 Question: an increase of the short-term interest rate of 1%, every thing else equal

7.4.2 Question: an increase of the long-term interest rate of 1%, every thing else equal

7.4.3 Question: a decrease of the entire yield curve of 1%

7.5 Bank's capital and credit risk

Assume 2 banks that are ex ante identical that both have 10 of capital, 100 of deposits and subject to reserve requirements of 10% of their deposits. Assume also that they can either grant loans of size 1 or buy risk free bonds of size 10. The 2 banks are small with respect to very large ppols of available bonds and loans.

7.5.1 Question

How much can they lend either in the form of loans or of bonds?

7.5.2 Question

Assume they initially split equally their loanable funds into loans and bonds and that loans are repaid with probability 0.9. If banks are risk neutral and the interest rate on bonds is 5%, what should be equilibrium interest rate on loans?

7.5.3 Question

Assume we enter a recession and the probability that loans are repaid drops to 0.8. What is the maximum proportion of loans that insulates depositors from a loss?

7.5.4 Question

Assume now that capital requirements are proportional to the size of loans portfolio. What ratio would you suggest if credit risk is 10% on average throughout the business cycle? If credit risk decreases to 5% in normal times and increases to 20% in recessions and the recessions occur every 10 periods, what level of capital requirement would you suggest? What would it imply for the required return on deposits?

7.5.5 Question

Consider that one of the two banks has a shortage of 50 loans opportunities and cannot buy bonds. Show how the interbank market can prevent collapse of the aggregate assets of the banking system.

7.5.6 Question

In the event the interbank market collapses, show how the central bank can prevent the collapse of the loans.

7.6 Implicit guaranties of the banking sector and sustainability of public debt

Consider 2 countries C and D, units are billion euros

	C	D
GDP	100	20
Bank assets	100	100
Bank capital	5	5
Public debt	80	15
Pub. debt of C held by banks	30	20
Pub. debt of D held by banks	0	10

7.6.1 Questions

Assuming all non public debt assets are either loans to households/firms or loans to the banking system of the other country and all liabilities are deposits that pay the interest rate set by the central bank,

1. how much can each banking system lend to households/firms or to the other banking system?
2. if the central bank interest rate is 2% and the return on public debt is 3%, write the return on equity of each banking sector as a function of the interest rate on loans, assuming these are risk free.
3. Assume now that banks have to hold 5% of capital on each unit of loans to the private sector or to the banking sector. What is the maximum they can lend? What if capital requirements increase to 10% of the loan portfolio? What would be the effect on the demand of banks for public debt.
4. Assume now that the loan portfolio of banks in country D is subject to large losses which will be comprised between 10 and 30%. In order to prevent a run of depositors, the government of country D decides to guaranty deposits of its banks. By how much does this increase the liability of the sovereign in country D? Is it problem?
5. What happens if the banking sector of country D tries to shed assets instead? How can it impact country C? Distinguish the case where the price of public debt is not affected and when it is.
6. Assume banks have to hold 10% of bank loans as capital and that each billion of public debt sold by banks induces a decline of 0,5%. What are the effects of the banking sector of country C selling half of its public debt.