



NTNU – Trondheim
Norwegian University of
Science and Technology

Department of Economics

Examination paper for SØK2009 International Macroeconomics

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Exam SØK2009 International Macroeconomics

The exam consists of two questions. You are expected to answer both. The first question counts for 35 percent and the second question for 65 percent of the total evaluation.

1. Discuss how the US dollar/yen exchange rate is affected by a monetary expansion in the US. We assume that the prices are fixed. Give also a few arguments outside the model why the US would expand its monetary policy.
2. The debt crisis in Euro area has reduced the economic activity in many European countries; if the slump is considered to be temporary what economic advice may the IMF give to France in order to restore its economy? *Hint: Take use of derivations in question 1*

BOKMÅL

Eksamen SØK2009 Internasjonal makroøkonomi

Eksamen består av to oppgaver. Det er forventet at du besvarer begge. Oppgave en teller 35 prosent og oppgave to teller 65 prosent av den totale evalueringen.

1. Diskuter hvordan US dollar/yen valutakursen blir påvirket av ekspansiv pengepolitikk i USA. Vi antar faste priser. Gi også noen få argumenter utenfor denne modellen for hvorfor USA kan ønske å benytte ekspansiv pengepolitikk
2. Gjeldskrisen i Euroområdet har gitt lavere økonomisk aktivitet i flere europeiske land. Hvis dette er antatt å være en kortsiktig konjunkturedgang, hvilket råd kan IMF gi til Frankrike for at de skal gjenopprette aktiviteten i økonomien? *Hint: Benytt utledningene i oppgave 1 også i denne bevarelsen.*

NYNORSK

Eksamen SØK2009 Internasjonal makroøkonomi

Eksamen består av to oppgåver. Det er venta at du svarar begge. Oppgåve ein tella 35 prosent og oppgåve to tella 65 prosent av den totale evalueringa.

1. Drøft korleis ekspansiv pengepolitikk i USA verkar på US dollar/yen valutakursen. Me går ut frå at prisane er faste. Gje òg nokre få argument utanfor denne modellen om kvifor USA kan ynskja og nytta ekspansiv pengepolitikk.
2. Gjeldskrisa i Euroområdet har gitt lægre økonomisk aktivitet i fleire europeiske land. Dersom ein går ut frå at dette er ein kortsiktig konjunkturedgang, kva råd kan IMF gje Frankrike for at dei skal gjenoppretta aktiviteten i økonomien? *Hint: Bruk utgreiingane frå fyrste oppgåva i dette svaret òg.*

Comment to SØK2009 Exam Autumn 2015

Candidate: 10113

Task 1

The student has given a good discussion of the equations to the model with an analytical derivation of the slopes. The mechanism that brings the model into equilibrium is explained. As well as the effect of the monetary policy shock.

The results are discussed and a highlight of this task is the discussion of the monetary policy trilemma.

The weak point of this task is the lack of clearly stated assumption that this model builds on.

Task 2

A short discussion of why the AA-DD model is suited to solve this problem would have improved this exam paper. Further, a better line-up of the equations would have strengthened the exam paper. The paper is rescued by an excellent discussion the output market and how the DD-schedule is derived. The discussion of the policy shocks is good.

The task finishes off by discussing the OCA theory. This shows that the student has understood the task and has a good overview of the literature.

Summary

In spite of lack of some formalities I normally expect included in the best exam papers, this exam scores top because of a solid discussion of the course literature, including both the monetary policy trilemma and the OCA theory. The discussion shows that no model is able to answer every question, so several models may often be used to analyze a problem.

Joakim Blix Prestmo, 1st of April 2016

Task 1)

To discuss this we start by deriving the models that give equilibrium in the foreign exchange market, and in the money market, (in the short run).

↑ as we assume prices are fixed!

Foreign exchange market:

Uncovered interest parity (UIP) holds:

$$R_{\$} = R_{¥} + \frac{E_{\$/¥}^e - E_{\$/¥}}{E_{\$/¥}}$$

Where, $R_{\$}$ - US interest rate

$R_{¥}$ - Japanese interest rate

$E_{\$/¥}$ - exchange rate between dollars and yens

$E_{\$/¥}^e$ - expected future exchange rate between dollars and yen.

The exchange rates are further defined as:

$$E_{\$/¥} = \frac{P_{us}}{P_{j}}, \text{ where}$$

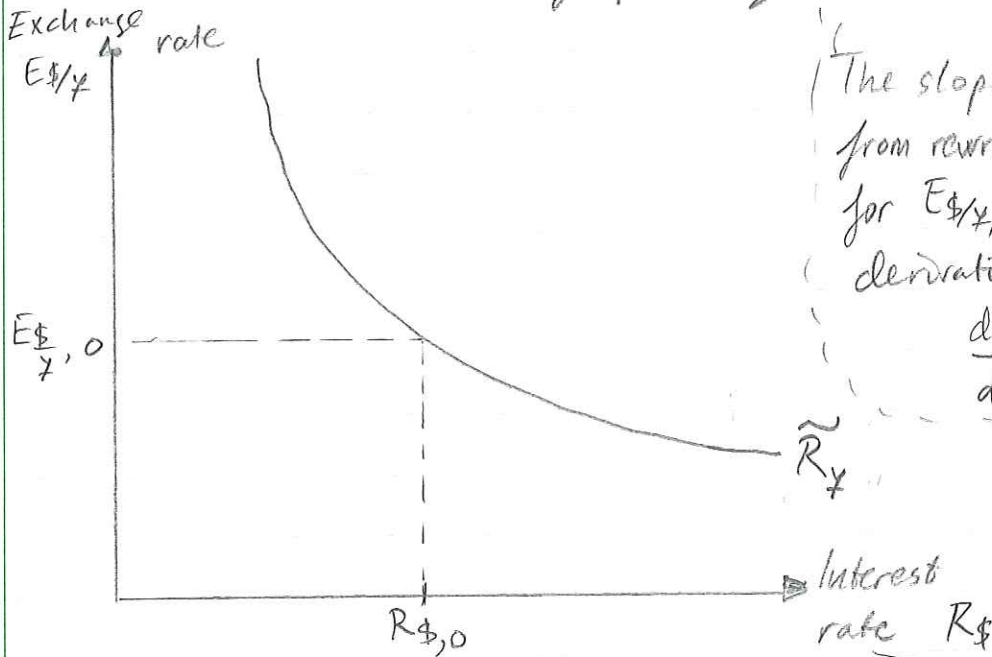
P_{us} - price level in the US

P_{j} - price level in Japan.

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Task 1 cont'd

We can show the relationship between the exchange rate and interest rate graphically:



The slope is found from rewriting UIP, solving for $E_{\$/\text{¥}}$, and taking the derivative:

$$\frac{dE_{\$/\text{¥}}}{dR_{\$}} < 0$$

The curve shows the expected return on yen holdings in dollar terms, $\tilde{R}_{\text{¥}} = R_{\$}$

Equilibrium in the foreign exchange market exists when the interest rate: $R = R_{\$,0}$

and the exchange rate: $E_{\$/\text{¥}} = E_{\$/\text{¥},0}$

We have now derived the short run equilibrium in the FOREX (foreign exchange market), and need to connect ~~to~~ this equilibrium to movements in the money supply.

Task 1 cont'd

We derive the money market equilibrium:

Money market:

Money market equilibrium is given by the relationship between money supply (M^S) and money demand (M^D).
The money market is in equilibrium when:

$$\frac{M^S}{P} = \frac{M^D}{P}$$

As we will look at the US money market, $P = P_{US}$, i.e. the US price level (considered fixed)

The money demand can be found from looking at the real money demand in ~~the~~ the US economy, which will be a function of the output and the interest rate:

$$\frac{M^D}{P} = L(R, Y)$$

The real ^{money} demand function $L(R, Y)$, where R - interest rates
 Y - output

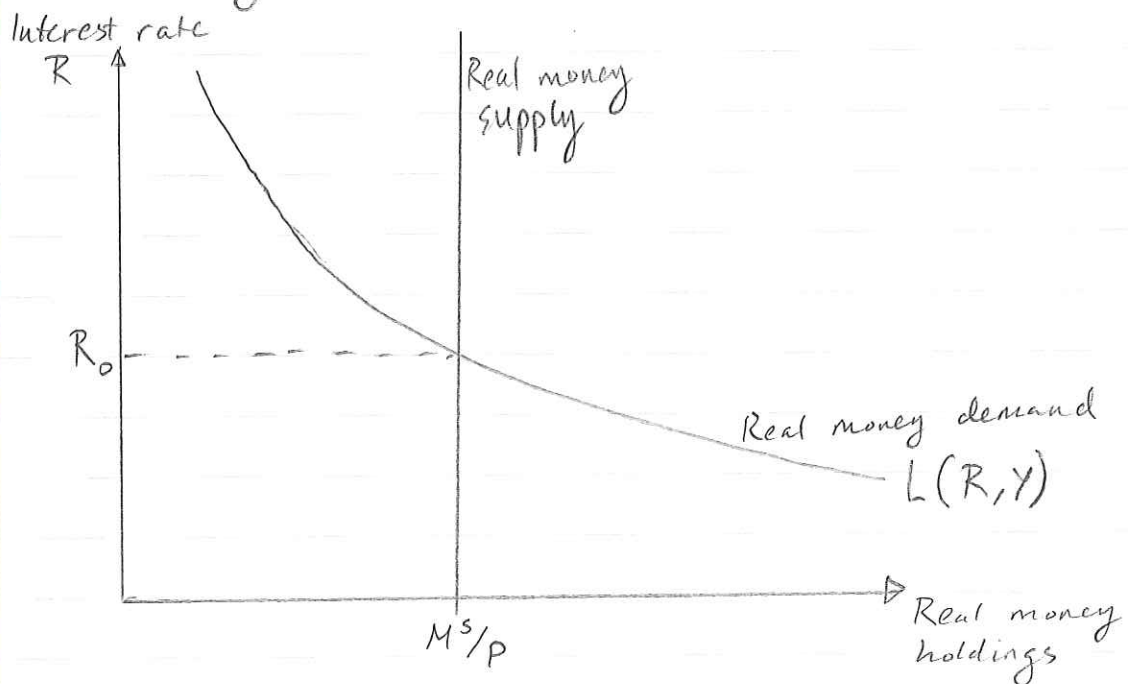
Thus, the equilibrium money market condition becomes:

$$\frac{M^S}{P} = L(R, Y)$$

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Task 1 cont'd:

The relationship between the interest rates and the real money holdings in the economy can be shown graphically, with the equilibrium given at the intersection of the real money supply and the real money demand:



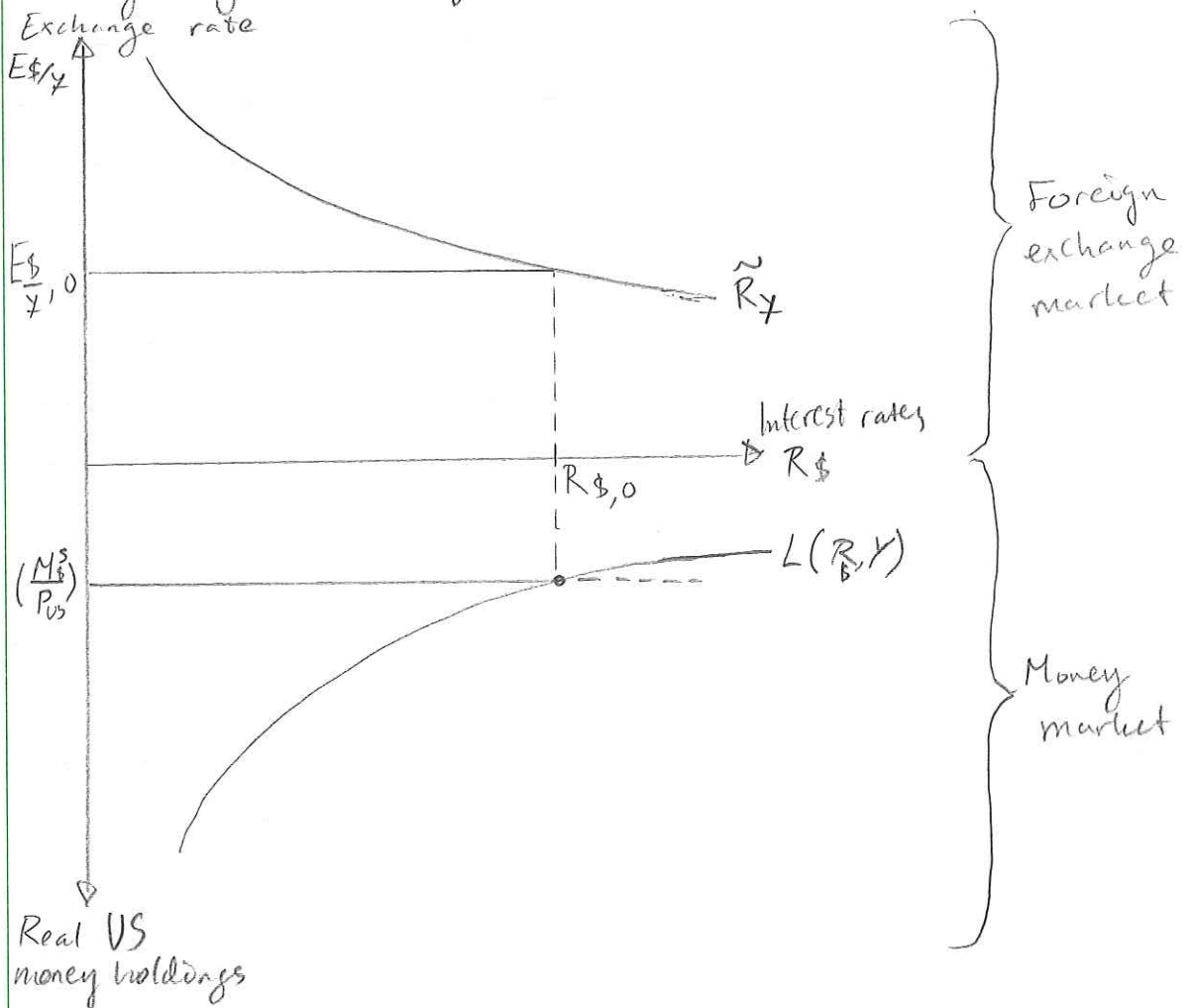
Connecting this to our specific problem, we can note that R_0 here, should be equal to $R_{\$}$ found in the derivation of the foreign exchange market!

Thus, taking the inverse of this relationship, essentially tilting/rotating the graph above 90° , we can show how a simultaneous equilibrium in the money market and the foreign exchange market must hold.

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Task 1 cont'd:

Simultaneous equilibria in the money market and the foreign exchange market:



Now, we can analyse the effect of the ~~expansive~~ monetary expansion in the US economy and its relationship to the $E_{\$/\text{¥}}$.

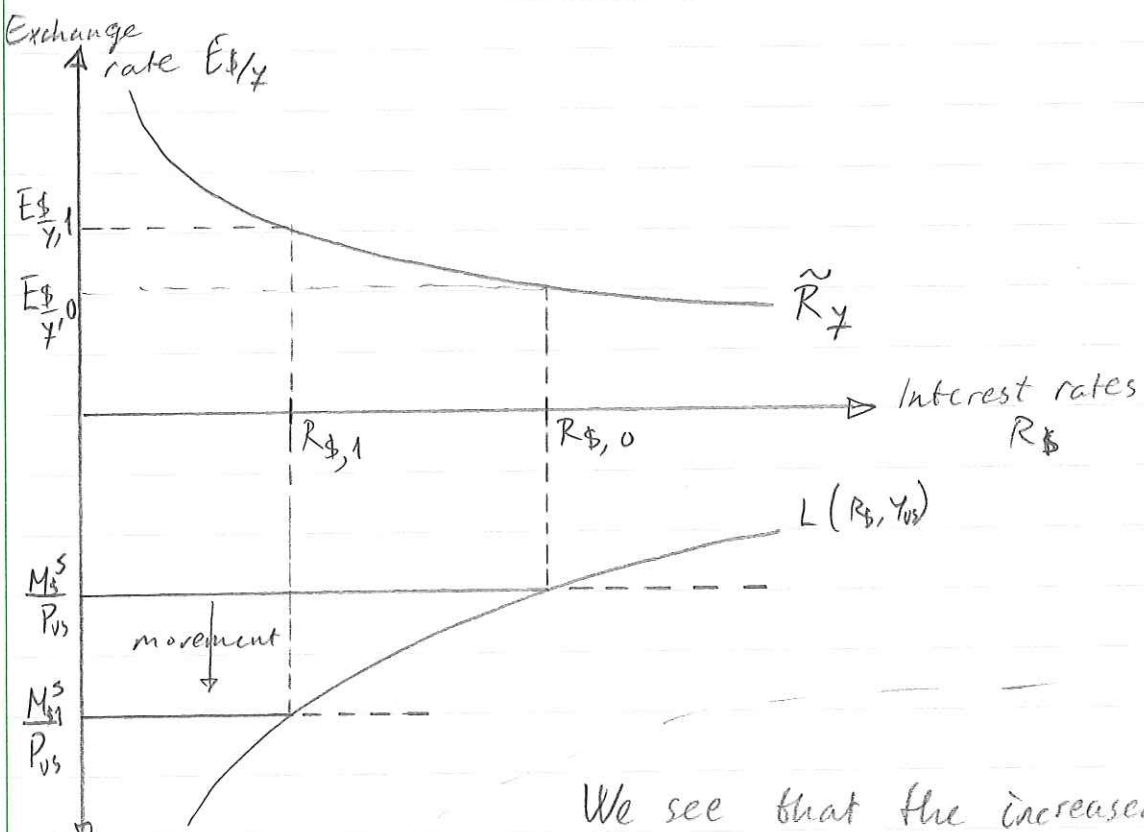
- Monetary expansion $M_{\$}^S \rightarrow M_{\$1}^S \quad M_{\$1}^S > M_{\S
- Real money supply goes up $\left(\frac{M_{\$}^S}{P_{us}}\right) \rightarrow \left(\frac{M_{\$1}^S}{P_{us}}\right) \quad \frac{M_{\$1}^S}{P_{us}} > \frac{M_{\$}^S}{P_{us}}$

We show this in the figure on the next page!

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Task 1 cont'd:

$$\frac{M_{\$}^S}{P_{\$}} \rightarrow \frac{M_{\$1}^S}{P_{\$1}} \quad \frac{M_{\$1}^S}{P_{\$1}} > \frac{M_{\$}^S}{P_{\$}}$$



We see that the increased money supply drives the interest rate $R_{\$}$ down from $R_{\$,0}$ to $R_{\$,1}$. This causes an increase in the exchange rate from $E_{\$/¥,0}$ to $E_{\$/¥,1}$. In other words, the dollar depreciates against the yen!

The economic intuition behind this depreciation can be explained as follows:

- The increase in money supply causes supply to exceed demand. When supply exceeds demand, the return on US dollar holdings will fall. When the return on US dollars fall, it is essentially the interest rate falling! Falling interest rates lead investors to seek more profitable assets than dollars,

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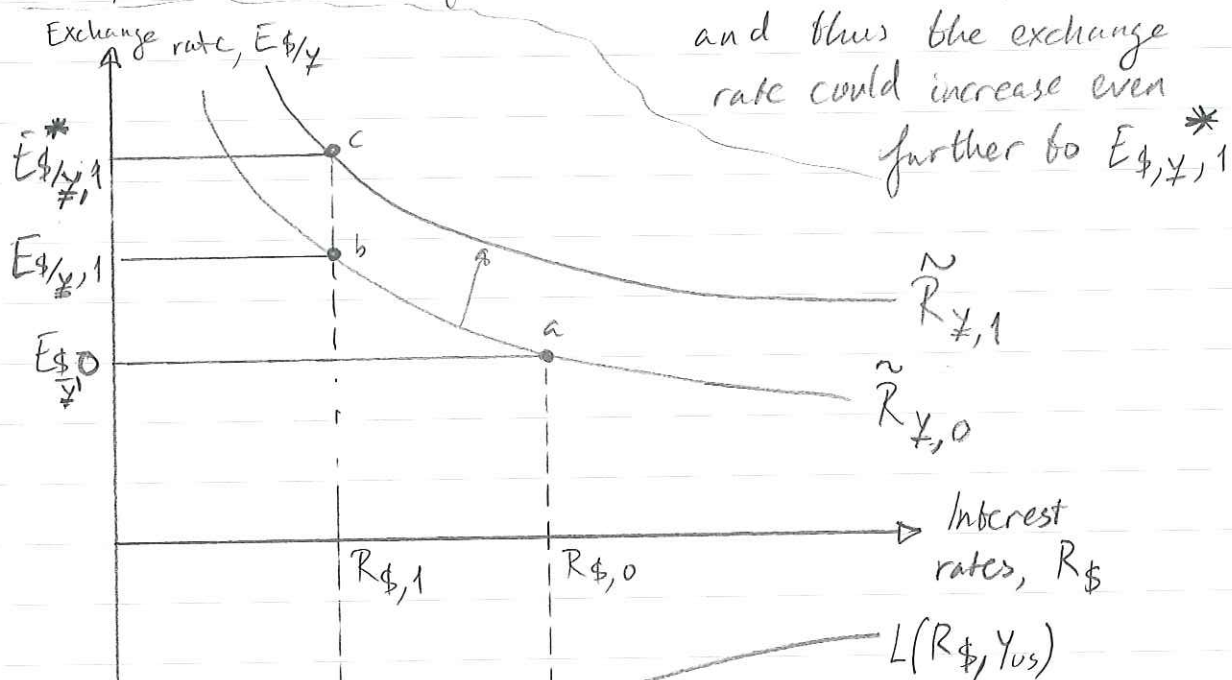
Task 1 cont'd

thus causing a fall in price of dollars in terms of yen.
This effect is the increase in exchange rates i.e. depreciation of dollars. It may also be that the expectations of investors change due to the monetary expansion:

Thus $E_{\$/\text{¥}}^e \uparrow$ from $E_{\$/\text{¥},0}^e \rightarrow E_{\$/\text{¥},1}^e$

This will cause an increase in expected return on foreignly held deposits in dollar terms, i.e.

$\tilde{R}_{\text{¥}}$ increases from $\tilde{R}_{\text{¥},0}$ to $\tilde{R}_{\text{¥},1}$,



Thus, the foreign exchange market equilibrium may move not only from a to b, but even further to point c due to a change in expectations!

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Task 1 cont'd:

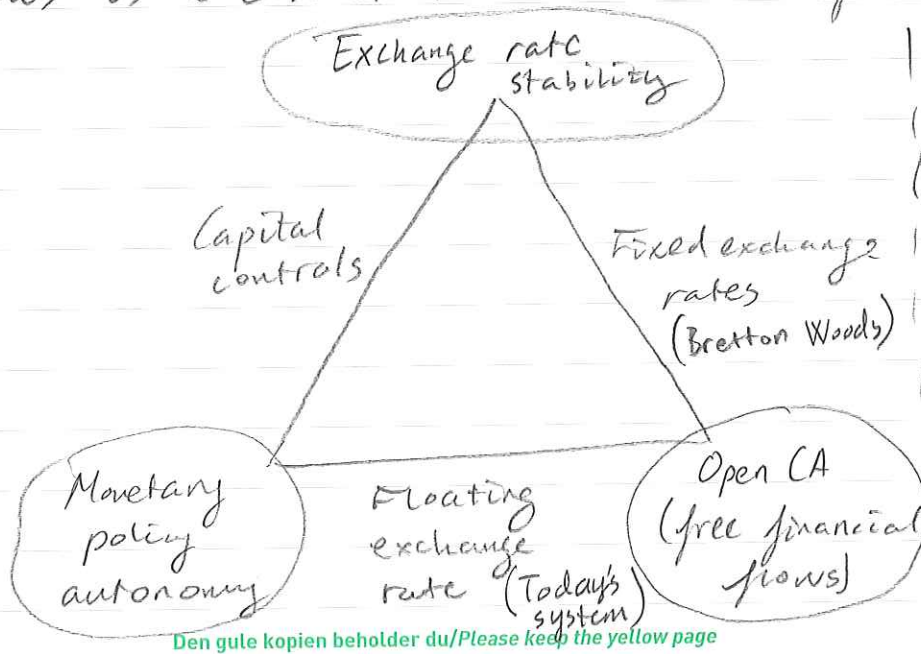
Finally, we point to reasons for leading expansive monetary policies:

- An initial decrease in output, i.e. $L(R, Y) \downarrow$

This is what expansive monetary policies were used for after the financial crisis of 2007-2008, (Quantitative Easing).

• In cases, where there is a fixed exchange rate. Typically not a problem for the US, as it has been used as a reserve currency. Under the Bretton Woods regime and other Reserve Currency systems, we get a problem that all other countries need to follow the lead of the Reserve Currency, ^(US) in order to peg the exchange rate. This is called the Nth currency problem, and justifies a case where monetary policies are used not to achieve some internal goal, but rather to maintain an exchange rate stability.

This is a case of the trilemma of open economies:



In essence, it is only possible to have two out of three corners at the same time.

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Task 2)

To answer this question, we develop the AA-DD model which relates the equilibria of the goods and service market and the asset market. We start by looking at aggregate demand:

Aggregate demand:

$$AD = C_0 + C_1(Y-T) + I + G + CA\left(\frac{EP^*}{P}, Y^*, Y-T\right)$$

Here, AD - aggregate demand

C_0 - baseline, independent consumption

$C_1(Y-T)$ - consumption, as a function of output Y and taxation T .

I - investments

G - government spending

$$CA\left(\frac{EP^*}{P}, Y^*, Y-T\right) = EX\left(\frac{EP^*}{P}, Y^*\right) - IM\left(\frac{EP^*}{P}, Y-T\right)$$

CA - current account is exports EX less imports IM

where

EX - function of exchange rates E , foreign price levels P^* and domestic price levels P

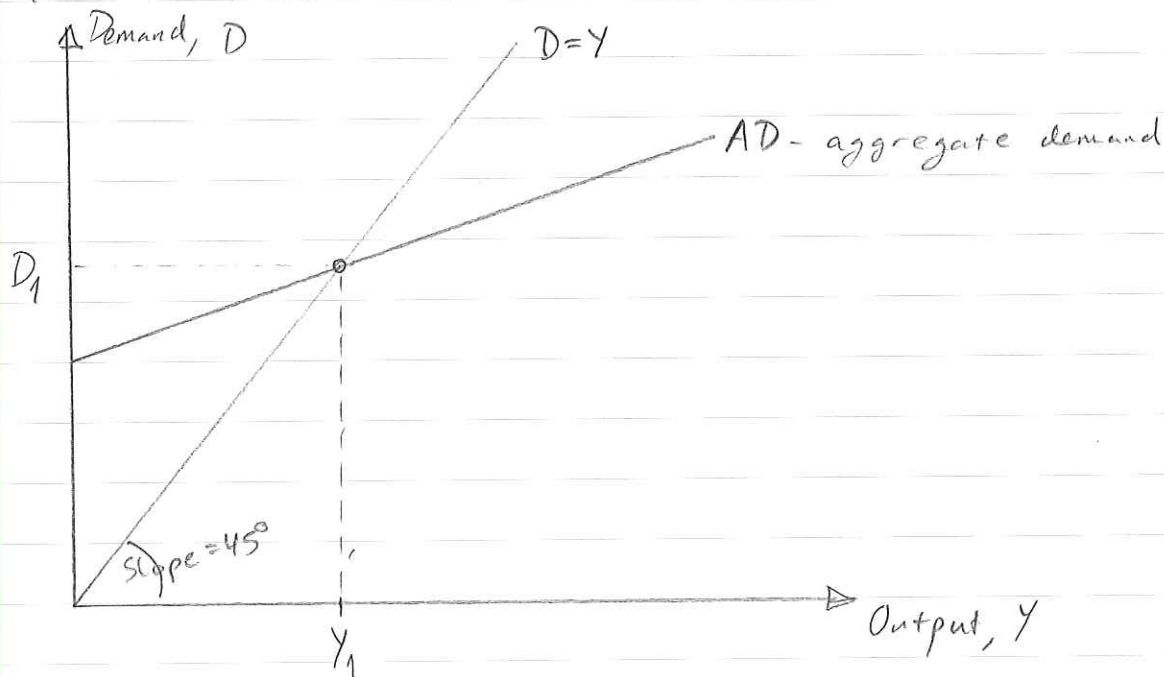
IM - function of E , P^* , P and output Y less taxation T .

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Task 2 cont'd:

Equilibrium in the goods and services market is achieved when $D=Y$, i.e. demand equals output.

This is shown below:



The market for goods and services is in equilibrium at $\{Y_1, D_1\}$

Using this, we can derive the DD-schedule, which relates output and exchange rates. If we rewrite, and take the derivative with respect to E , we find:

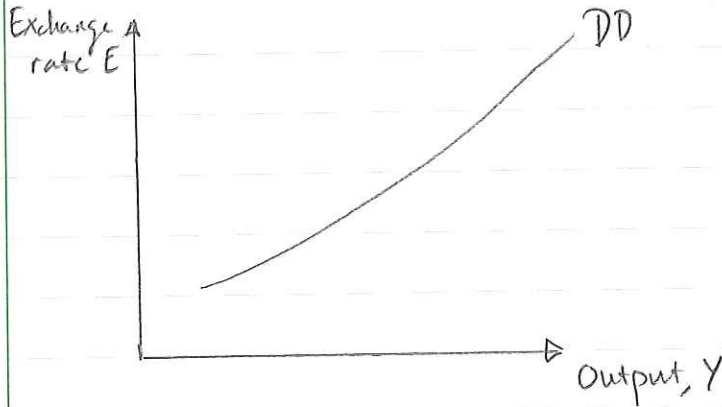
$$\frac{dY}{dE} > 0$$

This thus produces an upward-sloping positive DD-schedule which relates output Y and exchange rate E .

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Task 2: cont'd:

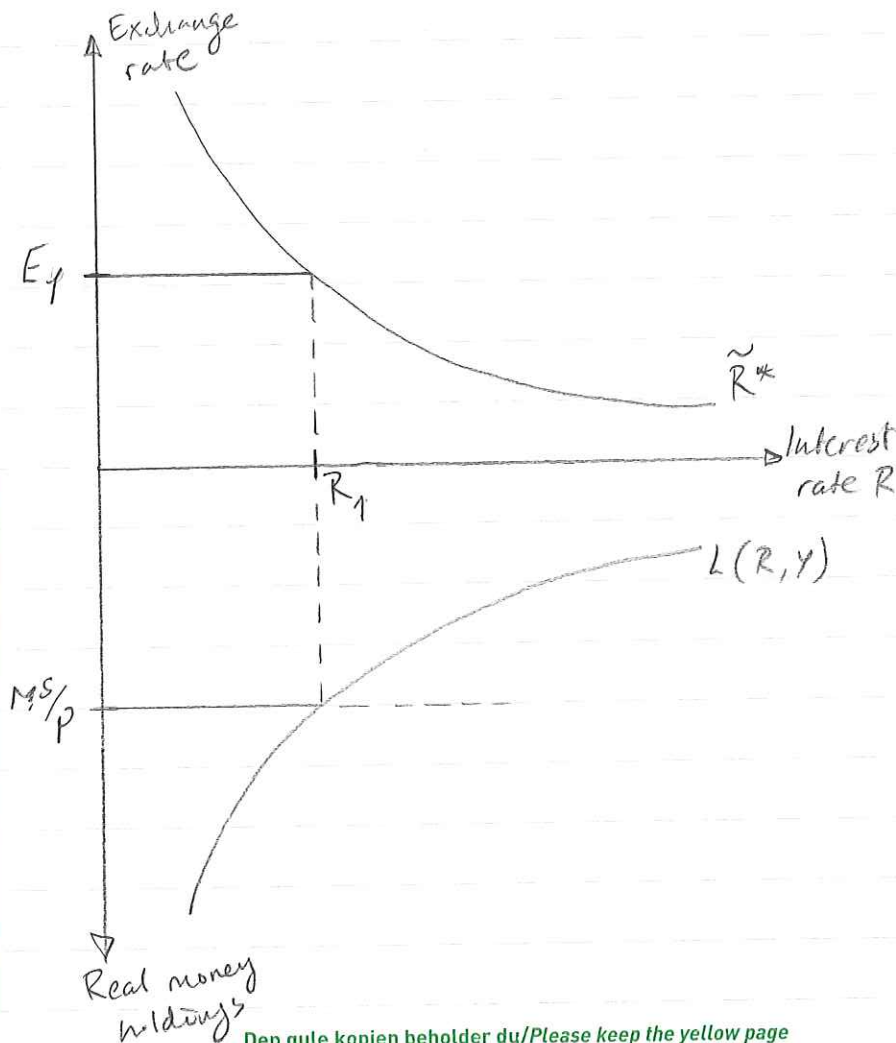
The DD-schedule:



Having derived the DD-schedule for goods and service market equilibrium, we turn to the asset market.

Asset market:

Found in Task 1, that simultaneous equilibria in foreign exchange and money markets, are given by:

$$\frac{M^s}{P} = L(R, Y) \quad \text{and} \quad \text{UIP: } R = R^* + \frac{E^e - E}{E}$$


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Task 2 cont'd:

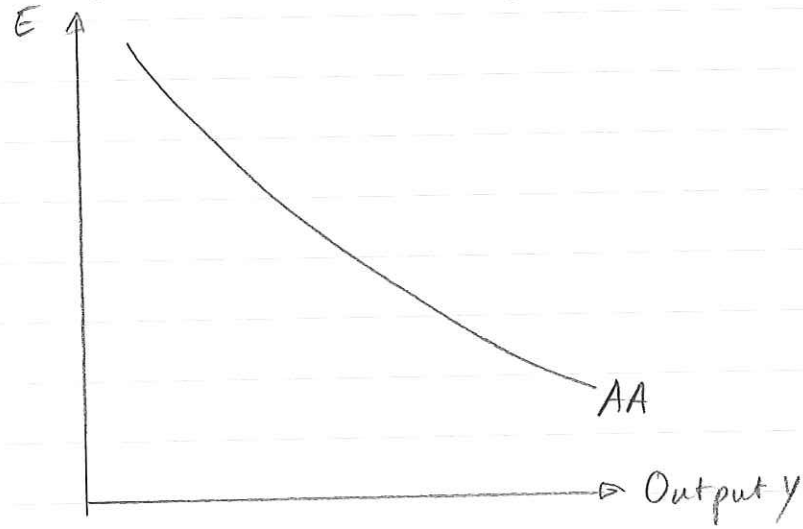
Combining the UIP and money market equilibrium, and solving for Y :

$$\frac{M^s}{P} = L(R, Y) \Rightarrow \frac{M^s}{P} = L\left(R^* + \frac{E^e - E}{E}, Y\right)$$

Solving for Y , and then taking the derivative with respect to exchange rates:

$\frac{dY}{dE} < 0$ ← The derivative will be negative, meaning that the AA-schedule is downward sloping!

AA-schedule:
Exchange rate

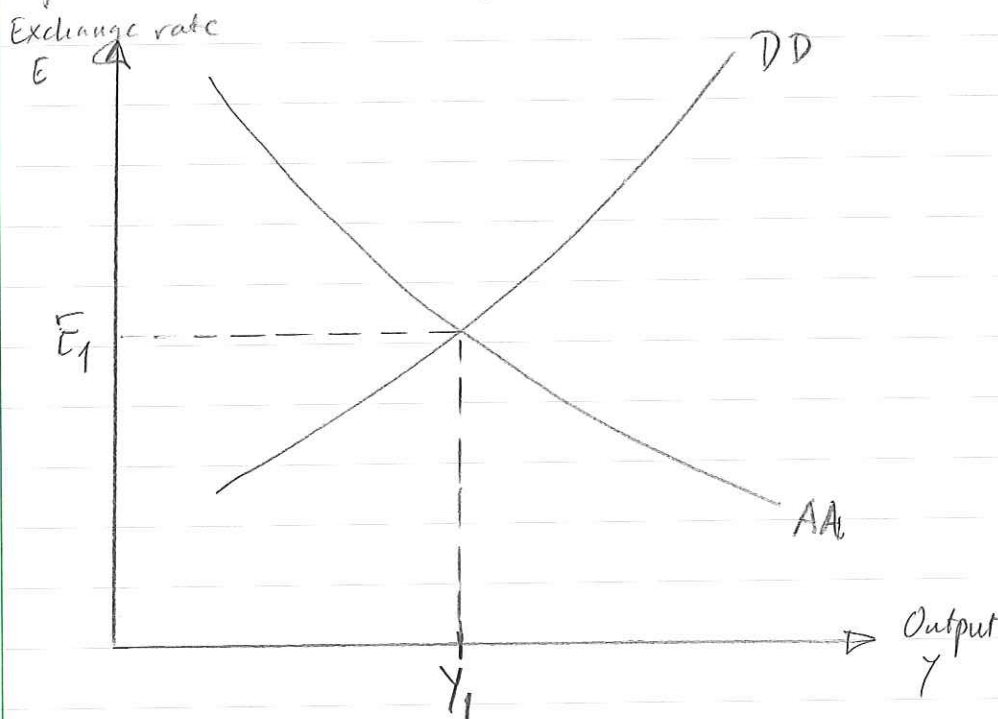


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Task 2 cont'd:

AA-DD model:

We now have the AA- and DD-schedules, and asset market and goods, services market is in equilibrium at $\{Y_1, E_1\}$:



The assumptions for this AA-DD-model are:

- Full information
- Short run (fixed prices)
- No consideration of long term growth
- Perfect asset substitutability (
- All assets are equally risky

Now, that the model has been established, we can analyse the situation in which a slump has reduced the activity level in the French economy.

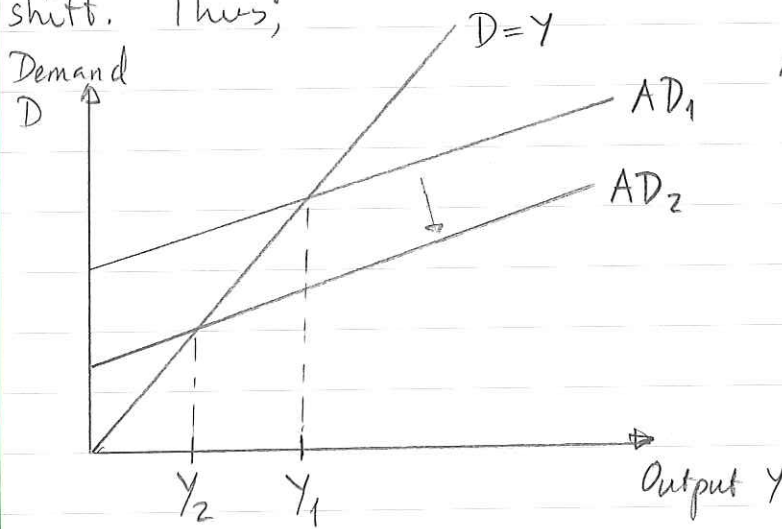
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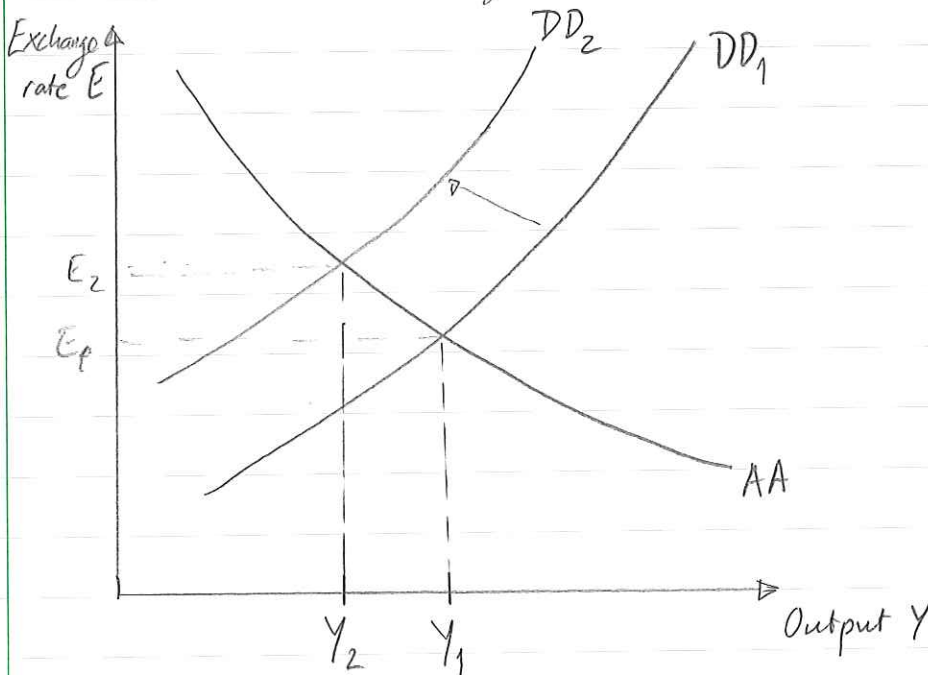
Task 2 cont'd :

The reduction in activity in France can be due to $C \downarrow$, $I \downarrow$, ~~etc.~~ etc. The important thing is that the AD (aggregate demand) will have a negative shift. Thus;



Aggregate demand decreases from AD_1 to AD_2 , causing a shift in output from Y_1 to Y_2

In the AA-DD model, this is shown as a shift in the DD-schedule: from DD_1 to DD_2 .



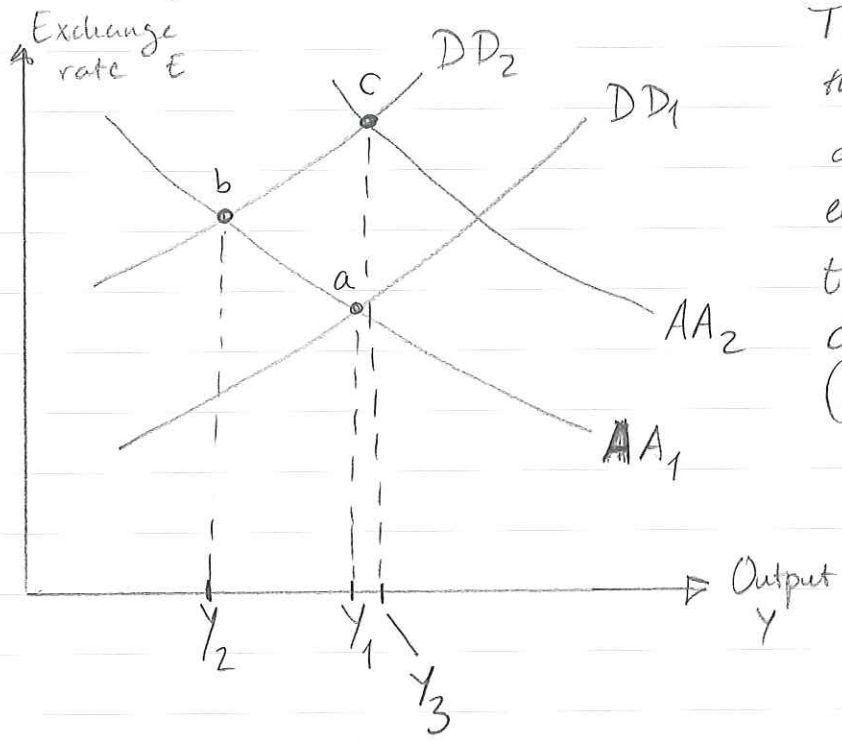
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Task 2 cont'd:

France is a member of the Eurozone, thus it cannot freely use monetary policy to avoid this slump.

However, if the rest of the Eurozone is also in a crisis situation experiencing a slump, then the European Central Bank may intervene, and can expand the money supply.

This will shift the AA-curve right, from AA_1 to AA_2 :



This will increase the output, but create a new equilibrium were the Euro is depreciated. (point C)

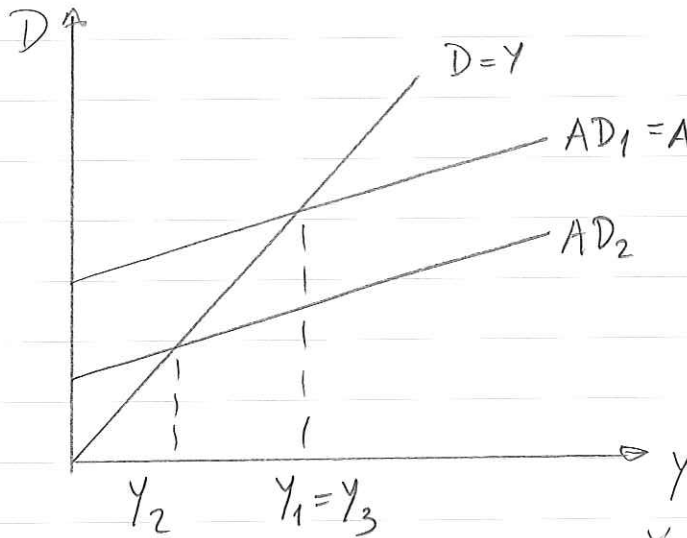
However, this is not up to France, and so we need to seek another solution, which could either be a fiscal solution, where aggregate demand is stimulated; This can be done by:

- Reducing taxes: $T \downarrow$
 - Increasing government spending: $G \uparrow$
- } $AD \uparrow$

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Task 2 cont'd:

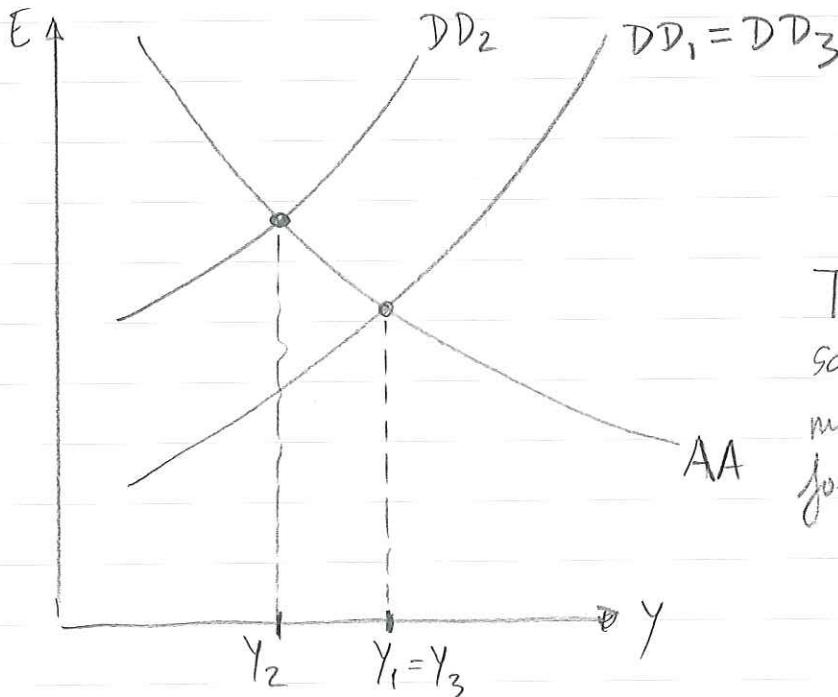
The fiscal solution illustrated on the previous page would have the following effect in the goods and services market:



After the slump where $AD_1 \rightarrow AD_2$, a fiscal expansion is done, increasing AD back, so that we get $AD_1 = AD_3$

This increases output so that $Y_1 = Y_3$

This corresponds to a shift in the DD-schedule from DD_2 back to DD_1 :



The fiscal solution will be my recommendation for France!

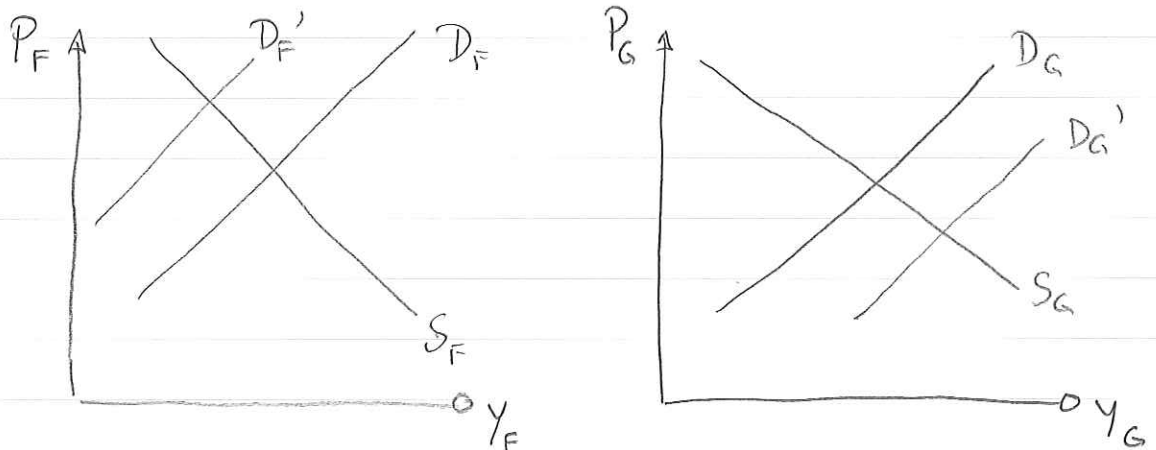
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Task 2 cont'd:

A final comment to this problem is that it highlights the problem of optimum currency areas. As France has a common currency with countries which have quite different fiscal properties, the overall monetary policy will not be an effective means to solve France's monetary policy needs.

even though that theory is for long runs analysis

One could think of a situation where the French slump is due to consumers increasingly preferring German goods over French goods. In Germany, demand would increase, while the opposite is true in France:



Now, Germany would favour contractive policies, while France would favour expansive policies. As the two countries have the same currency, monetary policy can not effectively solve the German overemployment problem, and French underemployment problem simultaneously.

This further strengthens the argument for fiscal policy actions to solve the problem given!