1 a)

In this task I will develop a model combining the foreign exchange market and the money market. This can be explained as a monetary approach to the balance of payments (MBOP)

Assumptions:

- PPP (purchasing power parity) absolute to hold, given by:

$$E_{A/B} = \frac{P_A}{P_B}$$

→ The exchange rate $E_{A/B}$ depends on the price relationship between a reference commodity basket in country A/B, implicating that prices are the same, measured in the same currency:

$$P_A = E_{A/B} \cdot P_B$$

- UIP (uncovered interest parity to hold

$$R = R^* + \frac{E^e - E}{E}$$

→ The interest rate depends on foreign interest rate R^* plus the expected depreciation of the exchange rate

- Equilibrium determined simultaneously in both markets

- Equal risk for deposits/assets, where investors choose the currency giving the largest profit

The foreign exchange market (forex)

The forex market is where currency trading occurs between two countries. This is useful when developing a MBOP, and also to look at fluctuations in the exchange rate, which will be determined in this model. We have 3 equations:

1) $RR\$ = R\$$

2) $RR€ = R€ + \frac{E^e - E}{E}$

3) $RR\$ = RR€$

Endogenous:
$RR€, RR\$, E$

Exogenous:
$R\$, R€, E^e$

$RR€ \neq RR\$$ = return to euro deposits / dollar deposits in rate, $R\$, R€$, Interest rate US/EU, E^e = expected exchange rate between $\$/€$, E = exchange rate between $\$/€$.

Note that subscript $\$/€$ is dropped. Assume US as our "home" country and the EU as our foreign country.

1/ Explains that the domestic rate of return shall equal the domestic interest rate

2/ the rate of return to foreign assets should equal the foreign interest rate, plus the expected depreciation of the exchange rate

3/ Equilibrium condition: In equilibrium both rates of return will meet and equal.

Analytically we solve the model by inserting 1/ and 2/ in to the equilibrium condition 3/

$$R\$ = R€ + \frac{E^e - E}{E} \quad 4/$$

This illustrates the uncovered interest parity cond. (UIP) (assumed holds). Fluctuations between the two interest rates should equal the expected depreciation of E in order for UIP to holds:

$$R\$ - R€ = \frac{E^e - E}{E}$$

To fully solve the model, we solve out for E, which we want to determine.

$$R\$ = R€ + \frac{E^e - E}{E} \quad |\cdot E$$

$$R\$\,E = R€\,E + E^e - E$$

$$E(1+R\$-R€) = E^e$$

$$E = \frac{E^e}{(1+R\$-R€)} \quad 5)$$

This is the equation for our equilibrium interest rate, which should depend upon $R\$$, $R€$ and E^e. We therefore derive E wrp to these exogenous variables

$$\frac{\partial E}{\partial R\$} = \frac{-E^e}{(1+R\$-R€)^2} < 0$$

A higher US interest rate shifts $RR\$ > RR€$, increasing demand and price on USD deposits. This reduces the return. Then is excess EUR deposits, and the exchange rate appreciates to eliminate.

$$\frac{\partial E}{\partial R€} = -E^e(1+R\$-R€)^{-2} \cdot -1 = \frac{E^e}{(1+R\$-R€)^2} > 0$$

A higher euro interest rate increases the supply of dollar deposits, by reducing demand and price. The exchange rate depreciates to eliminate excess supply

$$\frac{\partial E}{\partial E^e} = \frac{1}{(1+R\$-R€)} > 0$$

A higher expected exchange rate leads to a higher

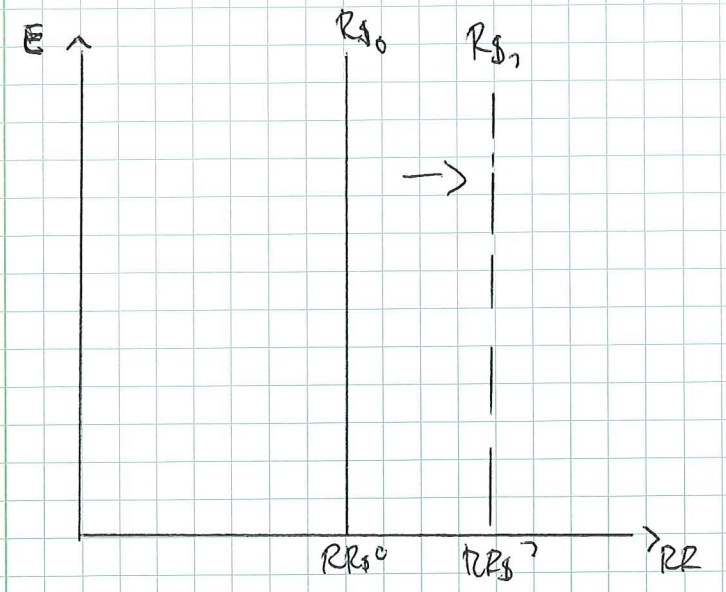
exchange rate through the expectations channel, giving a self fulfilling prophecy.

Graphical solution

Graphically we want a relationship between the return rate ~~to~~ ~~determ~~ and the exchange rate. Our main goal is to determine E. We therefore need $RR_{\$}$ and RRt.

1) $RR_{\$} = R_{\$}$

Since $R_{\$}$ is an exogenous variable (derivative = 0) this will be a vertical line. We illustrate in a RR(x), E(x) diagram:



A higher interest rate shifts $RR_\$ = R_\$$ to the right, giving a higher return for any given level of E.

2/ $RR_€ = R_€ + \frac{E^e - E}{E}$

$RR_€$ depends on E and must therefore be derived wrp to E

$$\frac{\partial RR_€}{\partial E} = 0 + \frac{-1 \cdot E - (E^e - E) \cdot 1}{E^2}$$

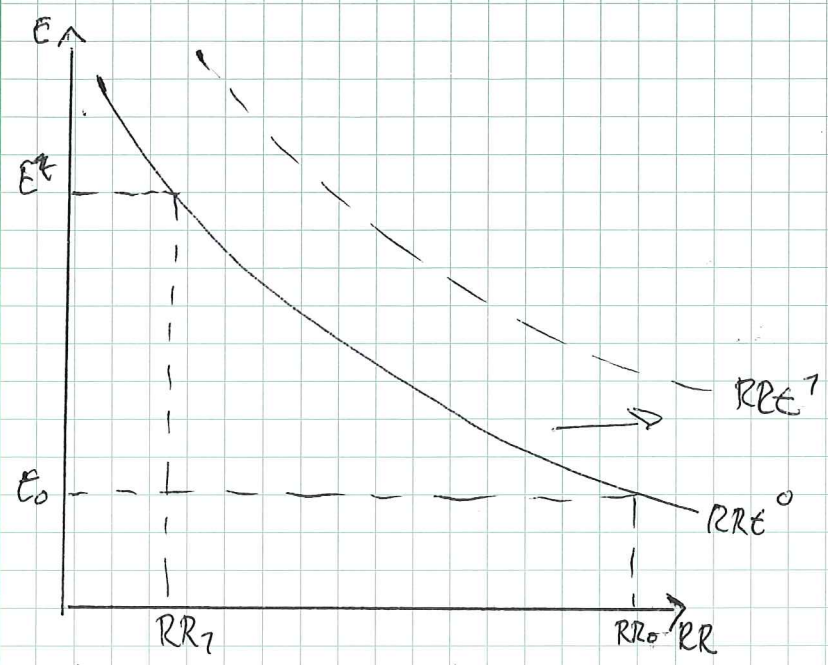
$$= -\frac{E^e}{E^2} < 0$$

This implies a falling curve

$$\frac{\partial^2 RR_€}{\partial E^2} = \frac{2E^e}{E^3} > 0$$

The curve is convex

We can illustrate $RR_€$ in the same diagram used for $RR_\$$.



A high exchange rate, eg E^1 correlates with a low return to euro deposits and vice versa. ~~Since a change in the~~ Changes in the expected exchange rate, E^e, shifts the curve to the right giving a higher return for any E.

Equilibrium

We can now illustrate the equilibrium graphically. Since our condition says $RR_\$ = RR_€$, we can join both curves in the same diagram used earlier.

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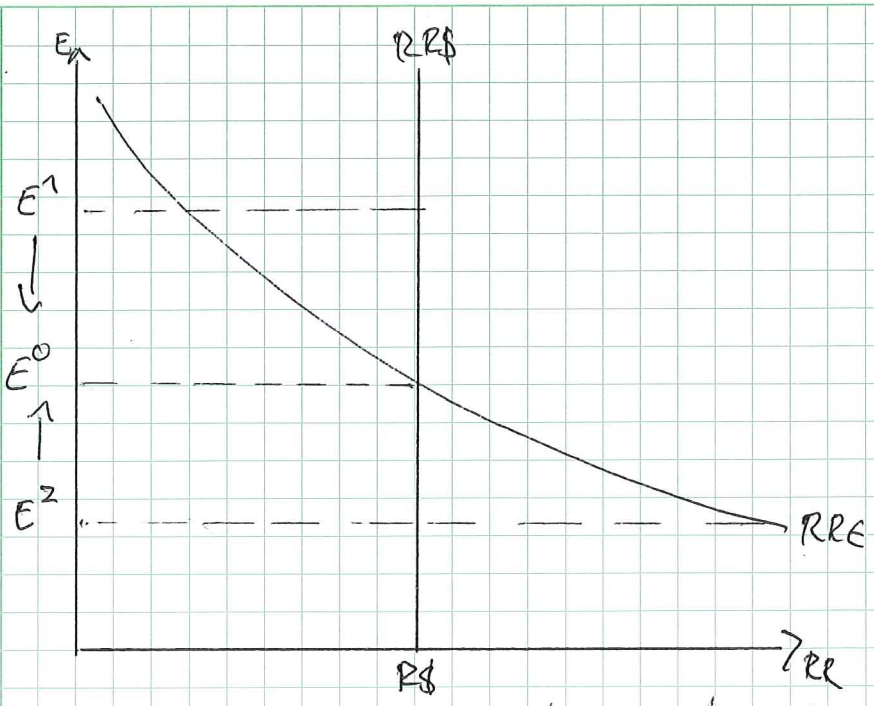


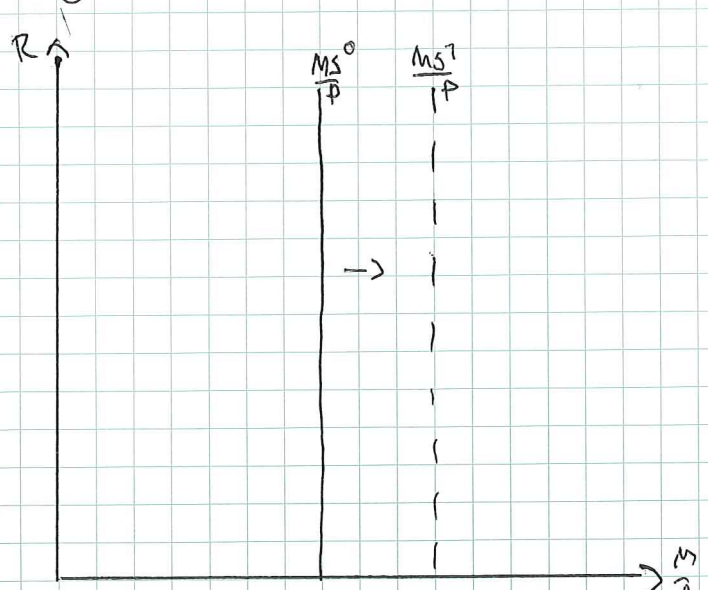
At $E > E^0$, eg E^1 the rate of return to USD deposits surpasses the rate of return to euro deposits. This increases price and demand for usd, thus appreciating the exchange rate gradually down to E^0. (Also shown in $\frac{\partial E}{\partial R\$} < 0$)

At $E < E^0$, eg E^2, the rate of return to euro deposits surpasses the rate of return to dollar deposits, reducing demand for dollar deposits, increasing supply. This triggers a depreciation, as shown analytically. The exchange rate depreciates until equilibrium. $E = E^0$ is our equilibrium where $RR\$ = RR€$, giving us our equilibrium exchange rate.

The next model needed is the money market, consisting of the demand for money and supply, determining the equilibrium interest rate.

Money supply

The money supply (M^S) is the monetary aggregate in the economy (M_1 in the US' case, determined by the FED. It is therefore an exogenous variable, but illustrates monetary policy, by affecting the interest rate. We want to illustrate the real money supply $\frac{M^S}{P}$ (P = price level) in a $\frac{M}{P}$ (real money holdings), R (interest rate) diagram. Since it is exogenous it is a vertical line.



A higher money supply shifts the $\frac{M}{P}^S$ curve to the right.

Money demand

Money demand is the total demand for money in the economy (liquidity-demand) given by:

$M^d = PL(R, Y)$ (1)

M^d = money demand, P = price level, L = liquidity function, R = interest rate, Y = output

Derivatives:

$\frac{\partial M^d}{\partial P} > 0$

A higher price level increases the need for liquidity per transaction, thus rising the demand for liquidity

$\frac{\partial M^d}{\partial Y} > 0$

Higher production means higher GNP, rising the amount of transactions in the economy, increasing the demand for money

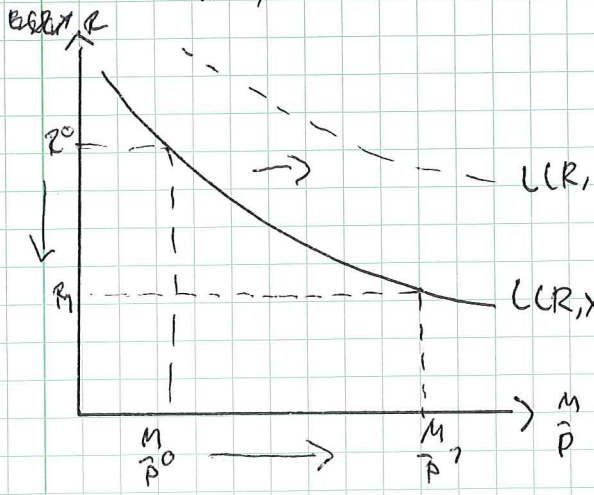
$\frac{\partial M^d}{\partial R} < 0$

A higher interest rate increases incentives to save money (bonds), thus reducing the demand for liquidity.

We usually display the real money demand:

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

Graphically the real money demand is illustrated in the same diagram as the real money supply. Since $\frac{\partial M^d}{\partial R} < 0$ it will be a falling curve, ~~assumed~~ assumed to have a convex form.



A higher interest rate lowers the money demand, while a lower interest rate increases the money demand. Higher output, Y, shifts the money demand curve to the right, giving us a higher demand for any given level of R.

We can now compute the equilibrium in the money market, by the condition

$M^S = M^d$

$M^S = PL(R,Y)$

$\frac{M^S}{P} = L(R,Y)$ #1

This is the equilibrium in the money market, when the real money supply equals the real money demand. Graphically we combine both curves in a joint diagram

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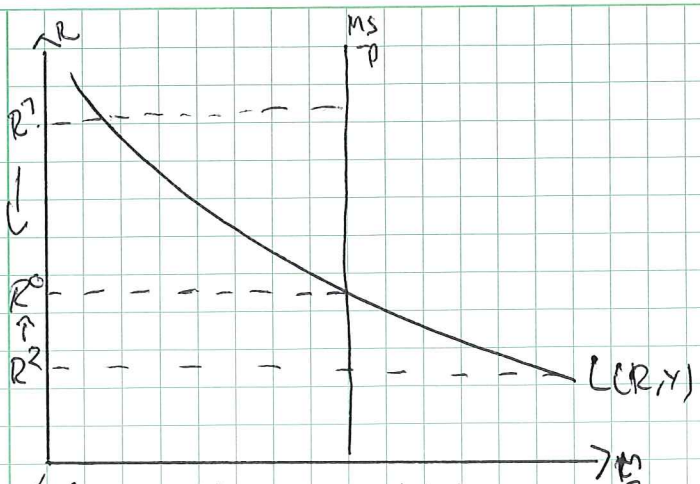
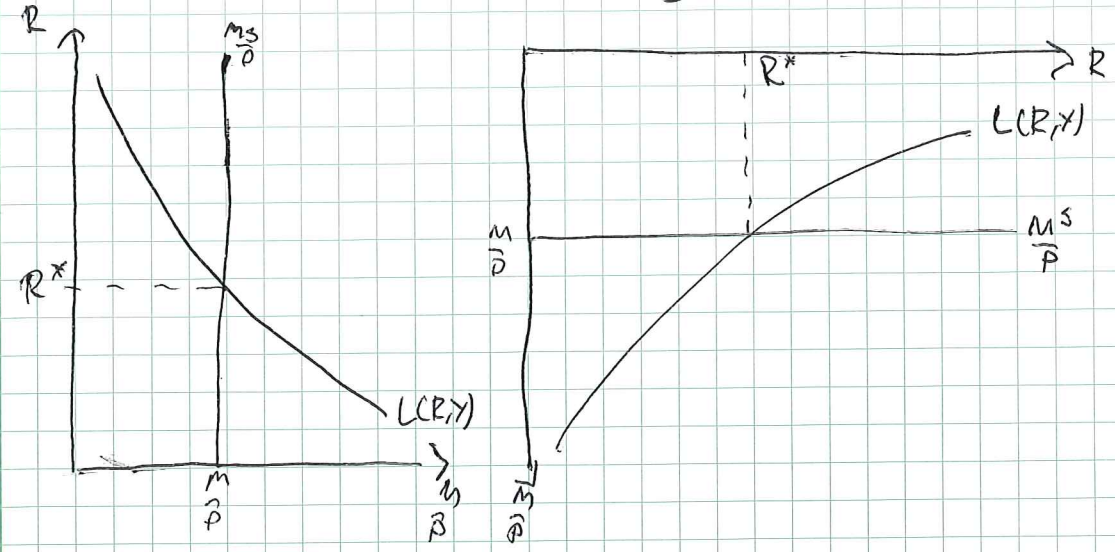
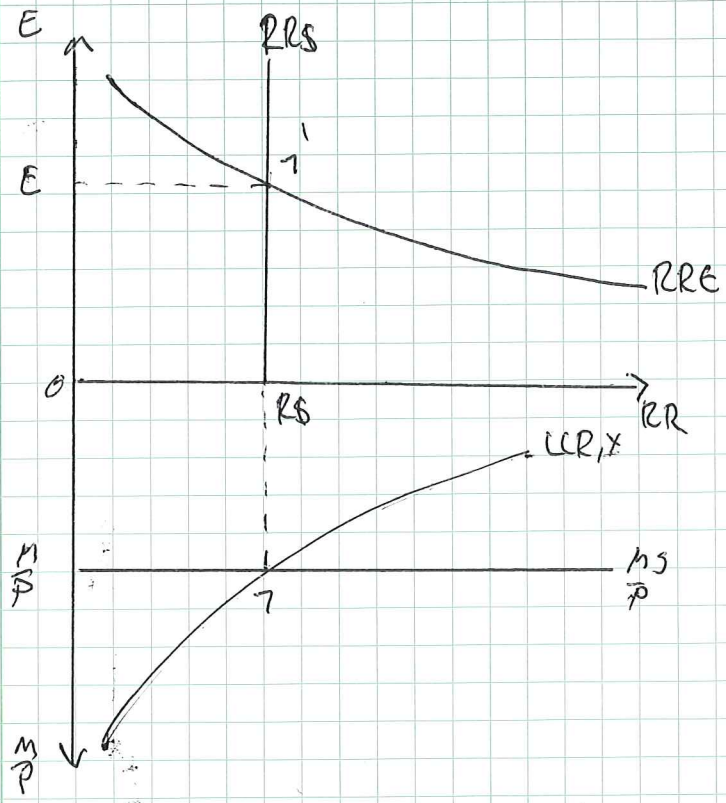


At $R > R^0$, eg R^1 the supply for money exceeds demand, increasing demand for bonds, rising price on bonds, thus lowering the return. The interest rate shifts down to R_0. At $R > R^0$ eg R_2 the demand for money exceeds the supply, increasing demand for liquidity, lowering demand and price on bonds, increasing the return. R shifts upto R^0. $R = R^0$ is our equilibrium, giving us the equilibrium interest rate.

In order to use a monetary approach to ~~the~~ BOP, we take advantage of the two R, RR curves, rotating the money market figure clockwise



We then illustrate the forex market on top, and the money market below.



Equilibrium in the money market (1). This gives the equilibrium interest rate RS, giving RRS for UIP to hold. This gives us the equilibrium in the forex market in 1', and the equilibrium exchange rate. Both equilibriums are determined simultaneously.

Equilibrium:

(1, 1') , RS, $\bar{E}$

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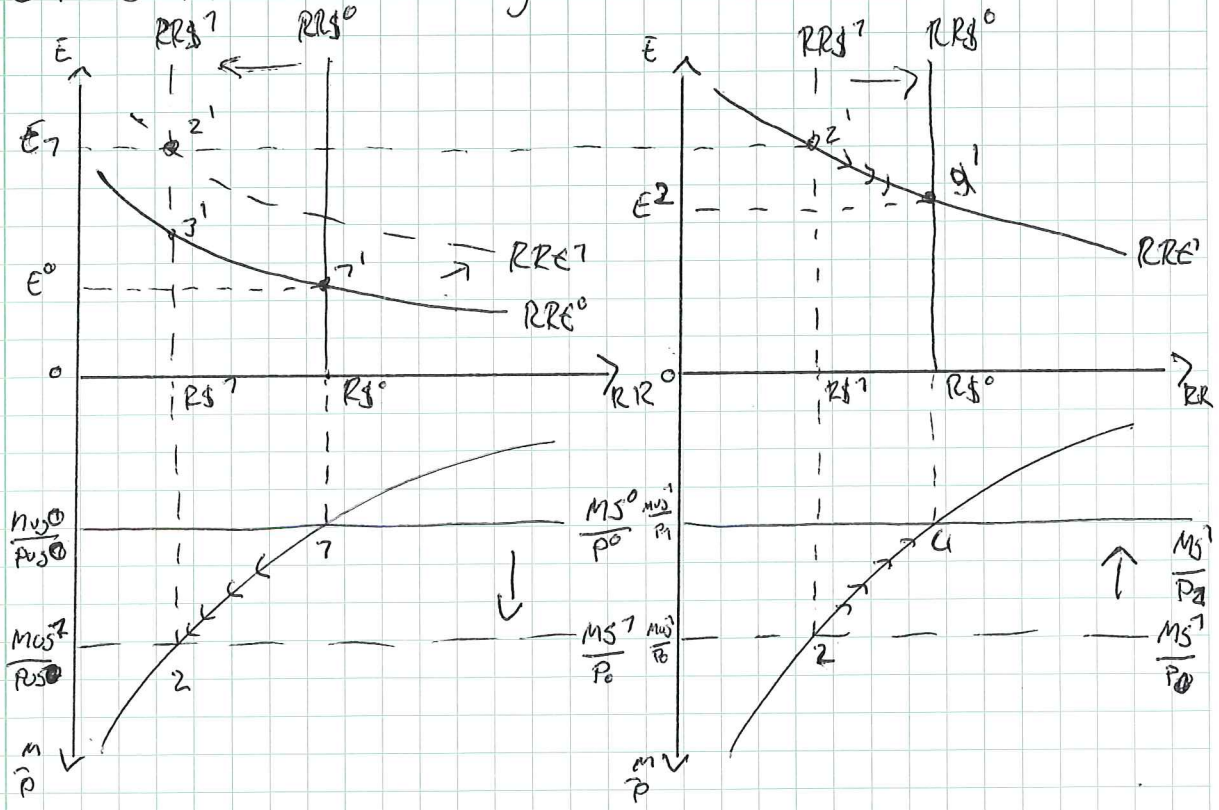
b) I will now analyze short and long run effects of a permanent increase in the money supply. Since the money supply reflects the monetary policy, this can be seen as a permanent ~~expansionary~~ monetary expansion. I will now analyze in our model:



Initial equilibrium in 1, 1' with $R\$^0$, $\frac{M^{S0}}{P^0}$, E^0. An increase in the money supply shifts $\frac{MS}{P}$ to a higher level, indicating a shift down. Since $M^S > M^d$ there is increased demand for bonds, pushing the price up and lowering the return. This gradually seeds the interest rate down to 2. At the same time the new forex market equilibrium is determined. Since $RR_E > RR^\$$ for a lower interest rate, there is excess USD supply, depreciating the exchange rate. But, the expansion in money supply is permanent, shifting RRE to the right, since the market now will expect a depreciation. This gives a new equilibrium in 2'.

Short run:

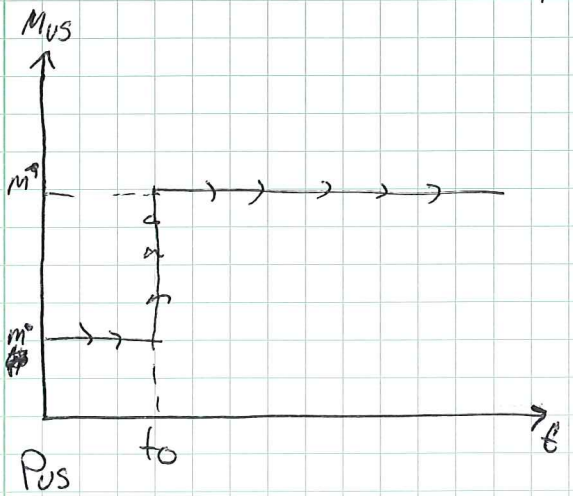
$1 \to 2$, $1' \to 2'$, $E^0 \to E_1$, $\frac{M^{S0}}{P^0} \to \frac{MS^1}{P_1}$, $R\$^0 \to R\$^1$.

In the long run prices gradually increase due to e.g. inflation. This will push the real money supply to a lower level, indicated by the movement from $2 \to 4$. Since $M^S < M^d$ for every shift, the demand for bonds and price on bonds decreases, lowering the interest rate, and return. This brings the real money supply and the interest rate back at its original levels. Our equilibrium moves simultaneously in the forex market from $2' \to 4'$, appreciating the exchange rate to E_2. We have a short run overshooting of the exchange rate, and an appreciation in the long run.

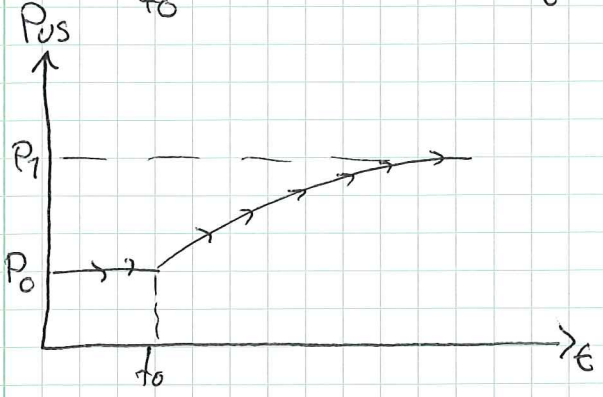
Long run equilibrium:

$Q, E^1, E^2, R\$^0, \frac{M_S^1}{P_1}$.

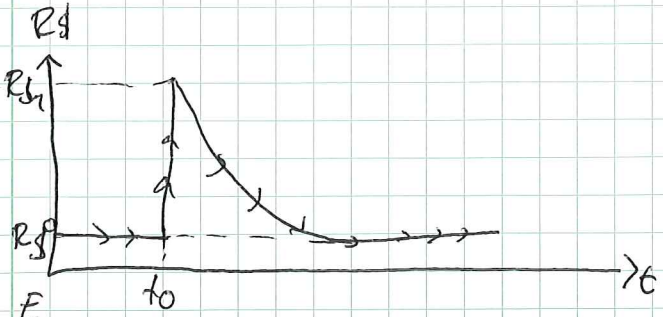
We can look at the time paths of (t_0 = monetary policy)



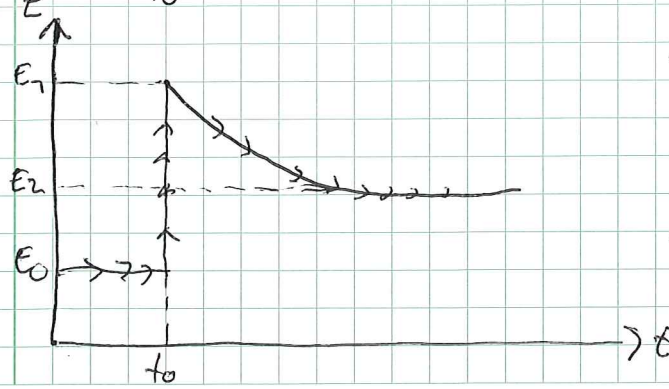
-> Increased overall money supply



-> Increased prices



-> Higher interest rate, then back to initial level



-> Short run heavy depreciation (overshooting) then appreciation to E_2. E will not be back at E_0 due to $E^e \uparrow$ (altered expectations)

a)

2) In this task I will use a two-country model to sufficient for assymetric shocks in a monetary union. I will use the aggregate supply - aggregate demand model (AS-AD). I assume two countries in a monetary union. A monetary union is a union where countries share the same currency. There are often free flow of labor, and strong internal markets. An example of a monetary union is the EU.

The ASAD model consits of two equations.

Demand:

$$Y = F\left(\underset{+}{\frac{M}{P}}, \underset{-}{T}, \underset{+}{G}, \underset{+}{\frac{EP^*}{P}}, \underset{+}{\alpha}\right)$$

Y = output, $\frac{M}{P}$ = real money supply, T = taxes, G = governmental expenditures, $\frac{EP^*}{P}$ = real exchange rate, E = exchange rate, P = domestic prices, P^* = foreign price levels, M = money supply, α = demand shock parameter.

Derivatives:

$\frac{\partial Y}{\partial \frac{M}{P}} > 0$ → Higher real money supply leads to an exchange rate depreciation, strengthening the current account through net exports, increasing Y

$\frac{\partial Y}{\partial T} < 0$

~~A reduction in~~ An increase in taxes reduces disposable income, reducing consumption and Y

$\frac{\partial Y}{\partial G} > 0$

Expansionary fiscal policy stimulates ~~output~~ the economy, increasing output

$\frac{\partial Y}{\partial \frac{EP^*}{P}} > 0$

A depreciation of the real exchange rate strengthens net exports, current account and output.

$\frac{\partial Y}{\partial \alpha} > 0$

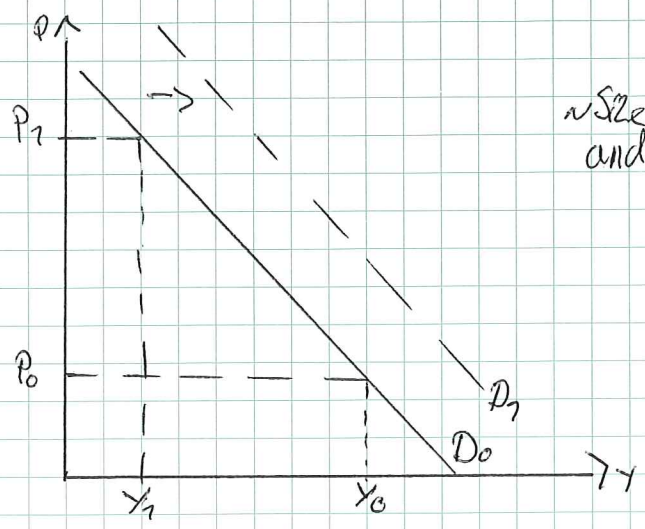
A positive demand shock rises output.

We want to illustrate the aggregate demand as a relationship between output and prices.

$\frac{\partial Y}{\partial P} < 0$

Higher prices leads to a lower real money supply, pushing the interest rate up. This reduces demand incentives, and investment incentives, reducing output. This is the monetary approach to a price increase.

One could also argue that a price increase depreciates the real exchange rate, stimulating net exports and the current account, increasing Y. This is the substitution effect of a price increase. In total, the demand curve will be a falling curve in an Y-P diagram



~Size of shift determined by variables and the multiplier effect

A price increase, $P_0 \rightarrow P_1$ reduces output, $Y_0 \rightarrow Y_1$.

Shifts in M, G, E, α, T shifts the demand curve.

$M\uparrow, G\uparrow, E\uparrow, \alpha\uparrow, T\downarrow$ has an expansionary effect, shifting D to the right.

Supply

The supply curve is the aggregate supply in the economy, given by:

$$Y = G\left(\frac{w}{P}, \beta\right)$$

$\frac{w}{P}$ = real wage, w = wage, β = supply shock parameter

Derivatives

$$\frac{\partial Y}{\partial \frac{w}{P}} < 0$$

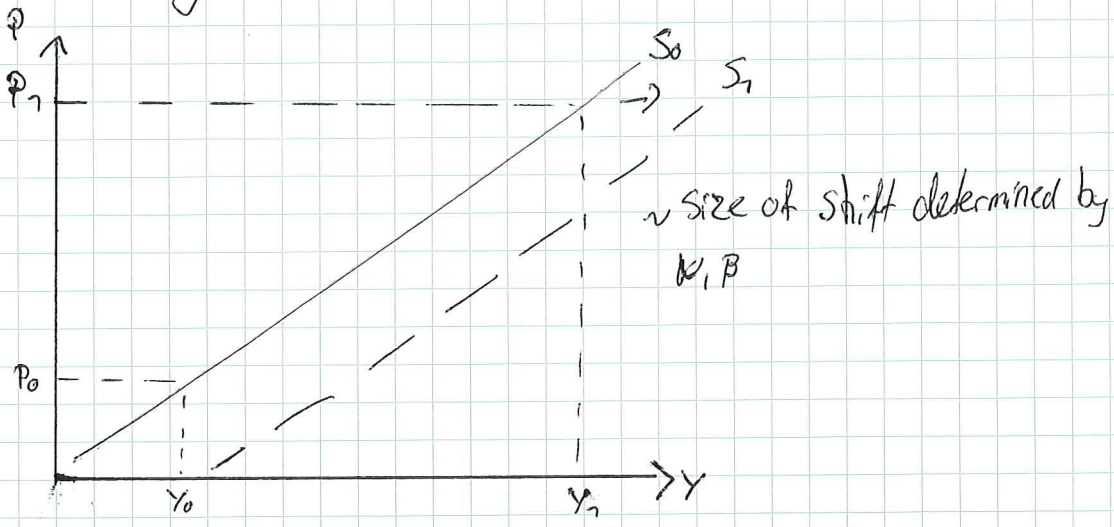
A higher real wage reduces supply by pushing expenses for firms up.

$\frac{\partial Y}{\partial \beta} > 0$

A positive supply shock increases supply.

$\frac{\partial Y}{\partial P} > 0$

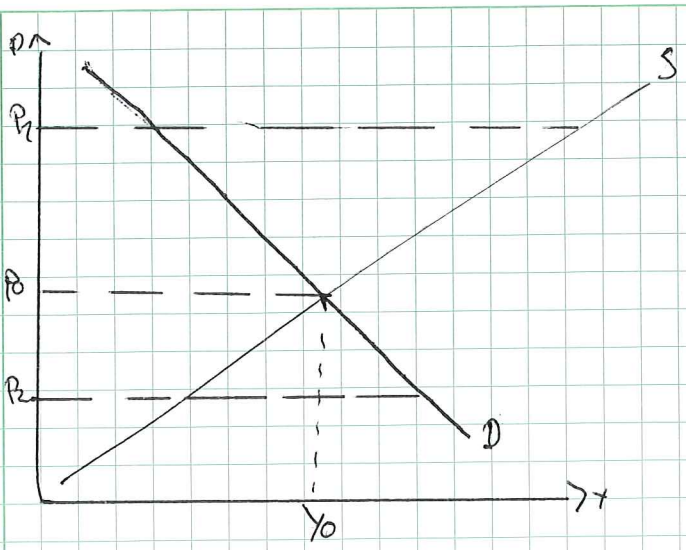
Higher prices leads to a lower real wage, reducing expenses for firms, allowing them to increase output. The relationship between supply and price is positive, indicating an upwards sloping supply curve in the same diagram as before.



A higher price increases output.

$\bar{w}\uparrow$ or $\beta\uparrow$ shifts the supply curve to the left.

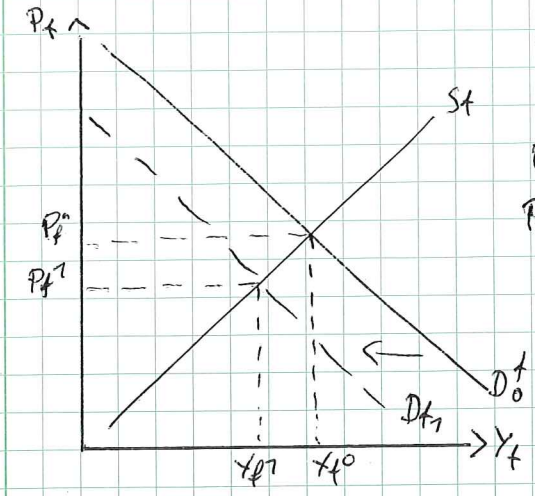
We can now illustrate the equilibrium in our model by combining the supply and demand curve in a joint diagram.



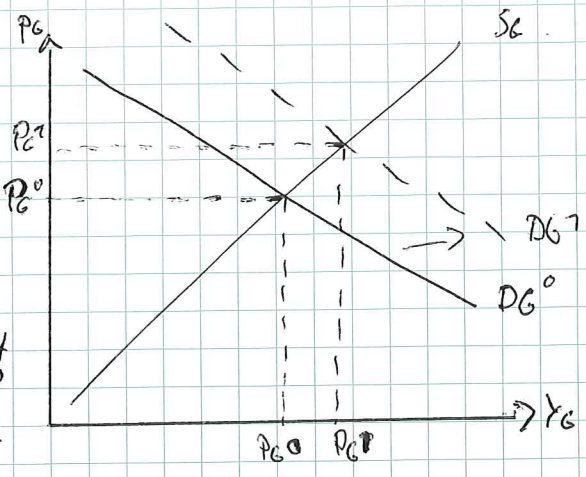
At $P > P^0$ eg P_1 supply surpasses demand, Production is larger than demand, leading to unsold goods either thrown away, or sold on sale. Prices are lowered down to P_0.

At $P < P^0$ eg P_2 demand surpasses supply leading to a rush to secure goods demanded. Prices increase to P_0, since firms recognize the potential for a higher supply. $P = P^0$ is our equilibrium with output Y_0. The price clears the market.

b) I now assume two countries, France and Germany both in the same monetary union. I assume there is a negative demand shock in France, and a positive demand shock in Germany.

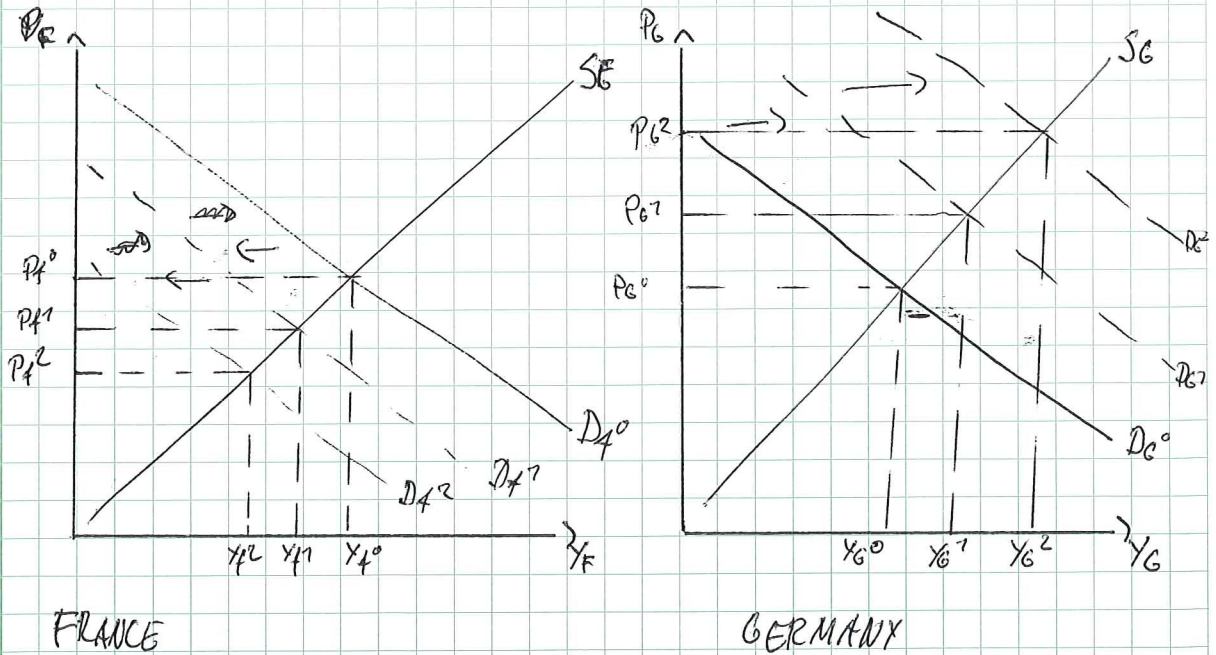


FRANCE



GERMANY

In France the negative demand shock reduces output and prices. In Germany the positive demand shock increases output and prices. Before analyzing policies and mechanisms, I will discuss debt dynamics. In France the fall in aggregate demand causes higher unemployment. This is both a reduction in income through tax, but also an increase in expenses through unemployment. If the decline in aggregate demand is large enough, there might be initialized a debt crisis. Investors may doubt the solvency of the French government, ~~fear~~ selling French bonds, in the worst case leading to another negative demand shock. Investors pulling out of France is looking for a new place to invest, rationally choosing Germany ~~as~~ in a cyclic upturn. The capital inflow to Germany increases demand, shifting the demand curve once again positively.



FRANCE GERMANY

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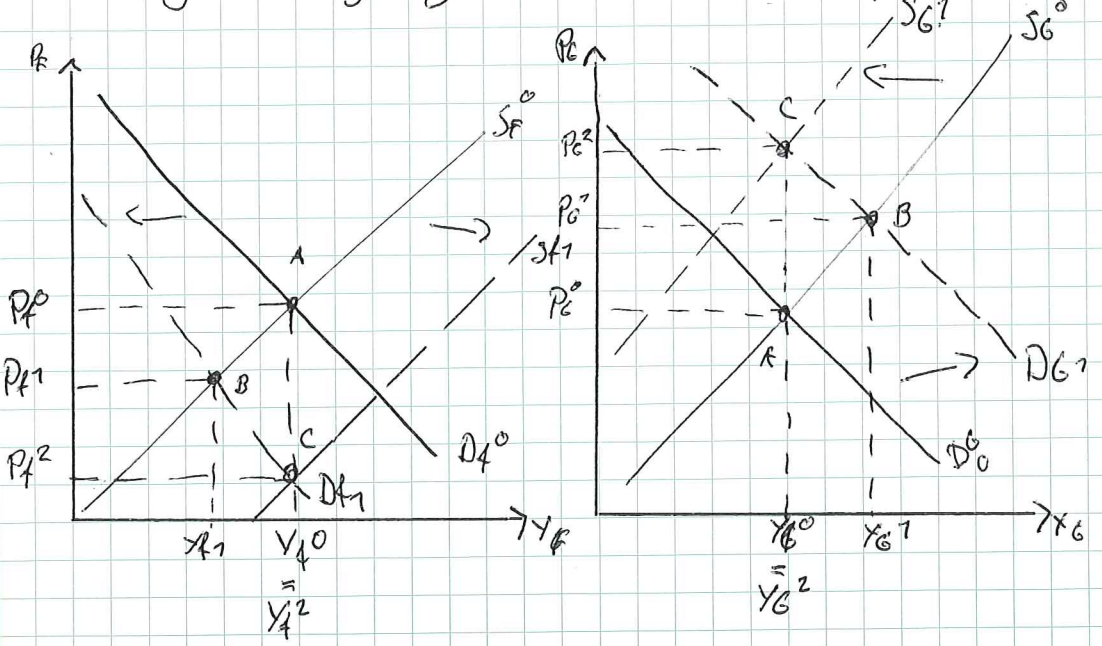
We see that debt crisis can generate capital outflow and a new demand shock, as in certain European countries in the post-financial crisis.

I will now analyze automatic adjustments which might bring the countries back to equilibrium.

1. Wage flexibility

Wage flexibility is the when wages can adapt and automatically adjust to situations in the economy. A labor market with a high flexibility of wages can reduce shocks greatly. I illustrate France and Germany in a situation where wage flexibility brings the countries in to equilibrium:



Our initial equilibrium is in A. The negative demand shock brings us to B.

France: Y_F↑, P_F↑

Ger: Y_G↑, P_G↑

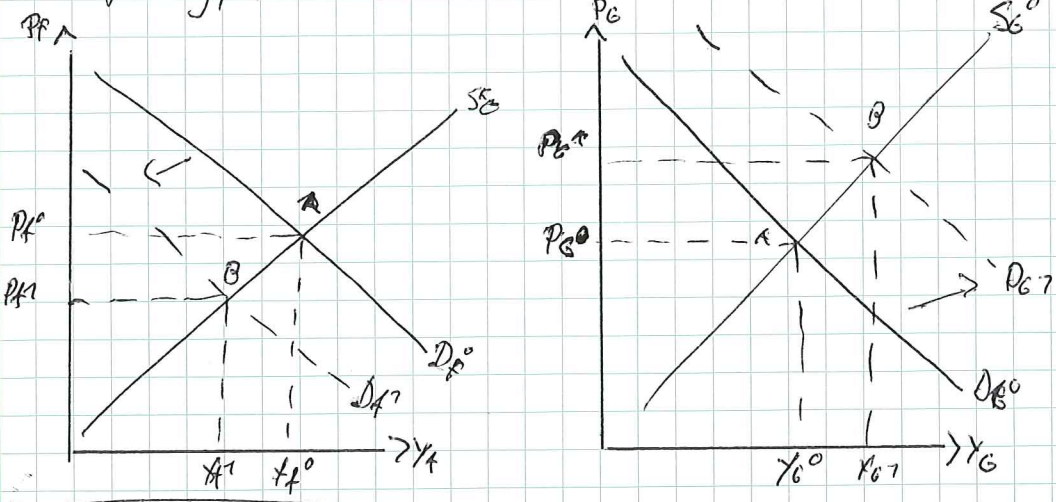
If there is a high flexibility of wage, the following will happen in France:

Due to the negative demand shock prices and output has decreased. Wage claims are now lower. Lower wage claims can lead to a reduction in expenses, allowing firms to produce more. A lower real wage, both due to prices, but also wage claims, shifts the supply curve to the right, S_P↑. In C our new equilibrium is found, with a restored output and a lower price level. However, if workers need to lower their wage, this is somewhat unlikely in an economy, often indicating a lower flexibility of wages.

In Germany there is a cyclic pattern, pushing us to B. There is high pressure in the labor market, leading to higher wage claims. Since ~~there~~, ~~there~~ there ~~is~~ are few unemployed workers in the economy, wages can rise in firms competing for labor. This increases expenses for firms, pushing supply down, restoring equilibrium output in C, with high prices.

2. Labor flexibility (Mobility of labor)

In a monetary union it is often easy to travel and work across borders. If this is the case, unemployed workers in France can move out of France, reducing the labor stock. This ~~reduces~~ brings the French economy in to equilibrium at B. French workers will move to Germany, since there is a lack of labor, bringing the German economy in to equilibrium in B. However, this model fails to analyze sentimentality. Workers will not necessarily move, but take family, friends etc. in to account.



~~Note: elastic segments~~

Automatic adjustments in this model depends on variables such as the openess of the economy, labor flexibility, wage flexibility and other determinants of supply and demand.

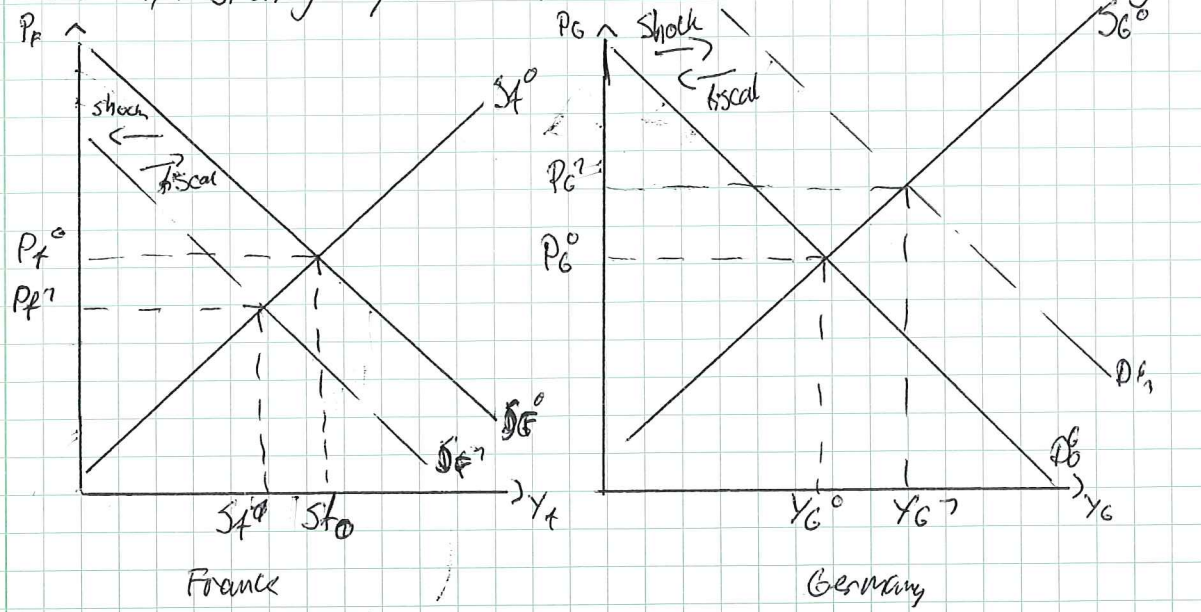
c) Policies

A: Monetary policy

Since the two countries are in a monetary union, both experiencing shocks, where the shocks are assymetrical, monetary policy will not work. The central bank can not both lower and rise the interest rate.

B: Fiscal Policy

Fiscal policy is used through G↑ or T↓. It's main goal, when used expansionary is to stimulate the economy. Either way, a rise in G will impact Y positively through increased demand, shifting demand curve back. When used contractionary G↓ or T↑, aggregate demand is reduced, restoring equilibrium. We look at France and Germany's



Equilibrium is restored with expansionary fiscal policy (France) and contractionary fiscal policy (Germany). Note that if these two countries had a centralised budget, money from Germany experiencing a cyclic upturn should have been

directed to France, However, this is somewhat unlikely due to selfishness. Fiscal policy could also be limited by public debt, reducing the room for expansionary fiscal policy. In total fiscal policy and/or automatic adjustments are the two sufficient options in a monetary union.

It is however relevant to bring up that a monetary union often has a tendency to have an reduced amount of assymetric shocks, giving the central bank an easier job in correcting shocks. Unions most rely on automatic adjustments with a central bank, since a central bank can not drastically adjust the interest rate, but must consider other countries and macroeconomic variables, often such as inflation.

Negative shocks outside a monetary union

I assume France, experiencing a cyclic downturn with a negative demand shock, reducing output and prices. I will assess fiscal and monetary policy.

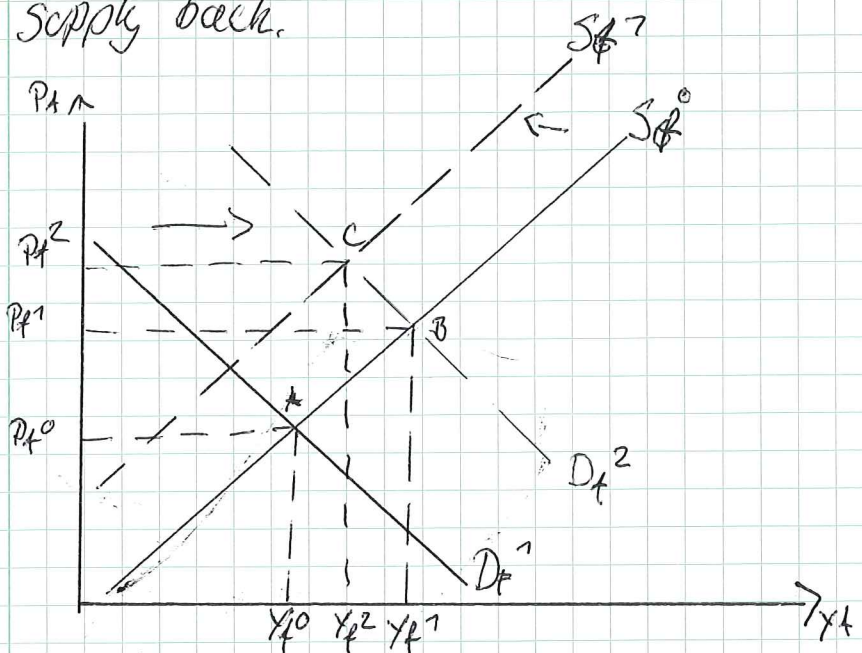
Fiscal policy

The intention here is the same as in a monetary union, an increase in G or reduction in T stimulate output, ideally restoring equilibrium.

Monetary policy

Since there is no monetary union France can have an independent monetary policy.

We assume France are in a negative demand shock, & Expansionary monetary policy increases the money supply, depreciating the exchange rate, strengthening the current account, posing demand up. However, this increases the price of french goods. At the same time, since prices increase, the workers purchasing power purity is reduced, and they will expect a rise in wages, shifting supply back.



The effect on output is unclear. Favourable effects of the depreciation has a tendency to disappear over time, shifting supply back ☹ The price increase to P_f^2 pushes supply back with workers demanding a wage compensation for loss in purchasing power. In a European perspective, the effects of a depreciation tends to be strong leading to an expansion in output. However in this model, these effects remain unclear, depending on the openess of the economy, wage flexibility, labor mobility, and other macroeconomic variables and mechanism helping to stabilize output