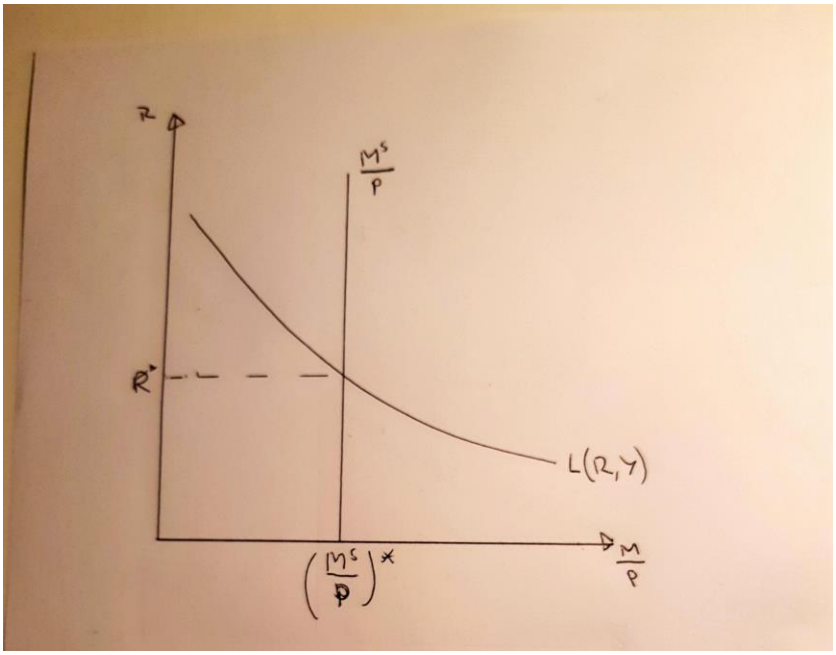
SØK2009 Exam 2/12 2020

Question 1:

A) Explain the two equations, show the equilibria graphically and give economic intuition behind the slopes of all curves involved.

Equation 1 is the equilibrium in the money market. It states that real money supply is equal to money demand, which is a function dependent on two variables: the rate of interest and output. The left-hand side of the equation is the real money supply of a country. It is held constant unless the central bank intervenes. It is the central bank that decides the rate of interest in the money market by controlling the money supply. This I will come back to.
The right-hand side of the equation is the money demand. Money demand is increasing with higher output $\frac{\partial L}{\partial Y} > 0$ and decreasing with higher interest rate $\frac{\partial L}{\partial R} < 0$.
Higher output gives higher money demand since higher output means more transactions and thus a higher demand for money for those transactions. A higher interest rate means less money demand because more people will invest more in bonds and other divided paying assets when interest rates increase.
The equilibrium in the money market is given by the following figure.



Since the Central Bank can decide the money supply it is not affected by the interest rate, thus creating a vertical line in the plane. This means that the money supply will be the same for all levels of interest rate if the central bank does not intervene.
The money demand curve is falling because, as I already explained, a higher rate of interest yields higher money demand. Thus we get an equilibrium in point $\left(\frac{M^s}{P}\right)^*, R^*$

If R is higher than R^*, money supply is higher than money demand which has consequences in the market for bonds. When there is a higher supply for money than what's demanded investors will use this overflow of money to place elsewhere. In this model you can either place your money as liquid assets, i.e., in a bank, or you can buy dividend paying assets, such as bonds. If there is higher supply of liquid assets than what is demanded, then the demand for bonds will increase. The rate of interest of a bond is, in this simple model, given by the difference between the price an investor pays for the bond today and the price you get for your bond when you sell it. This means that higher demand for bonds drive up prices today. However, the way a bond works is that it does not affect the price you get when you sell it. Thus, a higher price today means that this difference, the dividend, becomes smaller and thus the rate of interest falls. This was a long explanation to a simple process, which simply means that when this model is outside of equilibrium, normal market structures make it move back to an equilibrium where money supply equals money demand.

Equation 2 is the equilibrium in the FOREX market. It states that the interest rate in the home market is equal to the interest rate in the foreign market plus expected depreciation of the currency. In this model I have set up the home market to be the US and the foreign market to be the Euro zone.

For this equation to hold true we must assume that there is perfect mobility of capital meaning that the uncovered interest parity holds.

$$RR_{€} = RR_{\$} \quad (The\ uncovered\ interest\ parity, UIP)$$

Intuition behind UIP:
If rate of return on dollar deposits is higher than that of euro deposits more investors will invest in their money in the US meaning that demand for dollars will increase. This leads to an appreciation of the dollar currency, which means that the rate of return on dollar deposits decreases for Euro investors while the rate of return on Euro deposits increase for American investors. This process will go on until UIP once again is achieved and a new equilibrium is reached.

From equation 2 we can do a little bit of math to get an expression of the exchange rate as a function of exogenous variables.

$$R_{\$} = R_{€} + \frac{E^e - E}{E}$$

$$E(1 + R_{\$} - R_{€}) = E^e \rightarrow E = \frac{E^e}{1 + R_{\$} - R_{€}}$$

Where:

$$\frac{\partial E}{\partial R_{\$}} = -\frac{E^e}{(1 + R_{\$} - R_{€})^2} < 0\ (increased\ rate\ of\ interest\ on\ US\ bonds\ appreciates\ the\ dollar)$$

$$\frac{\partial E}{\partial R_{€}} = \frac{E^e}{(1 + R_{\$} - R_{€})^2} > 0\ (increased\ rate\ of\ interest\ in\ Euroaet\ pe\ leads\ to\ depreciated\ USD)$$

$$\frac{\partial E}{\partial E^e} = \frac{1}{1 + R_\$ - R_€} > 0 \ (expected\ depreciation\ leads\ to\ depreciation)$$

From equation 2 we can see the following:

The left-hand side of the equation is the rate of return on deposits in the home market, the US. The right-hand side of the equation is the rate of return on deposits in the foreign market, the Euro zone.

An American investor's dividend on an American bond will solely be affected by the rate of interest on that bond, and thus the rate of return on an American bond is not dependent on the exchange rate.

An American investor's dividend on a European bond will not only be affected by the rate of return on that bond. Imagine that the American investor buys a European bond. (S)he must buy this bond in euros. Thus this investor has to purchase EUR with USD in order to make the purchase. If the EUR appreciates rapidly while the investor is holding the bond it will be worth more in USD than it was at the time of purchase.

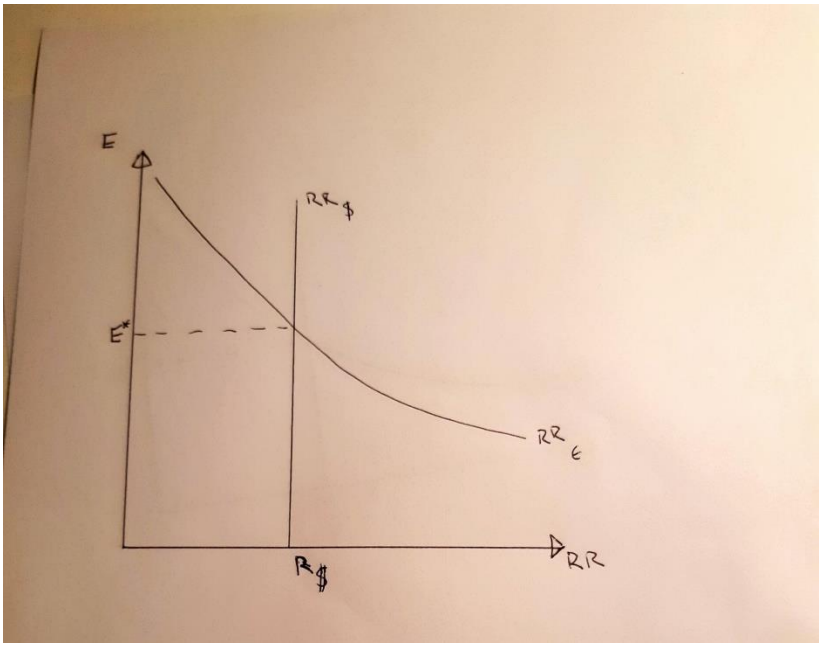
If the USD/EUR exchange rate suddenly increases (dollar depreciates) the EUR bonds will pay less dividend to an American investor than before this increase.

Thus the rate of return curve for the foreign market is downward sloping. Lower E means higher return on bonds placed in EUR.

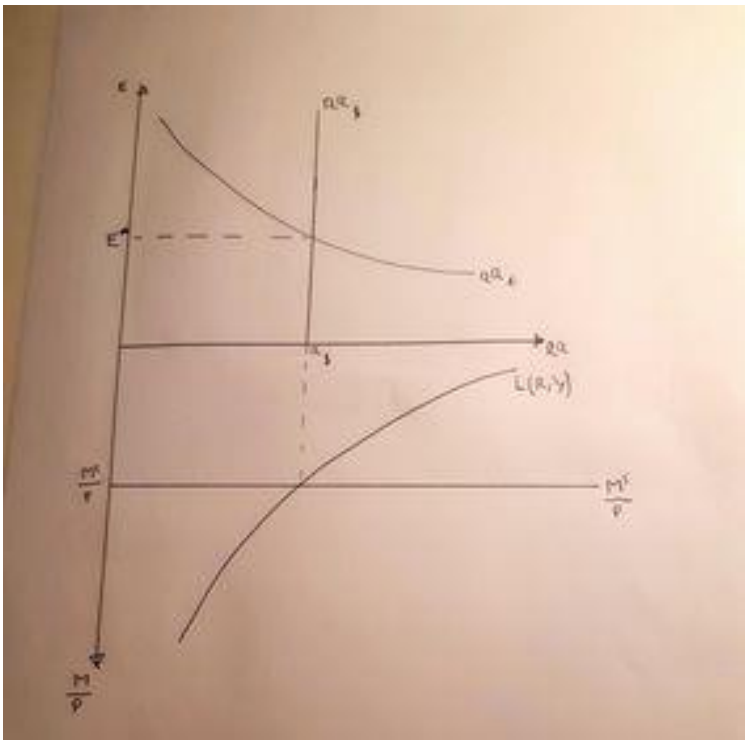
The equilibrium in this market is, due to UIP, given by the point in the plane where $RR_€ = RR_\$$

If rate of return had been higher in the US investors would move their money to the US, thus appreciating the USD and lowering the rate of return. Vice versa if RR had been higher in Europe.

This can be expressed graphically:



The two markets can be combined since both have R as an endogenous variable. Hence, we can express the two markets in the same figure where a rate of interest, R, that gives an equilibrium in both markets is obtained.



This combines the two markets and shows us the exchange rate and rate of interest where both markets are in equilibrium.

If the money market had not been in equilibrium and the domestic interest rate would have changed because of that, those changes would also have played out in the forex market and caused shifts in the exchange rate that would make this market obtain a new equilibrium as well

B) Assume that you are an American investor considering investing in euro or dollar. The dollar and euro interest rates equal 1.5% and 3.5%, respectively. The current dollar per euro exchange rate is 1.1 and is expected to equal 1.08 in a year. Based on this, should you invest in dollar or euro? Explain. What would the conclusion be if the dollar interest rate equals 2%, while everything else is unchanged?

The rate of return on dollars in this case is given by 1.5 %, I assume annually.

The rate of return on euros is given by: $RR_{€} = 0.035 - \frac{1.08-1.1}{1.1} \approx 0.017 > 0.015$

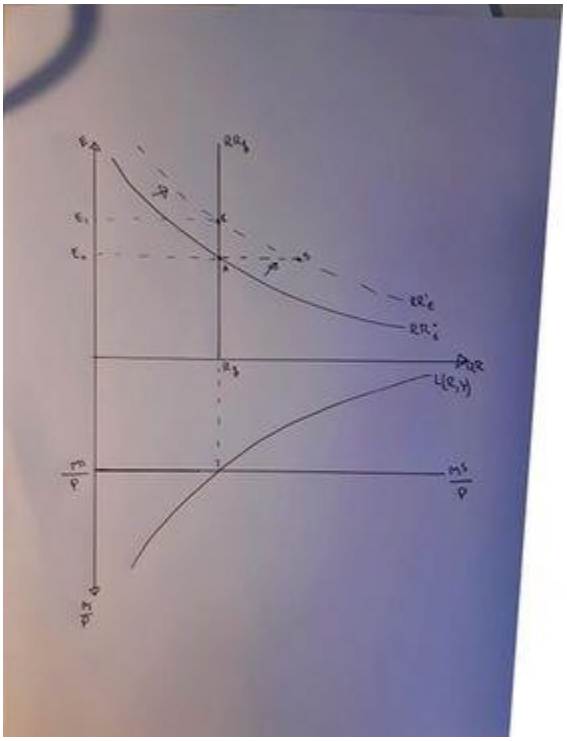
Thus, in this case, the investor should invest in euros.

If the dollar interest rate increases to 2 % the rate of return on euros is suddenly lower than that of dollars. This is due to the expected appreciation of the dollar, which is strong enough to justify investing in dollars even though the rate of interest in euros is 1.5 percentage points higher.

c) Use the graphical illustration of the equilibrium in the US money market and the foreign exchange market between dollar and euro to study implications of a temporary contractionary monetary policy by the EU central bank for the US interest rate and the dollar per euro exchange rate. Explain relevant mechanisms.

A temporary contractionary monetary policy by the European central bank(ECB) means that the ECB will lower supply of Euros. They do this by buying up Euro bonds using foreign currency.

All else constant, this will a higher relative demand for money than before (demand is constant but there is less money), which means that demand for bonds will decrease thus driving up interest rates. We remember that $RR_€ = R_€ + \frac{E^e - E}{E}$ and as such we see analytically that $\frac{\partial RR_€}{\partial R_€} = 1$ which is the same as saying that the $RR_€$ curve shifts out.



Mechanisms:

The rate of interest in the US is determined in the American money market. Thus when the European central bank uses contractionary monetary policies the American interest rate is not affected.

We do see things happening with the exchange rate though.

When the rate of return curve for EUR shifts out we suddenly find ourselves in point B instead of A and the market is not in equilibrium. That means that suddenly investors get higher dividends from investing

in EUR than USD. This means an increased relative demand for EUR. This process of people buying more EUR which means that the USD/EUR exchange rate increases will go on until the market has once again found an equilibrium where the expected return on investment is the same in both markets. Overall we end up in point C and the Euro has appreciated relative to the Dollar. You get more dollars for one euro than before the shift.

The American money market is not affected.

d) Assume that a country has a fixed exchange rate regime where its currency is fixed against the dollar. Explain what this means for the country's economic policy. Discuss how the country can defend the fixed exchange rate in a situation with strong expectations of devaluation.

We remember the equilibrium in the forex market.

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

With a fixed exchange rate E is constant.

If the fixed exchange rate regime is credible, $E^e = E$

This means that $R = R_{\$}$

When the country has a fixed exchange rate the economic policies will be different than with a floating exchange rate.

Monetary policy:

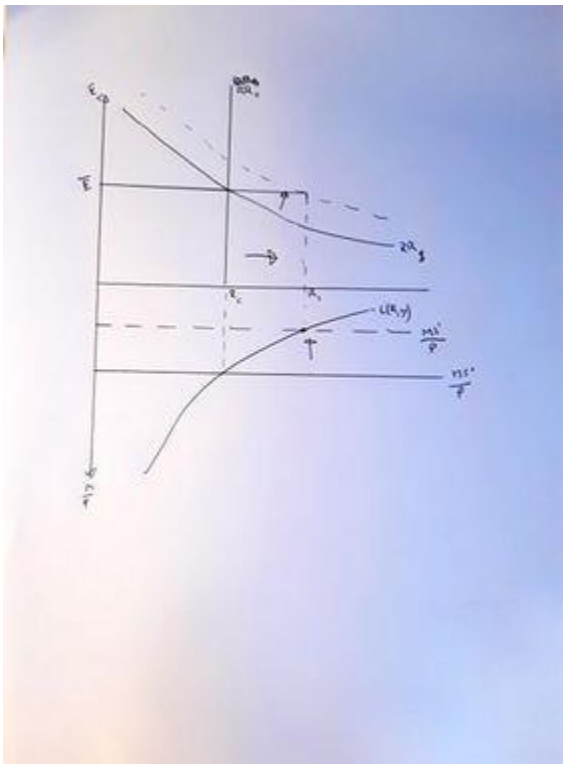
Monetary policy with a fixed exchange rate must be given up. To understand this, imagine the following:

The central bank decreases money supply as a contractionary monetary policy. This means higher money demand which in turn makes the interest rate in this country increase. This will affect the forex market where the currency will appreciate when the interest rate increases. The central bank cannot accept this. They must fix it by increasing money supply by the same amount and thus they withdraw this contractionary monetary policy by an equally large expansionary one. Thus we see that the monetary policy doesn't work with a fixed exchange rate.

Fiscal policy:

The fiscal policy still works with a fixed exchange rate. Imagine an expansionary fiscal policy, either by increasing spending or lowering taxes. This will increase money demand in the money market and thus the interest rate will increase. Since the central bank cannot accept that the exchange rate appreciates they will intervene with monetary policy to keep the exchange rate constant. This will be done by buying foreign assets with domestic currency. This will mean that fiscal policies actually will be even more effective than with a floating exchange rate since we don't get a leakage from the currency channel, where an expansionary fiscal policy would have meant an appreciated currency and thus higher imports and a weakened current account.

A country can defend its currency from strong expectations of devaluation either by increasing interest rates or they can give up the fixed exchange rate.



What happens here is that the market expects a devaluation meaning that they expect the exchange rate to depreciate. This will make the RR curve for dollars shift out. This would in a floating exchange rate lead to a depreciation. However in this case the central bank cannot let that happen. In order to counteract they will sell foreign reserves and buy up domestic bonds in the market. This will lower real money supply and lead to higher interest rates. The central bank must increase the interest rate all the way to r1. This may be enough to defend the fixed exchange regime but if it goes on long enough and the central bank does not have enough foreign assets to sell then they eventually may have to give up their fixed exchange regime and let the currency float.

Question 2:

a) **Explain equation (3), illustrate the equilibrium in the AA-DD model graphically, and give economic intuition behind the slopes of the two curves.**

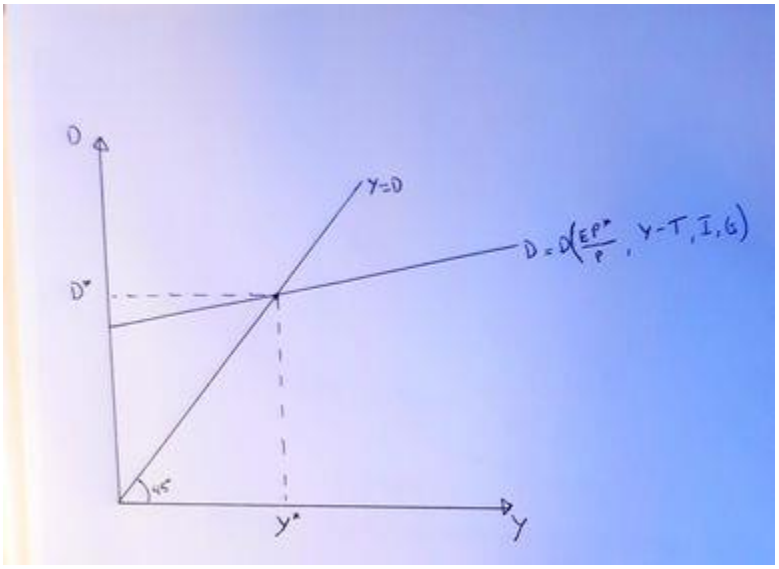
$$(3): D = c(Y - T) + I + G + CA\left(\frac{EP^*}{P}, Y - T\right)$$

Equation 3 is the equation for total demand in a country.

For the output market to have an equilibrium output must equal aggregate demand. This means that it can be rewritten to:

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

Graphically this is shown like this.



The equation consists of 4 parts. First off is the private consumption. It states that private consumption equals the marginal consumption rate multiplied by disposable income.

The next part is the private investments from firms in the economy.

The next part is expenditures by the public.

The last part is the current account, which equals exports minus imports.

In this case it has been rewritten to be a function of the real exchange rate and the disposable income.

I assume that the Marshall-Lerner condition holds and as such:

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

The Marshall-Lerner condition:

A depreciation of the currency of a country has three subsequent effects that all affect the current account.

1: Substitution effect from foreign towards domestic goods. When the currency depreciates foreign goods become more expensive relative to domestic goods. This means that consumers will substitute towards domestic goods thus decreasing imports and improving the current account.

2: Improved competitiveness of the economy. As a currency depreciates the goods produced domestically will become more competitive relative to foreign goods meaning that exports will increase. This improves the current account.

3: A price effect. When the currency depreciates, it becomes more expensive to import goods from abroad. This worsens the current account.

The Marshall Lerner condition assumes that effect 1 & 2 dominate effect no. 3, and thus a currency depreciation will improve the current account.

$$\frac{\partial CA}{\partial (Y - T)} < 0$$

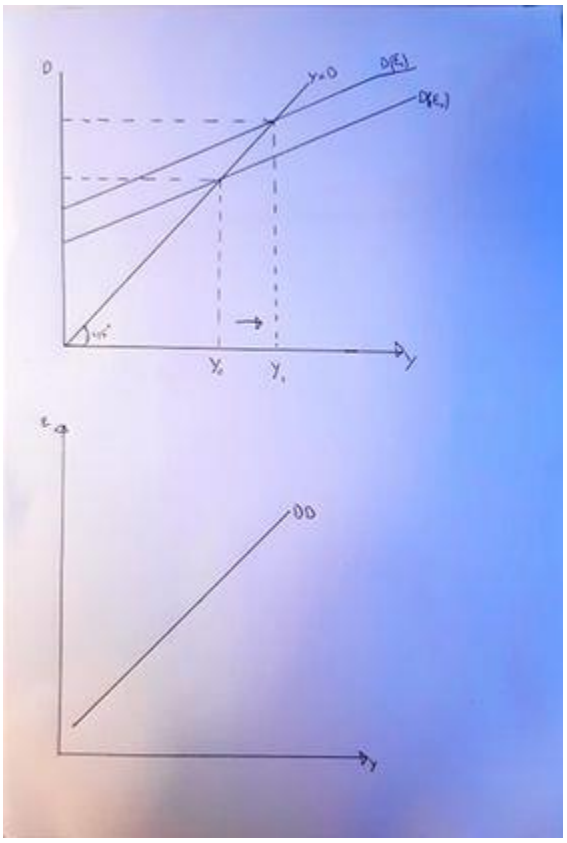
Higher disposable income increases imports and worsens the current account.

The DD-schedule display all combinations of the exchange rate and output where the output market is in equilibrium.

Thus, to find the slope, and the intuition behind the slope, of the DD-schedule, we must ask ourselves the following; All other constants being equal what is the consequence on output if the currency depreciates?

We already established that $\frac{\partial CA}{\partial E} > 0$ $(for\ constant\ prices\ home\ and\ abrod)$

Hence a depreciation of the currency (E increases) means an improved current account and thus a higher output. This means that the DD-schedule is upward sloping.



The AA schedule:

The AA schedule displays all combinations of the exchange rate and output where both asset markets are in equilibrium. That means that the money and the forex market must both be in equilibrium.

What we must ask ourselves is what effect an increase in output will have on the exchange rate given that the asset markets are in equilibrium.

Thus we start out with the combined model for the money and forex market and analyze what effect an increase in Y will have on E.

Graphically/intuitively:

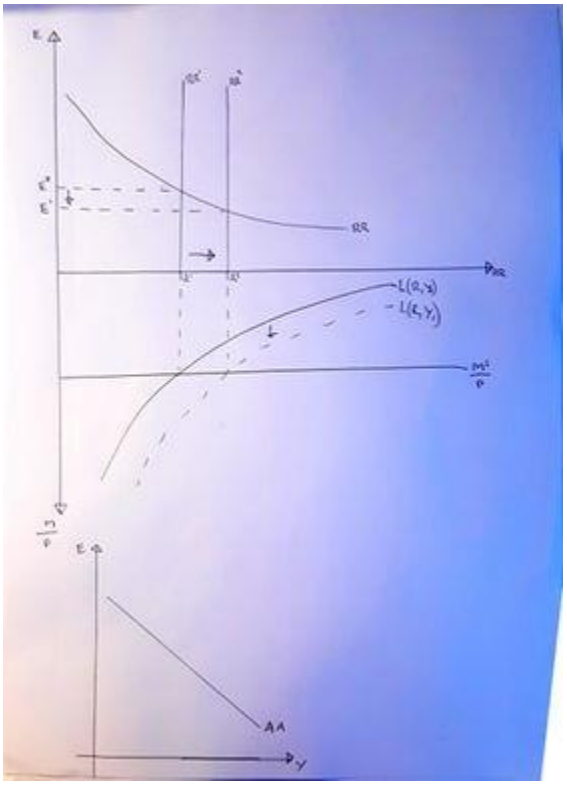
An increase in output means an outwards shift in money demand. All else given, this means that there will be less demand for bonds than before the demand shift. This means that bond prices will decrease. The rate of interest on bonds is given by: $R = \frac{P_{t+1} - P_t}{P_t}$

As such if the price today decreases, the rate of interest on the bond has increased.

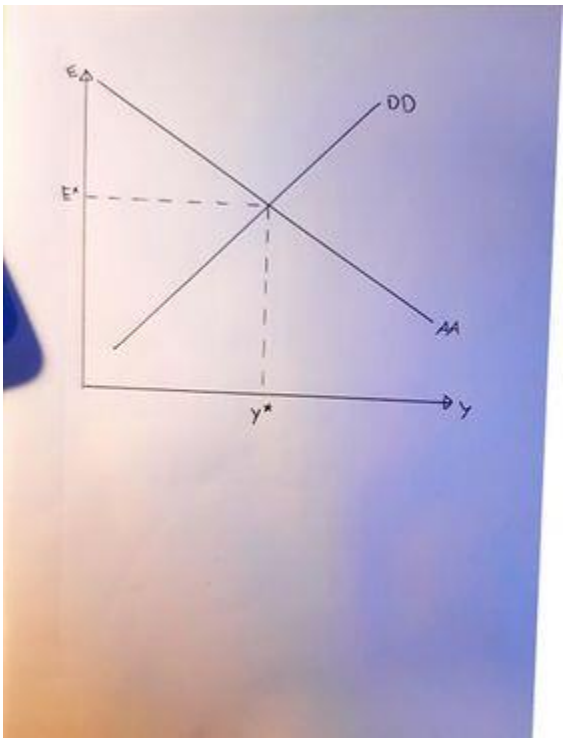
This means that the rate of interest will increase for the money market to obtain a new equilibrium.

When the rate of interest increases, the forex market will be affected.

An increased rate of interest makes it more profitable to invest in this country's bonds relative to the other country. This means that investors will demand more of this currency, resulting in an appreciation. This appreciation will continue until UIP is once again true. Hence, the AA-schedule is downward sloping. An increase in Y results in an appreciated currency.

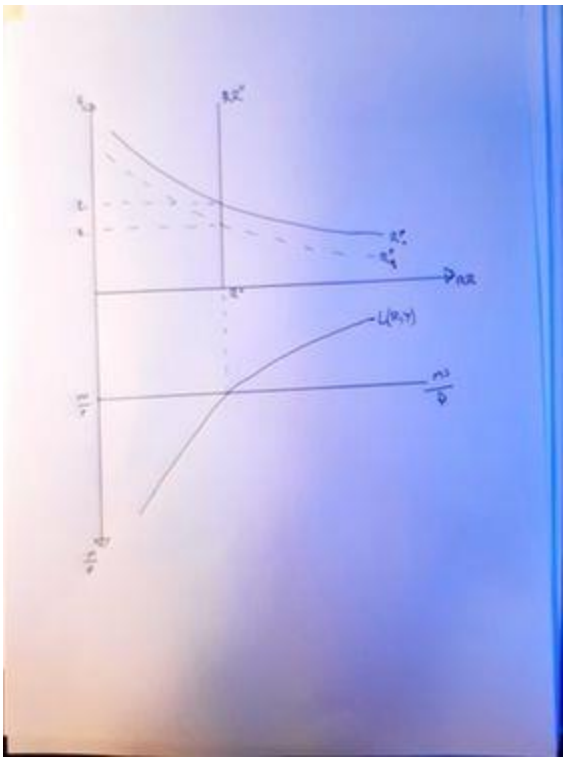


This means that we get an equilibrium when combining the AA & the DD schedule. This allows us to analyze the combination of the output and asset market when Y is endogenized.

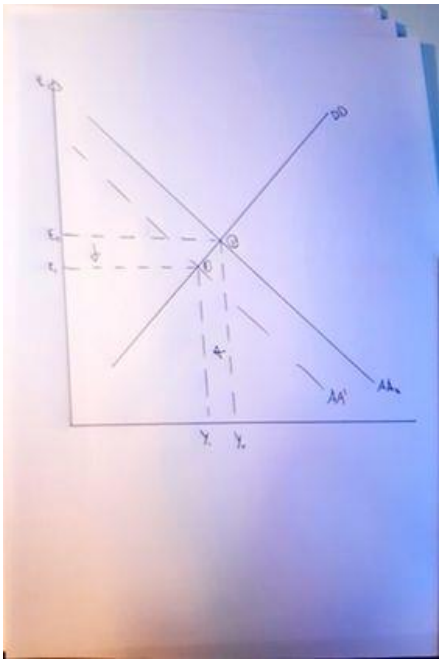


b) How does a decrease in the expected exchange rate (Ee) affect the AA-schedule? Explain the economic intuition and illustrate graphically.

A decrease in the expected exchange rate, an expected appreciation, will mean that the RR curve for the foreign country will shift inwards. This will happen because there will be a lower expected return on investment for investors from the home country when they buy foreign bonds. This means that for a given Y the domestic currency will appreciate. This shifts the AA curve inwards. There will be a lower E for a given Y than before the decrease in expected exchange rate. This can be shown graphically in the following way.



E^e does not affect the DD schedule. Thus we'll get a new equilibrium in point 2 where Y and E have both decreased. This happens since the current account is worsened when the exchange rate appreciates.



c) Assume a temporary contractionary fiscal policy through increased taxes. Explain why the policy change has a contractive effect, show the adjustment graphically, and explain the effect on output, exchange rate, interest rate, consumption and net exports.

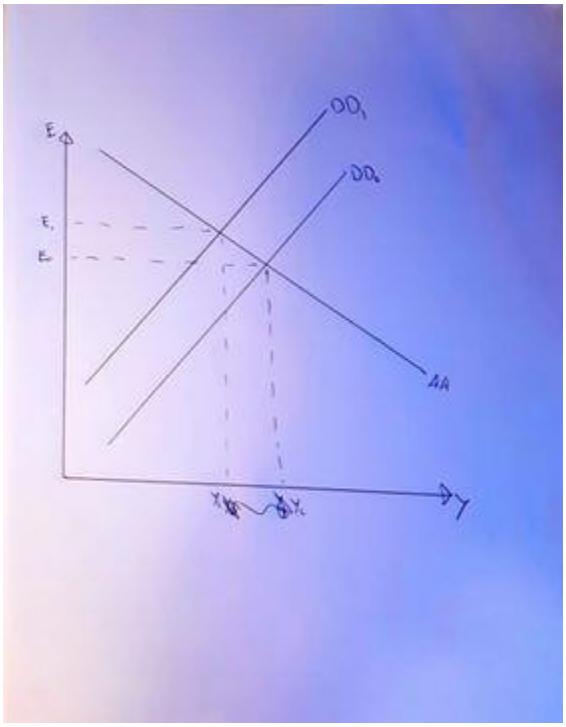
A temporary contractionary fiscal policy through increased taxes will lower the disposable income, which will affect the output in an economy. We see from the equation for aggregate demand in an economy, $Y = c(Y - T) + I + G + CA\left(\frac{EP^*}{P}, Y - T\right)$, that higher T will decrease consumption and thus worsen Y.

What happens here is that the consumers' disposable income decreases. Consumers don't have as much money to spend, and thus they will demand less. This means that the demand for money will decrease, due to less transactions. This will decrease the rate of interest, due to more people investing in bonds, *thus lowering the rate of interest domestically.*

The expected exchange rate and the foreign exchange rate haven't changed. *Thus the domestic currency will depreciate*, because less people invest in the home country.

The drop in disposable income will mean that consumers consume less. This means that total consumption drops and thus the *output will decrease*. This drop is limited a bit by the fact that the exchange rate drops and thus *the current account (Net exports) will increase.*

Graphically we see an inwards shift of the DD curve, which also shows us the drop in Y and the depreciated currency.



Question 3

a) What is a monetary union?

A monetary union is several countries, at least two, that have the same currency, and thus they also share the same central bank and the same monetary policy. The countries are often integrated more deeply than just through their currency. It is typically countries located geographically close to one another and it is typically countries that share some culture and history, maybe even language. A monetary union does not necessarily have to be made up of countries, as a country like the United States, with its 50 distinct states, is considered a monetary union. A monetary union will often share regulations and regulations on several key areas and there will be a higher level of mobility between countries, for instance in the form of labor or traded goods and services.

Prime examples of monetary unions are the US and the Euro zone. The EU, as a whole, is not considered a monetary union.

b) Explain the difference between a monetary union, a fixed exchange rate regime, and a floating exchange rate regime.

A monetary union are a number of countries that share the same currency. There is no separate monetary policy.

A fixed exchange rate regime means that countries have their own currencies, and their individual monetary policies but the exchange rates are pegged to one another, typically in a small interval to allow for some changes. This regime can be threatened by expectations of devaluation, which is not an option for a monetary union.

A floating exchange rate regime means that countries have their own individual currencies with their own monetary policies and that the currency is allowed to flow freely. It is traded in the market without interferences from the central bank. Supply and demand set the price

c) Discuss economic advantages and challenges for an economy in a monetary union.

Economic advantages for countries in monetary unions:

Countries in monetary unions have several advantages. If they are well integrated with one another the countries get more benefits, as they then have more to do with one another and thereby can gain from being closely connected.

General advantages include lower transaction costs if tolls are limited, volatility of prices can be lower due to a common currency and there can be an internal market that is highly functional. This can for instance mean that countries can get labor from many different places and that skill share can be improved.

The Barro-Gordon model looks at the advantages for a country that's suffering from high inflation of being in a monetary union.

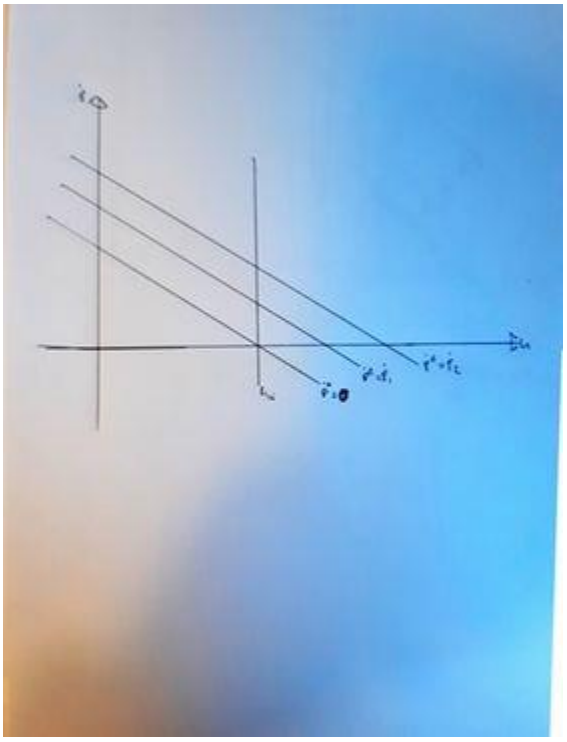
First off we set up the expectations augmented Phillips curve:

$$U = U_N + a(\dot{P}_e - \dot{P})$$

$$\dot{P} = \dot{P}_e - \frac{1}{a}(U - U_N)$$

$When\ U = U_N\ , \dot{P}_e = \dot{P}$

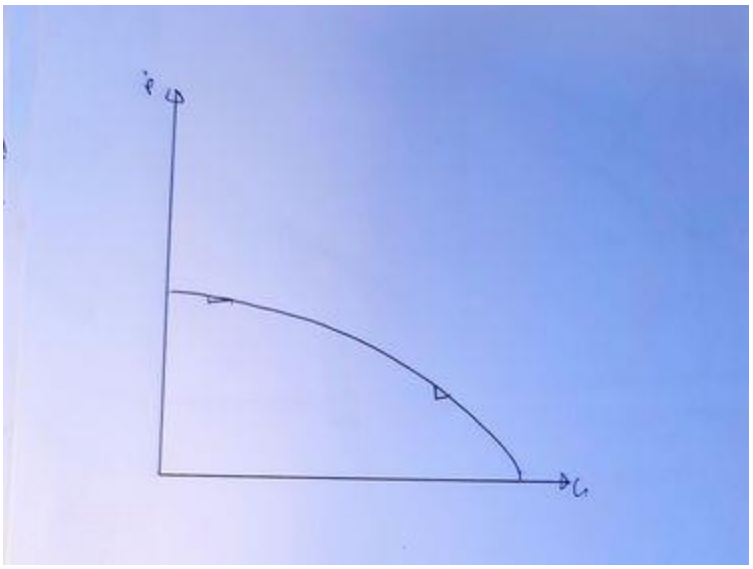
Can be graphed like this:



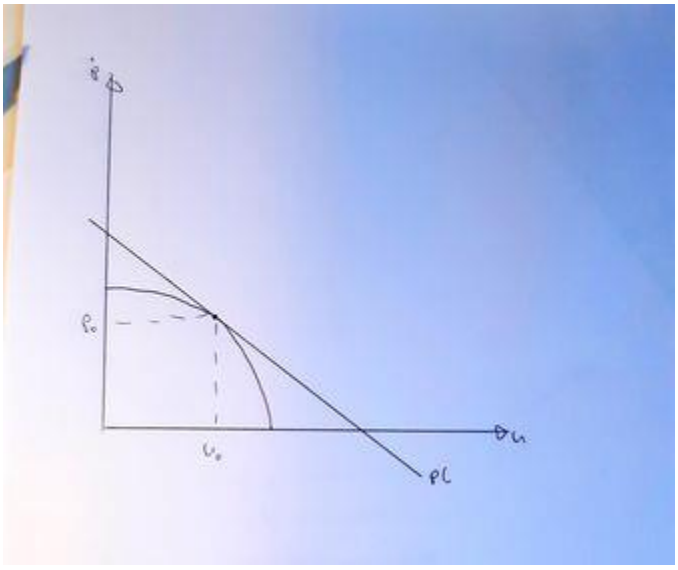
Here we see three different Phillips curves for three different levels of expected inflation.

A country's set of opportunities when choosing between inflation and unemployment is given by the welfare function of the government $V = V(U, \dot{p})$

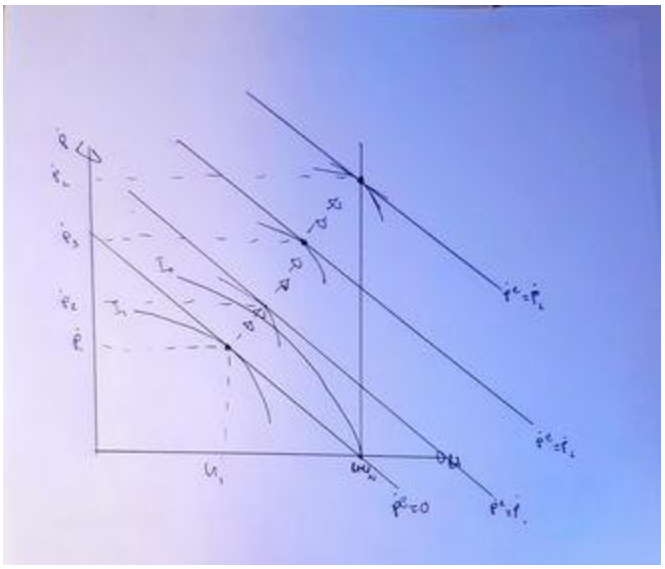
If a government prioritizes unemployment over inflation they are known as a wet government. If the opposite, the government is known as being hard-nosed.



The government will seek to minimize unemployment and inflation. Thus the equilibrium is given by the point of tangency between the Phillips curve and the welfare function.

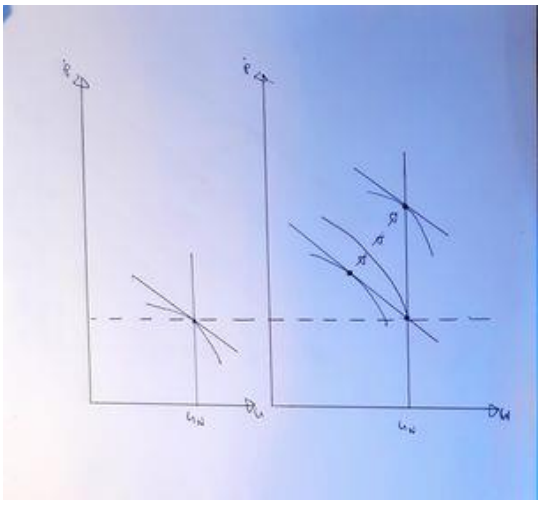


Consider a wet nosed government in point $\left(U = U_N, \dot{P} = 0\right)$



They can get closer to origo by lowering unemployment and raising inflation. What happens then? The expected inflation will increase causing the Phillips curve to shift up. This will lead to the inflation increasing all the way until the country is again at the level where inflation equals expected inflation. This is where the unemployment once again equals natural unemployment. We see that this country experiences very high inflation, also known as stagflation.

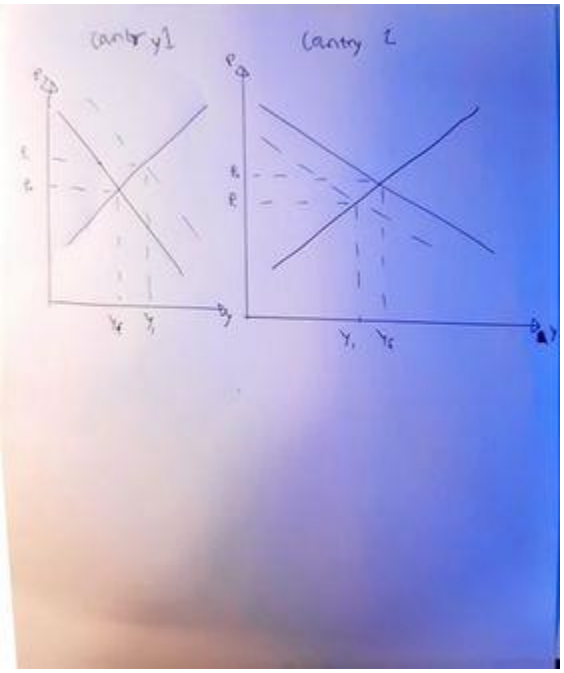
The wet-nosed country can borrow credibility from another country. If the two enter a fixed exchange rate or a monetary union the expected inflation for the two countries combined will be somewhere in between. This means that the wet-nosed government wins quite a bit from borrowing credibility. A fixed currency meaning that unemployment will fall again and inflation increase. This means that the same old story will repeat itself and the country will again experience stagflation. The only solution to this problem is thus to generate a monetary union where the wet-nosed government won't have any possibility to devaluate.



Challenges of a monetary union.

Two countries in a monetary union can experience asymmetric shocks which will be more difficult to handle when the countries cannot employ monetary policies.

Consider to countries where country 1 experiences a positive demand shock and country 2 experiences a negative demand shock.



The solutions to this are two-folded. Either the countries can use fiscal policies to counteract, in which case country 1 should employ contractionary fiscal policies and country 2 should use expansionary fiscal policies.

The two countries can also hope that automatic stabilizers will do the job. If a monetary union is highly functioning then the two countries will be so integrated that when there's little work to find in one country the workers will move to another country, thus generating less competition for jobs in the country in a crisis and getting the required labor force to the country which needs more labor due to good economic times.

Wage flexibility can also solve this, if the labor system is flexible enough so that countries doing poorly can lower wages thus becoming more competitive and vice versa with the country doing well.

The problem with these adjustments are that they aren't necessarily particularly realistic . It's hard to ask for a lot of people to move to a different country if they aren't very integrated. There are language and distance barriers. Also not many labor systems are flexible enough to allow for high levels of wage flexibility.

Fiscal policies have the potential to work but it requires good public finances to afford it. This is not a good opportunity in the long run for many countries.

Thus, it can be concluded, that if two countries often find themselves experiencing asymmetric shocks in their economies, then entering a monetary union is probably not a good idea.

It is one of the reasons why Norway is not a part of the EU as oil price increases are good news for the Norwegian economy but bad news for almost all other European countries.