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QUESTION 1

In this task I will use the Barro-Gordon model in order to explain motivations behind the introduction of the euro.

a.) In this task I will explain the incentive for surprise inflation that in the longrun leads to high equilibrium inflation, through the process of stagflation (long period of time with slow economic growth and stagnation).

The model consists of two curves:

- The Phillips curve
- The government value function

Before I can explain the incentive for surprise inflation, I will explain each of these curves and their equilibrium.

The Phillips curve

The Phillips curve is given by:

$$\dot{p} = \dot{p}^e - \frac{1}{a}(u - u_N)$$

where $\dot{p}$ – inflation

$\dot{p}^e$ – expected inflation

u – unemployment

u_N – natural unemployment

(where natural unemployment is the level of unemployment in which the economy is in balance)

a – parameter

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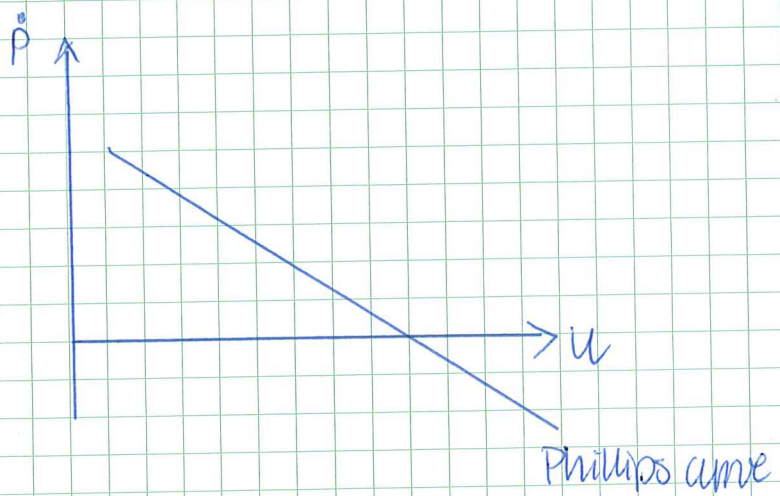
The interpretation of the Phillips curve is that inflation is affected by the expectations, and the deviation from natural unemployment $(u-u_N)$, by a factor of $\dot{\alpha}$.

We assume that $\frac{\partial \dot{p}}{\partial u} < 0$ because more unemployment will push the wages down through the natural mechanisms of the employment market, thereby reducing the price growth in the economy (inflation).

The Phillips curve graphically:



~~The government value function~~

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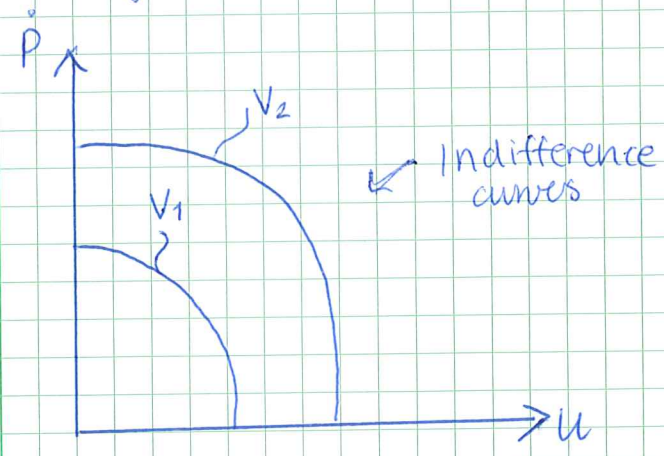
The government value function

The government value function V is given by:

$$V = V(\dot{p}, u)$$

The interpretation of the government value function is that for points along the same value function V_i, the government will be equally satisfied. The government wishes both low inflation and low unemployment, but can be willing to increase inflation/unemployment slightly in order to decrease the other slightly, for the same utility.

The government value function graphically:



The graph above shows two different levels of utility, V_1 and V_2, where V_1 has the highest utility ($V_1 > V_2$) because both unemployment and inflation are lower at all points of this curve.

The curves are concave because more of one means less of the other, for the same level of utility.

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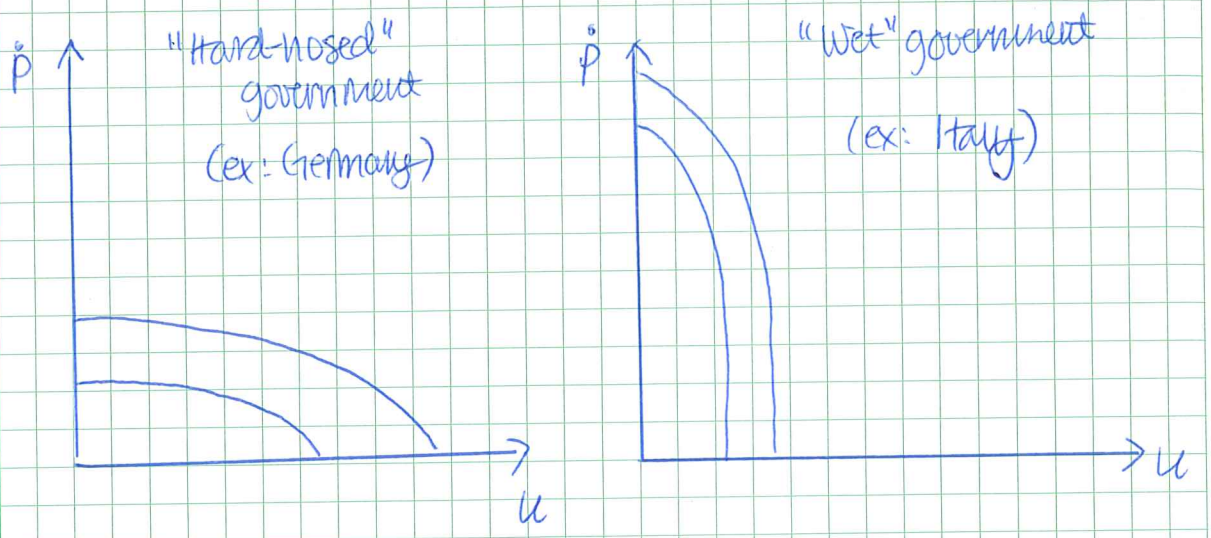
The preferences of different governments (inflation vs. unemployment) can vary. Graphic illustration:



A "hard-nosed" government will prefere low inflation to low unemployment (will have to give up a lot of unemployment in order to increase inflation by one unit). An example of such a governmente can be Germany.

A "wet" government will prefer low unemployment to low inflation. In order to be willing to increase unemployment by one unit, inflation has to decrease substantially. An example of such a government can be Italy.

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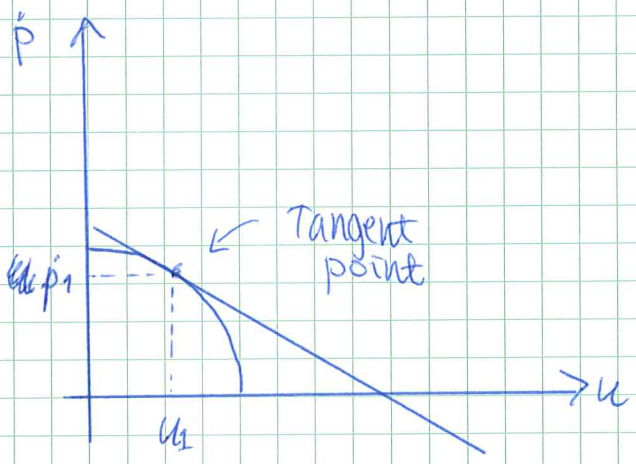
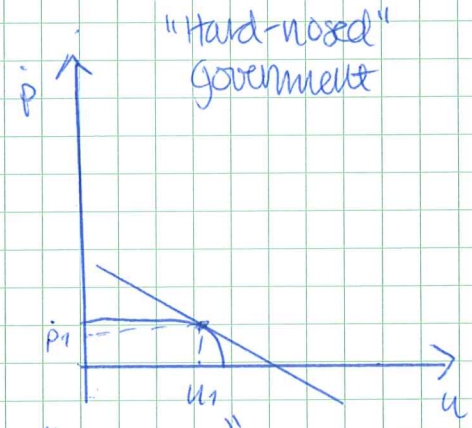
Model equilibrium

The model equilibrium in the Barro-Gordon model is where the Phillips curve is the tangent of the value function. This is because this will be the lowest possible value function we can achieve, and thereby the highest possible utility given the Phillips curve.

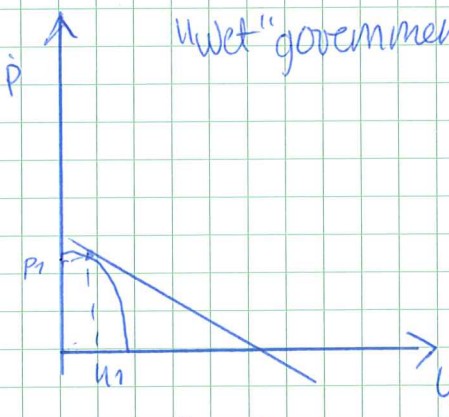
Graphically:



The tangent point will vary for different preferations of government



A "hard-nosed" government will initially have low inflation and high unemployment



A "Wet" government will initially have high inflation and low unemployment

(Will later show that their equilibrium levels in the long run will be different from this)

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Explaining the incentive for surprise inflation

We begin by assuming rational expectations, meaning that expected inflation reflects actual inflation ($\dot{p} = \dot{p}^e$).

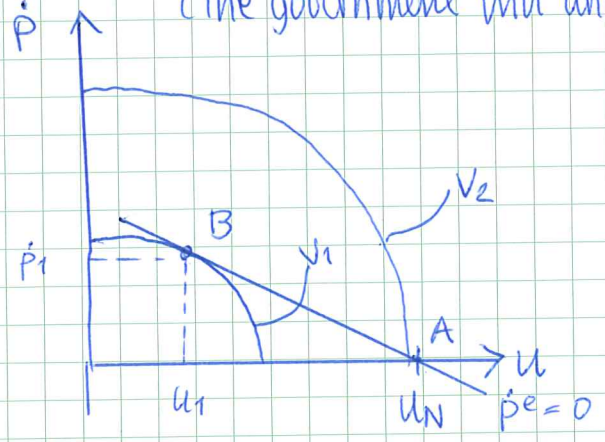
For this to hold, we must have that $u = u_N$ (unemployment is at its natural level):

$$\dot{p} = \dot{p}^e - \frac{1}{a}\underbrace{(u - u_N)}_{=0}$$

$$\Rightarrow \dot{p} = \dot{p}^e$$

If this holds, we will adapt to point A in the graph:

(The government will announce $\dot{p} = 0$)



However, the government will have an incentive to deviate from this, because it can achive higher utility than V_2, if it instead sets inflation $\dot{p} = \dot{p}_1$ and then adapts to point B, with utility V_1 ($V_1 > V_2$). This is an example of surprise inflation.

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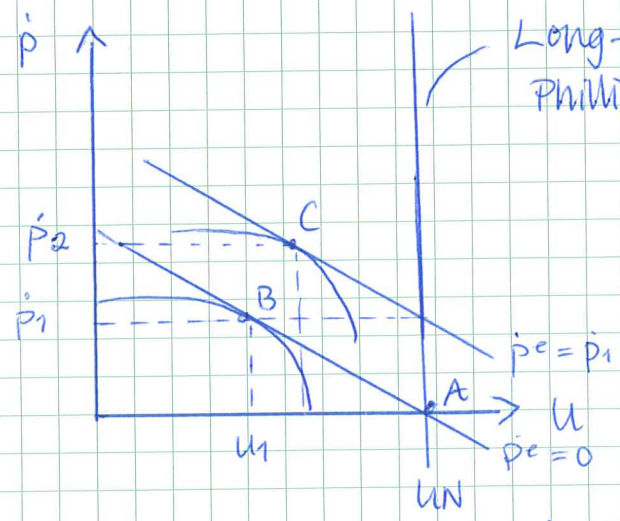
High equilibrium inflation

The effect of the adaptation to point B explained in the previous page is eventually high equilibrium inflation. The reason for this is that the inflation expectations will change when the government sets inflation $\dot{p} = \dot{p}_1$. The expectations are now $\dot{p}^e = \dot{p}_1$.

Graphically:



The result is the movement from B to C. The Phillips curve will shift when the inflation expectations adapt, and the best utility the government can achieve is then in point C, with inflation $\dot{p} = \dot{p}_2$ and expected inflation $\dot{p}^e = \dot{p}_1$.

However, this means that expected inflation again will increase, to $\dot{p}^e = \dot{p}_2$.

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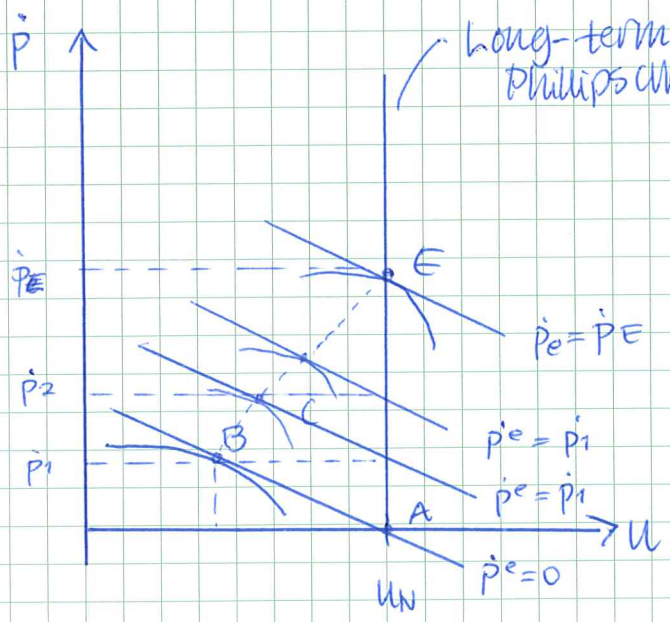
The expected inflation will continue to adapt, and we will eventually end up in the long-term equilibrium E (at the long-term Phillips curve).

Graphically:



The process is called stagflation, and is characterized by slow economic growth and stagnation. Eventually the government has reached its equilibrium level with $\dot{p}^e = \dot{p}_E$ (high inflation) and unemployment at its natural level, being worse off than the initial level A because E represents a meets a higher value function $\Rightarrow$ lower utility level.

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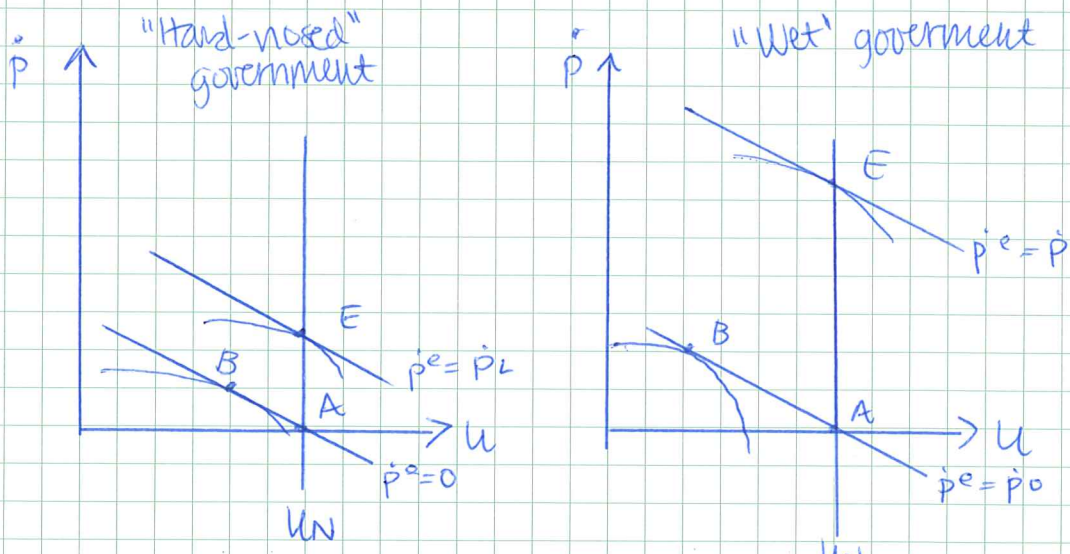
b) I will now elaborate on this long-term equilibrium analysis by taking into account the preferences of different types of government. I will show that governments with preferences for low unemployment will reach an equilibrium with higher equilibrium inflation than others.

The reason for this is the curvature of the value functions.

Graphically:



The "hard-nosed" government will reach an equilibrium with relatively low inflation $\dot{p}_L$, because it through the process not has been willing to give up ~~much~~ low inflation in order to maintain low unemployment.

The "wet" goverment will reache an equilibrium with relatively high inflation, $\dot{p}_H$, because it through the process of stagflation has been willing to sacrifice low inflation for maintaing lower unemployment instead.

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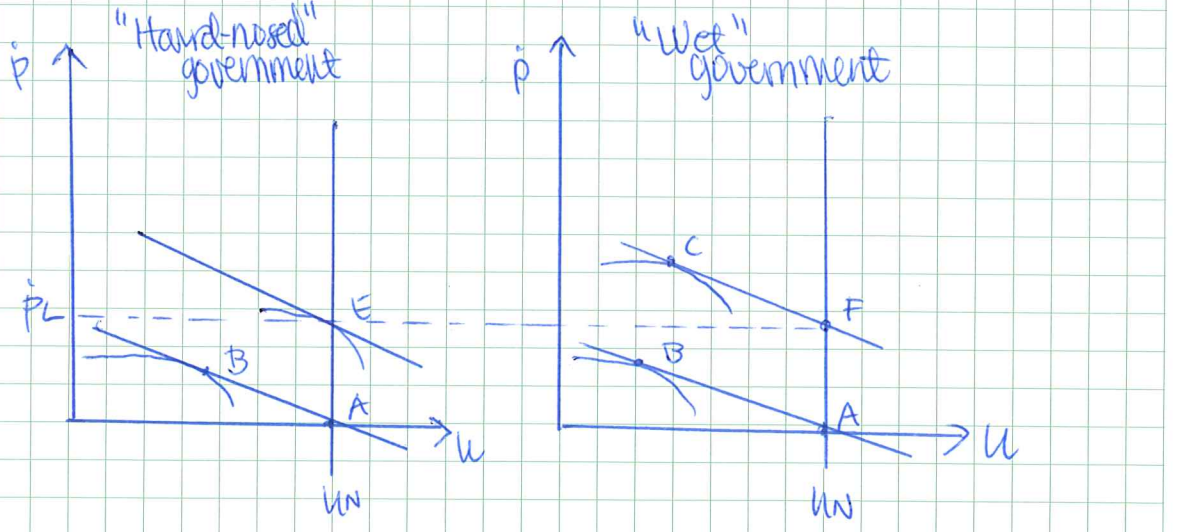
The important thing to note about this equilibrium is that both governments achieve the same unemployment level U_N, but very different levels of inflation. The "Wet" government is worse off than the "hard-nosed" one.
The "Wet" government should choose a lower level of inflation without more surprise inflation, but how can this be credible for the population? If the population does not belive that the government will stay at this low level, inflationary expectations will increase, and the government has no choice but to end up with high equilibrium inflation $\dot{p}_A$.

Graphically:



The wet government would be better off in the long term at point F, where equilibrium inflation $\dot{p} = \dot{p}_L$. However, this is not credible, since the point C represents higher utility (still incentives to choose C).

In the next part of the task I will discuss how the Euro can be used to make F more credible. membership of the

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c) I will now discuss how a monetary union can solve the inflation problem of a government with "wet" preferences.

First, I will explain ~~how~~ what a monetary union is:

A monetary union is a cooperation between governments where they aggree to having a common central bank, and a common currency. An example of this is the ECB (European Central Bank) and the Euro, as the central bank and common currency for most countries in the EU.

If both countries have the same central bank, ~~the~~ a lower equilibrium inflation (ex: point E) in the long term will be more credible. The "Wet" government "borrows" credibility from the "Hard-nosed" government.
However, it is not likely that the equilibrium for either country will be in point E with $\dot{P}_L$ as ~~illustrate~~ illustrated in the ~~prev~~ previous page. This is because the central bank most likely will consist of members from both governments, and the "wet" representatives will have incentives for negotiating a higher equilibrium ~~exchange rate~~ inflation than the "hard-nosed" representatives.

The equilibrium ~~exchange rate~~ inflation will lie somewhere between what it would be without a monetary union:

$$\dot{P}_{\text{"Hard-nosed"}} < \dot{P}_{\text{union}} < \dot{P}_{\text{"wet"}}$$

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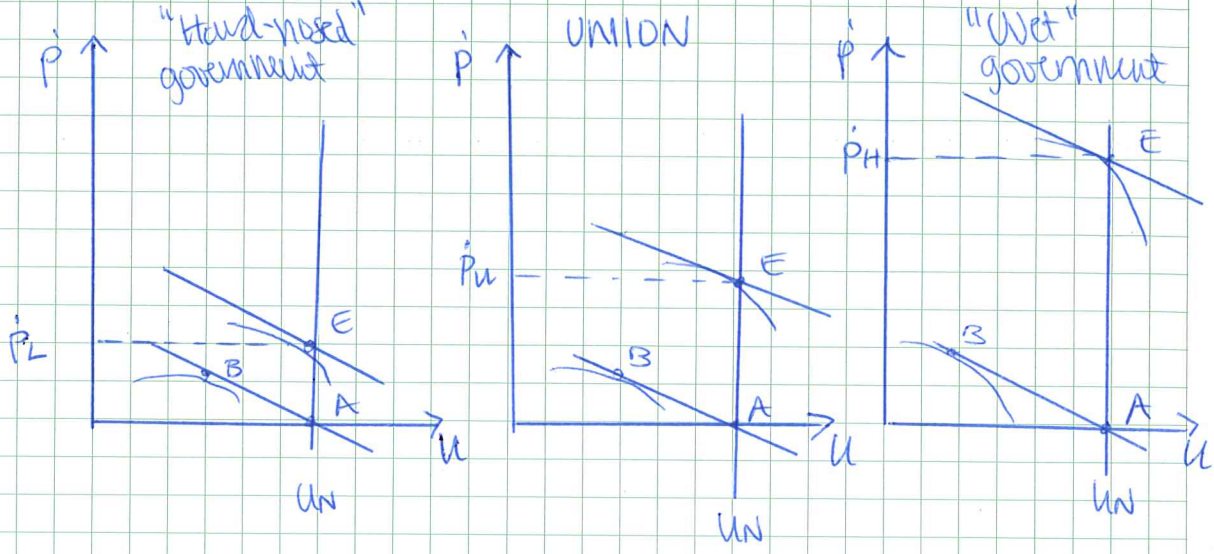
Graphically:



The "Wet" government ~~loses~~ gains welfare, and the "hardnosed" government loses welfare from joing in a monetary union.

The negative sides of having a monetary union is that the government can not alone choose to devaluate or revaluate ~~if among~~ its exchange rate in the event of a shock. Neither can it use monetary polizy alone to regulate the economy.

Norway is in a special agreement with the EU, called the EØS-agreement. This obligates Norway to follows most of the laws that are given by the EU, but gives economic indepenedence at the same time. Norway gets to have its own currency, own central bank, and therefore has the freedom to use means instruments to regulate the economy. Many will argue that Norway would not have had the same economic growth if it wasn't for this economic independence, but that other countries in the EU could benefit from an economic cooperation with Norway.

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QUESTION 2

I will show the cohesion between the exchange rates and the business cycle by examining a negative shift in the income level for a country with a floating exchange rate. In order to do this analysis I will use the foreign exchange rate and money market model.

First, I will explain the following concepts:

Exchange rate: The price of one currency in terms of another, denoted E. Example:

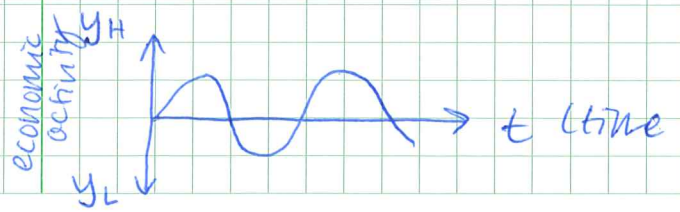
$E_{NOK/\$} = 9{,}00$ (the price of dollars in terms of NOK)

If E↑, we have a depreciation

If E↓, we have an appreciation

Floating exchange rate: When the exchange rate is allowed to vary with the business cycle. Opposite: fixed exchange rate. Note that the exchange rate can be considered an instrument to regulate the economy.

The business cycle: The movement (natural) of the economy between high and low economic activity over time. High economic activity is characterized by low unemployment and high investment. Low economic activity is characterized by higher unemployment and more saving.



The time between each top is usually ten years, and naturally regulated by the economic cycle.

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The model I will use to solve this task consists of both the foreign exchange market and ~~the (US) money market~~. I will first explain the different markets separately, and then in a combined model. This model will be used to show the dynamics between economic activity and exchange rates.

We assume that we have two regions:

- America (US)
- Europe (EU)

These regions have the following currencies:

- dollars ($)
- euros (€)

And investors can choose to invest either in dollars or euros.

For simplicity we will denote $E^{\$/€} = E$ (the price of euros in terms of dollars)

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The foreign exchange market

Consider an investment that can be made by an american, either in american currency with the dollar interest rate $R_\$$, or in european currency with the euro interest rate $R_€$.

The rate of return (RR) after the investment is dependent on which currency you choose.

a) American currency investment

Then the rate of return equals the American interest rate:

(1) $RR_\$ = R_\$$

b) European currency investment

Then the rate of return equals the european interest rate, minus depreciation:

(2) $RR_€ = R_€ + \frac{E^e - E}{E}$

↑ where E^e - expected exchangerate

and $\frac{E^e - E}{E}$ - expected depreciation

We assume that uncovered interest parity holds, meaning that the rate of return to an investment should be equal regardless of the currency you invest in:

(3) $RR_\$ = RR_€$

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The ~~rate~~ uncovered interest parity (UIP) condition can be found by combining (1) and (2) into (3):

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

↳ This will give the equilibrium exchange rate.

The next question is how the exchange rate is affected by the different factors of the model. We can show this by deriving an expression for E from the UIP-condition:

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

$$E \cdot R_\$ = E \cdot R_€ + E^e - E$$

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

$$E = \frac{E^e}{R_\$ - R_€ + 1}$$

By ~~deriving~~ derivation of E with respect to E^e, $R_\$$ and $R_€$, I can interpret the effect of the expected exchange rate, the dollar interest rate and the euro interest rate on the equilibrium exchange rate.

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

⇒ Higher expected exchange rate leads to higher exchange rate (expectations are self-fulfilling)

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

⇒ Higher dollar interest rate leads to a currency appreciation. More beneficial to invest in dollars.

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$\frac{\partial E}{\partial R_\epsilon} = \frac{E^e}{R_\epsilon^2} > 0$

⇒ The higher euro interest rate leads to a currency depreciation. More beneficial to invest in euros.

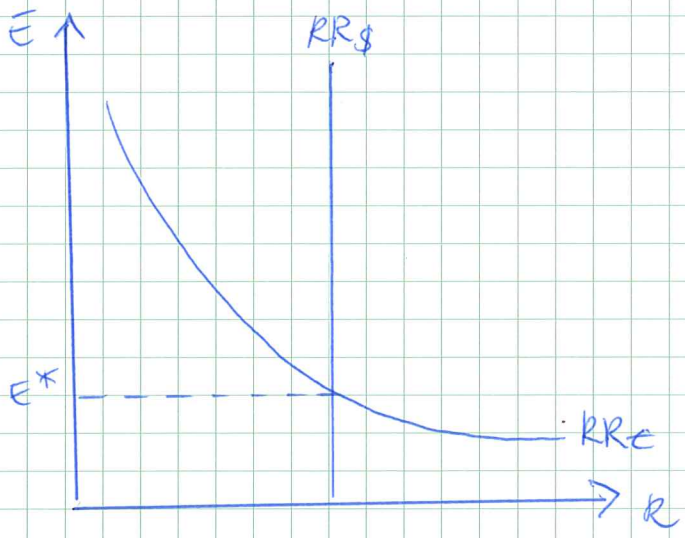
In order to draw the foreign exchange market and the equilibrium exchange rate graphically, we need the curve of (2).

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

$$\frac{\partial^2 RR_\epsilon^2}{\partial^2 E^2} = 2 \cdot E^e \cdot E^{-3} = 2\frac{E^e}{E^3} > 0$$

⇒ The curve is falling and ~~concave in E~~ convex in a E - R - diagram:

Graphically: (the foreign exchange market).



The equilibrium exchange rate E^* is given by where the $RR_\$$ and RR_ϵ curves meet (interscet).

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The (US) money market

The (US) money market consists of the money demand and the money supply. It determines ~~how much the exch.~~ the equilibrium interest rate R$, which will affect the foreign exchange market.

The money supply is given by the central bank, and denoted $\frac{M^S}{P}$, where M^S - money in circulation and P - price level.

The money demand is given by:

$$M^d = P \cdot L(R, Y)$$

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

Where $\frac{M^d}{P}$ - money demand

R - interest rate

Y - production / income / BNP

We assume that:

$\frac{\partial M^d}{\partial R} < 0 \Rightarrow$ Increased interest rate reduces the money demand (more beneficial to have money on the bank and earn interest rate R)

$\frac{\partial M^d}{\partial Y} > 0 \Rightarrow$ Increased ~~interest rate~~ income increases money demand because more money gets in circulation.

and we see from the expression that:

$\frac{\partial M^d}{\partial P} > 0 \Rightarrow$ Higher price levels means more money demand. Need more money in order to buy the same goods.

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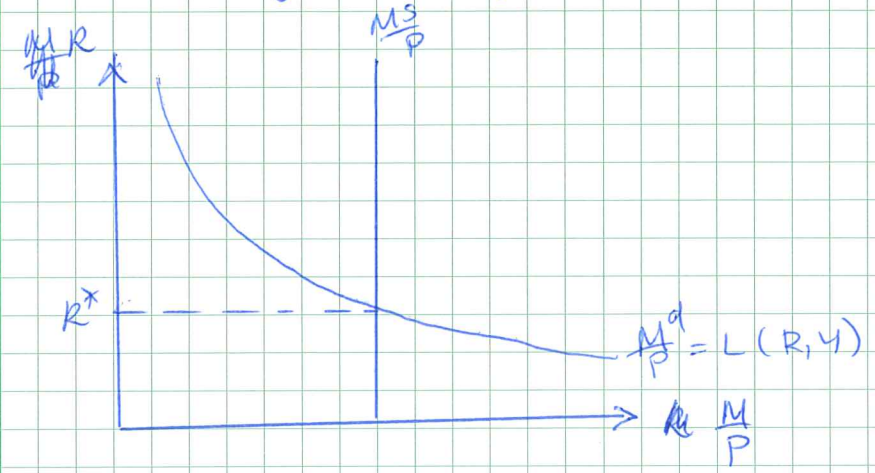
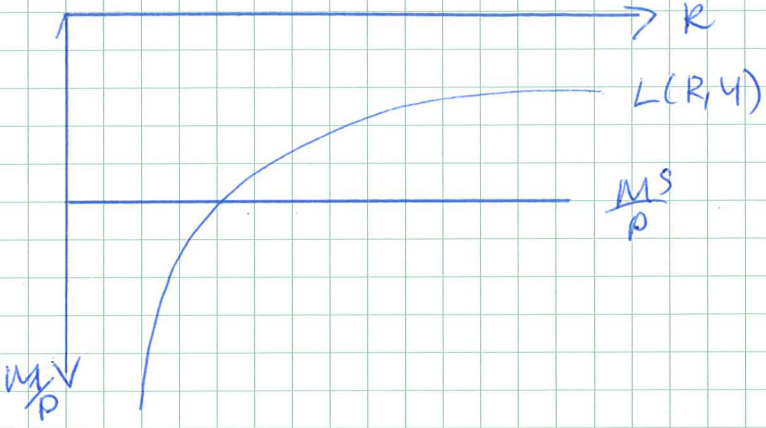
The money market graphically:



The intersection of the money demand and money supply curves gives the equilibrium exchange rate R^*.

The curve can be rotated in order to combine it with the foreign exchange market later:



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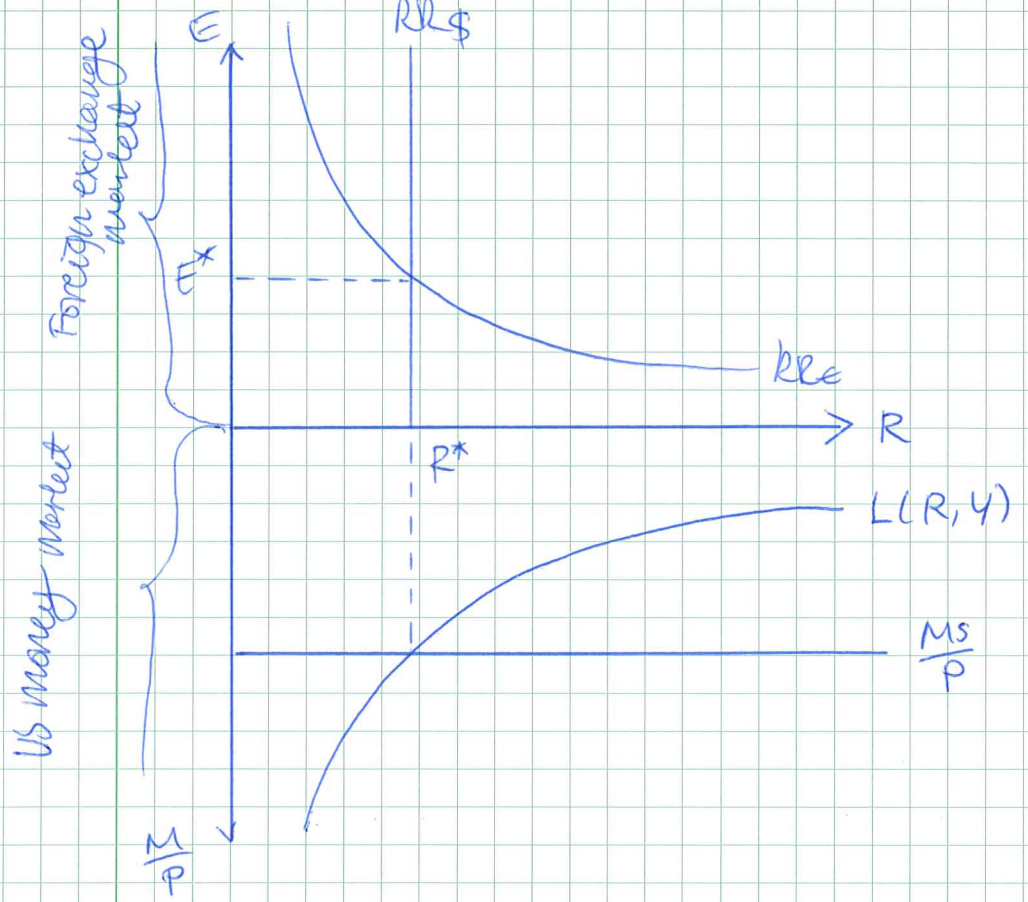
The foreign exchange and money market model

Now the two markets are combined in order to show the dynamics between the US money market and the exchange rate equilibrium in the foreign exchange market.



The dynamics are that the interest rate is determined by the intersection between money supply and money demand in the US money market, and then this decides where the RR$-curve lies in the foreign exchange market.

Here the equilibrium exchange rate is determined by the intersection of the rate of return-curves. ~~The RR~~

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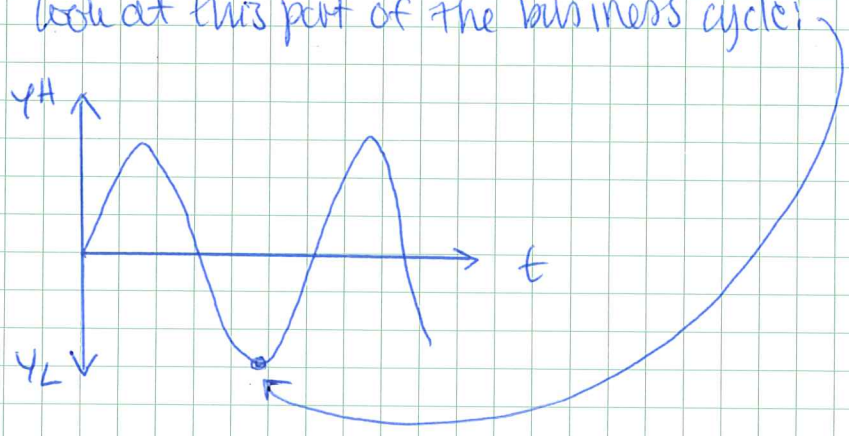
Negative shift in the income level

I will now analyze a negative shift in the income level, $Y\downarrow$, I do not consider it necessary to analyze a ~~long-term~~ permanent shift, as I will use the conclusion to describe the business cycle, where $Y\downarrow$ in periods of low economic activity, and $Y\uparrow$ in periods of high economic activity. Will in other words look at this part of the business cycle:



If I was looking at a ~~long-term~~ permanent shift in income, I would have to take into account that the prices would change, shifting the money demand curve. Additionally, the expected exchange rate would change, since the change is permanent, shifting the ~~euro~~ ~~in~~ curve for rate of return to ~~euros~~.

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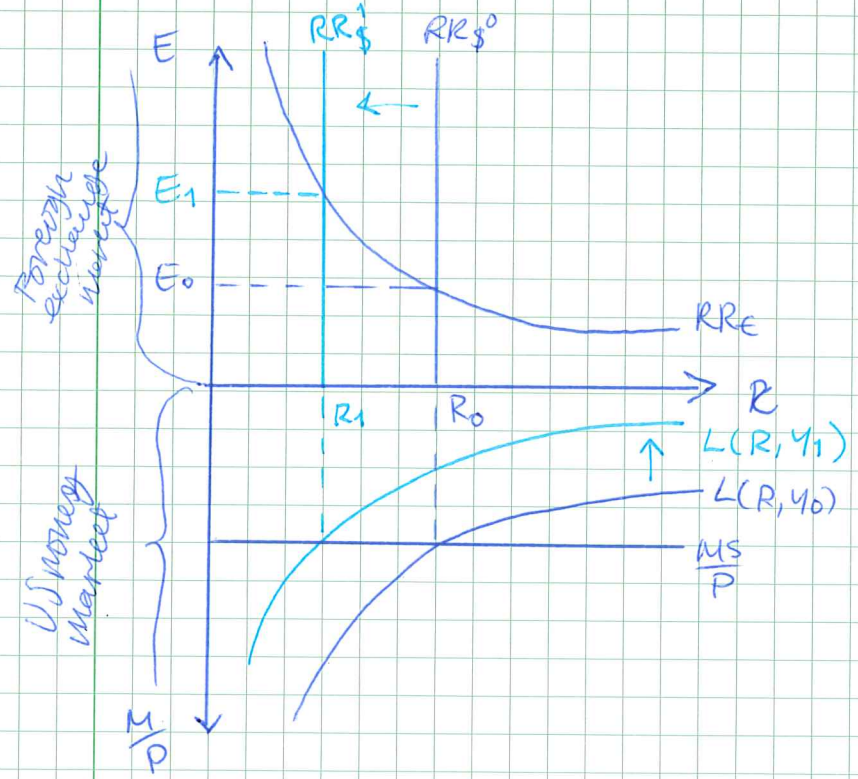
A negative shift in income will shift the money demand curve inwards, since $\frac{\partial Md}{\partial Y} > 0$



When the money demand curve shifts inwards, the ~~exchange~~ interest rate is reduced from R_0 to R_1 ($R_1 < R_0$). This is a natural government response, because when economic activity is low, the interest rate should be reduced in order to stimulate economic activity and investments (prevent high savings).

This affects the foreign exchange market. The exchange rate depreciates from E_0 to E_1 ($E_1 > E_0$). The US currency is now weaker compared to the euro, because you need more dollars to buy one euro than before. This also of makes sense, since we have a temporary economic recession.

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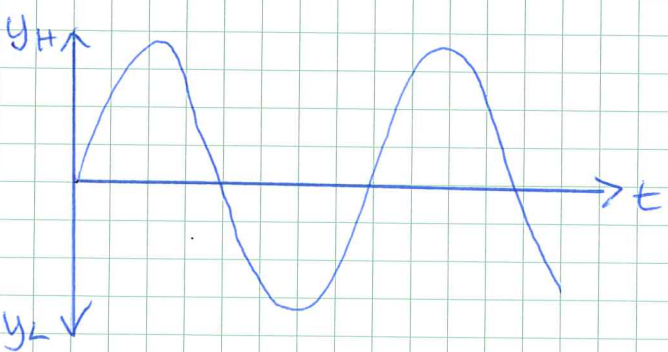
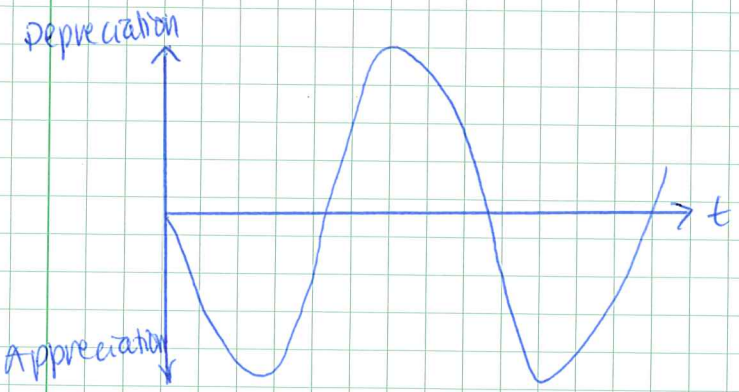
Now, how can we conclude that the exchange rate varies with the business cycle? From symmetry we can see that if we had higher economic activity, the exchange rate would appreciate. ~~Another~~ So we know that:

$Y\uparrow \Rightarrow E\downarrow$

$Y\downarrow \Rightarrow E\uparrow$

We can show this cohesion between the business cycle and the exchange rate graphically:





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Den gule kopien beholder du / *Please keep the yellow page*