Advanced Monetary Economics

Tutorial 3

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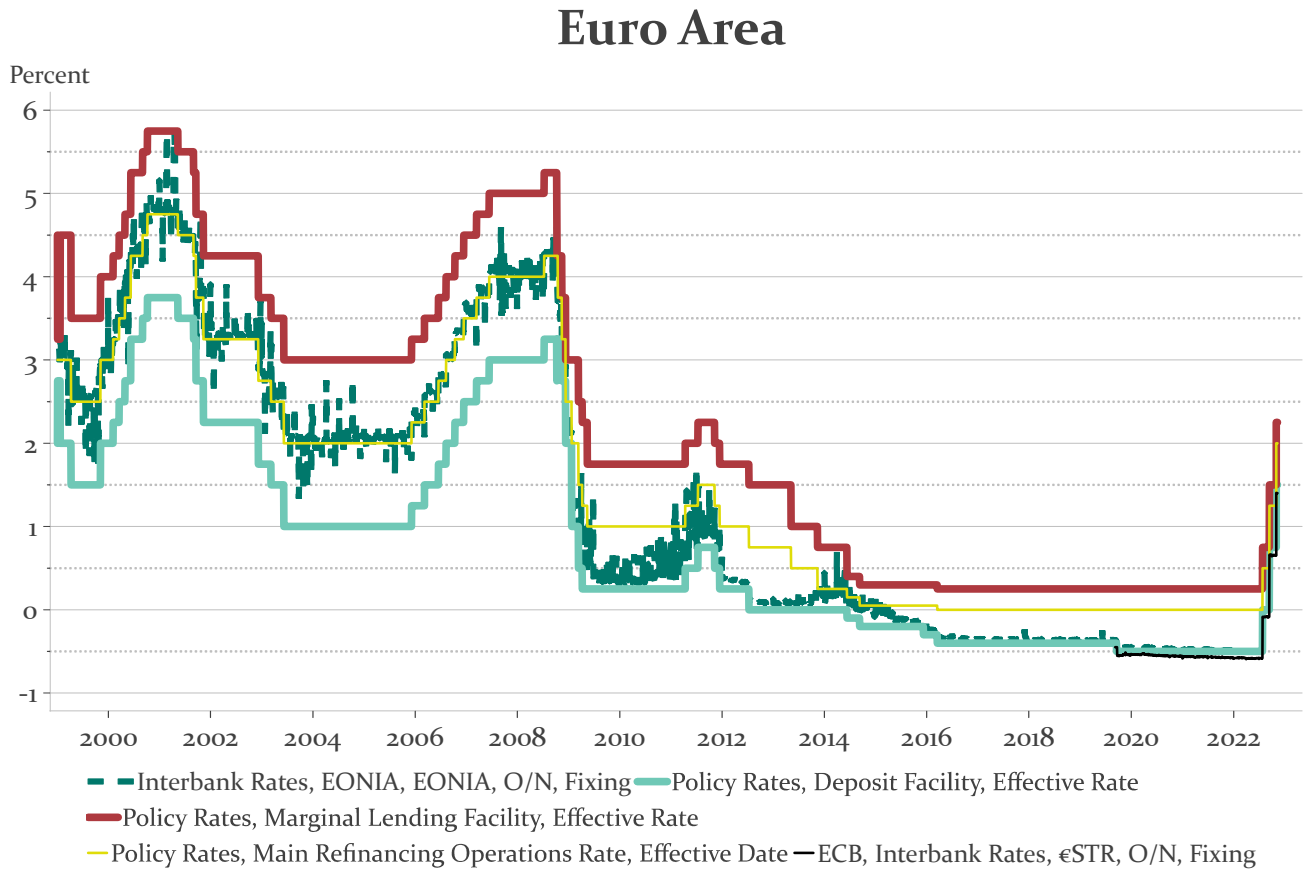
Lecture

1. Facts and theory of the yield curve

2. Conventional interest rate policy

3. Unconventional monetary policy

- Can interbank rates be negative? Can they fall below the deposit facility rate?



1 Exercise

Question: Explain the concept of the yield curve and provide the key facts about it.

- Concept of the yield curve: The yield curve indicates the effective interest rate at which comparable bonds with a given maturity are traded.

- Facts about the yield curve:

  1. Shifts in the entire yield curve: interest rates of different maturities tend to move together. They are affected in the same direction by changes in expectations about future short term rates.

  2. When short-term interest rates are low, the yield curve tends to be upward-sloping; when short-term interest rates are high, the yield curve tends to be downward-sloping. Underlying this observation is the concept of a long-run

equilibrium rate. If current short-term rates are unusually high, they are expected to fall back to their normal level in the future. Reversely, if current short-term rates are low, they are expected to rise back to the normal level in the future when the economy grows at trend and inflation is at its long-run level.

3. Typically, yield curves tend to rise (see exercise below).

2 Exercise

Question: Explain the expectation theory using a numerical example you have chosen yourself. Subject this approach to a critical review with regard to the facts.

General on the theory of expectations: The interest rate of a long-term bond corresponds to the average expected interest rates over the relevant period (or the relevant remaining term).

- If the expected short-term interest rate for the next 5 years averages 10%, the interest rate of a bond with a remaining maturity of five years is also 10%.

- If the expected short-term interest rate for the next 10 years averages 11%, the interest rate of a bond with a ten-year maturity is also 11% $\longrightarrow$ rising interest rate with increasing maturity, due to rising expected short-term interest rates.

- Core assumption: Bonds are perfect substitutes. The investor is indifferent between short maturities and a long maturity.

Numerical example:

- Bond with a one-year expected interest rate for the first and second period of 5% and 6%.

- Average interest rate is therefore: $\frac{0.05+0.06}{2} = 5.5\%$
- Expectation theory: Indifference to a bond with a two-year maturity.
- The 5.5% is the interest rate of a two-year bond.
- Generally, for a bon with n years maturity the interest rate is $i_{n,t} = \frac{i_t+i^e_{t+1}+i^e_{t+2}\cdots+i^e_{t+n-1}}{n}$
- For a bond with a remaining maturity of 5 years (n = 5) and 5% to 9%: $i_{5,t} = 7\%$.
- Furthermore, $i_{1,t} = 5\%$, $i_{2,t} = 5.5\%$, $i_{3,t} = 6\%$, $i_{4,t} = 6.5\%$, $i_{5,t} = 7\%$.
- $\rightarrow$Increasing short-term expected interest rates cause a rising average, and thus a rising yield curve.

Implications

- Short-term current interest rate in the example is 5%.

- Here, a long-term interest rate (e.g. $i_{5,t}$) is higher than the short-term current interest rate (5%). Equivalent statement: An average of the expected short-term interest rates (e.g. $i_{5,t}$) is higher than the current short-term interest rate (5%).

- However, an average (e.g. $i_{5,t}$) is only higher than the current short-term interest rate (5%), if increases in the short-term interest rate are expected (as assumed here).

- Rising yield curves are therefore often referred to as rising interest rate expectations.

Relation to the facts

- Shifts in the yield curve: change in expected interest rates affects yields for different maturities similarly. This fits the data.

- When short-term interest rates are low, the yield curve tends to slope upwards: when short-term interest rates are low, an increase is typically expected, causing expected average rates, and thus long-term interest rates, to rise with increasing residual maturity. This matches the data.

- Yield curves typically upward-sloping? The upward-sloping yield curve requires that expected short-term interest rates rise (see above). In practice: Same probability for up and down movement of future short-term interest rates. $\longrightarrow$ Expectation theory with more realistic expectation formation therefore suggests that the yield curve is flat on average, and not most of the time upward-sloping.

3 Exercise

Question: Explain the main assumption and idea of the liquidity premium theory. What is the relation of the liquidity and the expectations theory? How well does the liquidity premium theory explain the facts about yield curves? Does the liquidity premium theory rule out downward-sloping yield curves?

- The main idea of the liquidity premium theory (LPT) is that bonds of different maturities are not perfect substitutes. Generally, investors prefer short-term bonds because they have lower interest rate risk.

- Remember: the longer the duration of a bond, the more sensitive is its prices to changes in interest rates

- Investors ask for a compensation for this additional risk in form of higher interest rates: a liquidity premium.

- That premium rises in the duration of the bond because the interest rate risk rises in the duration of the bond.

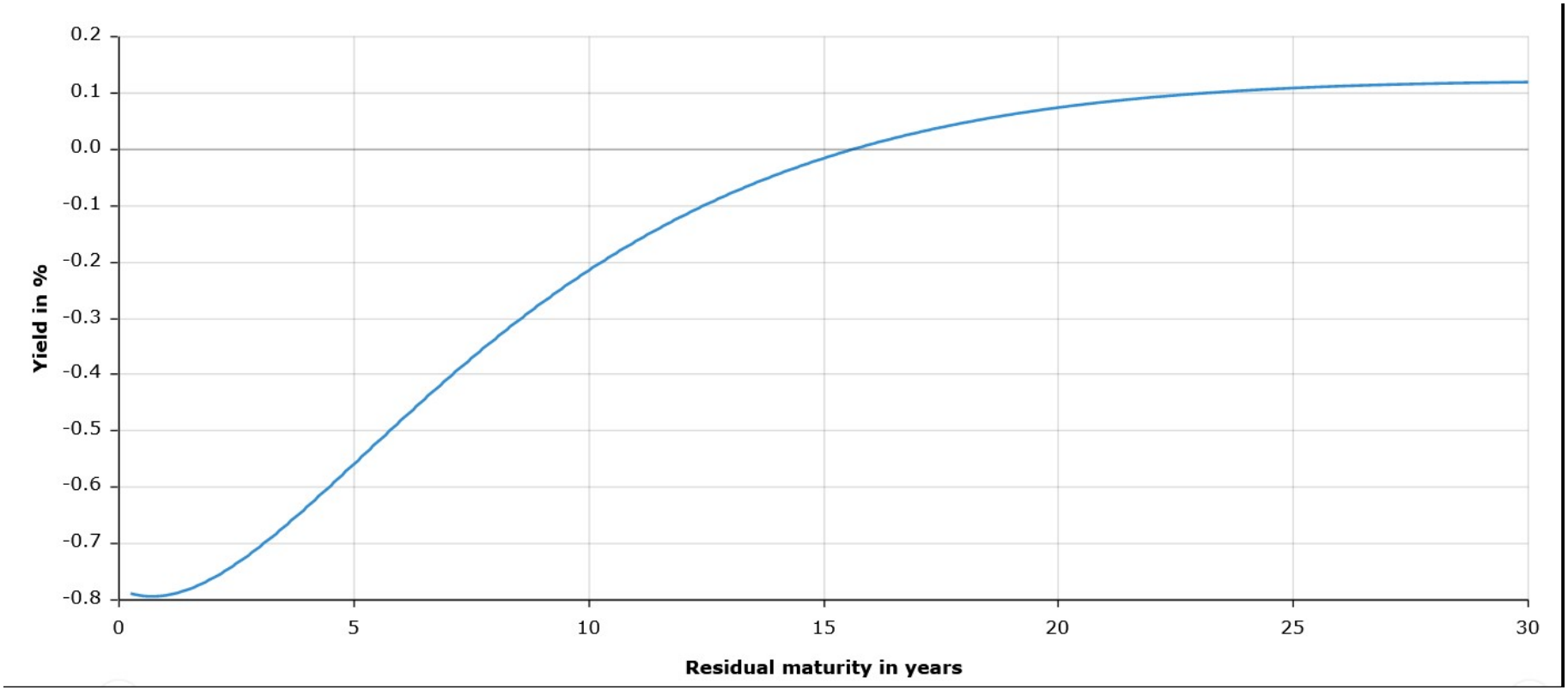
- The LPT subsumes the expectations theory. It relaxes the assumption of perfect substitutes of bonds with different maturities.

- The LPT can explain all three facts of the yield curve. The expectations theory can explain the first two and is covered by the LPT. In addition, the LPT can explain the third fact (yield curves slope upward most of the time).

- The LPT allows for downward-sloping yield curves. This can happen when current short-term rates are extremely high. Then, the expectations theory implies a steeply falling yield curve, which is not fully compensated by the liquidity premium. In other word, it depends which component of yields dominate.

4 Exercise

Question: Provide an interpretation of the yield curve below. Do you find anything strange about the level of the yield curve?



- The yield curve suggest a falling short-term rates for the next year. Then, short-term interest rates are expected to be constant or to rise. Without further analysis, we cannot say whether the increase of the yield curve is due to expectations about rising short-term rates or just a reflection of the liquidity premium and constant short-term rates.

- It is remarkable that interest rates until 15 years are negative. Investors pay interest rates to lend! (not to borrow)

5 Exercise

Question: Which options does the ECB have at the zero lower bound? Discuss some pros and cons of the options.

- Generally, the ECB has the following options

  1. Change policy rates
  2. Say something about future policy rates
  3. Purchase assets

- The ECB has three main policy rates. The marginal lending facility rate, the deposit facility rate and the main refinancing rate. If the main refinancing rate is already at the zero lower bound, this option is not on the table.

- If banks have already sufficient liquidity, changing the marginal lending rate would have no effect.

- The ECB could lower the deposit rate. That could induce banks to hold their cash not at the ECB but bring it to the interbank market. This could reduce interbank rates and stimulate bank lending to firms and households.

- But it could also generate losses for banks, which could reduce credit provision.

- The ECB could signal that it will keep rates low for longer than what investors have expected so far.

- The problem might be that interest rate statements about the very far future are not very credible.

- The ECB could also buy financial assets. This would reduce the yield curve.

- There are several risks of asset purchases:

  1. Inflation risk

  2. Asset price inflation risk (bubbles in other asset markets, in particular stocks and housing)

3. Sovereign solvency risk on the ECB balance sheet increases.