THE ZERO LOWER BOUND (ZLB) & OTHER PROBLEMS IN MONETARY POLICY

Week 10

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1. Inflation Targeting

Inflation Targeting

All central banks in advanced countries have an optimal value for inflation they want to achieve. This is called the inflation target:

$$\pi^T$$

Central Bank News

Central Bank	Target	Central Bank	Target
US	2	New Zealand	2,± 1
Japan	2	Australia	[2-3]
EuroZone	2	Canada	2,± 1
UK	2	Switzerland	<2
Sweden	2	China	3
Norway	2	Mexico	3,± 1

Inflation Targeting: Two Ways

There are two different ways of looking at the target value:

1. π^T is a ***ceiling***. The central bank suffers a loss if $\pi > \pi^T$:

$$\min(\pi - \pi^T)$$

2. π^T as a true ***target***. The central bank suffers a loss if $\pi \neq \pi^T$:

$$\min(\pi - \pi^T)^2$$

Examples:

- Ceiling: Switzerland, ECB (until July 2021)
- True target: all central banks in advanced economies

Two Ways: Is there a Problem?

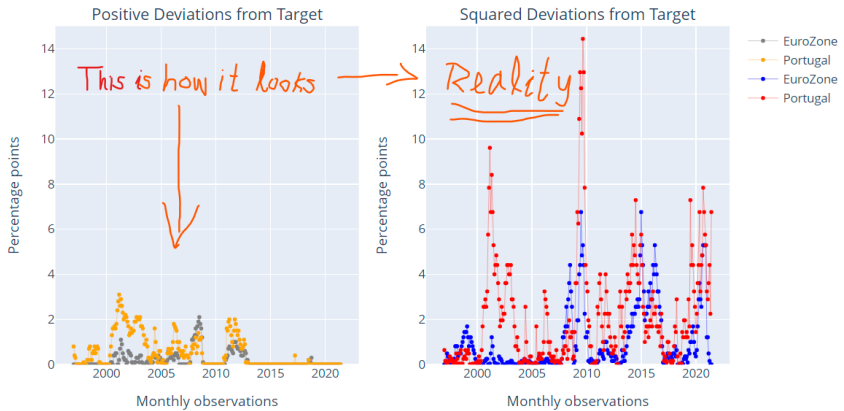
- Yes. If π^T is used as a ***ceiling***, central banks will be biased to keep inflation systematically below the target.
- It may lead to "too low inflation" or even deflation
- The costs to the economy and society will be higher than if the target were reached
- The ECB changed its monetary policy strategy in July 2021 for that reason.

European Central Bank, 8 July 2021

> *"The Governing Council considers that price stability is best maintained by aiming for a 2% inflation target over the medium term. This target is symmetric, meaning negative and positive deviations of inflation from the target are equally undesirable."*

How much costly can it be?

A "ceiling" leads to artificially low losses to society (left panel below). In reality, the losses may be much higher, and we will only know if we consider positive and negative deviations from the target (right panel).



2. The Taylor Rule

The Textbook Rule

- The MP rule studied in the previous chapters was helpful in explaining basic things.
- However, it was a simplified version of what happens in central bank policy.
- We may recall our well-known MP curve (rule) as:

$$r = \bar{r} + \lambda \cdot \pi$$

- After using the Fisher equation

$$i = \pi + r$$

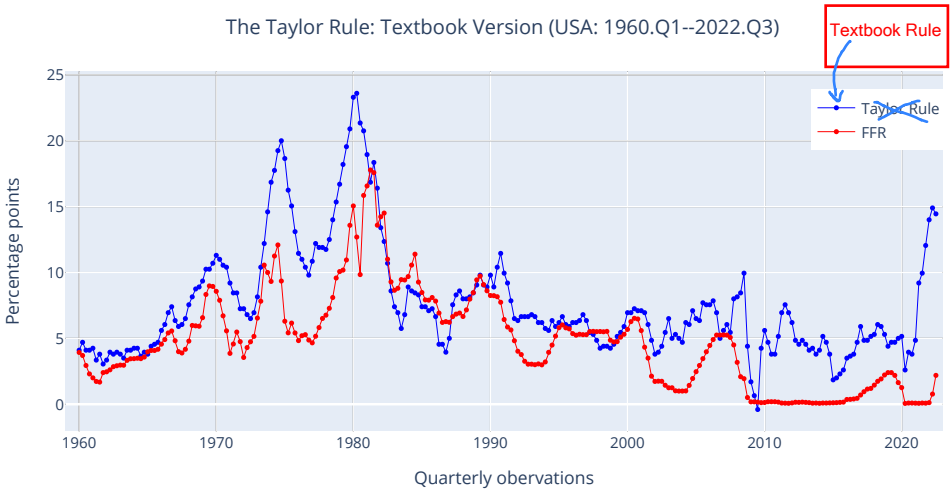
- The Fed funds rate (i) comes out as:

$$i = \bar{r} + \pi + \lambda \cdot \pi$$

- Using data on $\bar{r}, \pi, \lambda$ we can calculate i from this rule. Moreover, we can confront this value against the Fed funds rate that the Fed sets over time.
- See the following figure.

The Textbook Rule

We set: $\lambda = 0.5, \bar{r} = 2$. The textbook rule performs very badly.



The Taylor Rule

- John Taylor (1993) proposed a more comprehensive rule that includes the ***inflation gap***:

$$\pi^{gap} = \pi - \pi^T$$

- ... and the ***output gap***:

$$Y^{gap} = \frac{Y - Y^P}{Y^P}$$

- Output gap is expressed in percentage points $(+2\%, -1\%, ...)$.[1]

John B. Taylor (1993). "Discretion versus policy rules in practice", Carnegie-Rochester Conference Series on Public Policy 39, pag. 195-214.

[1] The textbook defines output gap as $Y - Y^P$, because they are using natural logarithms: $Y = \ln(Y), Y^P = \ln(Y^P)$. Both definitions lead to the same values.

The Taylor Rule

- The Taylor rule gives the nominal interest rate set by the central bank as:

$$i = \bar{r} + \pi + 0.5 \cdot \pi^{gap} + 0.5 \cdot Y^{gap} \tag{1}$$

- As the Fisher equation gives us

$$i = \pi + r \tag{2}$$

- Equalizing eq. (1) and (2), we get the real interest rate that results from the intervention of the central bank:

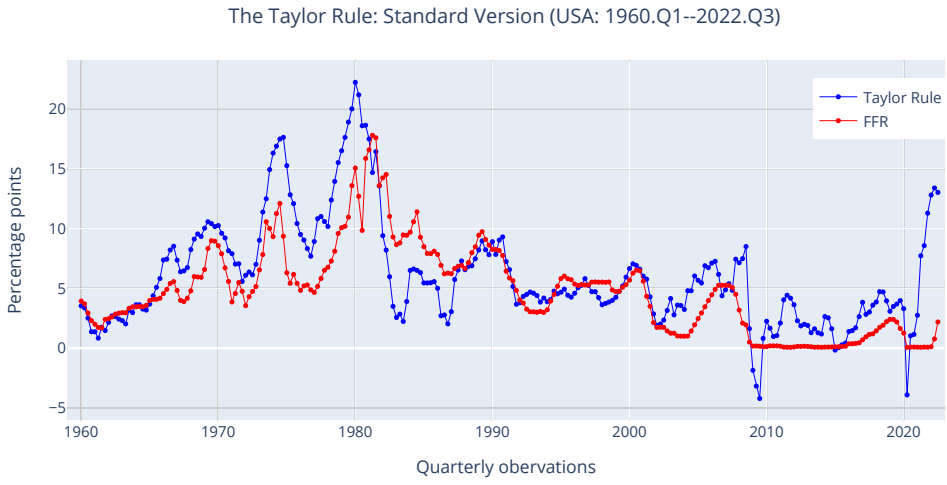
$$r = \bar{r} + 0.5 \cdot \pi^{gap} + 0.5 \cdot Y^{gap} \tag{3}$$

- Finally, Taylor proposes also:

$$\bar{r} = 2\%, \pi^{T} = 2\%$$

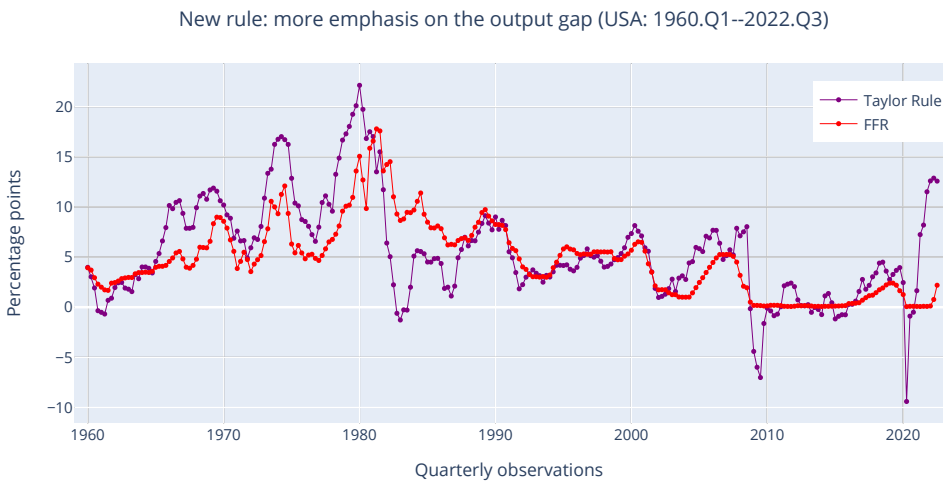
The Taylor Rule and the Fed Funds Rate

Weights: 0.5 for the output-gap, 0.5 for the inflation-gap.



The Taylor Rule and the Fed Funds Rate

Weights: 1.0 for the output-gap, 0.5 for the inflation-gap.



Taylor Rule on Autopilot?

Why hasn't the Fed put the federal funds rate on Taylor rule autopilot, guided by a computer?

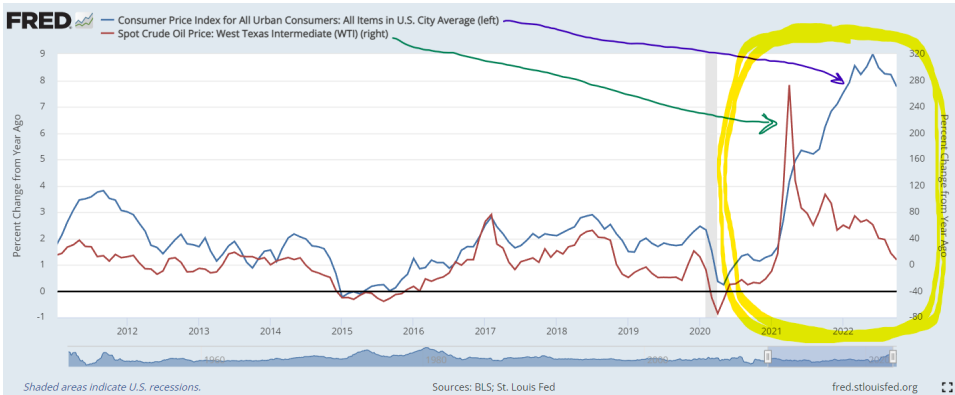
Recall the logic behind rules in monetary policy:

- No rules leave room for speculation, higher uncertainty, and risk.
- Too strict rules leave room for too much punishment.
- It is a balance between some guiding rule and a flexible implementation of such rule that leads to the best possible outcome.

The Taylor rule may be pretty helpful in "normal" situations. ***But exceptional circumstances can only be dealt with exceptional measures***. That happened during the Great Recession in 2008-2011 and the COVID pandemic in 2020-21. It is also happening now with ramping oil prices and the war in Ukraine.

Living in Strange Times

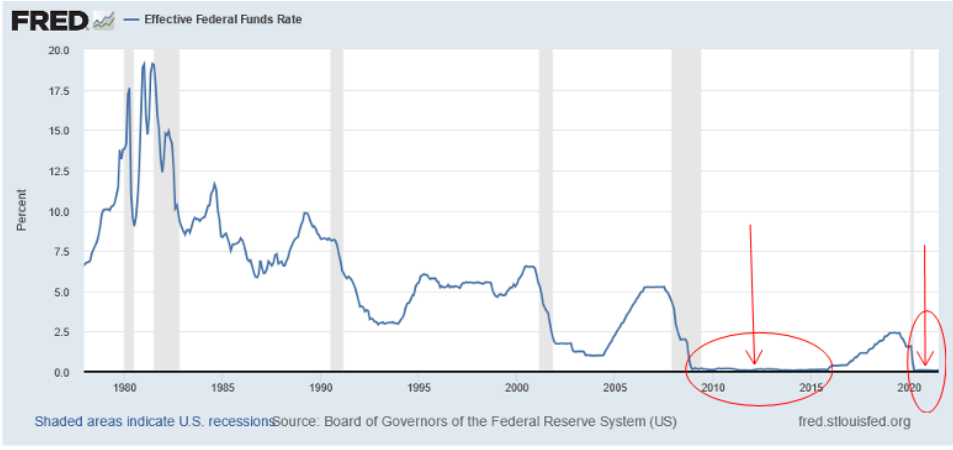
- We live in a period where the western economies are experiencing the highest inflation rates since the late 1970s.
- Central banks do not know very well what to do to bring inflation back to 2%, without causing a terrible recession.



3. The Zero Lower Bound (ZLB)

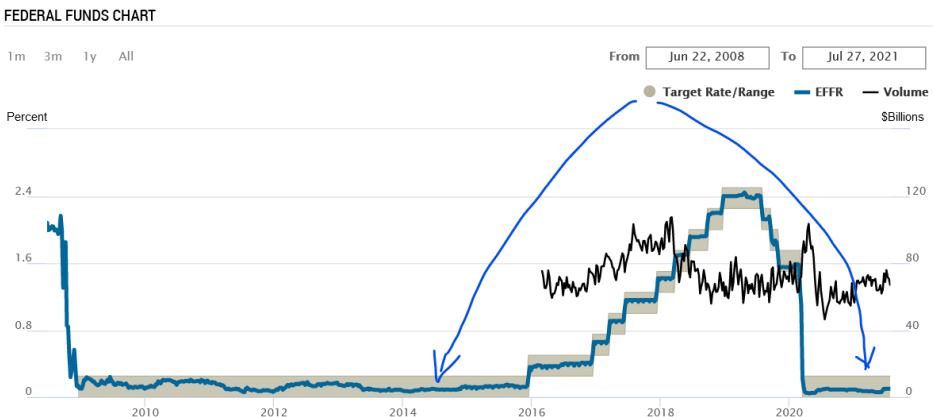
What is the ZLB?

The ZLB is a situation where the central bank reduces its short term interest rate to 0%, but stops there: this rate will not go into negative values. The USA evidence:



More on the ZLB: USA

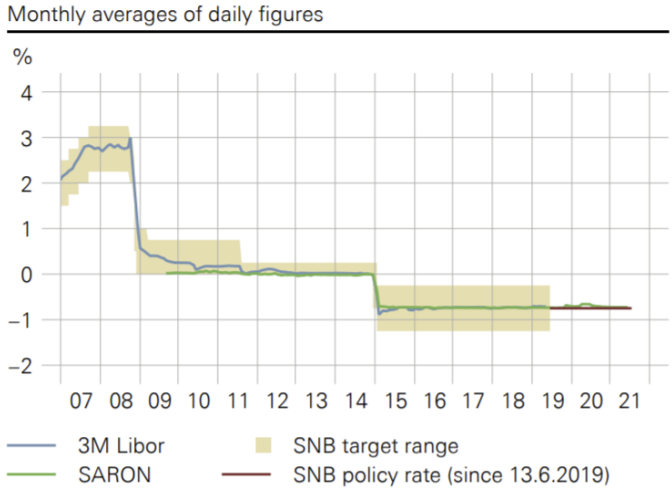
The Fed Funds Rate is the blue line (it is the overnight market rate); the FED sets the range (the gray interval). FRB of New York



Having Lived in Strange Times

- 15 years ago, it was inconceivable to think that ***nominal*** interest rates could be negative.
- However, the summer of 2021 they were negative in many countries (Switzerland, EZ, Japan, Denmark, Sweden).
- They were zero in the USA, Sweden, Norway, and close to 0% in Canada and the UK.

Switzerland: Pinnacle of Financial Stability



Euribor Rates: the Unthinkable

EURIBOR rates

7/28/2021

Euribor 1 week	-0.565 %
Euribor 1 month	-0.558 %
Euribor 3 months	-0.547 %
Euribor 6 months	-0.524 %
Euribor 12 months	-0.498 %

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ZLB: Consequences

- Until the ZLB is reached, the MP and AD curves have their normal representations.
- However, when the ZLB is reached, there will be a **kink** in those two curves, and their slopes become the opposite of what they were.
- This has dramatic consequences for:
  - The macroeconomic equilibrium
  - GDP, inflation and unemployment
  - The implementation of monetary policy by the central bank
  - The way fiscal policy is used as an economic policy tool

ZLB: Algebraic Determination

The material on this slide will not be covered in class

- From the Fisher equation we have

$$r = i - \pi \tag{4}$$

- From the MP curve we get

$$r = \bar{r} + \lambda\pi \tag{5}$$

- Equalizing eq. (4) and (5), and imposing the ZLB condition ($i = 0$), we get the inflation rate that corresponds to the ZLB:

$$\bar{r} + \lambda\pi = \underbrace{i}_{=0} - \pi \Rightarrow \pi_{ZL} = -\frac{\bar{r}}{1+\lambda} \tag{6}$$

- Therefore, from (6) we can obtain

$$\bar{r} = -(1+\lambda)\pi_{ZL} \tag{7}$$

ZLB: Algebraic Determination (cont.)

The material on this slide will not be covered in class

- Now, substitute eq. (7) into eq. (5), and we will obtain

$$\begin{aligned} r &= -(1+\lambda)\pi_{zL} + \lambda\pi_{ZL} \\ r &= -\pi_{ZL} \end{aligned} \tag{8}$$

- Surprisingly, in the ZLB ($i = 0\%$), the MP curve acquires a negative slope.

$$r = -\pi_{ZL} \tag{9}$$

with values for for inflation in the ZLB such that

$$\pi_{ZL} \leq -\frac{\bar{r}}{1+\lambda}.$$

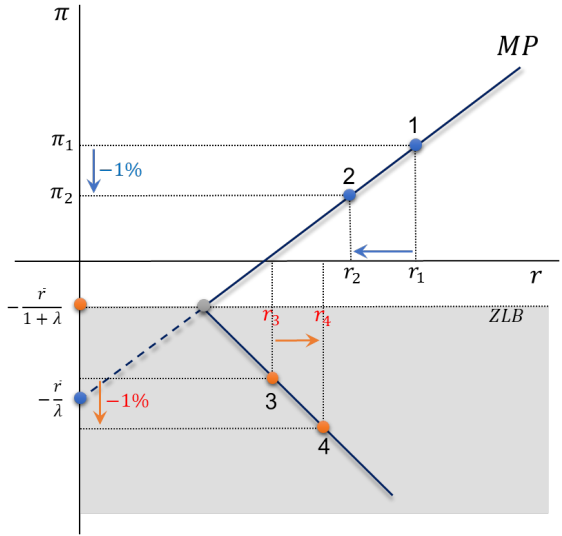
ZLB: Representation of the MP curve

MP in the normal zone:

$$r = \overline{r} + \lambda\pi$$

MP in the ZLB:

$$r = -\pi_{ZL}$$



ZLB and the AD curve

The material on this slide will not be covered in class

- Recall the expression of AD curve in the normal zone:

$$Y = m \cdot \overline{A} - m \cdot \phi \cdot (\overline{r} + \lambda\pi) \tag{10}$$

- Now, recall eq. (7)

$$\overline{r} = -(1+\lambda)\pi_{ZL}$$

- Substitute eq. (7) into eq. (10), and we will get

$$Y = m \cdot \overline{A} + m \cdot \phi \cdot \pi_{ZL} \tag{11}$$

- Surprisingly, the AD curve acquires a positive slope in the ZLB:

$$\partial Y / \partial \pi_{ZL} = m\phi > 0$$

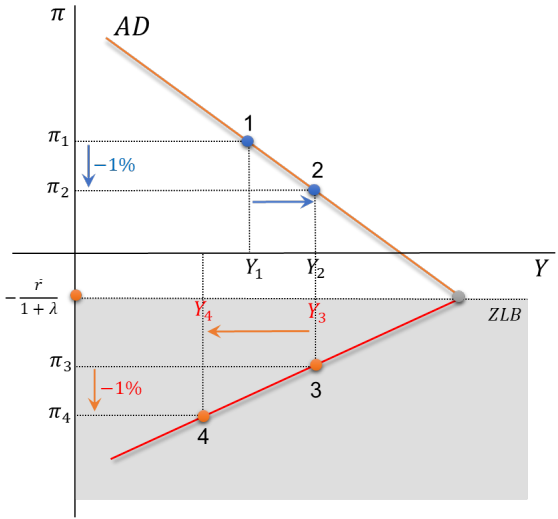
ZLB: Representation of the AD curve

AD in the normal zone:

$$Y = m \cdot \overline{A} - m \cdot \phi \cdot (\overline{r} + \lambda \pi)$$

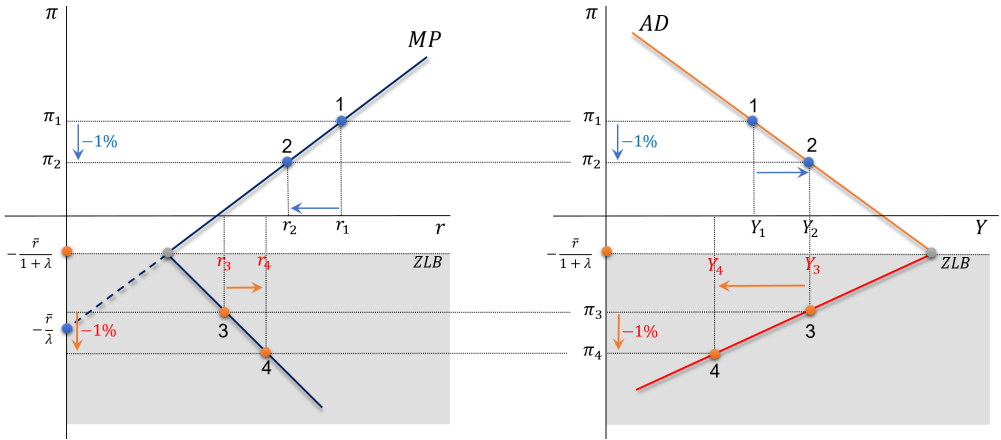
AD in the ZLB:

$$Y = m \cdot \overline{A} + m \cdot \phi \cdot \pi_{ZL}$$



ZLB: Representation of AD and MP curves

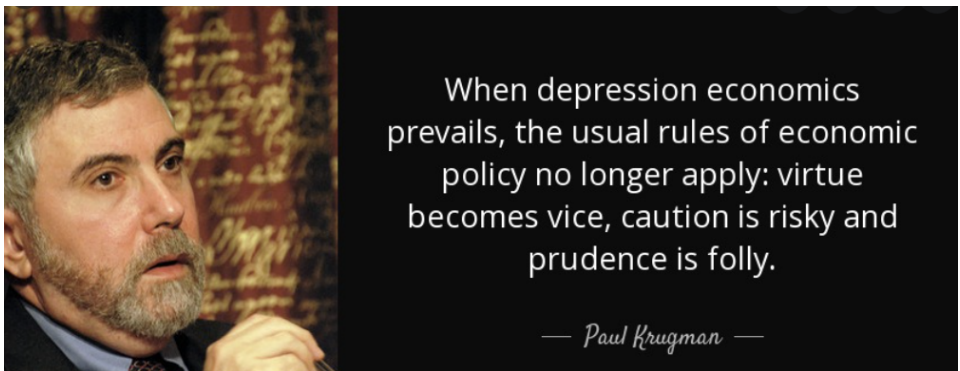
A reduction in inflation of 1% causes different (opposite) impacts upon Y and r when we look at the ZLB and at the normal zone.



4. Strange Things Happen in the ZLB

Alice Through the Looking Glass

Paul Krugman, Nobel Prize winner 2008



What Strange Things Happen in the ZLB?

In macroeconomics there are various strange things that can happen in the ZLB. We will cover only two of them here.

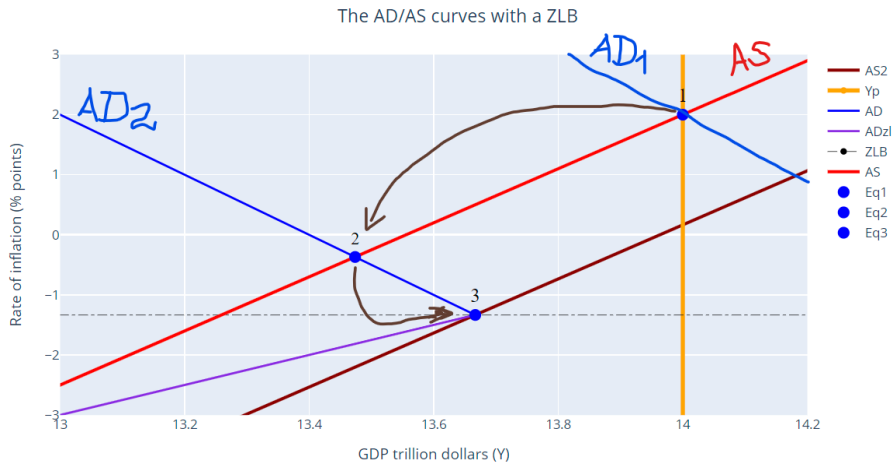
1. The economy may fall into a ***deflation trap*** like Japan: with persistent very low unemployment rate (2.5%) and negative inflation. Japan has been in such a situation since the early 2000s.
2. The economy may fall into ***"Secular stagnation"***: a situation where the economy will stagnate below potential GDP for a long period of time. This idea was put forward by Larry Summers in 2015.

Larry Summers, 2015

Larry Summers basic point is that there is currently a permanent shortfall of aggregate demand in western economies, due to an excess of desired saving over desired investment, which can only be eliminated at a negative interest rate.

Secular Stagnation

If the AD suffers a huge shock such that it moves from point 1 to 2, the economy will end up at point 3.



Previous Slide's Details: Read at Home

Consider the economy is operating at point 1, with inflation of $\pi_1 = 2\%$ and $Y = Y^P = 14$ trillion dollars: it is a long-run equilibrium.

Suppose that the AD suffers a huge negative shock: AD1 $\rightarrow$ AD2.

The new short-run equilibrium point is given by 2. This point is not a long-run equilibrium because we are in a large recession.

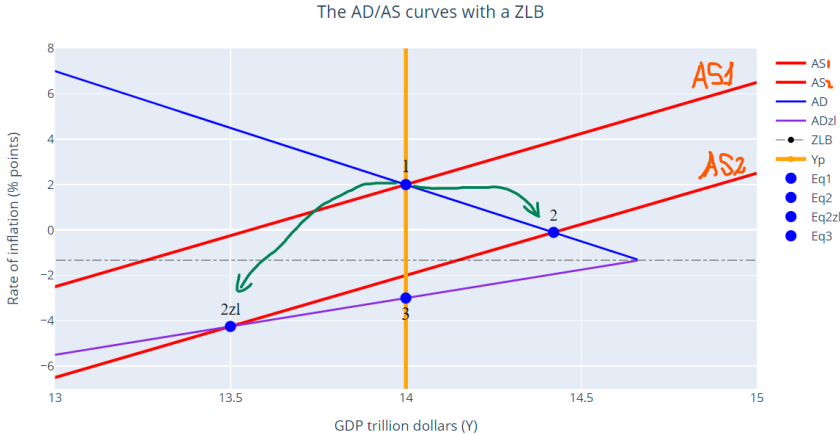
In a recession, inflation decreases, and AS shifts to the right. The economy moves to point (3).

At point 3, demand is insufficient to match supply at a higher GDP level. So GDP is stuck at a level that is permanently lower than what the economy can produce (Potential GDP).

Only very aggressive monetary and fiscal expansionary policies can (by forcing a large increase in AD) remove the economy from such stagnation.

Deflation trap

If the AS suffers a large shock such that it moves from AS1 to AS2, the economy will move away from point 1 to 2zl or 2. If it moves to 2, it will return to point 1. If it moves to 2zl, it will end up at point 3.



Previous Slide's Details: Read at Home

Consider the economy is operating at point 1, with inflation of $\pi_1 = 2\%$ and $Y = Y^P = 14$ trillion dollars: it is a long-run equilibrium.

Suppose that the AS suffers a large shock: AS1 $\rightarrow$ AS2.

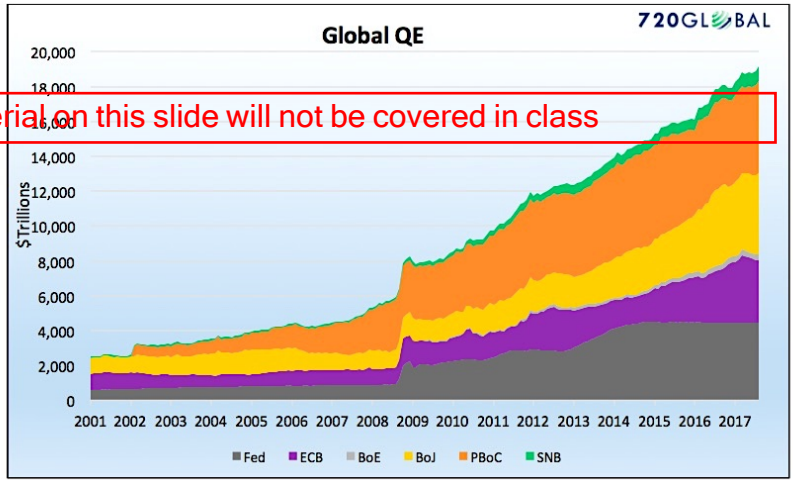
This shock leads the economy to move either to point 2zl, or to point 2. If it moves to 2, the self-correcting mechanism will force the economy to return to point 1. However, at point 2zl the same mechanism will push the economy to point 3.

Whether the economy ends at point 3 or 1 will depend merely on the subjective beliefs of private agents. So the ZLB may lead to a "good equilibrium" at point 1, or a "bad equilibrium" at point 3.

Unconventional fiscal and monetary policies may be required to prevent the economy from being permanently stuck at the "bad equilibrium".

QE Across the World to fight the ZLB

Quantitative Easing (QE) has been implemented in almost every developed economy.



The material on this slide will not be covered in class

Unconventional Monetary Policy: QE

The material on this slide will not be covered in class

- Unconventional monetary policy ("Quantitative Easing"), consists of buying fixed income financial assets, but with long term maturity, with potentially high risk, and on a large scale.
- It led to a brutal increase in central banks's assets.
- In the case of Fed's total assets: \$800 billion in 2008, $\approx$ \$4.5 trillion in 2015.

QE objectives:

1. "Forward Guidance". Convince private economic agents, that the Fed will do everything it takes to get the economy out of the ZLB.
2. Reduce financial risk and thus "spreads": $(\downarrow \overline{f})$
3. Create expectations in the economy of higher inflation $(\uparrow \pi^e)$

5. Readings

Readings

- Read Chapter 13 of the adopted textbook:

  Frederic S. Mishkin (2015). *Macroeconomics: Policy & Practice*, Second Edition, Pearson Editors.