# Macroeconomics A: EI056

## Final exam

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## 1 General instructions

The exam consists of 4 questions. Section 2 has 3 short subquestions that mostly connect with what we saw in class, and sections 3-4-5 go beyond what we saw in class.

The weight of each question in the grade is indicated, so you can allocate your time accordingly.

A good strategy is to first read through the questions, and then start with the easiest one before proceeding to the harder ones.

Short "bullet points" answers stressing the main points are fine, you don't have to write long paragraphs.

Best of luck!

# 2 Short questions (25 % of grade)

## 2.1 Inflation-unemployment trade-off

Imagine that you are sitting in a policy meeting where someone makes a careful econometric presentation showing that times of high inflation are also times of low unemployment.

One policy maker then points that given this correlation, the central bank should be more relaxed about inflation to reduce unemployment, and asks for your opinion. What would you reply?

## 2.2 Bank panic

In the class on financial intermediaries we saw that depositors' panics could bring down a healthy bank. Explain the mechanism.

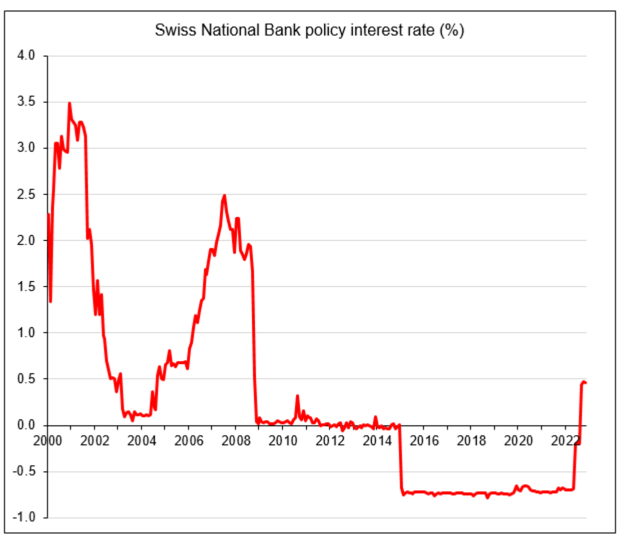
How can public deposit insurance, and "lending of last resort" by the central bank help?

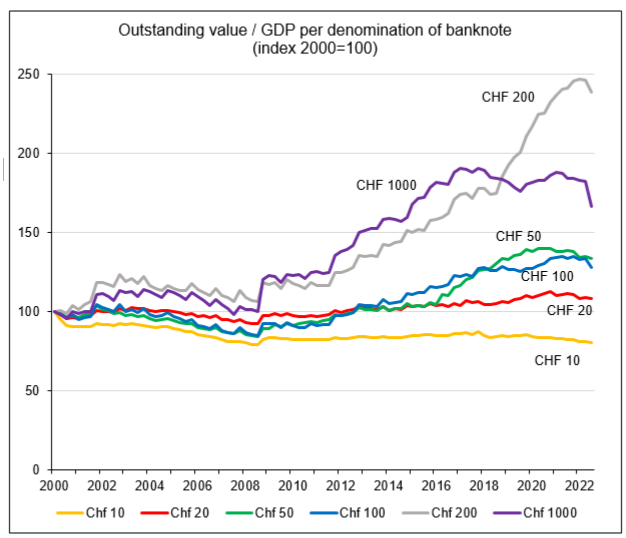
## 2.3 Cash usage

The figures below show the policy interest rate of the Swiss National Bank, and the volumes of cash in circulation (scaled by GDP, expressed as an index 2000=100 for simplicity) distinguishing between the different banknotes denomination (the lowest is the 10 franc banknote, the highest the 1'000 franc note).

1. Explain the co-movements between the volume of cash and the interest rate. How does this relate to models seen in class?

2. Is the pattern the same for all banknotes? Discuss in relation to the different roles of money (in class we discussed the role of "mean of exchange" and "store of value".



# 4 Patience in overlapping generations model (25 % of grade)

## 4.1 Structure and steady state

Consider the overlapping generations (OLG) model.

An individual lives for two periods and maximizes a log utility of consumption. An important parameter is the discount factor $\rho$. A higher $\rho$ means the agent is more **impatient**.

$$U_t = \ln(c_{1,t}) + \frac{1}{1+\rho}\ln(c_{2,t+1})$$

There are $L_t$ young agents at time $t$, with population growing at a rate $n$. As we saw in class, an agent born at time $t$ supplies one unit of labor when young, getting a wage $w_t$, and saves resources into old age earning a rate of return $r_{t+1}$.

The agent pays a tax $\tau_{1,t}$ when young and $\tau_{2,t+1}$ when old.

We present the model to "set the stage" (don't try to derive the equations). Output is produced using labor and capital, $Y_t = (K_t)^{\alpha}(L_t)^{1-\alpha}$. Scale capital is $k_t = K_t/L_t$. The wage and the interest rate are (take this as given):

$$w_t = (1-\alpha)(k_t)^{\alpha} \qquad ; \qquad r_t = \alpha (k_t)^{\alpha-1}$$

As in class, the young agents invest in capital. This gives a dynamic of capital (take this as given):

$$k_{t+1} = \frac{1}{(2+\rho)(1+n)}\left((w_t - \tau_{1,t}) + (1+\rho)\frac{\tau_{2,t+1}}{1+r_{t+1}}\right)$$

The clearing of the market for goods is (take this as given):

$$(k_t)^{\alpha} = c_{1,t} + \frac{1}{1+n}c_{2,t} + (1+n)k_{t+1} - k_t$$

We assume that there is not government spending or debt, so the total taxes add up to zero (remember that population is growing):

$$0 = \tau_{1,t} + \frac{1}{1+n}\tau_{2,t}$$

We first solve for the steady state of the model when taxes are zero and the discount factor is equal to $\rho$. Do **not** do the derivations. Instead, consider the numbers in the table below. We contrast two cases. In case 1 agents are impatient (high $\rho$), while they are patient in case 2 (low $\rho$). In both cases $\alpha = 0.1$ and $n = 0.32$.

| | | Case 1 | Case 2 |
|---|---|---|---|
| Discount | $\rho$ | 0.5 | 0 |
| Wage | $w^*$ | 0.779 | 0.799 |
| Capital | $k^*$ | 0.236 | 0.302 |
| Interest rate | $r^*$ | 0.367 | 0.293 |

A useful result (take this as given) is that consumption in the steady state is:

$$c_1^* + \frac{1}{1+n^*}c_2^* = (k^*)^\alpha - nk^*$$

1. Discuss the relative values of the wage, capital and interest rates across the two cases.
2. Is consumption maximized in either case? Hint: think of the sensitivity of consumption with respect to capital.

## 4.2 Tax and transfer: impatient economy

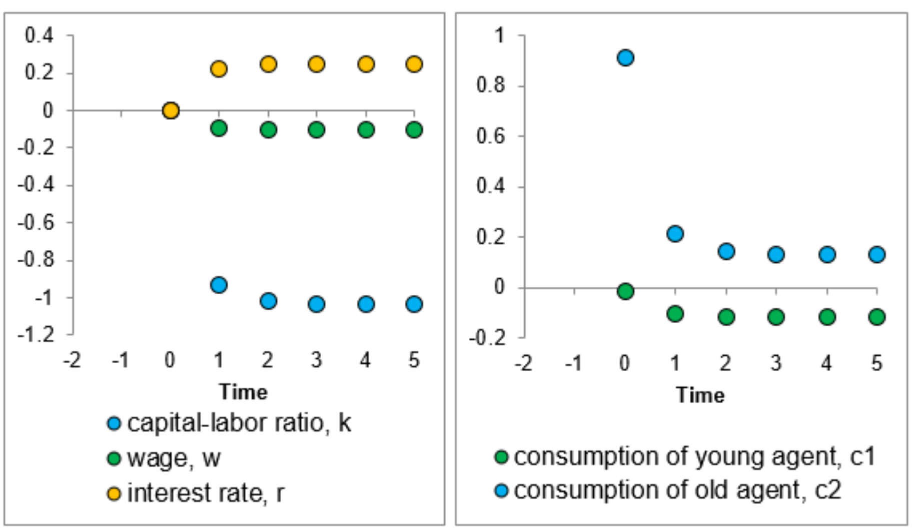
The economy starts in the steady state. At time $t = 0$ the government announces a tax-transfer scheme.

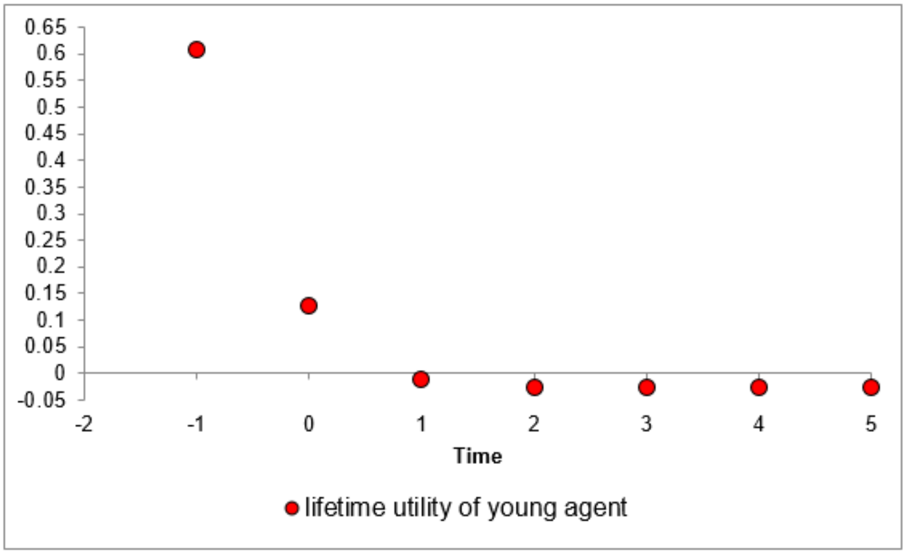
- Each young agent is taxed.
- The proceeds are fully used to give a transfer to the old agents in the same period.
- The scheme remains in place forever.

The figure below shows the path of the various variables in a log-linearized version of the model, considering case 1 ($\rho = 0.5$) in the table above.

The top-left panel presents the capital, the wage and the real interest rate. The top right panel presents the movements in the consumption of young and old agents. The bottom panel presents the lifetime utility of a newborn agent (while the policy starts at $t = 0$, there is an effect on the ex-post utility of the agent borne at time $t = -1$).

1. Describe the effect of the tax-transfer.
2. Is it welfare improving? Why or why not?





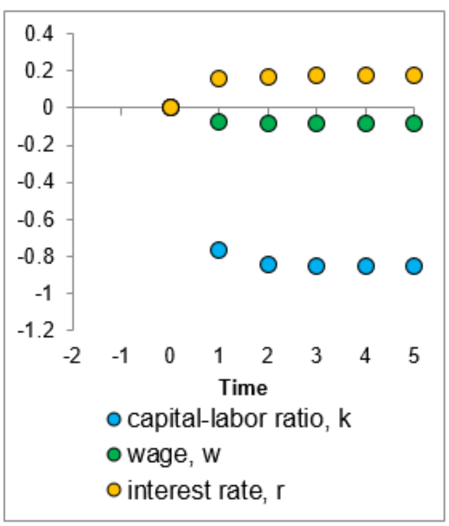

## 4.3 Tax and transfer: patient economy

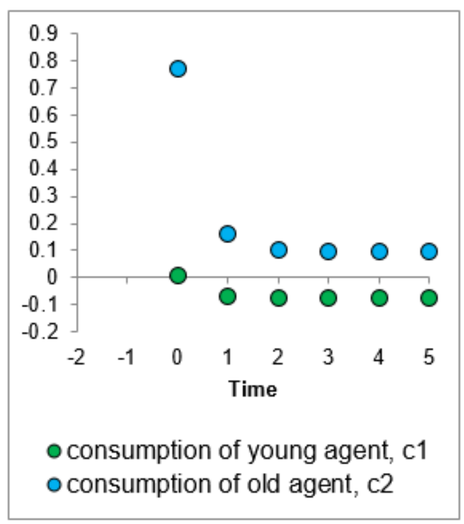
We consider the same tax and transfer scheme, but now in the patient economic of case 2 ($\rho = 0$).

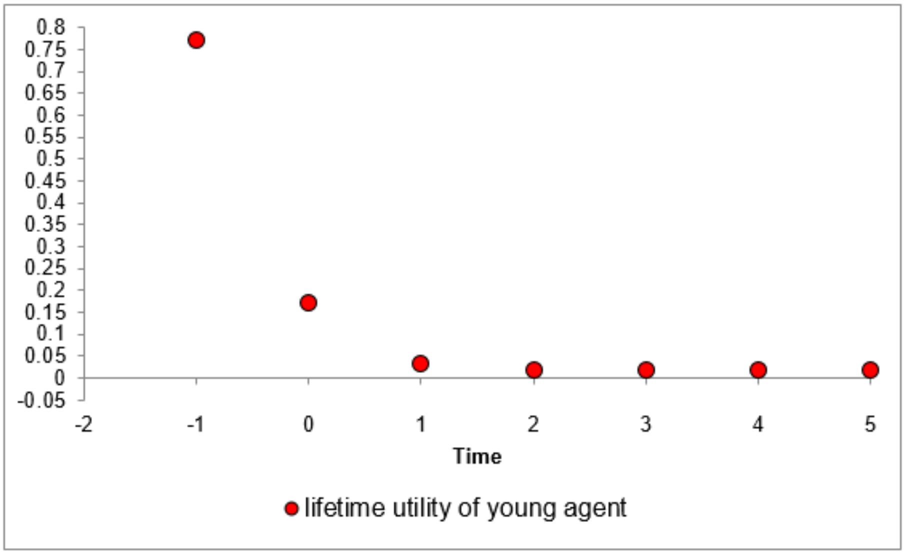
The figure below shows the path of the various variables.

1. Describe the effect of the tax-transfer.

2. Is it welfare improving? Why or why not?






### 4.4 Application to recent trends

Until recently, the world economy has been faced with a persistent decrease of real interest rates over the last 15 years.

In light of this model, what are the implications for the funding of retirement schemes. Specifically, should we ask people to acquire assets or do transfers across generations?

# 5 Timing of interest rate policy (25 % of grade)

## 5.1 Dynamics of inflation and output

Consider a model where inflation is driven by a Phillips curve where inflation, $\pi_t$, increases ($\dot{\pi}_t > 0$) when output is above equilibrium ($y_t > 0$):

$$\dot{\pi}_t = \lambda y_t \qquad ; \qquad \lambda > 0$$

Output reflects the real interest rate, as seen in the New Keynesian model (this is coming from the Euler condition), where $i_t$ is the nominal interest rate set by the central bank:

$$y_t = -b\,(i_t - \pi_t) \qquad ; \qquad b > 0$$

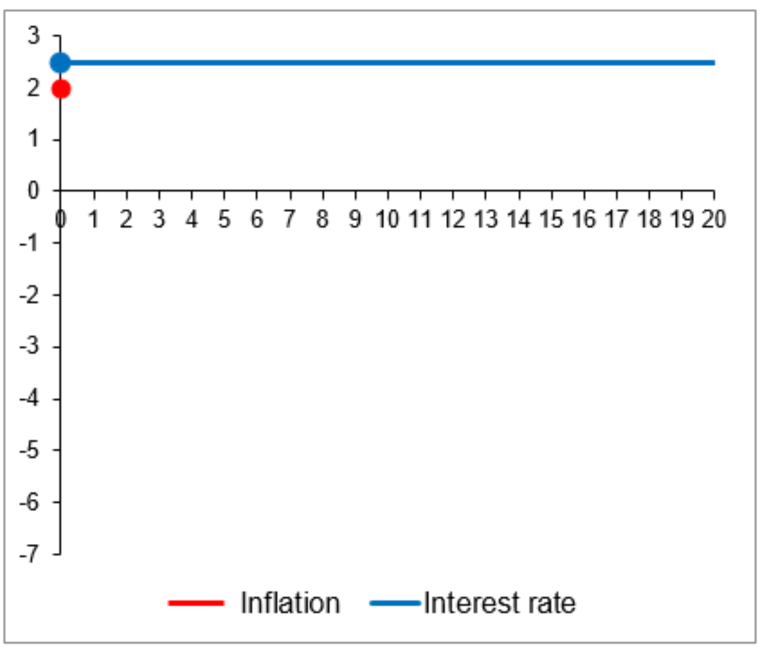
Using this framework:

1. How can the central bank stabilize inflation?
2. How can it bring inflation down?

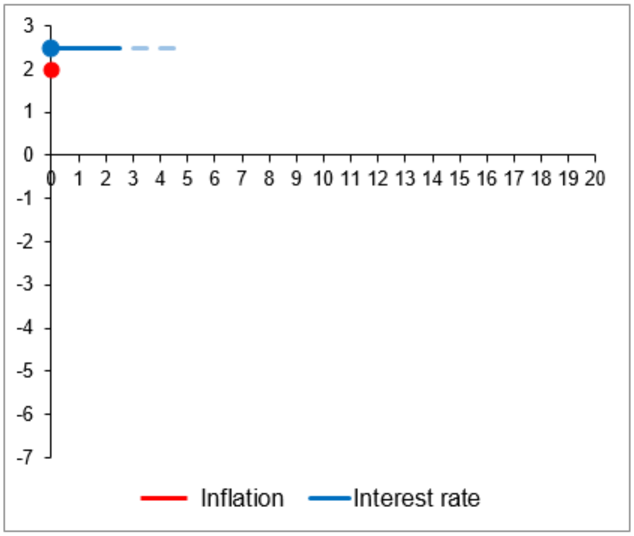
## 5.2 Impact of constant interest rate

Suppose that inflation is initially positive $\pi_0 > 0$.

Consider that the central bank keeps the interest rate at a value $i_0 > \pi_0 > 0$ and always keeps the interest rate at that value. The chart below shows the path of the interest rate (blue line, with initial value at the blue point), and the initial inflation value (red point).



1. What is the path of inflation through time? Hint: use the charts provided at the end of the question to draw the various variables.
2. What is the path of output?
3. Is the policy a good idea?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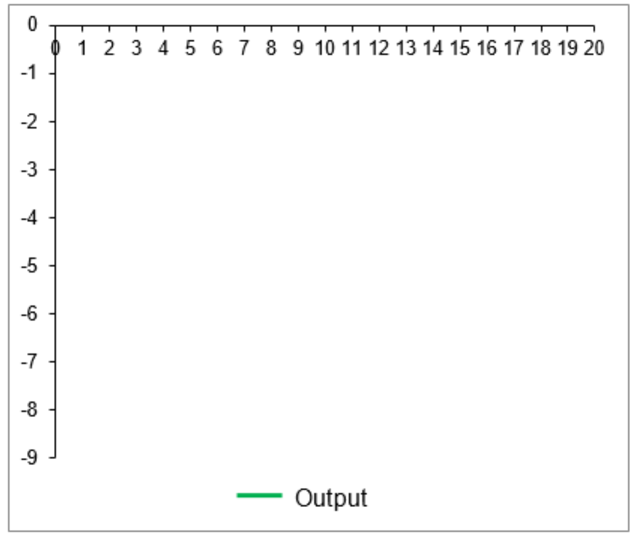
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Inflation
Interest rate


0 -1 -2 -3 -4 -5 -6 -7 -8 -9
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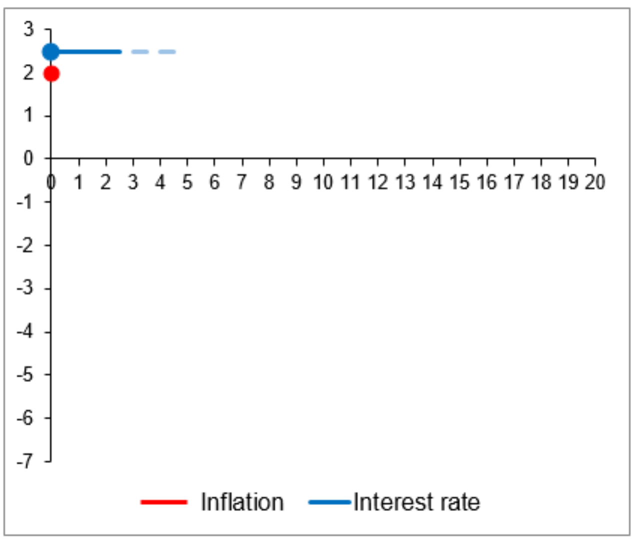
Output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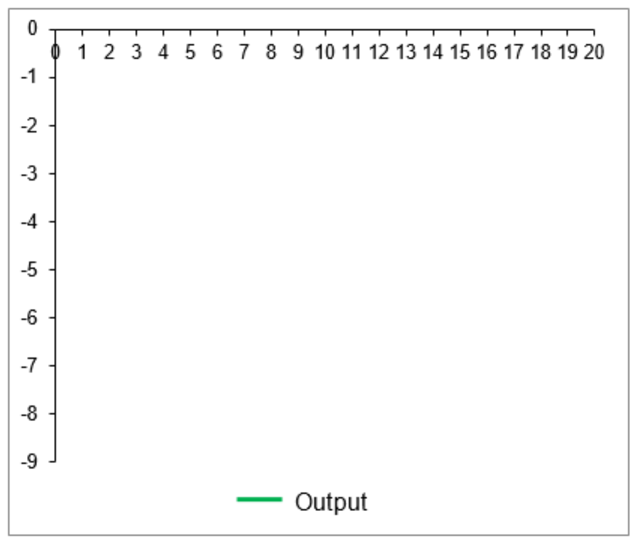
Inflation
Interest rate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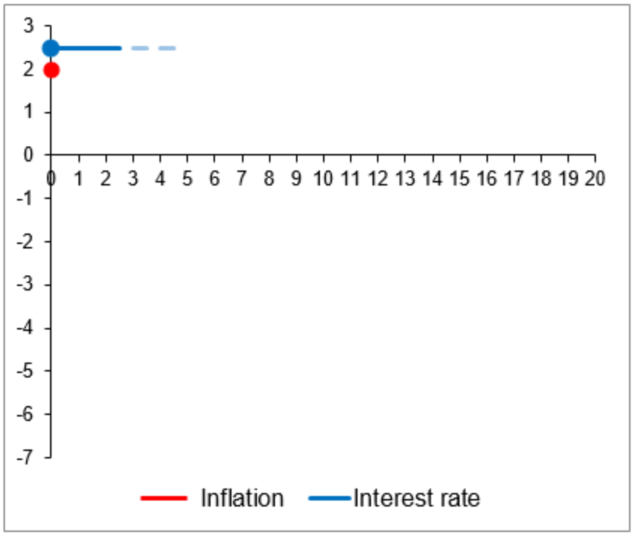
Output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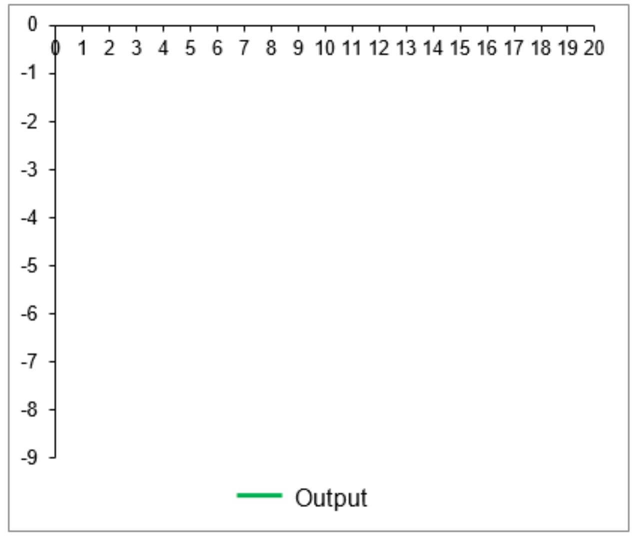
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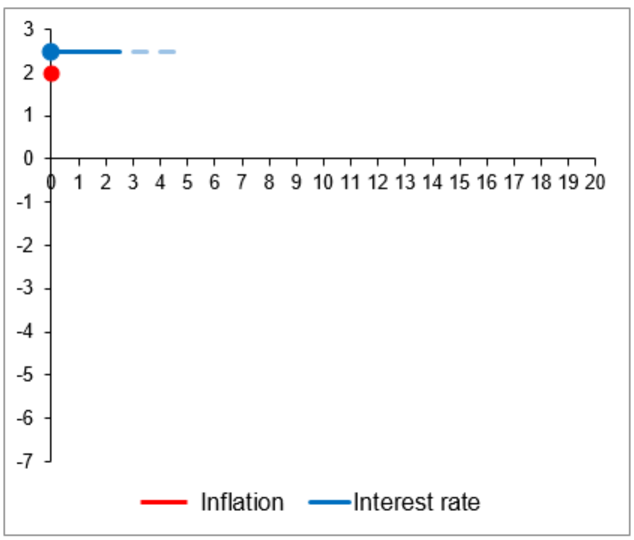
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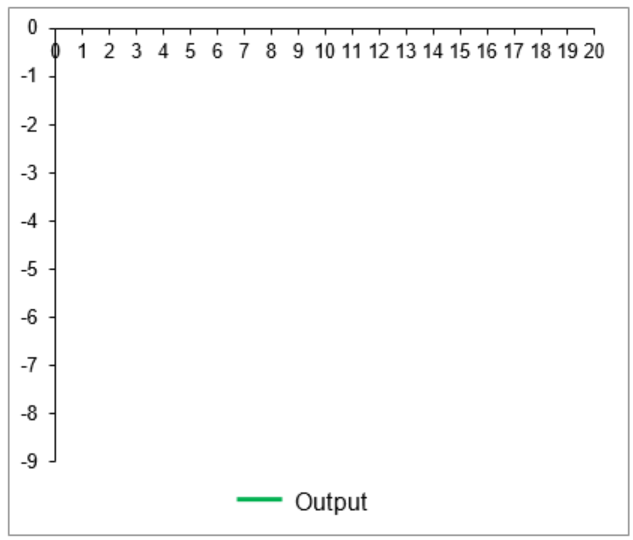
Output