

PRICE LEVEL DETERMINATION IN A MONETARY ECONOMY

FISCAL AND MONETARY POLICY 2023

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PLAN

- We study how the price level (and inflation) is determined in a monetary economy.
- This will later serve us as a framework to study interactions of fiscal and monetary policy.
- We will start with a very simple environment and then gradually add more features.

ENDOWMENT ECONOMY

ENDOWMENT ECONOMY

- We start with a simple economy in which every period there is an endowment of nonstorable goods y_t .
- For simplicity assume $y_t = y$ for all t .
- We denote the price level in period t by P_t .
- One unit of goods costs P_t units of account.
- There is a representative household that trades contingent claims (Arrow securities).
- The household maximizes $\mathbb{E} \sum_{t=0}^{\infty} \beta^t u(c_t)$.
- No government expenditures,

NOMINAL INTEREST RATES

- Let $q_{t,t+1}$ be the real price (in goods) of a claim that pays one unit of goods in period $t + 1$ in particular state of the world.
- The nominal contingent claim price is

$$Q_{t,t+1} = q_{t,t+1} \frac{P_t}{P_{t+1}}.$$

- The **nominal interest rate** i_t satisfies

$$\frac{1}{1 + i_t} = \mathbb{E}_t Q_{t,t+1}.$$

NOMINAL INTEREST RATES

- In this economy we have $c_t = y$.
- The SDF is constant and equal to β .
- The **real interest rate** is also constant r :

$$\frac{1}{1+r} = \beta.$$

- The nominal discount factor is $Q_{t,t+1} = \beta \frac{P_t}{P_{t+1}}$.
- Define $\Pi_{t+1} = \frac{P_{t+1}}{P_t}$.
- We obtain the **Fisher equation**

$$\frac{1}{1+i_t} = \frac{1}{1+r} E_t \frac{P_t}{P_{t+1}} = \frac{1}{1+r} E_t \frac{1}{\Pi_{t+1}} = \beta E_t \frac{1}{\Pi_{t+1}}.$$

FISHER EQUATION

- The usual formulation of the Fisher equation is obtained by linearization:

$$i_t = r + \mathbb{E}_t \pi_{t+1}.$$

- We already used the constancy of the real interest rate.
- In general, the Fisher equation is

$$i_t = r_t + \mathbb{E}_t \pi_{t+1}.$$

- This is a no-arbitrage condition: you should be indifferent between two types of investment (real and nominal).

FISHER EQUATION

- In this endowment economy

$$\frac{1}{1+i_t} = \beta E_t \frac{1}{\Pi_{t+1}}$$

is the **only** equilibrium condition.

- What does it imply for the sequence of price levels $\{P_t\}_{t=0}^{\infty}$?
- In particular, we say that the level of inflation is unique or determinate in equilibrium if:
 1. There is a unique scalar P_0 in equilibrium.
 2. If Π^{prime} and Π'' are two sequences that satisfy equilibrium conditions, then $\Pi' = \Pi''$.

DETERMINACY

- The question of determinacy may seem esoteric, but it is important.
- It boils down to the question of whether some policy can control prices.
- In this simple economy, the only available policy is the choice of the nominal interest rate.
- Suppose we have some target for the price level (or inflation rate) – can we achieve it by setting interest rates?

DETERMINACY

- Consider the simplest possible policy: **interest rate peg**.
- The central bank sets $i_t = i$ for all t .
- We have

$$\frac{1}{1+i} = \beta E_t \frac{1}{\Pi_{t+1}}.$$

- This determines $E_t \frac{1}{\Pi_{t+1}}$ – approximately the **expected** inflation rate.
- But it does **not** determine Π_{t+1} – the **actual** inflation rate.

DETERMINACY

- What if we have perfect foresight?
- The Π_{t+1} is determined by the peg, but P_0 is not (because Π_0 is not)
- Conclusion: interest rate peg does not ensure price level determinacy.

DETERMINACY

- Consider a interest rate rule $i_t = r + \phi \pi_t$.
- We call these rules **Taylor rules**.
- Use the linearized Fisher equation $i_t = r + \mathbb{E}_t \pi_{t+1}$ to obtain

$$\phi \pi_t = \mathbb{E}_t \pi_{t+1}.$$

- If $\phi > 1$ the only solution that does not diverge is $\pi_t = 0$ for all t .