

SEIGNORAGE AND INFLATION

FISCAL AND MONETARY POLICY 2024

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BUDGET CONSTRAINT AGAIN

- To link deficits and debt with monetary policy we revisit the intertemporal government budget constraint.
- The static budget constraint of the **fiscal branch** of the government is

$$P_t G_t + i_{t-1} B_{t-1}^T = P_t T_t + (B_t^T - B_{t-1}^T) + RCB_t$$

where i_t is the nominal interest rate promised at t , B_t^T is total **nominal** debt issued in period t , G_t is real government purchases, T_t is real (net) tax revenue and RCB_t is direct receipts from the central bank.

BUDGET CONSTRAINT AGAIN

- The central bank has a similar budget constraint:

$$B_t^M - B_{t-1}^M + RCB_t = i_{t-1}B_{t-1}^M + (M_t - M_{t-1}).$$

where B_t^M is the central bank's purchases of government debt, and $M_t - M_{t-1}$ is an increase in nominal money supply in period t .

- M_t here is high-powered money, monetary base – stock of currency held by the nonbank public + bank reserves.

BUDGET CONSTRAINT AGAIN

- If we do not put any restriction on RCB_t , then we can add the two budget constraints to obtain

$$P_t G_t + i_{t-1} B_{t-1} = P_t T_t + (B_t - B_{t-1}) + (M_t - M_{t-1}).$$

- It makes clear that the government can finance its spending needs by issuing debt or by printing money.
- Does the liability composition matter? The only difference is that debt pays interest.

BUDGET CONSTRAINT AGAIN

- In real terms:

$$G_t + \bar{r}_{t-1} \frac{B_{t-1}}{P_{t-1}} = T_t + \left(\frac{B_t}{P_t} - \frac{B_{t-1}}{P_{t-1}} \right) + \left(\frac{M_t}{P_t} - \frac{1}{1 + \pi_t} \frac{M_{t-1}}{P_{t-1}} \right).$$

where $1 + \pi_t := \frac{P_t}{P_{t-1}}$ and $1 + \bar{r}_{t-1} := \frac{1+i_{t-1}}{1+\pi_t}$.

- Here \bar{r}_{t-1} is the **ex post** real interest rate on government debt.
- **Unanticipated** inflation reduces the real value of debt.

MONETARY FINANCING

- Real resources due to monetary financing are

$$S_t := \frac{M_t}{P_t} - \frac{1}{1 + \pi_t} \frac{M_{t-1}}{P_{t-1}}.$$

- We call this the **seigniorage** revenue.
- It can be rewritten as

$$\frac{M_t}{P_t} - \frac{M_{t-1}}{P_{t-1}} + \frac{\pi_t}{1 + \pi_t} \frac{M_{t-1}}{P_{t-1}}.$$

- Two sources of seignorage:
 1. change in real money holdings;
 2. to maintain constant real money holdings the private sector needs to purchase more nominal money to offset the effects of inflation.

MONETARY FINANCING

- Are there limits to monetary financing?
- Study the formula in the steady state:

$$G + r \frac{B}{P} = T + \frac{M}{P} \frac{\pi}{1 + \pi}.$$

- Is it possible to finance **any real government purchases** by printing money?
- The answer depends on $\frac{M}{P} \frac{\pi}{1 + \pi}$
- In most models demand for **real** balances $\frac{M}{P}$ is decreasing in the nominal interest rate (so also in inflation).
- The other term is increasing in inflation, but bounded by 1.
- A Laffer curve for inflation?

Table P1 **Polish Receipts and Expenditures (in thousands of zloty)**

	1921	1922	1923	1924	1925
Receipts:					
Administration	261,676	467,979	—	—	1,491,743
State Enterprises	11,413	14,556	—	—	133,530
Monopolies	72,222	47,893	—	—	356,611
Total	345,311	530,428	426,000	1,703,000	1,981,884
Expenditures:					
Administration	765,263	734,310	—	—	1,830,231
State Enterprises	115,589	145,003	—	—	106,343
Monopolies	—	—	—	—	45,019
Total	880,852	879,313	1,119,800	1,629,000	1,981,593
Deficit	535,541	348,885	692,000	—	—
Surplus	—	—	—	74,000	251

Source: Young [36, vol. 2, p. 183].

Sargent (1982)

Table P3 **Polish Index Numbers of Wholesale Prices, 1921-25**

Year	Month	Wholesale Price Index ¹	Year	Month	Wholesale Price Index ¹
1921	January	25.139	1923	April	1,058,920
	February	31.827		May	1,125,350
	March	32.882		June	1,881,410
	April	31.710		July	3,069,970
	May	32,639		August	5,294,680
	June	35,392		September	7,302,200
	July	45,654		October	27,380,680
	August	53,100		November	67,943,700
	September	60,203		December	142,300,700
	October	65,539	1924	January	242,167,700
	November	58,583		February	248,429,600
	December	57,046		March	245,277,900
1922	January	59,231		April	242,321,800
	February	63,445		May	
	March	73,465		June	
	April	75,106		July	
	May	78,634		August	
	June	87,694		September	
	July	101,587		October	
	August	135,786		November	
	September	152,365		December	
	October	201,326	1925	January	
	November	275,647		February	
	December	346,353		March	
1923	January	544,690		April	
	February	859,110		May	
	March	988,500			

Source: Young [36, vol. 2, p. 349].

¹1914 = 100.

MONETARY FINANCING

- Can the government boost demand for real balances?
- Restrictions on the rights of banks and other intermediaries to issue close substitutes for government issued currency.
- Limitations on trading assets that are close substitutes for government issued currency.
- Reserve requirements.
- At the end of the day it amounts to a transfer of real resources from the private sector to the government – is it any different from taxation?

MONETARY FINANCING

- What is the optimal level of seignorage?
- Without a fully specified model it is hard to say, but we can think about the tradeoffs.
- Note that inflation is like a distortionary tax on money holdings.
- But other taxes (consumption, capital, labor) are usually distortionary too.
- This is an argument for some positive inflation – distortion smoothing.

DETOUR: OPTIMAL QUANTITY OF MONEY?

- Friedman's (1969) discussion of the optimal quantity of money is related to this.
- Suppose the government can levy a non-distortionary tax on the private sector. How much money should it print?
- In this case fiscal considerations are irrelevant.
- The optimum calls for the government to print money until the marginal benefit of money equals the marginal cost.

DETOUR: OPTIMAL QUANTITY OF MONEY?

- The opportunity cost of holding money is the nominal interest rate.
- At the optimum money and bonds should be perfect substitutes: nominal interest rate should be zero.
- Because $i = r + \pi$, this implies that inflation should be constant and equal to the negative of the real interest rate.
- If $r > 0$ then the optimal inflation rate is negative.
- **Friedman's rule**: satiate the demand for money.

LIMITS OF MONETARY POLICY?

To state the general conclusion still differently, the monetary authority controls nominal quantities—directly, the quantity of its own liabilities. In principle, it can use this control to peg a nominal quantity—an exchange rate, the price level, the nominal level of national income, the quantity of money by one or another definition—or to peg the rate of change in a nominal quantity—the rate of inflation or deflation, the rate of growth or decline in nominal national income, the rate of growth of the quantity of money. It cannot use its control over nominal quantities to peg a real quantity—the real rate of interest, the rate of unemployment, the level of real national income, the real quantity of money, the rate of growth of real national income, or the rate of growth of the real quantity of money.

Friedman (1968)

LIMITS OF MONETARY POLICY?

- Friedman (1968) warned not to expect too much from monetary policy.
- He argued that a monetary authority **could exert substantial control** over the inflation rate, especially in the long run.
- Is it really true? What assumptions are needed to ensure that?
- Recall that there is an equation that links debt, deficits, and inflation.
- We will tackle this question in two ways:
 1. first illustrate the idea in an environment with money (Sargent and Wallace, 1981);
 2. then reconsider the role of the government budget "constraint"

SOME UNPLEASANT MONETARIST ARITHMETIC

- Sargent and Wallace (1981) warn us about thinking about monetary policy and fiscal policy separately.
- They study a simple endowment economy with money.
- The nominal government budget constraint is

$$B_t + M_t = P_t (G_t - T_t) + (1 + i_{t-1}) B_{t-1} + M_{t-1}.$$

- Demand for real balances decreases in the nominal rate

$$\frac{M_t}{P_t} = L(i_t)$$

- The Fisher equation is

$$1 + i_t = (1 + r_t) (1 + \pi_{t+1})$$

SOME UNPLEASANT MONETARIST ARITHMETIC

- Let B_{-1} , M_{-1} and i_{-1} be given and assume that $r_t = r$.
- Assume the IGBC is satisfied to obtain

$$\sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t \frac{M_t - M_{t-1}}{P_t} = \sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t (G_t - T_t) + \frac{B_{-1}}{P_0} (1 + i_{-1})$$

- The left hand side is the present value of seignorage. It can be written as

$$\sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t \frac{i_{t-1}}{1 + i_{t-1}} L(i_t) - \omega L(i_0)$$

where ω is a constant.

SOME UNPLEASANT MONETARIST ARITHMETIC

- We can write the IGBC as

$$\sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t \frac{i_{t-1}}{1+i_{t-1}} L(i_t) - \omega L(i_0) = D$$

- **Key assumption:** the fiscal authority commits to a particular D . It will not adjust.
- The monetary authority has to provide financing such that the IGBC holds.
- This means that the monetary authority can **only** change the timing of i_t and thus of seignorage revenue.

SOME UNPLEASANT MONETARIST ARITHMETIC

- Example: the central bank reduces the growth rate of money in early periods to "control inflation".
- But it will have to compensate for it with a higher growth rate of money and inflation later on.
- Note: as usually in frictionless models, here higher inflation is associated with **higher** nominal rates.
- Conclusion: monetary policy ultimately cannot control inflation, if it is forced to finance deficits.

SOME UNPLEASANT MONETARIST ARITHMETIC

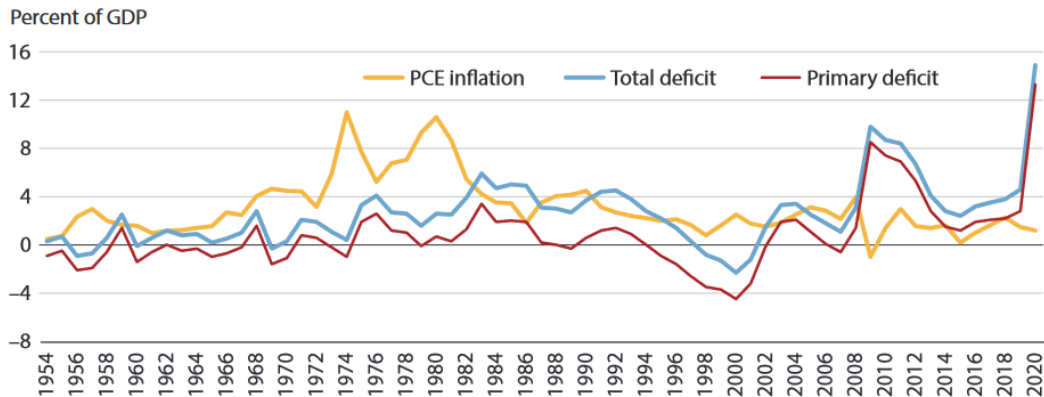
- Sargent and Wallace (1981) provide an even more drastic example.
- Suppose MP is tight initially. It is expected it will be loosened to finance a deficit in the future.
- This means high inflation in the future.
- This means high nominal rates in the future.
- High nominal interest rates in the future lower demand for real balances today
- Given nominal money supply, this means high price level today.
- Conclusion: MP tries to control inflation, but actually causes it!

SOME UNPLEASANT MONETARIST ARITHMETIC?

- Andolfatto (2021) uses a similar logic to question conventional wisdom about Volcker Disinflation.
- Standard narrative: after prolonged inflation in the 1970s, Volcker tightened monetary policy to reduce inflation. This demonstrated that MP can control inflation.
- Andolfatto suggests it was the fiscal policy that was responsible for the disinflation.
- By increasing interest expenses on the debt, Volcker forced the Treasury to reduce deficits.

SOME UNPLEASANT MONETARIST ARITHMETIC?

U.S. Budget Deficits and PCE Inflation, Fiscal Years 1954-2020



SOURCE: Bureau of Economic Analysis and the Office of Management and Budget.

Andolfatto (2021)

JUST “PRINTING MONEY”?

- So far we have seen that fiscal policy can affect inflation / price levels by affecting supply / demand of money.
- Is there any other link? In particular, what if the economy is **cashless**?
- We will explore price determination in a more general model next time.