Money Growth and Inflation

David A. Díaz

UNC Chapel Hill

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- **Principle 9: Prices Rise when the Government Prints Too Much Money**

- We have already discussed how to calculate inflation using the CPI or GDP deflator.

- Moreover, we have discussed how inflation can decrease purchasing power over time.

- This section examines a theory that explains why an economy experiences inflation and how much. We also consider some other costs of inflation.

Classical Theory of Inflation

- The economy's overall price level can be viewed two ways:
    1. The price of a basket of goods and services.
    2. A measure of the value of money.
- Let P represent the price level. P measures the number of dollars needed to buy a basket of goods and services.
- So, how many goods and services could be bought with \$1? $1/P$.
- $1/P$ is the value of money measured in terms of goods and services.
- Thus, when the price level rises, the value of money falls.

Classical Theory of Inflation

- Just like other markets, the value of money is determined by supply and demand.

- For the sake of simplicity, we will assume that the quantity of money supplied is controlled perfectly by the Fed, implying that the money supply curve is perfectly inelastic.

Classical Theory of Inflation

- The demand for money is determined by a few factors:
    1. How much wealth people wish to hold in liquid form
    2. Access to credit
    3. Interest rates of less liquid stores of value
    4. The average level of prices

Classical Theory of Inflation

- Remember that the main function of money is that it is used as a medium of exchange. Thus, the higher prices are, the more money a typical transaction requires, and so the quantity of money demanded will increase as the price level increases.

- Equivalently, we can say that the quantity of money demanded increases as the value of money decreases.

Classical Theory of Inflation

- Balancing the quantity of money supplied and demanded depends on the time horizon being considered. For the purposes of this section, we will only examine the long run.

- In the long run, money supply and money demand are brought into equilibrium by the overall price level.

Classical Theory of Inflation

- Suppose the Fed takes some action that increases the supply of money.
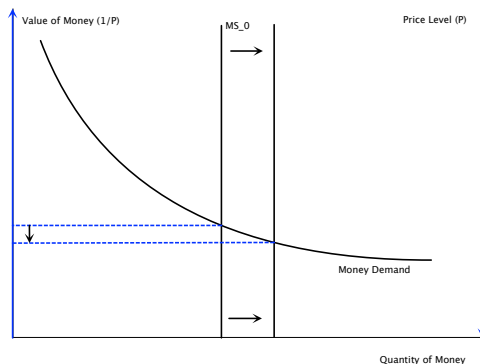

Figure: Monetary Injection

The Quantity Theory

- **Quantity Theory of Money:** A theory asserting that the quantity of money available determines the price level and that changes in the money supply determine the inflation rate.
- Division of economic variables:
    1. **Nominal variables:** Variables measured in monetary units without accounting for the effects of inflation.
    2. **Real variables:** Variables measured in physical units or in terms of purchasing power (i.e., taking inflation into account).
- This separation is referred to as the classical dichotomy.
- Examples of real variables:
    1. Real wages
    2. Real interest rates
    3. Relative prices

Classical Theory of Inflation

- According to this analysis, <u>nominal variables</u> are influenced by changes in the monetary system, while <u>real variables</u> are by and large not affected by money.

- This second point is referred to as <u>monetary neutrality</u>.

- This is true in the long run, but not necessarily in the short run. We will examine the short-run effects of monetary changes later. Money is <u>"neutral"</u> in the long run because it has no effect on real variables.

The Quantity Equation

- **Money velocity (v):** The rate at which money changes hands.
- **The Quantity equation:**

$$M \times v = P \times Y$$

- We can express this equation in percent change terms as

$$\vec{M} + \vec{v} = \pi + \vec{Y}$$

The Quantity Equation

- Because the velocity of money is relatively stable over time, it is generally safe to assume that $\vec{v} = \underline{0}$. Thus, a change in M leads to a proportional change in $P \times Y$.

- Because money is neutral, it does not affect output and so the entire change in M is reflected in the changes in the price level in the long run.

The Quantity Equation

Example

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$\vec{M} + \vec{v} = \pi^* + \vec{Y}$, where $\vec{v} = 0$ and $\pi^* = 0 \Rightarrow \vec{M} = \vec{Y}$.
If $\pi^* = 3$, then $\vec{M} = \vec{Y} + 3\%$.

The Fisher Effect

- **Nominal interest rate**: The advertised rate of return that does not take into account inflation.
- **Real interest rate**: Corrects the nominal rate for inflation and tells you how your purchasing power changes over time.
- The relationship between the variables is $r = i - \pi$.
- The equilibrium real interest rate is determined by the market for loanable funds and the growth of the money supply determines the inflation rate.

The Fisher Effect

- **Fisher Effect:** The one-for-one adjustment of the nominal interest rate to the inflation rate.
- Because loans are set before inflation occurs, a lender that wishes the make a certain real rate of return must anticipate what inflation will be. This is called the expected inflation.
- Nominal interest rates are set using the equation $i = r^* + \pi^e$.
- In the long run, it will be the case that the nominal interest rate adjusts to expected inflation, and expected inflation moves with actual inflation.

The Costs of Inflation

- The Inflation Fallacy: Inflation in incomes goes hand-in-hand with inflation of prices. So, inflation itself does not lead to decreases in purchasing power. It is relative to the increase in wages. What matters to individuals are whether or not real wages are increasing or decreasing.

- Shoeleather costs: The resources wasted when inflation encourages people to reduce their money holdings. They might make more frequent trips to purchase goods, etc. and this time and effort wasted on unneeded trips is inefficient.

- Menu costs: The costs of changing prices. Both this and shoeleather costs are more of a factor in cases of hyperinflation.

The Costs of Inflation

- Relative-Price Variability: Because prices only change occasionally, inflation causes relative prices to vary more than they otherwise would. Distorted relative prices leads to distorted consumer decisions and thus misallocation of resources.

- Tax Distortions: Inflation discourages savings in the context of taxes on capital gains or interest income. Inflation exaggerates these gains and increases the tax burden on this type of income.

- Deflation: Many of the same costs as inflation, but usually deflation also indicates deeper economic issues.

The Costs of Inflation

- Redistribution of Wealth: Rising inflation diminishes the real value of debts
  - Lenders set nominal interest rates as $i = r^* + \pi^e$
  - Actual rate of return is given by $r_{actual} = i - \pi$
  - We can rewrite this as $r_{actual} = r^* + (\pi^e - \pi)$
- Thus, if inflation is greater than expected the real return is less than the expected return on the loan and wealth is transferred from lenders to borrowers.
- If inflation is less than expected, then wealth is transferred from borrowers to lenders.

The Costs of Inflation

Example

Consider the table below. In each case, state which party was hurt more: the bank, the mortgage holder, or neither.

Expected Inflation (π^e)	Actual Inflation (π)	Hurt?
4%	10%	

The Costs of Inflation

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Expected Inflation (π^e)	Actual Inflation (π)	Hurt?
4%	10%	Banks: $\pi > \pi^e$
10%	4%	

The Costs of Inflation

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10%	4%	Mortgage holders: $\pi < \pi^e$
-3%	0%	

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10%	4%	Mortgage holders: $\pi < \pi^e$
-3%	0%	Banks: $\pi > \pi^e$
-3%	-6%	

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-3%	0%	Banks: $\pi > \pi^e$
-3%	-6%	Mortgage holders: $\pi < \pi^e$

Readings and Assignments

- Today: Mankiw Ch. 30
- Next time: Mankiw Ch. 32
- Problem Set 6, section 2