Money and Inflation

Intermediate Macroeconomic Theory
Macroeconomic Analysis

University of North Texas
Outline

1. What is Money?
2. The Quantity Theory of Money
3. Inflation and Interest Rates
4. The Social Costs of Inflation
5. Hyperinflation
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2. The Quantity Theory of Money
3. Inflation and Interest Rates
4. The Social Costs of Inflation
5. Hyperinflation
What is Money?

- Definition: the stock of assets that can be readily used to make transaction
- The functions of money
- The types of money
- How the quantity of money is measured
- How the quantity of money is controlled
What is Money?

- Definition: the stock of assets that can be readily used to make transaction
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  - How the quantity of money is controlled
What is Money?

- Definition: the stock of assets that can be readily used to make transaction

- The functions of money
  1. Store of value: a way to transfer purchasing power from the present to the future
  2. Unit of account: the terms in which prices are quoted and debts are recorded
  3. Medium of exchange: what we use to buy goods and services

- The types of money

- How the quantity of money is measured

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- Definition: the stock of assets that can be readily used to make transaction
- The functions of money
- The types of money
  1. Fiat money: money that has no intrinsic value (dollar bills)
  2. Commodity money: money that has intrinsic value (gold)
- How the quantity of money is measured
- How the quantity of money is controlled
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- How the quantity of money is measured
  - \( M_1 = \text{Currency} + \text{demand deposits} + \text{travelers’ checks} \)
- How the quantity of money is controlled
What is Money?

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- The functions of money
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- How the quantity of money is measured
- How the quantity of money is controlled
  - Delegated to a partially independent institution
  - Federal Reserve (Fed), Federal Open Market Committee (FOMC)
  - Open market operation: the purchase and sale of government bonds
1. What is Money?

2. The Quantity Theory of Money

3. Inflation and Interest Rates

4. The Social Costs of Inflation

5. Hyperinflation
Quantity Theory of Money (QTM): how the quantity of money affects the economy

Quantity equation: the link between transactions and money

\[ MV = PY \]

What determines the quantity of real money balance \((M/P)\) people wish to hold
The Quantity Theory of Money

Quantity Equation

- **Quantity Theory of Money (QTM):** how the quantity of money affects the economy

- **Quantity equation:** the link between transactions and money

  \[ MV = PY \]

- What determines the quantity of real money balance \((M/P)\) people wish to hold
Quantity Theory of Money (QTM): how the quantity of money affects the economy

Quantity equation: the link between transactions and money

\[ MV = PT \]

1. \( M \): the quantity of money
2. \( V \): the transaction velocity of money (measures the rate at which money circulates in the economy)
3. \( P \): the price of a typical transaction (the number of dollars exchanged)
4. \( T \): total number of transactions during some period of time → difficult to measure

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$$MV = PY$$

- $M$: the quantity of money
- $V$: Income velocity of money
- $P$: GDP deflator
- $Y$: Total output of the economy (real GDP)

What determines the quantity of real money balance ($M/P$) people wish to hold
The Quantity Theory of Money (QTM): how the quantity of money affects the economy

Quantity equation: the link between transactions and money

⇒ $MV = PY$

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\[ MV = PY \]

What determines the quantity of real money balance \( \frac{M}{P} \) people wish to hold

\[ \frac{M}{P} = kY \]

\[ \implies M \cdot \frac{1}{k} = PY \]

\[ \implies \text{If } V = \frac{1}{k}, \quad MV = PY \]

When people want to hold a lot of money for each dollar of income, money changes hands infrequently
Assuming constant velocity, $M\overline{V} = PY$

1. The quantity of money determines the dollar value of the economy’s output
2. A change in the quantity of money must cause a proportionate change in nominal GDP ($PY$)
3. The price level ($P$) is proportional to the money supply ($M$)
4. $\%\Delta M + \%\Delta V = \%\Delta P = \%\Delta Y \rightarrow \%\Delta M = \%\Delta P(\pi)$

⇒ “Inflation is always and everywhere a monetary phenomenon” (Milton Friedman)
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Money supply growth and Inflation
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Outline

1. What is Money?
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4. The Social Costs of Inflation
5. Hyperinflation
Nominal interest rate versus Real interest rate

Fisher equation: \( i = r + \pi^e \)

⇒ Nominal interest rate can change

The Fisher effect: one-for-one relationship between the inflation rate and nominal interest rate
Nominal interest rate versus Real interest rate

1 Nominal interest rate \( (i) \): the rate of interest that investors pay to borrow money

2 Real interest rate \( (r) \): the nominal interest rate corrected for the effects of inflation

\[ r = i - \pi \]

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\( \Rightarrow \) Nominal interest rate can change

1. Real interest rate changes
2. (Expected) inflation rate changes

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The Fisher effect: one-for-one relationship between the inflation rate and nominal interest rate

- 1% increase in \( \%\Delta M \)
  - \( \rightarrow \) 1% increase in \( \pi \) (by QTM)
  - \( \rightarrow \) 1% increase in \( i \) (by Fisher effect)
Inflation and Nominal Interest Rate
Inflation and Nominal Interest Rate
Inflation and Nominal Interest Rate
The nominal interest rate is the opportunity cost of holding money.

The quantity of money demanded depends on both:

1. The level of income
2. The nominal interest rate

\[ (\frac{M}{P})^D = L(i, Y) = L(r + \pi^e, Y) \]
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The costs of expected inflation:

1. Shoeleather cost
2. Menu costs
3. Relative price distortions
4. Unfair tax treatment
5. General inconvenience
The Social Costs of Inflation

The Costs of Expected Inflation

- The costs of *expected* inflation:
  1. Shoeleather cost
  2. Menu costs
  3. Relative price distortions
  4. Unfair tax treatment
  5. General inconvenience
The Social Costs of Inflation
The Costs of Expected Inflation

The costs of expected inflation:

1. **Shoeleather cost**
   - The costs and inconveniences of reducing money balances to avoid the inflation tax
   - $\pi \uparrow \Rightarrow i \uparrow \Rightarrow M/P \downarrow$
   - So, same monthly spending but lower average money holdings means more frequent trips to the bank to withdraw smaller amounts of cash

2. **Menu costs**
3. **Relative price distortions**
4. **Unfair tax treatment**
5. **General inconvenience**
The costs of expected inflation:

1. Shoeleather cost
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The Social Costs of Inflation
The Costs of Expected Inflation

- The costs of **expected** inflation:
  1. **Shoeleather cost**
  2. **Menu costs**
     - Examples: print new menus, print & mail new catalogs
     - The higher is inflation, the more frequently firms must change their prices and incur these costs
  3. **Relative price distortions**
  4. **Unfair tax treatment**
  5. **General inconvenience**
The costs of expected inflation:

1. Shoeleather cost
2. Menu costs
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The Social Costs of Inflation
The Costs of Expected Inflation

- The costs of **expected** inflation:
  1. Shoeleather cost
  2. Menu costs
  3. Relative price distortions
     - Suppose a firm issues new catalog each January. As $P$ rises throughout the year, the firm’s relative price will fall
     - Different firms change their prices at different times, leading to relative price distortions
     - Cause microeconomic inefficiencies in the allocation of resources
  4. Unfair tax treatment
  5. General inconvenience
The costs of expected inflation:

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- Some taxes are not adjusted to account for inflation, such as capital gains tax
  1. 1/1/2001: you bought $10,000 worth of Starbucks stock
  2. 12/31/2001: you sold the stock for $11,000, so your nominal capital gain was $1000 (10%)
  3. Suppose $\pi = 10\%$ in 2001. Your real capital gain is $0$
  4. But the government requires you to pay taxes on your $1000 nominal gain!!

5. General inconvenience
The costs of *expected* inflation:

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The costs of expected inflation:

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- Inflation makes it harder to compare nominal values from different time periods
- This complicates long-range financial planning
Additional cost of unexpected inflation:

1. Arbitrary redistributions of purchasing power
2. Increased uncertainty
The Social Costs of Inflation
Additional Cost of Unexpected Inflation

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Additional cost of unexpected inflation:

1. **Arbitrary redistributions of purchasing power**
   - Many long-term contracts are not indexed, but based on $\pi^e$
   - If $\pi \neq \pi^e$, then some gain at others’ expense
   - If $\pi > \pi^e$, then purchasing power is transferred from lenders to borrowers
   - If $\pi < \pi^e$, then purchasing power is transferred from borrowers to lenders

2. **Increased uncertainty**
Additional cost of unexpected inflation:

1. Arbitrary redistributions of purchasing power
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Additional cost of unexpected inflation:

1. Arbitrary redistributions of purchasing power
2. Increased uncertainty
   - When inflation is high, it’s more variable and unpredictable
   - $\pi$ turns out different from $\pi^e$ more often, and the differences tend to be larger
   - This creates higher uncertainty, which makes risk averse people worse off
What is Money?
The Quantity Theory of Money
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Hyperinflation
Hyperinflation: Inflation that exceeds 50% per month (more than 100-fold increase in price level over a year)

The cause of hyperinflation: excessive growth in the supply of money
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The cause of hyperinflation: excessive growth in the supply of money

(1) Hyperinflation in interwar Germany
Hyperinflation

- The cause of hyperinflation: **excessive growth in the supply of money**

(2) Recent episodes of hyperinflation

![Graph showing percent growth of inflation and growth of money supply for various countries over different years.]

- **Israel**: 1983-85
- **Poland**: 1989-90
- **Brazil**: 1987-94
- **Argentina**: 1988-90
- **Peru**: 1988-90
- **Nicaragua**: 1987-91
- **Bolivia**: 1984-85

Legend:
- **Inflation**
- **Growth of money supply**