UNBC

Money, Banking, and Financial Institutions

Chapter 4 : Inflation, Quantity Theory of Money, and Wealth Redistribution.

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1. Understand how inflation is measured

2. Explore the quantitative theory of money

3. Analyze the effects of inflation on wealth redistribution

4. Examine the economic costs associated with inflation

5. Study practical cases, including hyperinflation and deflation

Inflation Rate

▶ Inflation π corresponds to the growth rate of the Consumer Price Index (CPI): $\pi_t = \frac{P_t}{P_{t-1}} - 1$, where P_t is the CPI at time t.

▶ The CPI measures the average price evolution of consumer goods.

▶ To determine this evolution, we compare the cost of a basket of goods and services over time.

  • The basket consists of a set of goods and services (apples, haircuts, shirts, cars, etc.) whose prices are measured every month.

▶ The price index aggregates individual price changes to obtain an average value of price evolution.

▶ Consider a basket of N goods: $i = 1, 2, ..., N$ and ω_i the weight of good i in the basket.

▶ If $\pi_{it} := \frac{p_{it}}{p_{it-1}} - 1$ is the growth rate of the price p_{it} of good i, then the inflation rate π_t for the whole economy is given by:

$$\pi_t = \sum_{i=1}^{N} \omega_i \pi_{it}$$

Figure 1: 12-month change in the CPI 2014-2023
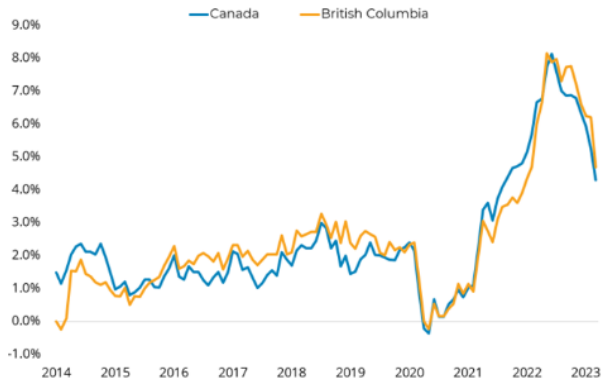
Quantity Theory of Money

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The equation describing the quantity theory of money is given by:

$$M_t V_t = P_t Y_t \tag{1}$$

M_t : Money supply in circulation

V_t : Velocity of money (assumed constant)

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- ▶ $M_t V_t$: Money supply
- ▶ $P_t Y_t$: Money demand (*Quantity of money exchanged*).
- ▶ Using equation (1), we can express the price level P_t and derive its growth rate. Assuming $g_{V_t} = 0$, we obtain:

$$g_{P_t} = g_{M_t} - g_{Y_t} \tag{2}$$

- ▶ If real output remains constant, an increase in the money supply will result in an increase in the general price level:

$$g_{P_t} = g_{M_t} \tag{3}$$

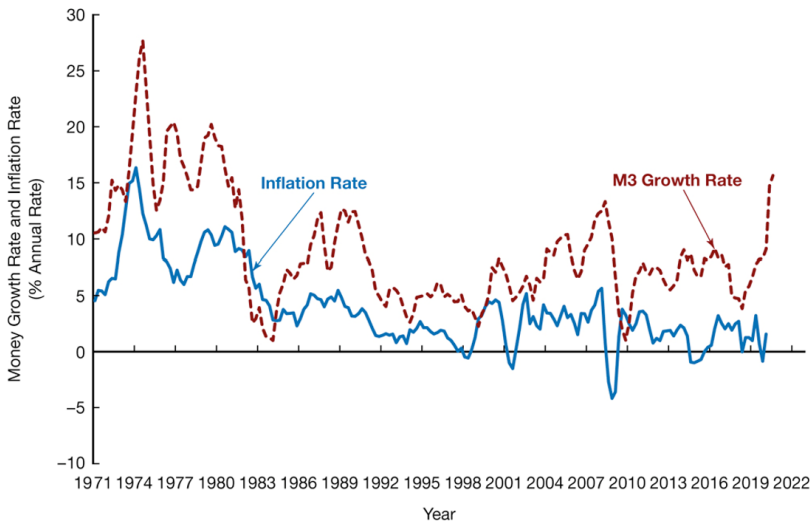**Figure 2:** Inflation Rate and Money Supply Growth in Canada

Figure 3: International Comparison on Average Inflation and Money Growth (2009-2019)
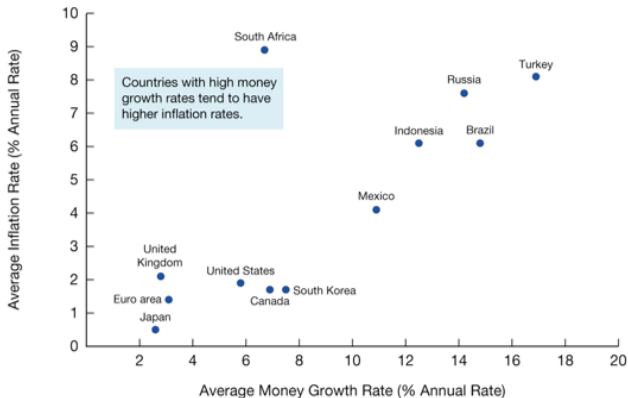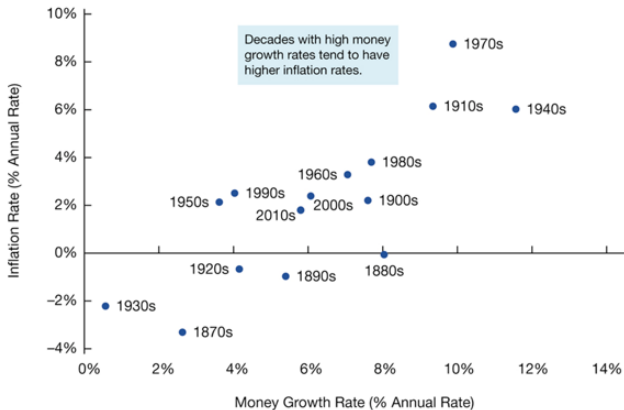
Figure 4: U.S. Inflation and Mone Growth Rates by Decade, 1870s-2010s

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▶ **The quantity theory of money implies that inflation rises if the money supply increases faster than the growth rate of production.**

▶ This hypothesis seems to hold in the long run but may not hold in the short run:
  - **Price rigidities** in the short term.
  - Expectations (the possibility of increasing production to meet an anticipated rise in demand).

Inflation and the Fisher Effect

- ▶ Imagine **you borrow \$10** from a friend today and buy an economics book for \$10. A week later, you repay your friend.
  - Bad luck: **prices have doubled in one week**. The book now costs \$20, and your friend can no longer buy it!
  - For this reason, **lenders charge interest** when they lend money.

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- ▶ Justin borrows \$1000 at a nominal rate of $i = 10\%$ in year 0. In year 1, he must repay \$1100.
  - Over the period, prices have risen by 3%, increasing from \$1 to \$1.03.
  - What was the real cost of borrowing for Justin?

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▶ An approximation of the real interest rate is:

$$r = i - \pi \tag{4}$$

where π is the inflation rate. Thus, $r = 10\% - 3\% = 7\%$

▶ Justin and his bank realize that the return (for the bank) and the real cost of borrowing (for Justin) depend on the inflation rate. However, the contract is signed at the beginning of the period, and the inflation rate is unknown at that time.

▶ At the time of signing, Justin and the bank anticipate a certain level of inflation π^e and therefore a real interest rate:

$$r^{\text{ex-ante}} = i - \pi^e \tag{5}$$

▶ When repayment occurs, the actual inflation rate π is known, and the effective real interest rate is:

$$r^{\text{ex-post}} = i - \pi \tag{6}$$

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▶ If inflation is higher than anticipated $\pi > \pi^e$, the ex-post real interest rate is lower than the anticipated real interest rate, benefiting borrowers. Conversely, if inflation is lower than anticipated $\pi < \pi^e$, lenders benefit.

Figure 5: Comovement of inflation rate, nominal interest rates, and real interest rates
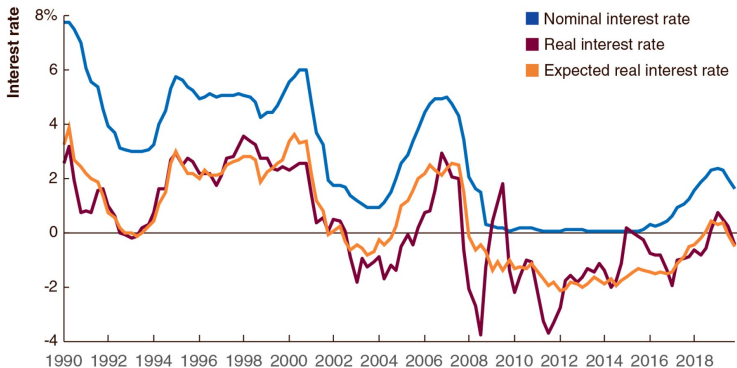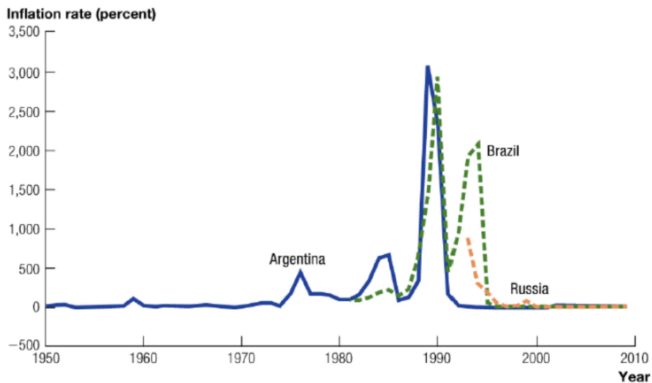
Case Studies of Hyperinflation

► Hyperinflation occurs when the inflation rate exceeds 50% per month.

Figure 6: Hyperinflation in Argentina, Brazil, and Russia

Hyperinflation: Post-War Germany

After World War I, Germany had to pay reparations to France.

▶ Germany used monetary creation to repay France, leading to a massive increase in the money supply.

▶ Hyperinflation ensued, with prices rising by 35,000%.

Hyperinflation: Zimbabwe 2008-2009

Zimbabwe was established in 1980 after the division of Rhodesia.

► Multiple violations of international law led the EU and the USA to impose economic sanctions in 2002.

► Since then, Mugabe has financed the war in the Democratic Republic of Congo and government spending through monetary creation.

Table 1: Annual Inflation Rate, Zimbabwe 2004-2008

Date	Inflation Rate
2004	132.75%
2005	585.84%
2006	1,281.11%
2007	66,212.3%
Jul. 2008	231,150,888.87%
Aug. 2008	471,000,000,000%
Sep. 2008	3,840,000,000,000,000,000%
Nov. 2008	89,700,000,000,000,000,000,000%

How to Curb Hyperinflation?

► **Cause**: Hyperinflation is generally due to uncontrolled government spending.

► **Possible Reforms**:
  - Fiscal reforms: reducing spending and increasing revenue.
  - Central Bank independence.
  - Use of foreign currencies.

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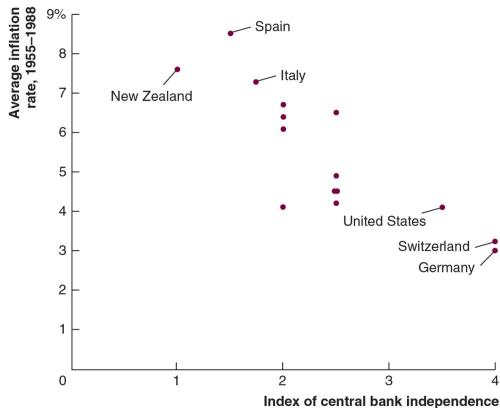
Key Takeaways

- ▶ The relationship between money supply, velocity, price level, and output is fundamental to understanding inflation dynamics : an increase in **money supply** leads to **higher inflation** unless offset by a proportional increase in output.

- ▶ Inflation erodes **purchasing power**, creating winners (debtors) and losers (creditors) in the economy : persistent inflation, especially when unanticipated, may distort long-term economic decisions.

- ▶ Inflation acts as a **redistribution mechanism**, benefiting borrowers (who repay loans with "cheaper" money) while harming savers and those with fixed incomes.

- ▶ **Wealth redistribution through inflation can exacerbate income inequality**, particularly in low-income and non-asset-owning populations.