Lecture 5:
Part 2: Inflation

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**Inflation: Definition**

- Inflation is a sustained, continuous increase in the price level. The opposite is termed **deflation**.
- Inflation deals with the increase in the average of prices and not just significant increases in the price of a few goods.
- Since it concerns, first and foremost, the value of the economy’s medium of exchange, it is the prime concern of the Fed.
Inflation: Historical Aspects

- Over the past sixty years, prices have risen on average about 5% per year.
- *Deflation* occurred in the 19th century and briefly in the 20th century.
- In the 1970’s prices rose by 7% per year.
- From 1990 to 1998 prices rose about 2% per year.
Real Money \((M/P)\) demand is proportional to the total transactions in the economy:

\[(M/P)^D = kT\]

Where:

- \(M\) = the quantity of nominal money
- \(P\) = the average price level
- \(T\) = the number of transactions in the economy
- \(k\) = factor of proportionality (constant)
Money Demand

- Since \((M/P)^D\) must equal money supply \((M/P)^S\), we can rewrite the money demand as

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

Rearranging:

\[
M(1/k) = PT
\]

if \(V = 1/k\):

\[
MV = PT
\]

- \(V\) is the average number of times a dollar is involved in a transaction in a period.
The Quantity Theory

MV = PT

Where:  M = the quantity of money  
V = Transaction Velocity of money.  
P = the average price level  
T = the number of transactions in the economy

- This is a long run identity between money and its use in the economy.
Transactions and Income

Assuming that transaction level in the economy is proportionate to income, the Quantity Theory can be re-written in terms of income:

\[ MV = PY \]

V now becomes the “income velocity of money”. This measures the average number of times a dollar enters someone’s income in a given time.
The velocity of money ($V$) is relatively stable over time.

Real GDP ($Y$) is determined only by factors of production and technology.

The nominal value of GDP is ($PY$) and the GDP deflator ($P$) expresses the ratio of nominal to real GDP:

$$PY/Y = P$$
Since $MV = PY$ and $V$ is fixed, changes in the money supply ($M$) that induce parallel changes in the nominal value of output ($PY$) are also reflected in changes in the price level, since they do not affect real output ($Y$).

When the Fed increases the money supply rapidly, the result is a higher rate of inflation.
Expressing the Quantity Equation in rates of change:

\[ \%\Delta \text{ in } M + \%\Delta \text{ in } V = \%\Delta \text{ in } P + \%\Delta \text{ in } Y \]

- when \( \%\Delta \text{ in } V = 0 \) and \( \%\Delta \text{ in } Y = 0 \):
  \[ \%\Delta \text{ in } M = \%\Delta \text{ in } P \]

- Since the Fed controls the money supply (M), they have ultimate control over the rate of inflation (\( \%\Delta \text{ in } P \))

- The inflation rate depends on the rate of growth of the money supply.
Historical Data on U.S. Inflation and Money Growth
International Data on Inflation and Money Growth
Seigniorage

- This is the term for the revenue raised through printing money.
- When governments print money to finance expenditure, they cause inflation.
- This inflation reduces the value of money balances of people in the country.
- In effect, the government imposes an inflation tax on money-holders to finance its expenditures.
The Fisher Effect

- Since the nominal interest rate \( i \) is expressed as:

\[
    i = r + \pi
\]

\( r = \) real interest rate (determined in the financial markets)

\( \pi = \) inflation rate

- Therefore, a 1% increase in the rate of growth of money would cause a 1% increase in the inflation rate, which causes a 1% increase in the nominal interest rate. This is called the Fisher Effect.
Inflation and Nominal Interest Rates Over Time

- Nominal interest rate
- Inflation rate
The Fisher Effect

- This is a long run relationship, that describes outcomes after all prices have a chance to adjust.

- Borrowers and lenders cannot predict the actual inflation rate, but have an expected inflation rate $\pi^e$.

- Nominal interest rate can only adjust to expected inflation, so the Fisher Effect becomes:

\[ i = r + \pi^e \]

- Rate of growth of the money supply in the long run should determine $\pi^e$. 
The cost of holding money has two components:
- rate of return on other assets: \( r \)
- the “return” to money: \( -\pi^e \)

Therefore the cost of holding money is: \( r - (-\pi^e) = r + \pi^e = i \)
- this is the nominal interest rate.

From this the demand for money must have two components:
- \( i = r + \pi^e \) (speculative demand)
- income (transactions demand)
Money Demand

- Real Money demand is therefore a function of both influences:
  \[(M/P)^d = L(r + \pi^e, Y) = L(i, Y)\]
- \((M/P)^d\) increases with higher incomes and decreases with higher nominal interest rates.
  - From the Quantity Theory, Real Money Demand and Real Money Supply determine the price level.
  - Price changes determine inflation.
  - Expected inflation then determines real money demand.
The Linkages Among Money, Prices, and Interest Rates
Determinants of Inflation

- This implies inflation is determined in the following way:
  - holding $Y$ and $i$ constant ($\text{holding } (M/P)^d \text{ constant}$), today’s money supply determines price level, $P$.
  - Rate of growth of the money supply determines expected inflation, $\pi^e$.

- This implies that real money demand ($M/P$) is determined by today’s money supply ($M$)... and the expected money supply tomorrow (its rate of growth).
Example:

- Suppose the Fed announces it will reduce the inflation rate, but does not change the money supply \((M)\)...
  - this implies reduced rate of growth of the money supply \((M)\) in future.
  - This reduces inflation expectations \(\pi^e\).
  - This reduces the nominal interest rate \(i\).
  - This increases real money demand \((M/P)\).
  - Since \((M)\) is unchanged, this leads to lower \(P\) today!
The Inflation Fallacy

- Fallacy: “Inflation reduces individuals’ incomes and causes living standards to decline.”

- Fact: “One person’s inflated price is another’s inflated income.” Unless incomes are fixed in nominal terms, the higher prices paid by consumers are exactly offset by the higher incomes received by sellers.
The True Costs of Inflation

- The four major costs of inflation are:
  - Unproductive activities provoked by inflation
  - Increased variability of relative prices
  - Unintended changes in tax liabilities
  - Arbitrary redistribution of wealth
Unproductive activities provoked by inflation

- These include:
  - shoeleather costs - lower \((M/P)^d\)
  - menu costs
  - confusion and inconvenience

- All of these reasons lead to people pursuing unproductive activities in order to avoid the effects of inflation.
Increased Variability of Relative Prices

- During times of rising prices, not all prices are increased at the same time. It then becomes difficult to know exact relative prices as prices change irregularly.
- This makes it difficult to make spending decisions that maximize the people’s standards of living.
With inflation, nominal incomes rise yet real incomes do not.

Taxes do not differentiate between nominal and real income, so income increases are treated as real gains.

With progressive taxation, rising nominal incomes are taxed more heavily even though people are no better off.
**Arbitrary Redistribution of Wealth**

- With **unexpected inflation**, wealth is redistributed between net monetary debtors and creditors. This may result in wealth transfers that would not otherwise be acceptable.
  - Recall the Fisher Effect.
- People on fixed incomes (seniors on pension for example) are also made worse off.
Summary

- Inflation refers to continuously increasing price levels.
- Price levels are determined in the long run by money supply and money demand. The more scarce money is the higher it’s value and the less money will be needed to buy things (prices are lower).
- Higher rates of money growth cause higher inflation rates.
- Money does not affect real variables (neutrality).
- Higher inflation rates cause higher nominal interest rates (the Fisher Effect).
- The true costs of inflation include redistribution of income, tax distortions, changes in relative prices, and unproductive reactions to inflation.