

Inflation: Its Causes, Effects, & Social Costs

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Lenin is said to have declared the best way to destroy the Capitalist System was to debauch the currency...Lenin was certainly right. There is no subtler, no surer means of overturning the existing basis of society than to debauch the currency. The process engages all the hidden forces of economic law on the side of destruction, and does it in a manner which not one man in a million is able to diagnose.

—John Maynard Keynes

In 1970,

- The *New York Times* cost \$0.15
- Median single-family home cost \$23,400
- Average wage of production workers was \$3.39 /hr

In 2014,

- the *Times* cost \$2.50
- Median single-family home cost \$265,700
- Average wage was \$20.58 /hr

- **Inflation** is the overall increase in prices.
- **Hyperinflation** is an episode of extraordinarily high inflation.



The Quantity Theory of Money

Transactions and the Quantity Equation

The link between transactions and money is expressed in the **quantity equation**

$$\text{Money} \times \text{Velocity} = \text{Price} \times \text{Transactions}$$

$$M \times V = P \times T$$

T : total number of transactions during some period of time

P : price of a typical transaction

PT : number of dollar exchanged in a year

M : quantity of money

V : **transactions velocity of money**

An Example

- 60 loaves of bread are sold in a year
- They are sold for \$0.50 each
- $\Rightarrow PT = \$30 \text{ /yr}$
- There are \$10 of money in the economy
- $\Rightarrow V = PT/M = 3/\text{yr}$

The quantity equation is an *identity*

From Transactions to Income

Frequently, it is hard to measure the exact number of transactions.

$$\textit{Money} \times \textit{Velocity} = \textit{Price} \times \textit{Output}$$

$$M \times V = P \times Y$$

Because Y in this equation is total income, V in this version of the quantity equation is called the **income velocity of money**

The Money Demand Function & the Quantity Equation

It is often useful to express money in the quantity of goods and services it can buy. This amount, M/P is called **real money balances**.

Let's, for example, say the quantity of money is \$10 and the only available good in the economy is a loaf of bread which costs \$0.50. Then real money balances are 20.

The Money Demand Equation and the Quantity Equation

A **money demand function** is an equation that shows the determinants of the quantity of real money balances people wish to hold. A simple money demand function is

$$(M/P)^d = kY$$

k : constant that tells us how much money people want to hold for every dollar of income.

The money demand function offers another way to view the quantity of money. Note that in equilibrium money demanded equals money supplied. Then

$$M/P = kY$$

$$M(1/k) = PY$$

$$MV = PY$$

$$V \Longleftrightarrow (1/k)$$

When k is large then money changes hands infrequently (V is small).

The Assumption of Constant Velocity

If we make the additional assumption that the velocity of money is constant, then the quantity equation becomes a useful theory about the effects of money called the **quantity theory of money**.

$$M\bar{V} = PY$$

A change in M must cause a proportionate change in nominal GDP.

Money, Prices, and Inflation

- 1 The factors of production and the production function determine the level of output Y .
- 2 The money supply M set by the central bank determines the nominal value of output PY
- 3 The price level P is then the ratio of the nominal value of output PY to the level of output Y .

Money, Prices, and Inflation

The inflation rate is the percentage change in the price level. We can rewrite the quantity equation in percentage change form to pin down how the theory is related.

$$\% \text{ Change in } M + \% \text{ Change in } V = \% \text{ Change in } P + \% \text{ Change in } Y$$

The quantity theory of money states that the central bank, which controls the money supply, has ultimate control over the rate of inflation. If the central bank keeps the money supply stable, the price level will be stable. If the central bank increases the money supply rapidly, the price level will rise rapidly.

Seignorage: The Revenue from Printing Money

All governments spend money

- Goods & services (roads, police)
- Transfers

That spending is financed in three ways:

- Taxes
- Borrowing
- Money printing

Seignorage

Seignorage is the revenue raised by printing money.

- Government prints money $\rightarrow M \uparrow$
- $M \uparrow \rightarrow$ inflation
- Printing money to raise revenue is akin to imposing an *inflation tax*

Who Pays the Inflation Tax?

A: Holders of money

Why?

As prices rise, the real value of money M/P falls.

History Lesson

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- They solved this by printing fiat money, the “Continental” and promised it would be redeemable in gold after the War was won
- By the end of the war, “Continental” were more useful as kindling, and directly led to the Mint Act of 1792.

Inflation and Real Interest Rates

Real and Nominal Interest

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- Your purchasing power has increased but not by the stated interest rate

The interest rate the bank pays is the **nominal interest rate**.

The increase in your purchasing power is the **real interest rate**.

$$r = i - \pi$$

r : real interest rate

i : nominal interest rate

π : inflation

The Fisher Effect

$$i = r + \pi$$

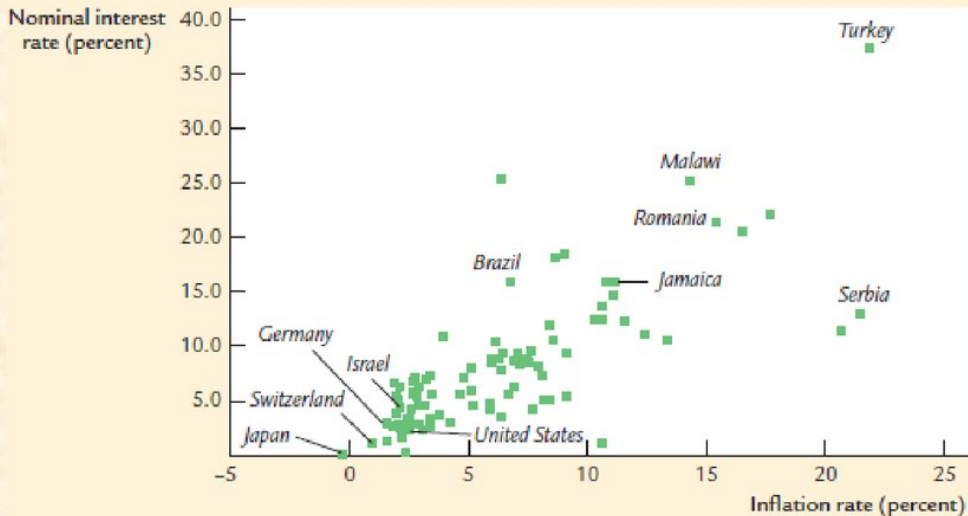
- The real interest rate adjusts to equilibrate saving and investment
- The quantity theory of money shows that the rate of money growth determines the rate of inflation
- The quantity theory and Fisher equation tell us how money growth affects the nominal interest rate

Fisher Effect

An increase in the rate of money growth of 1 percent causes a 1 percent increase in the rate of inflation according to the quantity theory. A 1 percent increase in the rate of inflation causes a 1 percent increase in the nominal interest rate according to the Fisher equation.

Inflation and Nominal Interest Rates

FIGURE 5-4



Ex Ante vs Ex Post Real Interest Rate

- The **ex ante real interest rate** is the real interest rate that borrowers and lenders *expect* when a loan is made
- The **ex post real interest rate** is the *realized* real interest rate

$$i = r + E\pi$$

- $E\pi$ is *expected* future inflation

Ex Ante Real Interest	Ex Post Real Interest
$i - E\pi$	$i - \pi$

The nominal interest rate cannot adjust to the actual interest rate because it is unknown when it is set. Therefore, the Fisher effect is more precisely written as

$$i = r + E\pi$$

The Nominal Interest Rate and the Demand for Money

The Cost of Holding Money

The nominal interest rate is the opportunity cost of holding money.

$$(M/P)^d = L(i, Y)$$

- The higher the level of income, Y , the greater the demand for real money balances
- The higher the real interest rate, i , the lower the demand for real money balances

Future Money and Current Prices

- 1 Money supply and money demand effect the equilibrium price level
- 2 The price level effects the rate of inflation
- 3 Inflation effects the nominal interest rate
- 4 The nominal interest rate effects money demand

$$M/P = L(i, Y)$$

$$M/P = L(r + E\pi, Y)$$

Today's price level depends on today's money supply but also on the money supply expected in the future.

An Example

- 1 Suppose the Fed announces it will increase the money supply in the future, but it does not change the money supply today.
- 2 The announcement causes people to expect higher money growth, thus, higher inflation. The increase in expected inflation is passed onto the nominal interest rate (*Fisher effect*).
- 3 The higher nominal interest rate reduces the demand for real money balances by increasing the cost of holding money.
- 4 The Fed has not yet changed the quantity of money, so this must be met with an increase in the price level $\left(\frac{M}{P} = L(r + E\pi, Y) \right)$.

The Social Costs of Inflation

The Layman's View & the Classical Response

- In general, the layman believes inflation to be a bad because it diminishes purchasing power
- The purchasing power of labor —real wage —depends on the marginal productivity of labor
- When inflation slows, firms will increase their prices less each year and in turn give their workers smaller raises

The Costs of Expected Inflation

Suppose that every month prices rose 0.5%. What would the social costs of a steady and predictable 6% inflation?

- 1 **Shoeleather cost** inconvenience of reduced money holdings
- 2 **Menu costs** Costs associated with frequent price changes
- 3 Inefficiencies caused by the variability in relative prices
If I post my prices once a year, changes in price through the year create microeconomic inefficiencies.
- 4 Tax inefficiencies
e.g. stocks are taxed on their nominal return, quarterly collected taxes can be eroded by quickly changing prices
- 5 General inconvenience of frequently changing prices
financial planning is trickier when the future is less certain

Homeownership in the 1960s

- A thirty year mortgage had an interest rate of six percent
- Inflation from the previous decade was about two-and-a-half percent which informed expected inflation
- Inflation over the life of the mortgage was about five percent

Additional Note: Unexpected inflation is especially pernicious to those living on fixed income.

The Costs of Unexpected Inflation

Unexpected inflation arbitrarily redistributes wealth.

The Costs of Unexpected Inflation

Most loan agreements specify nominal-interest rates that are based on expected inflation at the time of agreement.

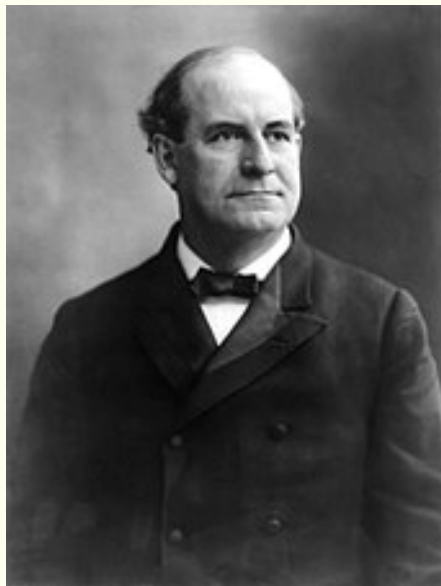
$E\pi > \pi^A \rightarrow$ Creditor wins, debtor loses

$E\pi < \pi^A \rightarrow$ Creditor loses, debtor wins

Because most people are *risk averse* —they dislike uncertainty —the unpredictability caused by highly variable inflation hurts almost everyone.

Lesson from History —The Free Silver Movement

- From 1880 –1896 the price level in the U.S. fell 23% —Deflation, bad for creditors.
- WJB (right) ran on a platform of reversion to bimetallism which would increase the money supply and stop the deflation
- *The Wizard of Oz* is an allegory for this moment in history.
 - The yellow brick road was a metaphor for the gold standard.



One Benefit of Inflation

Some, if not the majority, of economists believe that a little bit of inflation is healthy.

- Cuts in nominal wages are rare (e.g. How would you feel taking a 2% cut in a zero-inflation world vs. taking a 3% raise in a 6% inflation world)
- Some inflation, then, may make labor markets work better
- An increase in supply or a decrease in demand would lower equilibrium real wages

Hyperinflation

The Costs of Hyperinflation

- Tremendous shoeleather & menu costs
- Extreme reduction in real tax revenue

TABLE 1
ZIMBABWE'S HYPERINFLATION

Date	Month-over-month inflation rate (%)	Year-over-year inflation rate (%)
March 2007	50.54	2,200.20
April 2007	100.70	3,713.90
May 2007	55.40	4,530.00
June 2007	86.20	7,251.10
July 2007	31.60	7,634.80
August 2007	11.80	6,592.80
September 2007	38.70	7,982.10
October 2007	135.62	14,840.65
November 2007	131.42	26,470.78
December 2007	240.06	66,212.30
January 2008	120.83	100,580.16
February 2008	125.86	164,900.29
March 2008	281.29	417,823.13
April 2008	212.54	650,599.00
May 2008	433.40	2,233,713.43
June 2008	839.30	11,268,758.90
July 2008	2,600.24	231,150,888.87
August 2008	3,190.00	9,690,000,000.00
September 2008	12,400.00	471,000,000,000.00
October 2008	690,000,000.00	3,840,000,000,000,000.00
14 November 2008	79,600,000,000.00	89,700,000,000,000,000,000.00

NOTES: The Reserve Bank of Zimbabwe reported inflation rates for March 2007–July 2008. The authors calculated rates for August 2008–14 November 2008.

SOURCES: Reserve Bank of Zimbabwe (2008a) and authors' calculations.

Causes of Hyperinflation

- Excessive growth in the money supply
- Governments have inadequate tax revenue to meet expenditures
- Tax revenues shrink, reliance on seignorage become self-enforcing
- **Cure:** Fiscal Reform

History Lesson —Weimar Republic

- Treaty of Versailles commanded Germany to pay reparations
- Reparations led to fiscal deficits.
Convenient solution: seignorage
- Real balances declined by 80% (1922 –23); inflation peaked at 10,000% a month between '23 and '24
- Fiscal reform swiftly ended hyperinflation at the end of 1923: gov't payroll shrank by 1/3, negotiation of debt suspension and relief, new central bank

75 The Ends of Four Big Inflations

Table G1 (continued)

Year	Month	Price Index	Year	Month	Price Index
1922	January	3,670	1923	July	7,478,700
	February	4,100		August	94,404,100
	March	5,430		September	2,394,889,300
	April	6,360		October	709,480,000,000
	May	6,460		November	72,570,000,000,000
	June	7,030		December	126,160,000,000,000
	July	10,160	1924	January	117,320,000,000,000
	August	19,200		February	116,170,000,000,000
	September	28,700		March	120,670,000,000,000
	October	56,600		April	124,050,000,000,000
	November	115,100		May	122,460,000,000,000
	December	147,480		June	115,900,000,000,000
1923	January	278,500		July	115 ¹
	February	588,500		August	120 ¹
	March	488,800		September	127 ¹
	April	521,200		October	131 ¹
	May	817,000		November	129 ¹
	June	1,938,500		December	131 ¹

Source: Young [36, vol. 1, p. 530].

¹On basis of prices in reichsmarks. (1 reichsmark = 1 trillion [10¹²] former marks.)

The Classical Dichotomy

- The real wage is the quantity of output a worker earns for each hour of work. The real interest rate is the quantity of output a person earns in the future by lending one unit of output today.
- **Nominal variables** are expressed in terms of money
- The theoretical separation of nominal and real variables is called the **classical dichotomy**
- The irrelevance of money in determination of real variables is called **monetary neutrality**