

International Finance: Lecture 2

Foundations of Economics and Finance

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Outline

1 Introduction

2 Price Theory

- The Law of Demand and Supply
- The Demand and Supply Model

3 Money Theory

- Function and Measurement
- Quantity Theory of Money

4 Interest Theory

- Income, Capital and Interest
- Money and Financial Markets

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Foundations of Economics

- Classical Political Economy builds the foundations and themes in modern economic analysis.
- Price theory (value, trade, market, firm) are the foundations.
- Resource allocation and income distribution are the themes.
- From classical to neoclassical synthesis, Alfred Marshall brought elements of physics and mathematics into the analytical framework.
- As the founder of modern macroeconomics, John M. Keynes revolutionized the theory and practice of economics and the economic policies of governments.
- In its modern transition, Paul Samuelson has applied complex mathematical tools, developed static and dynamic economic theory, and raised the level of analysis in economic science.

Pioneers and Magnum Opus

1 Classical Political Economy

- Adam Smith (1776) An Inquiry into the Nature and Causes of the Wealth of Nations
- David Ricardo (1817) Principles of Political Economy and Taxation
- John Stuart Mill (1848) Principles of Political Economy with some of their Applications to Social Philosophy

2 Neoclassical Economics

- Alfred Marshall (1890) Principles of Economics

3 Keynesian Revolution

- John Maynard Keynes (1936) The General Theory of Employment, Interest, and Money

4 Modern Economic Analysis

- Paul Samuelson (1947) Foundations of Economic Analysis

Microeconomics and Macroeconomics

Price Theory and Money Theory

- Economics is the study of choice under scarcity. In terms of scope, it can be broadly divided into micro and macro analysis.
- Microeconomics examines how individuals make decisions, and as a result of their interplay, the functioning of the market.
- Since price plays the central role in allocating resources and distributing income, microeconomics is also titled price theory.
- Macroeconomics studies how the aggregate economy functions. Topics: national income, unemployment, inflation, economic growth, business cycles, monetary and fiscal policies.
- Since money plays a vital role in affecting all these variables, macroeconomics is also dubbed money theory.

Finance and Investment

The Theory of Interest

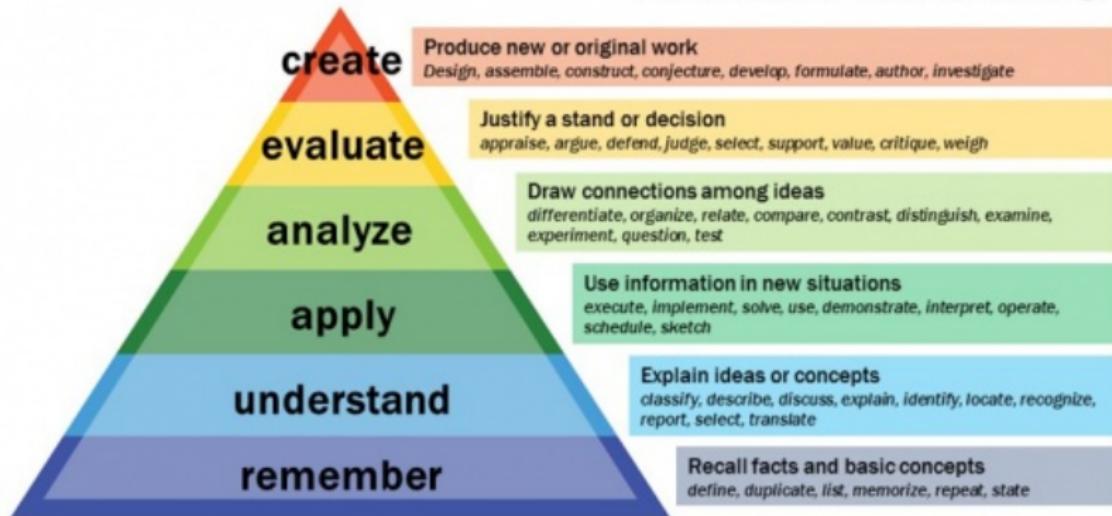
- Finance is the study of income allocation over time under uncertainty. The foundations of modern finance and investment theories is the theory of interest, developed by Irving Fisher.
- Published in 1930, Fisher's book, the theory of interest, discusses the nature and determinants of market interest rate.
- After explaining the concepts and relations of income, wealth, capital in a crystal clear manner, Fisher built his theory of interest on six principles: two subjective, two objective, and two market clearing conditions.
- Fisher's theory of interest is pure in the sense that interest rates still exist in a world without money and risk.
- In a monetary world, the relationship between nominal interest rate and expected inflation rate was revealed in the well-known Fisher equation.

The Economic Way of Thinking: 8 Guidelines

- ① The use of scarce resources is costly, so people make trade-offs.
- ② Individual choose purposefully – they try to get the most from their limited resources, implied by the rationality postulate.
- ③ Incentives matter – change in incentives influence human choices in a predictive way, which follows the law of demand.
- ④ Individual make decisions at the margin (benefit-cost analysis).
- ⑤ Although information can help us make better choices, its acquisition is costly.
- ⑥ Beware of the secondary effects and unintended consequences: economic actions often generate indirect as well as direct effects.
- ⑦ The value of a good or service is subjective (use value).
- ⑧ The test of a theory is its ability to predict.

Learning Goals: Progress to Application and Analysis

Bloom's Taxonomy



Vanderbilt University Center for Teaching

<http://diversifyingecon.org/index.php?title=Bloom>

The Law of Demand and Supply

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Scarcity and Competition

- Economics is the **study of choice under scarcity**.
- Given the limitations of nature and the unlimited desires of man, scarcity is inevitable and pervasive.
- People's desire for more goods leads to conflict of interests, or social competition.
- Scarcity and competition are inseparably paired.
- **Competitive criterion** selects "winners" and "losers."
- Society allocates its scarce resources and distributes incomes based on the competitive criterion.
- The **rules of the game** determine the ways social members cooperate and compete with one another.

Rationality and Opportunity Cost

- The postulate of economics is **rationality or self-interest**.
- It implies decision-makers try to achieve best outcome possible at a minimum cost. All costs are opportunity cost.
- **The cost of an event is the highest-valued opportunity necessarily forsaken.** No choice, no cost, no economics.
- Costs are tied to actions and decisions, not things. All costs relevant decision making lie in the future.
- Costs are always the opportunities that particular people sacrifice. All costs are costs to someone who places value on forgone opportunities.
- Historical costs are not cost. Costs are forward-looking.

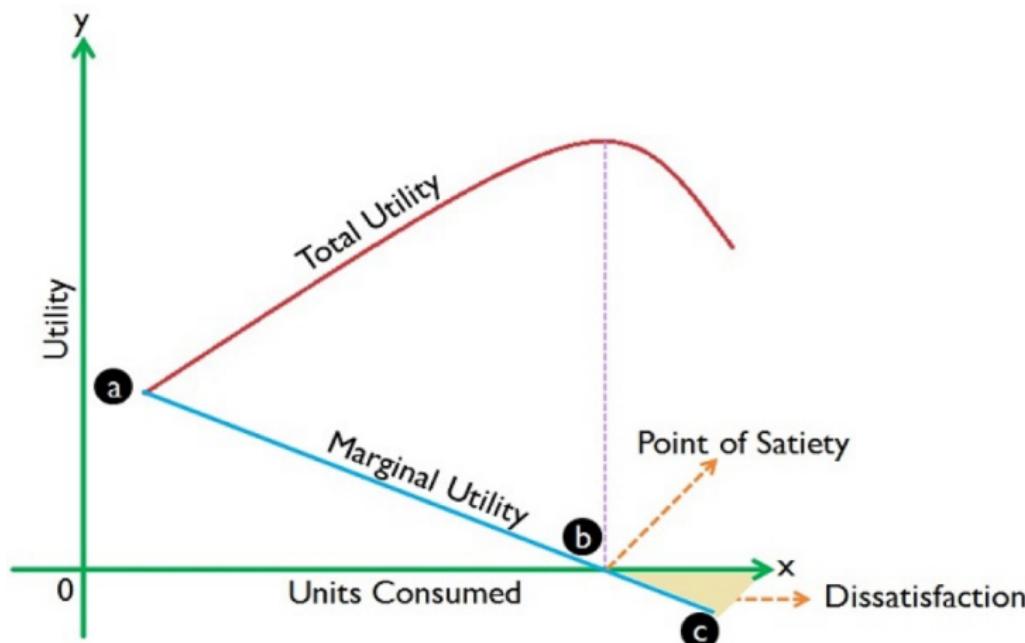
Value and Exchange

The word VALUE, it is to be observed, has two different meanings, and sometimes expresses the utility of some particular object, and sometimes the power of purchasing other goods which the possession of that object conveys.

—Adam Smith, Wealth of Nations (1776), Book I

- **Use value:** the highest value a consumer esteems from the consumption of a good or service, it can be measured by the maximum amount the consumer is willing and able to pay for the good or service.
- **Exchange value:** the amount of money or property a consumer actually pays for a good or service. In the market, exchange value is the price.
- **Exchange condition:** a person will buy the item if its use value is no less than its exchange value, by definition. Market exchange is win-win.
- **Net gain from exchange (surplus):** the difference between use value and exchange value. Any voluntary exchange is mutually beneficial.

The Law of Diminishing Marginal Utility



<https://forestrypedia.com/total-utility-and-marginal-utility/>

Consumers' Behavior

- **The law of demand:** all else equal, the quantity demanded is inversely related to the price of the good. Higher price, more reluctant to buy; and vice versa. $D = Q_d(P)$
- **Quantity demanded:** the maximum quantity the consumer is willing and able to buy at a given price. It is not observable since we don't know other person's intention.
- Demand (curve): a schedule of the quantity demanded at all possible price levels, all else equal.
- Drawn in a graph, we can derive a downward-sloping curve.
- The law of demand represents the idea of diminishing marginal use value of the good.

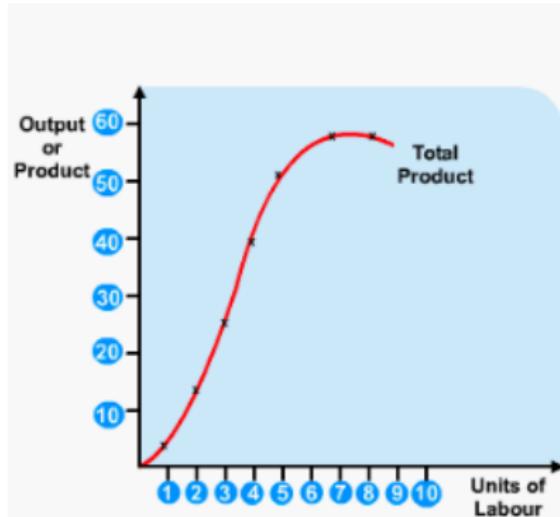
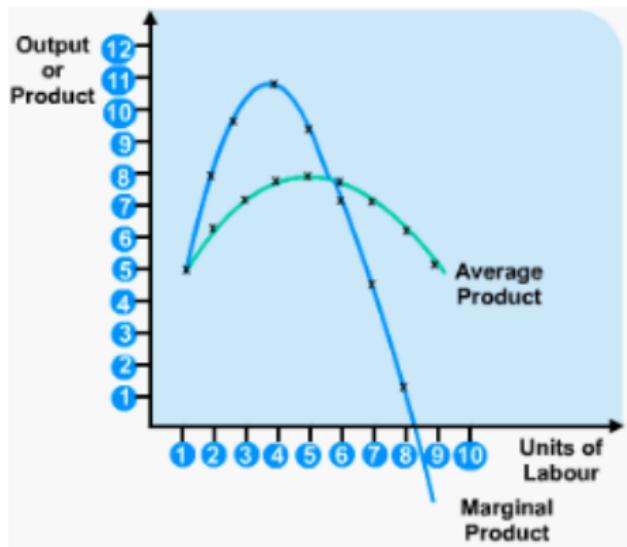
The Demand Curve Shifters

Demand factors: all variables other than price of the good, because price only affect quantity demanded. These variables include:

- income (normal vs inferior good)
- the price of substitutes and complements
- family size and population structure
- weather, climate, and temperature
- government taxes and subsidies
- fashion, news, and advertisement
- market expectations
- ...

The Law of Demand and Supply

The Law of Diminishing Marginal Product



<https://www.s-cool.co.uk/a-level/economics/costs-and-revenues>

Producers' Behavior

- **The law of supply:** all else equal, the quantity supplied is positively related to the price of the good. Higher price, stronger incentive to supply; and vice versa. $S = Q_s(P)$. The law of supply reflects the effect of diminishing marginal product.
- **Quantity supplied:** the maximum quantity the producer is willing and able to supply at a given price. Like Q_d , it is not observable.
- **Supply (curve):** a schedule of the quantity supplied at all possible price levels, all else equal. Drawn in a graph, S is upward-sloping.
- Holding the factor price constant, TP, AP, MP are the mirror images of TC, AC, MC, respectively.
- Efficient production amounts to profit maximization subject to either the iso-quant or iso-cost constraint.

The Supply Curve Shifters

Supply (curve) shifters: all variables other than price of the good, because price only affect quantity supplied. These variables include:

- production costs
- new technology
- price of related components
- new institution or legislation
- government policies or regulations
- weather, climate and disaster
- social and political events
- ...

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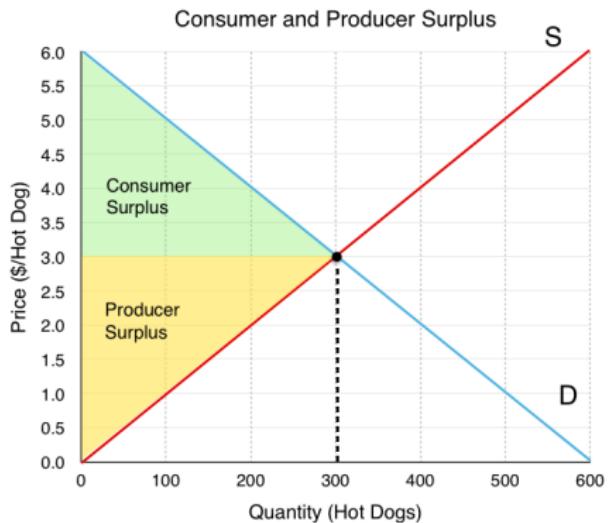
Money and Financial Markets

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The Market Equilibrium

- Following Alfred Marshall's tradition, neoclassical economics developed the powerful tool for analyzing market conditions.
- Combining the law of demand and supply, the price is determined by the intersection of a downward-sloping demand curve and an upward-sloping supply curve.
- Market equilibrium refers to the combination of price and quantity transacted. These two variables are of our interest.
- Market conditions in terms of demand and supply change all the time, therefore, equilibrium is a result of a series of events.
- Mathematical representation: $Q_d(P) = Q_s(P) = Q^*(P^*)$.

Market Equilibrium and Welfare



- Market equilibrium (\$3, 300)
 - Market welfare measures net gain from exchange. It is the sum of consumer surplus and producer surplus.
 - Consumer surplus (CS): reservation value minus price.
 - Producer surplus (PS): market price minus reservation cost.

<https://pressbooks.bccampus.ca/uvicsecon103/chapter/3-6-equilibrium-and-market-surplus/>

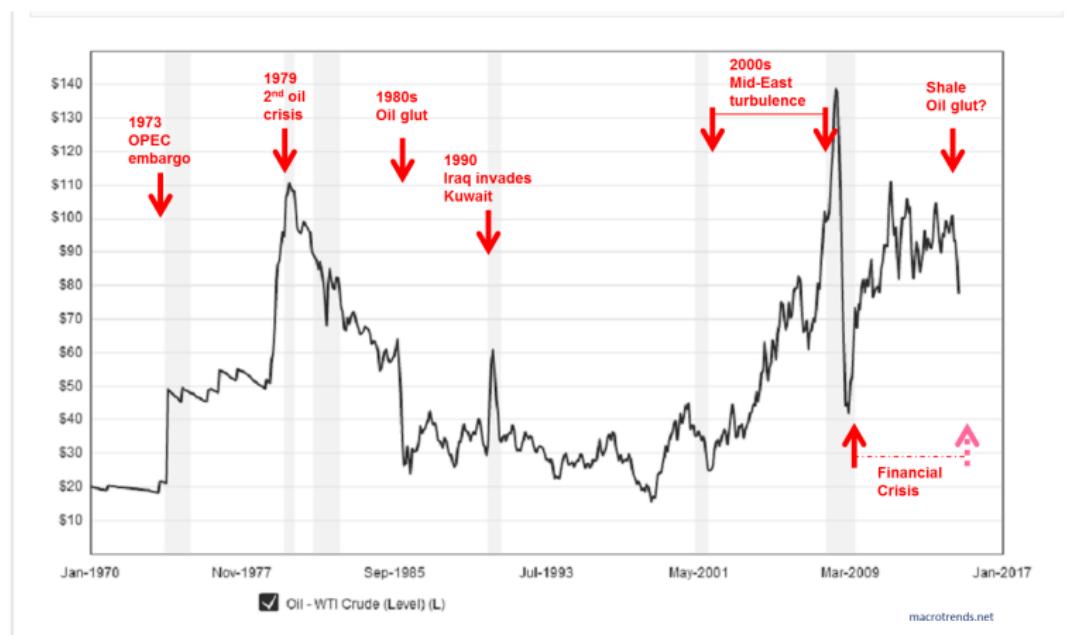
Steps to Characterize Market Equilibrium

- Graph the initial equilibrium: Q_0 and P_0
- Event analysis: demand shifter or supply shifter or both?
- Pin down the direction of the effect: positive or negative?
- Draw the movement of the curves in the graph: D or S?
- Graph the new equilibrium: Q_1 and P_1
- Make comparisons: Q_1 v.s. Q_0 , P_1 v.s. P_0

Market equilibrium is a beautiful story taught by all economists. As a popular concept, equilibrium is to Physics is not as equilibrium to Economics: equilibrium in Physics is a fact but in Economics it is the solution of a model. In reality, no economists can see and know exactly where the market equilibrium is, not to mention market welfare.

The Demand and Supply Model

DS Model: An Application to Oil Prices



Crude Oil Price History Chart

DS Model: Application Questions

The historical crude oil prices is shown above, apply demand and supply model to analyze the effect of certain event or policy on global oil market equilibrium.

- a. What were those significant events that pushed the crude oil prices above 60 dollars per barrel?
- b. Were these events affecting the supply side or demand side of the oil market? Why?
- c. When price goes up too high, how could consumers respond to such adverse events? How would these responses from consumers affect future oil prices?

DS Model: Application Questions

- f. During the early 1970s, the US government imposed the price control on domestic oil consumption. Normally, price control policy aims to restrict the price below market equilibrium level so that consumers are supposed to pay lower price and benefit from this policy. What is the effect of price control on oil market equilibrium?
- g. When the price of the oil is controlled by the government below its market equilibrium level, how do the consumers and supplies respond to this policy? Compare the quantity demanded and quantity supplied in the oil market and analyze whether the price control policy could help the American consumers. Predict the consequence of the policy if it lasts for a long period.

Say's Law: Supply Creates its Own Demand (w)

It is worthwhile to remark that a product is no sooner created than it, from that instant, affords a market for other products to the full extent of its own value...

Jean-Baptiste Say, A Treatise on Political Economy, 1803: pp.138-9

- Why does supply create its own demand?
- If an individual produces a good, then he will be keen to sell it. This production creates wages and income. Therefore, the production has increased wealth and leads to demand for other goods.
- Say argued it was irrational to hoard money because "he is most anxious to sell it immediately, lest its value should diminish in his hands" i.e. inflation may reduce the value of cash.
- This theory assumes that markets clear and that businessmen produce goods that are demanded by the market. Say's law suggests that the key to economic growth is not increasing demand, but increasing production.

Demand Creates its Own Supply

- From the value theory, the opposite is also true: demand creates its own supply. Why? Recall the concepts of use value and exchange value.
- Every demander is a supplier of the good! Under what condition?
- Selling condition: $\text{use value} < \text{exchange value}$.
- Every supplier is a demander of the good! Under what condition?
- Buying condition: $\text{use value} > \text{exchange value}$.
- For the same good, a buyer can also be a seller. The opportunity cost of an event is the highest-valued option necessarily forsaken.
- Graph the idea: prosumer's endowment equilibrium generates the symmetry. A new interpretation for market equilibrium.
- Economics provides a story of demand, supply, and market equilibrium. The chicken or egg question aside, the answer depends on simultaneity.

Coase Theorem and Market Transaction

- Traditional and mainstream views on **market failures** (externality, public goods, market power, and asymmetric information) do not deepen our understanding of the markets.
- According to the **Coase theorem**, market arrangements can help overcome externality problems and provide public goods when transaction costs are not too prohibitive.
- **The delineation of rights is the prelude to market transactions.** Clearly-defined and enforced property rights system guarantees smooth functioning of the market and economic prosperity.
- Government intervention and public policies may not be necessarily more efficient than market solutions. However, public institutions serve as infrastructure for the markets.

Function and Measurement

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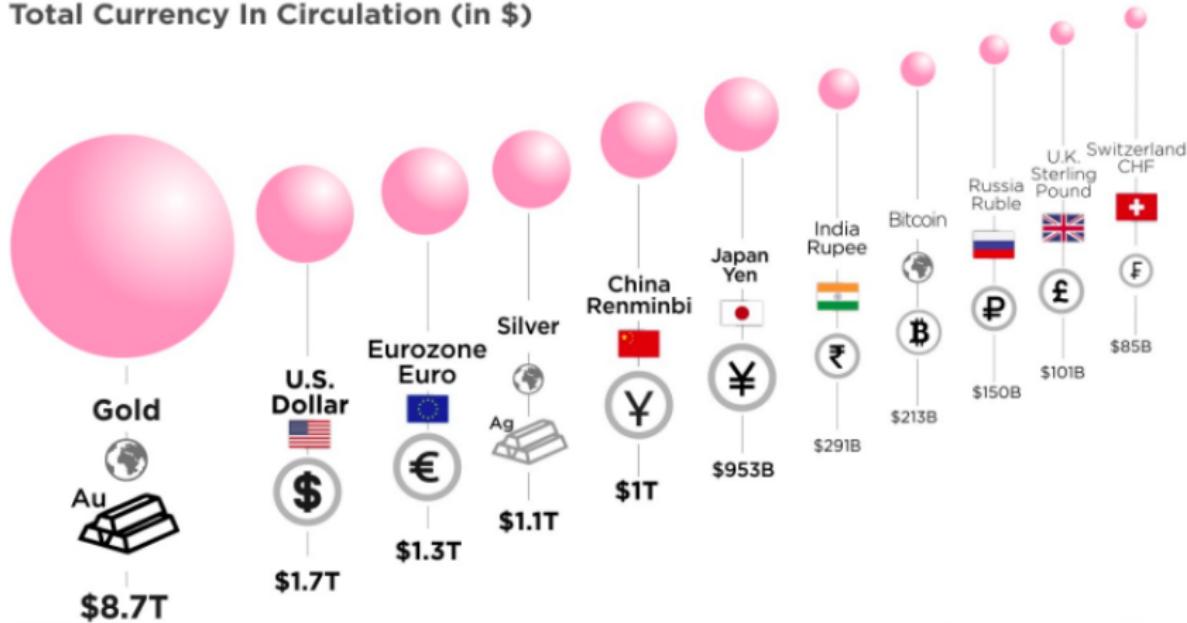
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Global Currencies 2019 (w)

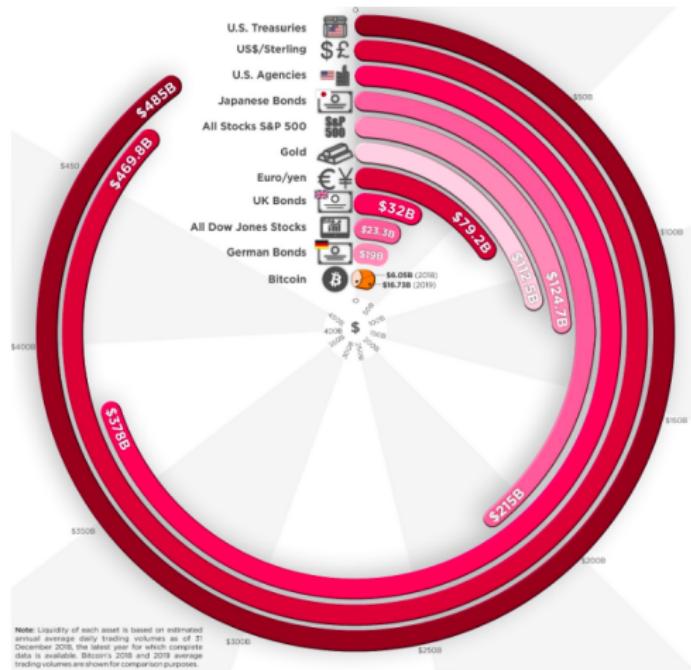
Total Currency In Circulation (in \$)



<https://howmuch.net/articles/how-much-currencies-are-worth>

Function and Measurement

Global Liquidity of Financial Assets 2018 (w)



<https://howmuch.net/articles/stacking-up-liquidity-financial-assets>

Functions of Money

All money is a matter of belief. –Adam Smith

- Money is a standardized medium of exchange. Money stores all memories of income and wealth.
 - Money, as a **medium of exchange**, evolves from society's persistent endeavor to reduce transaction cost.
 - Money, as a **store of value**, enables its owner to finance inter-temporal exchange, balancing consumption over time.
 - Money, as a **unit of account**, measures the value of the goods and services being exchanged. Prices are expressed in monetary units.
 - In history, any good being chosen and developed as a universal medium of exchange can be defined as money. Other functions of money are derived henceforth. In a modern economy, however, money carries a more vital role — **credit and debt instrument**.

A Brief History of Money (w)

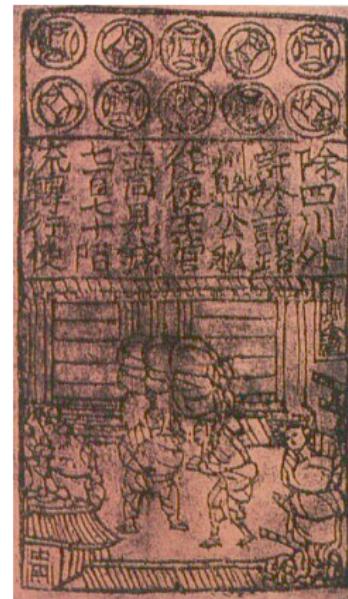


Source: PublishOX.

- In the beginning: Barter
- 9000 - 6000 B.C.: Cattle
- 1200 B.C.: Cowrie shells
- 1000 B.C.: First metal money and coins
- 500 B.C.: Modern coinage
- 118 B.C.: Leather money
- 806: Paper currency
- 1816: The gold standard
- 1930: End of the gold standard
- The present: Fiat money
- The future: Digital money

The Earliest Paper Money - Banknote ^(w)

Development of the banknote began in the Tang dynasty during the 7th century, with local issues of paper currency, although true paper money did not appear until the 11th century, during the Song dynasty. Before the use of paper, the Chinese used coins that were circular, with a rectangular hole in the middle. Several coins could be strung together on a rope. Merchants in China, if they became rich enough, found that their strings of coins were too heavy to carry around easily. To solve this problem, coins were often left with a trustworthy person, and the merchant was given a slip of paper recording how much money they had with the person. Eventually, the Song Dynasty paper money called "jiaozi" originated from these promissory notes.



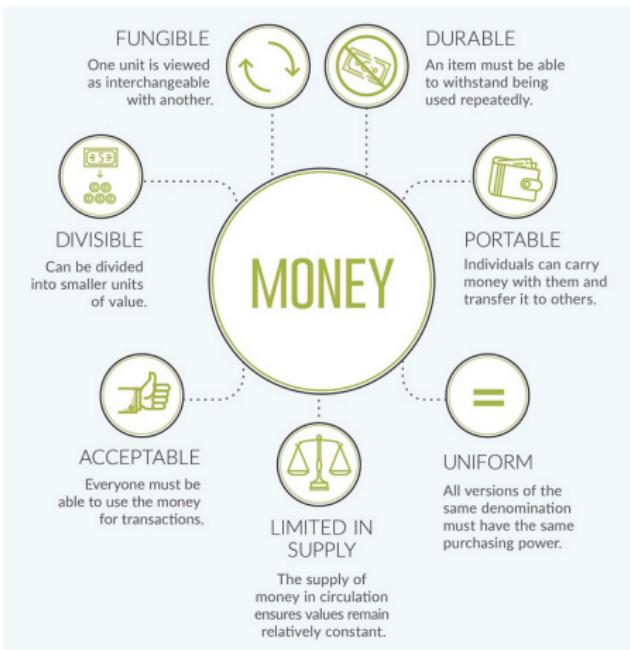
Wiki: Song Dynasty "Jiaozi."

Function and Measurement

Properties of Money (w)

Are these money?

- Checking accounts
- Savings accounts
- Checks
- Credit card
- Debit card
- Gold and silver
- Diamond
- Bitcoin



<https://sunnyclo.ipower.com/pearlsofliberty/>

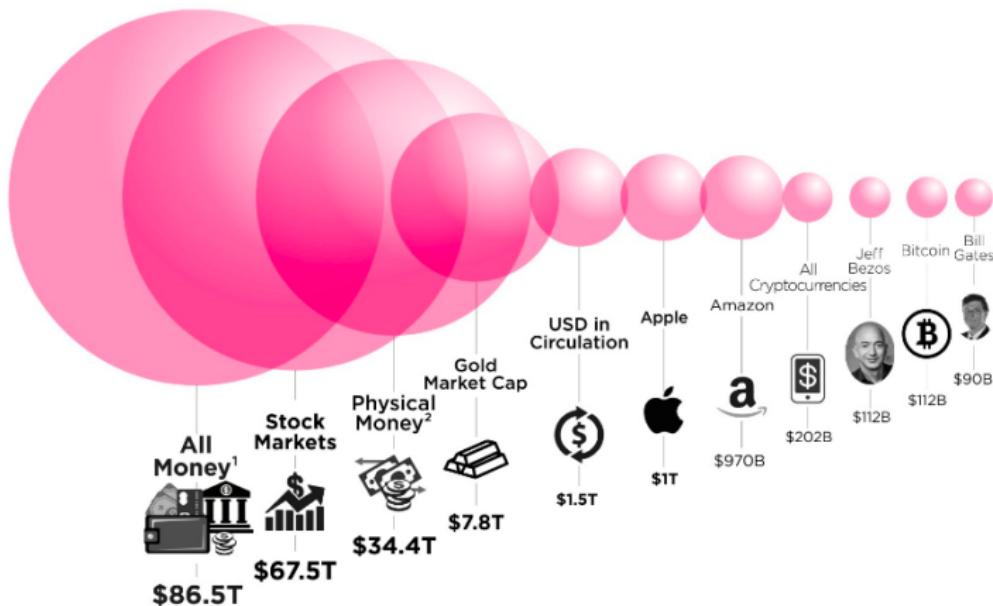
Function and Measurement

Case Study: Is Bitcoin Money? (web)

- What is Bitcoin? Let's watch a video. (web)
- For a detailed introduction, see <http://en.wikipedia.org/wiki/Bitcoin>
- To examine whether Bitcoin functions as money, let's check its performance. <https://www.coinbase.com/charts>
- Medium of exchange? Is it popular?
- Unit of account? Is it a good yardstick?
- Store of value? Is it safe and convenient?
- What determines the value of the Bitcoin?

Function and Measurement

Bitcoin in the Economy 2018 (w)



¹ All figures are shown as of latest available data on September 17th, 2018

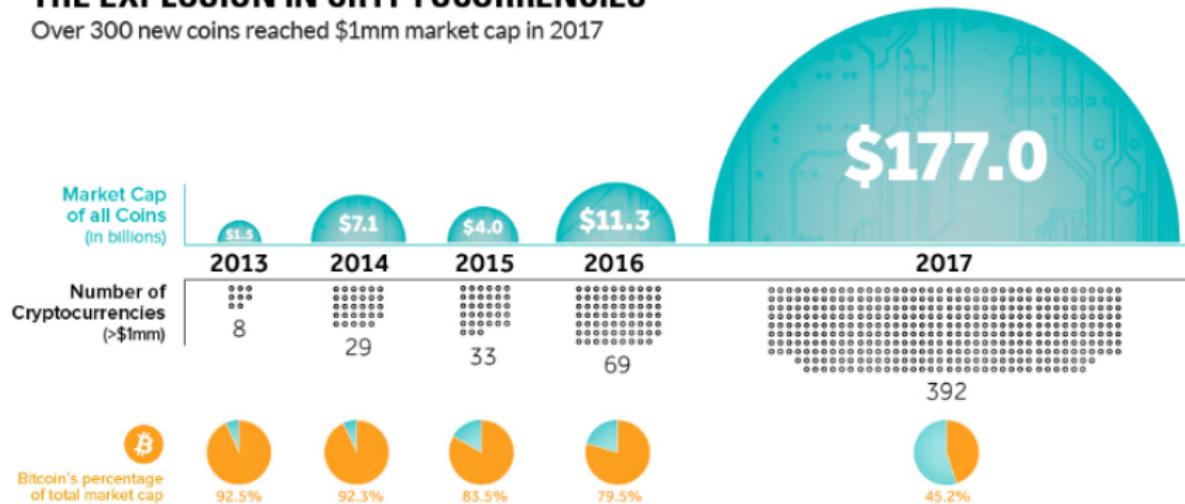
<https://howmuch.net/articles/worlds-money-in-perspective-2018>

Function and Measurement

Explosion in Cryptocurrencies 2013-2017 (w)

THE EXPLOSION IN CRYPTOCURRENCIES

Over 300 new coins reached \$1mm market cap in 2017



SOURCE: Coinmarketcap.com, last week of August 2017 each year

visualcapitalist.com



Function and Measurement

Money and Financial Innovation

Watch the videos below to be amazed by the financial innovations in the recent years and consider their impacts on our world of money, more specifically, the measurements of money and challenges to monetary policy.

- 201703 What is Blockchain? | CNBC 4:52 (w)
- 201806 What is Fintech? | CNBC 3:47 (w)
- 201901 How Robinhood Makes Money | CNBC 9:00 (w)
- 201904 How Venmo Makes Money | CNBC 11:29 (w)
- 201910 How Square Makes Money | CNBC 13:40 (w)
- 201910 Why Facebook's Libra Is In Trouble | CNBC 14:51 (w)

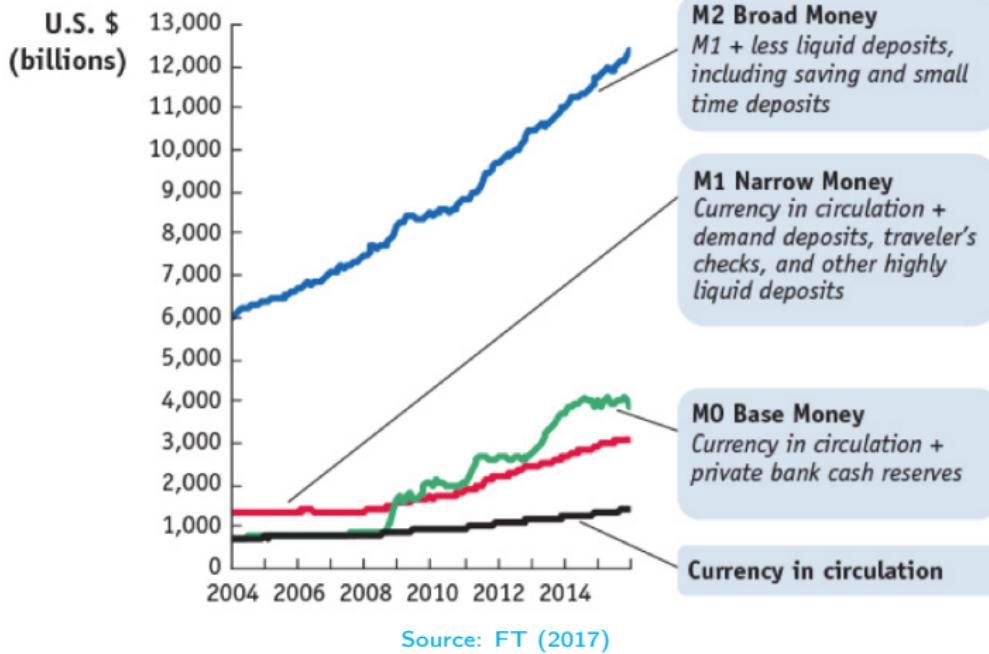
U.S. Money Stock Measures H.6: Background

- The [Federal Reserve System](#) has constructed and published monetary statistics since 1914.
- Timely and accurate data on the monetary aggregates are needed by the Board of Governors and the Federal Open Market Committee for use in monetary policy deliberations and by the public in assessing financial flows and conditions and their implications for the economy.
- Concepts and definitions of the money stock have evolved over time, reflecting changes in the regulatory and institutional environment.

U.S. Money Stock Measures: M1 and M2

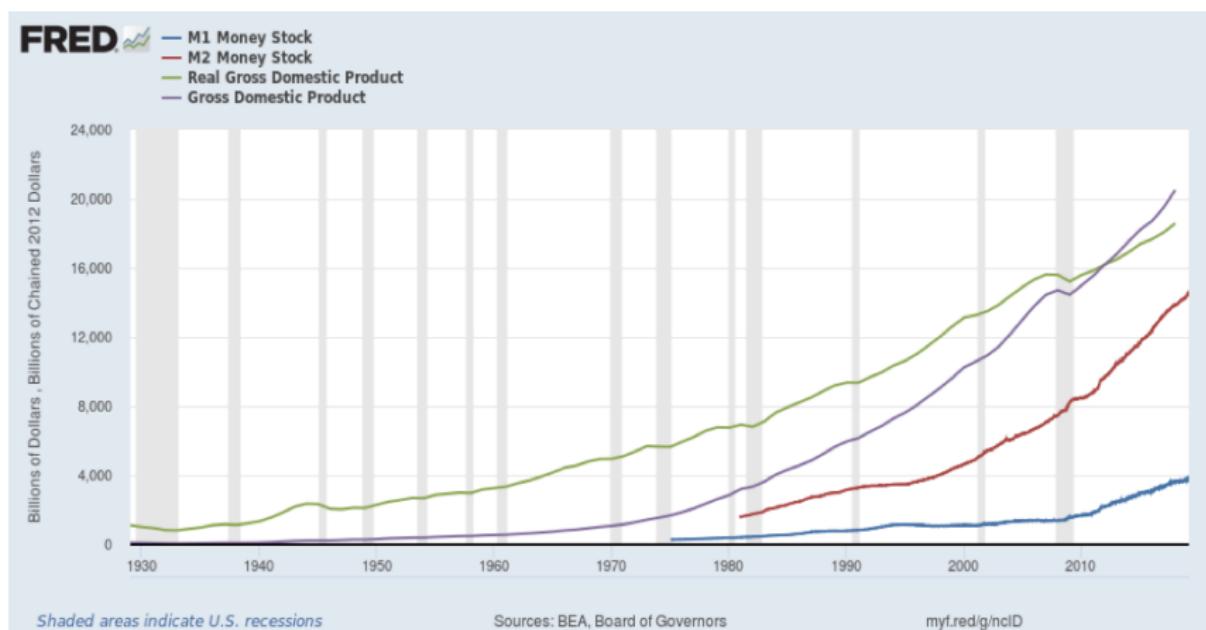
- The H.6 release, published weekly, provides measures of the monetary aggregates (M1 and M2) and their components.
- M1, the more narrowly defined measure, consists of the most liquid forms of money, namely currency and checkable deposits. M1 is included in M2.
- The non-M1 components of M2 are primarily household holdings of savings deposits, small time deposits, and retail money market mutual funds.
- H.6 statistical release website:
<http://www.federalreserve.gov/releases/h6/current/>
- H.3 (aggregate reserves and monetary base) website: (w)

Money Stock Classification



Function and Measurement

Money Stocks in U.S. Economy



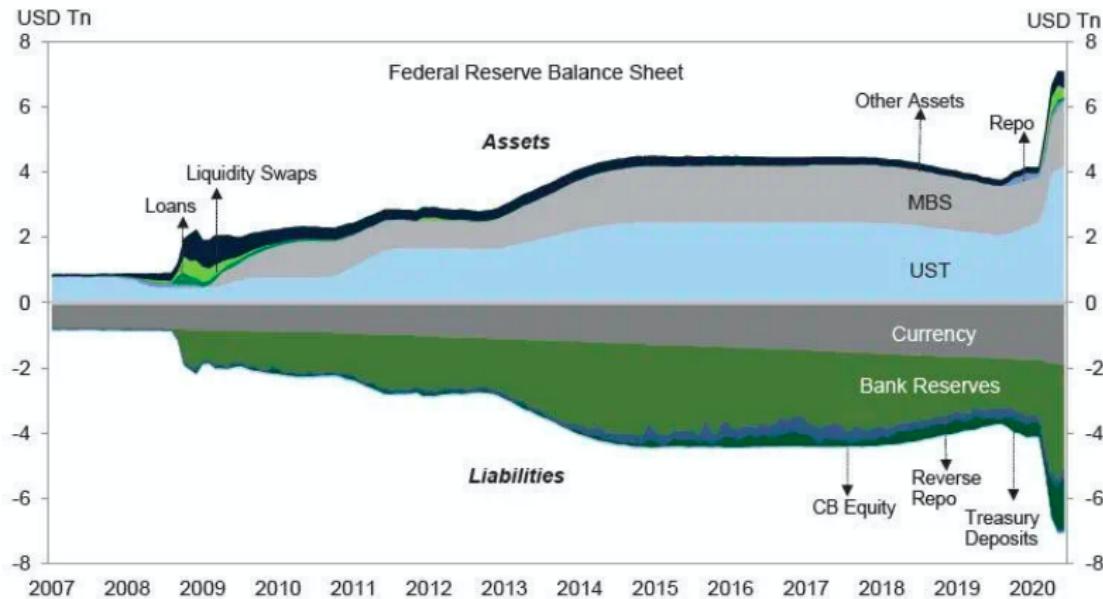
Function and Measurement

Federal Reserve: Monetary Policy and Functions ^(w)

Source: Mishkin (2015)

Function and Measurement

Federal Reserve: Balance Sheet 2007-2020

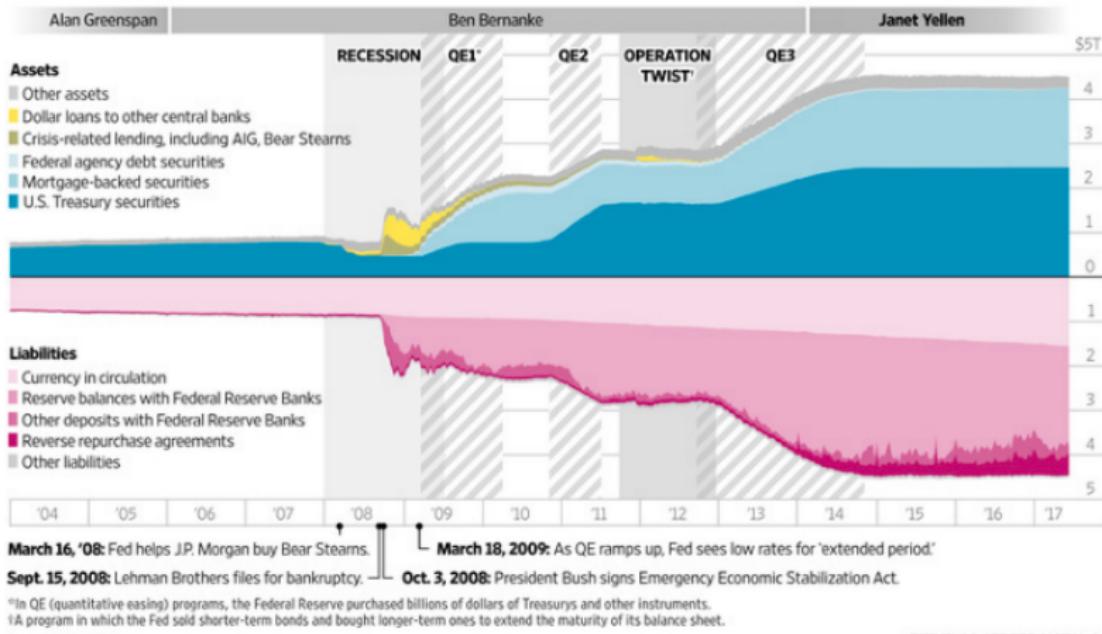


Source: Haver Analytics, Goldman Sachs Global Investment Research

Function and Measurement

Federal Reserve: Quantitative Easing (w)

The Fed purchased trillions of dollars of mortgage and Treasury securities to encourage businesses and consumers to borrow, spend and invest more after the 2008 financial crisis. It announced plans Wednesday to begin slowly paring down its holdings this year.

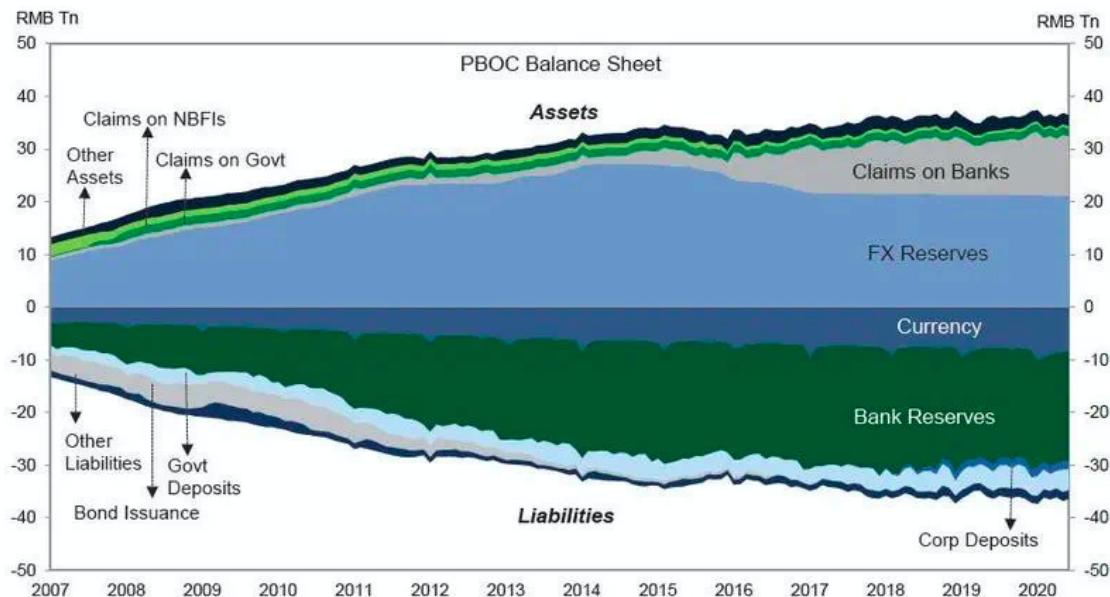


Source: Federal Reserve

THE WALL STREET JOURNAL.

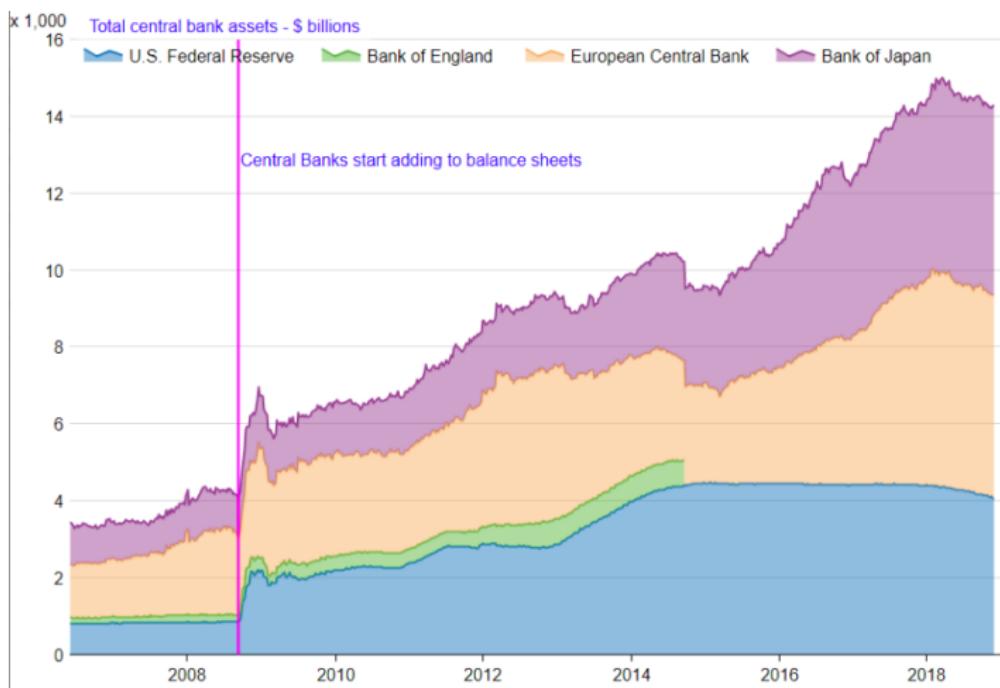
Function and Measurement

People's Bank of China: Balance Sheet 2007-2020



Source: Haver Analytics, Goldman Sachs Global Investment Research

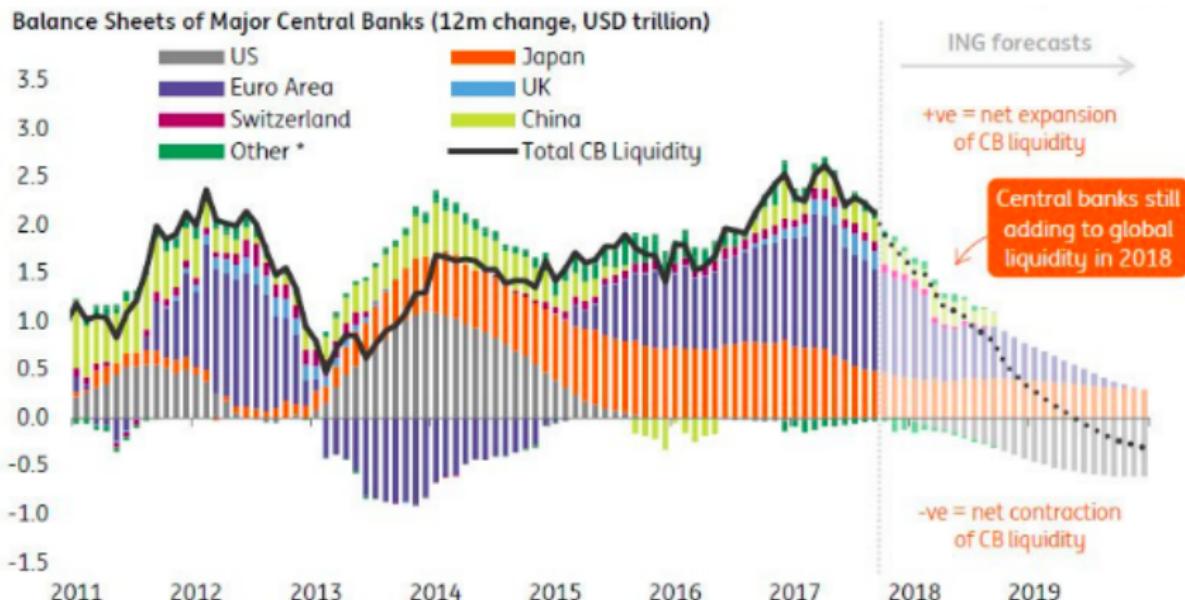
Function and Measurement

Global Central Banks: Balance Sheet Expansion ^(w)

<https://seekingalpha.com/article/4231177-2019-will-be-echo-of-2016-due-to-central-bank-policy>

Function and Measurement

Global Central Banks: Draining Liquidity? (w)



Note: Other includes Brazil, Russia, India and Sweden

Source: Macrobond, ING estimates

Function and Measurement

Global Reserve Currencies in 2019 (w)

Foreign exchange reserves are for international payments and to support a national currency.

- ① U.S. Dollar: \$6.74 trillion (61.82%)
- ② Euro: \$2.21 trillion (20.24%)
- ③ Japanese Yen: \$572 billion (5.25%)
- ④ Pound Sterling: \$495 billion (4.54%)
- ⑤ Chinese Renminbi: \$213 billion (1.95%)



Article & Sources:

<https://howmuch.net/articles/worlds-top-reserve-currencies-2019>
International Monetary Fund - <http://data.imf.org>

howMuch.net

Quantity Theory of Money

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Quantity Theory of Money

Quantity Theory of Money: Origin

- QTM is an economic theory relating changes in the price levels to changes in the quantity of money. In its developed form, it constitutes an analysis of the factors underlying inflation and deflation.
- As developed by the English philosopher John Locke in the 17th century, the Scottish philosopher David Hume in the 18th century, and others, it was a weapon against the mercantilists, who were thought to equate wealth with money.
- If the accumulation of money by a nation merely raised prices, argued the quantity theorists, then a "favourable" balance of trade, as desired by mercantilists, would increase the supply of money but not wealth.
- In the 19th century the quantity theory contributed to the ascendancy of free trade over protectionism. In the 19th and 20th centuries it played a part in the analysis of business cycles and in the theory of foreign exchange rates.

<https://www.britannica.com/topic/quantity-theory-of-money>

Quantity Theory of Money

Quantity Theory of Money: Intuition

- The quantity theory of money states that the quantity of money in circulation bears a direct, proportional relationship to the price of the output.
- Consider a simple example: an economy produce only one good and use one dollar to measure its value. Thus, the price of the good is one dollar.
- All else equal, what be the price of the good if a hundred dollar were used? What if two goods were produced?
- In principle, it is an exchange equation. The equation works well to explain the price of the goods and services. It also helps to understand the exchange rate between two currencies.
- Suppose an apple costs one dollar in the US but a hundred yen in Japan, then the exchange rate should be one dollar for a hundred yen.

Quantity Theory of Money

Transaction Equation: $MV=PY$

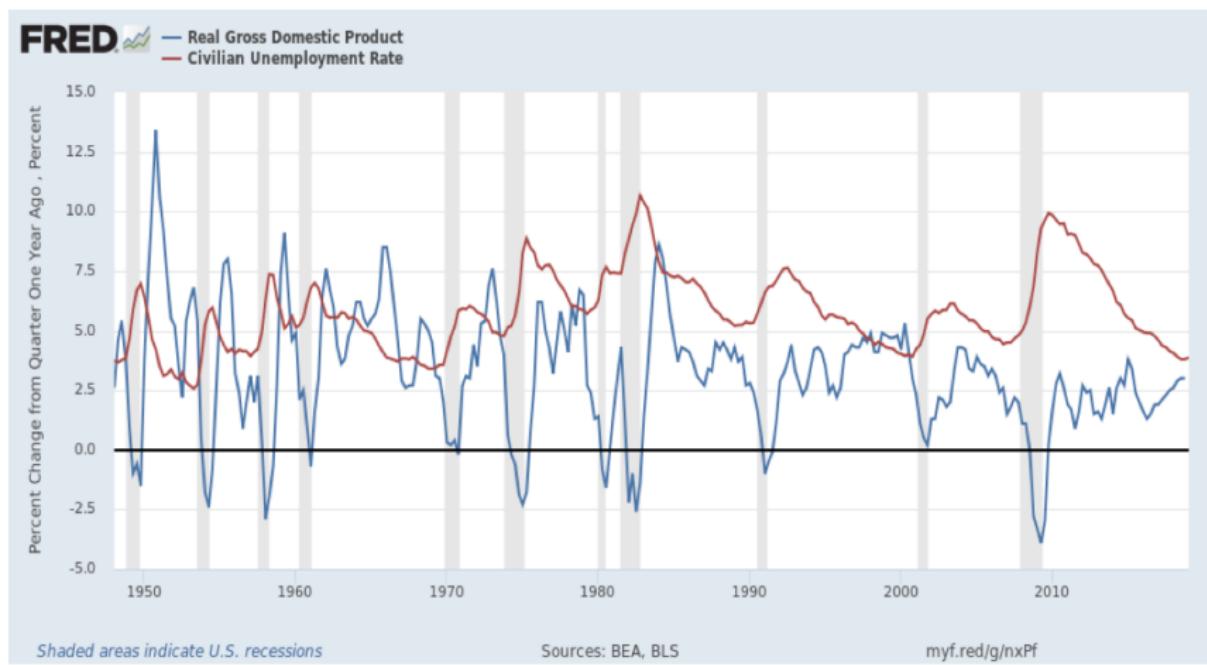
- Mathematically, the quantity theory of money can be shown in an equation $MV=PY$. In money market equilibrium, demand for money equals supply of money. Recall M_1 & M_2 .
- M money quantity: How many dollars in the economy are exchanged for goods and services? It is a stock variable.
- V transaction velocity: How many transactions occur in each period? Payment technology can affect transaction frequency.
- The aggregate price level (index) in the economy is P.
- The quantity of the goods exchanged in the economy is Y.
- Classical economists assume that M only affect P in the long run—neutrality of money. Money is a veil.

Aggregate Income PY

- In $MV=PY$, the total amount of goods, services, and assets available for exchange in the economy is Y .
- For illustrative purpose, focus on the flow variable first. How do economists measure the aggregate output for an economy? The national income account.
- **Gross Domestic Product (GDP)**: the total market value of all final goods and services produced within a country in a given period of time. Nominal GDP v.s. Real GDP.
- Nominal GDP is measured in current prices whereas real GDP isolates the price effect on market value and measures the real quantity of goods and services.
- **GDP per capita**: GDP divided by total population, which measures average income instead of total income.

Quantity Theory of Money

Aggregate Output Y: Growth and Fluctuation

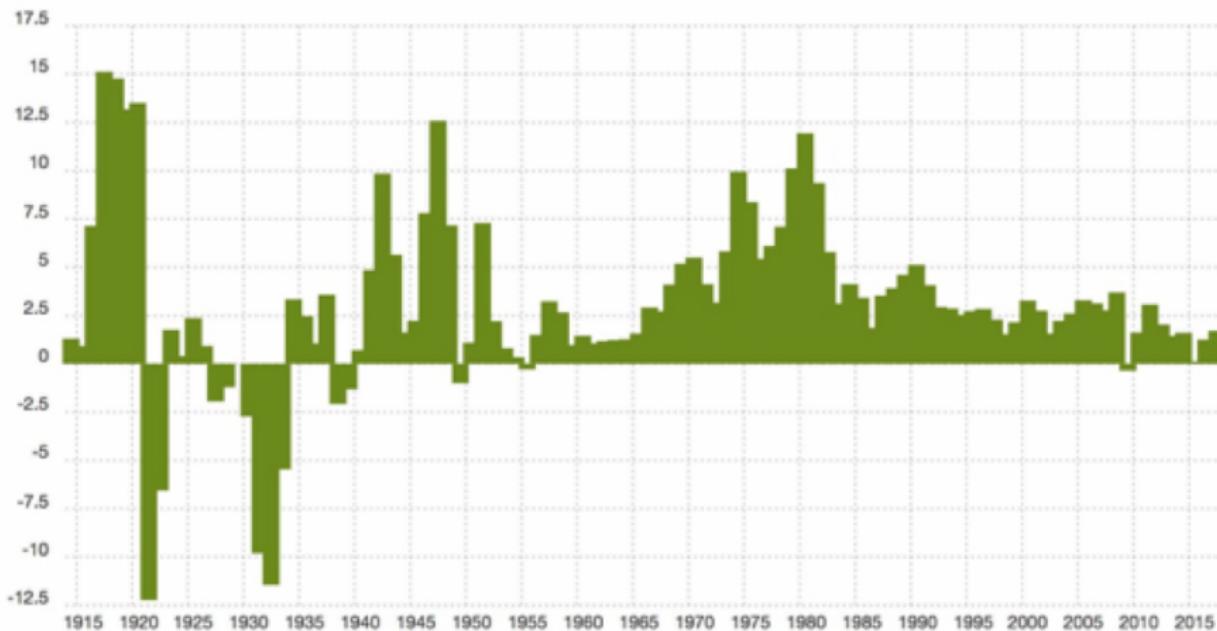


Aggregate Price Level P

- In $MV=PY$, the overall price level is P . How do economists measure P ? The technique is to construct a **price index**.
- Economists choose a fixed basket of goods and services representing the economy, measuring its market value over time with the base year indexed as 100.
- Popular measurements: Consumer Price Index (CPI) and core CPI (excluding food and energy), Personal Expenditure (PCE) and core PCE, and Producer Price Index (PPI).
- If an economy experiences increasing price level, goods and services are becoming more expensive, though the real quantity does not increase. The overall rise in the price level is called **inflation**. The percentage change of the price level is a measure of inflation.

Quantity Theory of Money

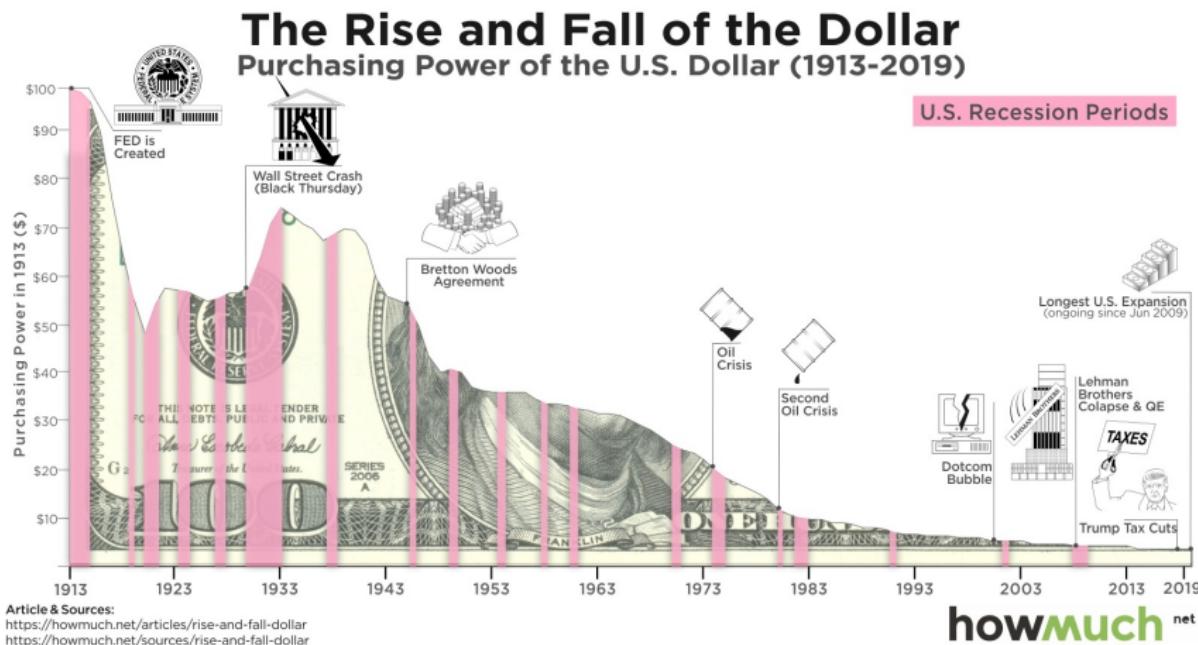
U.S. Inflation Rate since 1913



<https://www.in2013dollars.com/current-inflation-rate>

Quantity Theory of Money

U.S. Dollar Purchasing Power



Quantity Theory of Money

MV=PY: Aggregate Causes and Effects

In the quantity equation, holding some variables constant enables us, in turn, to explain the change in other variables.

- V, Y constant, M+ \Rightarrow P+; M- \Rightarrow P-.
- M, V constant, Y+ \Rightarrow P-; Y- \Rightarrow P+.
- M, Y constant, V+ \Rightarrow P+; V- \Rightarrow P-.
- AD-AS model can explain these effects intuitively.
- What are the causes of inflation in the long run?
- Money neutrality assumed, P is determined by changes in M, V and Y, but not vice versa. In reality, P can affect others.
- Deep question: what determine the change in M,V and Y?

Quantity Theory of Money

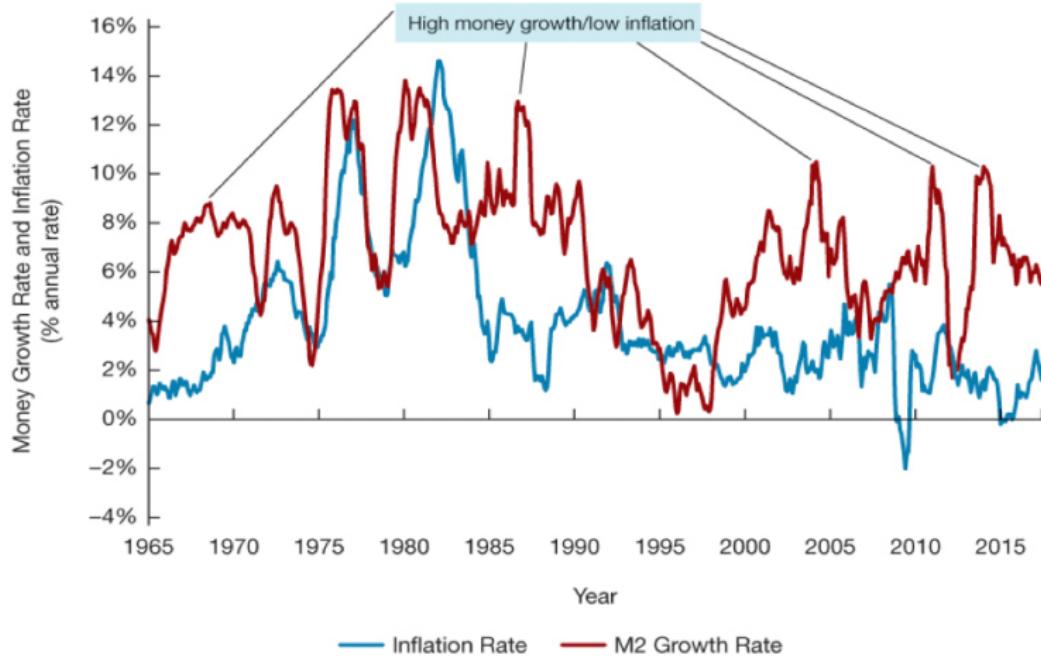
Application: Money and Inflation

"Inflation is always and everywhere a monetary phenomenon, in the sense that it cannot occur without a more rapid increase in the quantity of money than in output."

- Why is Milton Friedman right? Answer: $MV=PY$.
- A little mathematical trick is helpful for deriving the relation.
- Taking logs on both sides: $\ln(MV) = \ln(PY)$
- Which expands to $\ln M + \ln V = \ln P + \ln Y$
- Total differentiation: $\frac{dM}{M} + \frac{dV}{V} = \frac{dP}{P} + \frac{dY}{Y}$
- Assuming V is a constant, thus $dV = 0$.
- The growth rate of money can be decomposed into the growth rate of price level and growth rate of output.

Quantity Theory of Money

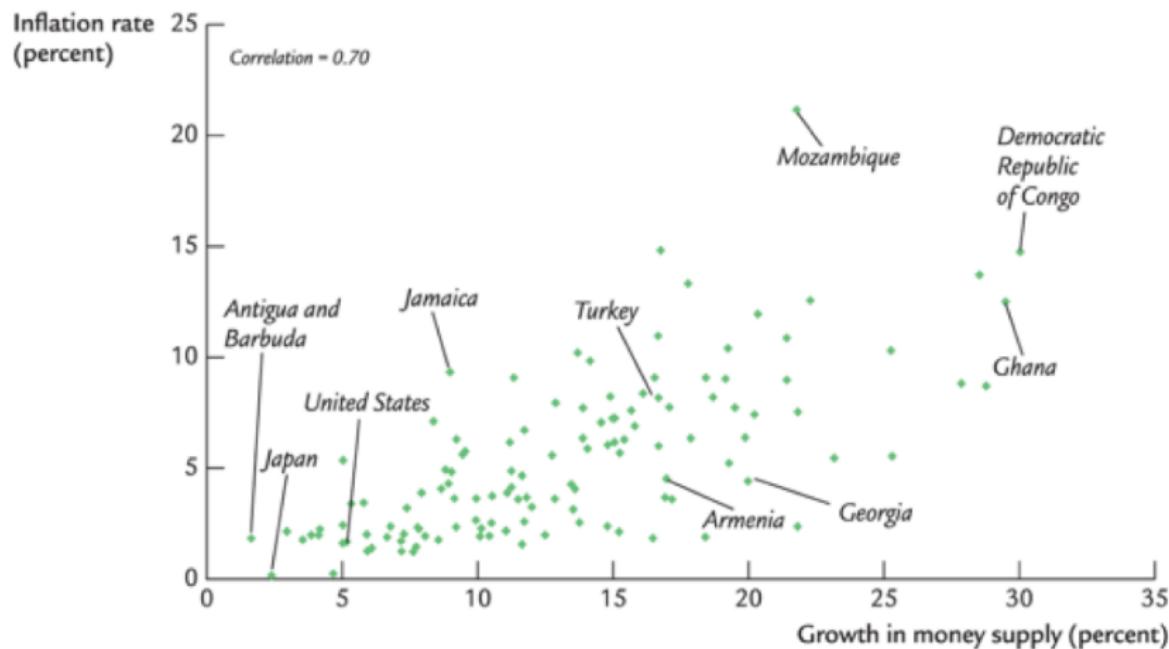
Money Growth and Inflation – U.S. Evidence



Source: Mankiw (2019) Macroeconomics.

Quantity Theory of Money

Money Growth and Inflation – International Evidence



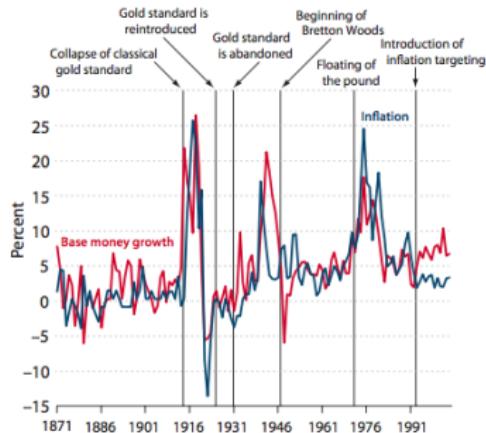
Source: Mankiw (2019) Macroeconomics.

Quantity Theory of Money

Money Growth and Inflation – U.K. Evidence

**Inflation and Money Growth in the United Kingdom:
Raw Data**

Composite Index Price* and M0 (annual rates of changes)

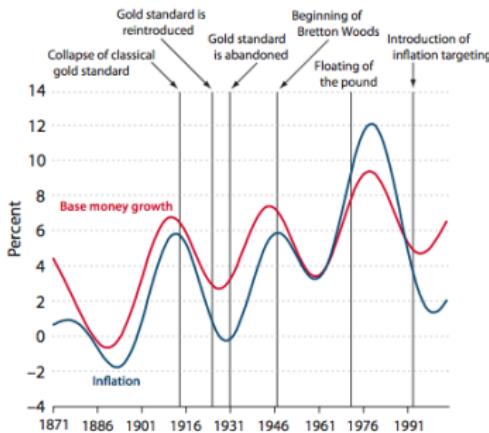


NOTE: *See O'Donoghue, Goulding, and Allen (2004).

SOURCE: Reproduced from Benati (2005, Chart 1a) with permission from the Bank of England.

**Inflation and Money Growth in the United Kingdom:
Components Beyond 30 Years**

Composite Index Price and M0 (annual changes)

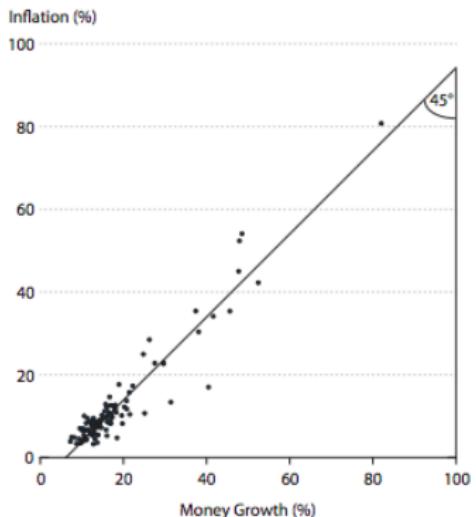


SOURCE: Reproduced from Benati (2005, Chart 2a) with permission from the Bank of England.

Source: Robert Lucas (2014)

Quantity Theory of Money

Money Growth and Inflation – International Evidence



NOTE: The figure shows average annual rates of growth in M2 and in consumer prices during 1960-90 in 110 countries.

SOURCE: Data source IMF. Reproduced with permission from McCandless and Weber (1995, Chart 1, p. 5).

Sample	Coefficient for each definition of money		
	M0	M1	M2
All 110 countries	0.925	0.958	0.950
<i>Subsamples</i>			
21 OECD countries	0.894	0.940	0.958
14 Latin American countries	0.973	0.992	0.993

NOTE: Based on data from 1960-90. Inflation is defined as changes in a measure of consumer prices.

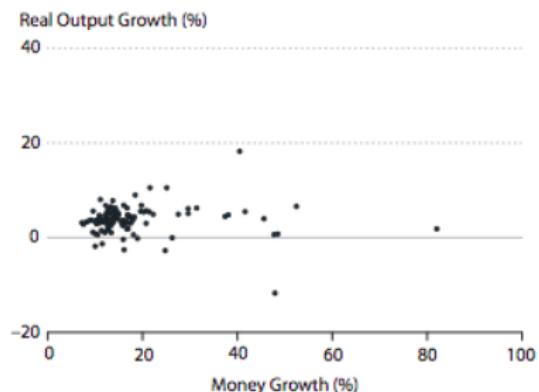
SOURCE: Data source IMF. Reproduced with permission from McCandless and Weber (1995, Table 1, p. 4).

Source: Robert Lucas (2014)

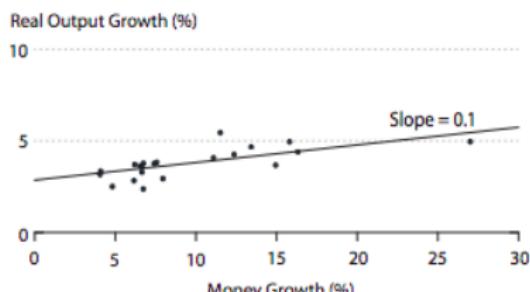
Quantity Theory of Money

Money and Output Growth – International Evidence

Money and Real Output Growth: No Correlation in the Full Sample...



...But a Positive Correlation in the OECD Subsample



NOTE: The figure shows average annual rates of growth in M2 and in nominal GDP, deflated by consumer prices during 1960-90 in 110 countries.

SOURCE: Data source IMF. Reproduced with permission from McCandless and Weber (1995, Chart 2, p. 7).

NOTE: The figure shows average annual rates of growth in M0 and in nominal GDP, deflated by consumer prices during 1960-90 in 21 countries.

SOURCE: Data source IMF. Reproduced with permission from McCandless and Weber (1995, Chart 3, p. 8).

Source: Robert Lucas (2014)

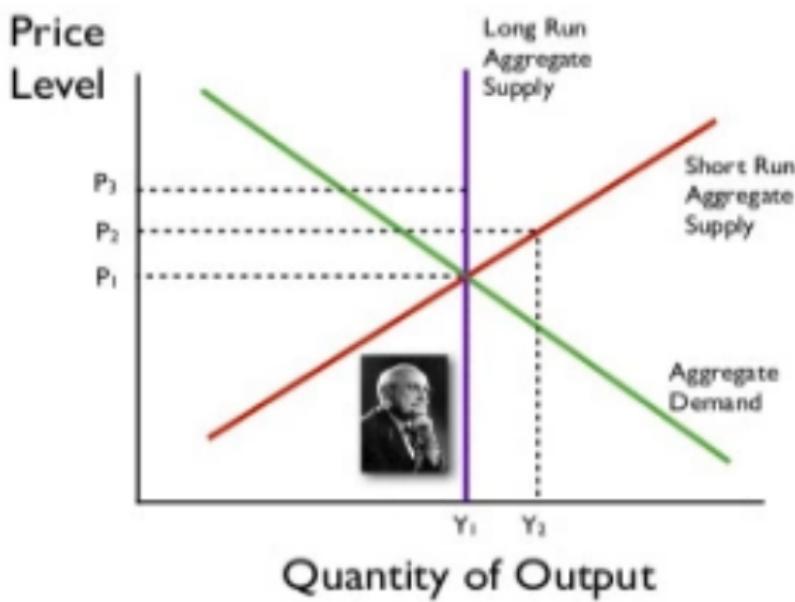
MV=PY: Extensions

- This powerful equation is the cornerstone of macroeconomics.
- For any good, its price is determined by market forces D v.s. S. At aggregate level, M, V, Y can unevenly affect each individual market and result in an aggregate equilibrium price level.
- Why can private institutions not issue money? How to determine the quantity of money in circulation? What is the difference between money and credit?
- How does money flow into the economy through the financial system? Does it flow like "water" or "honey"? How do we measure its liquidity? What determine its velocity and effects?
- All these questions are thought-provoking and pivotal subjects in money and banking.

Application: AD-AS Model

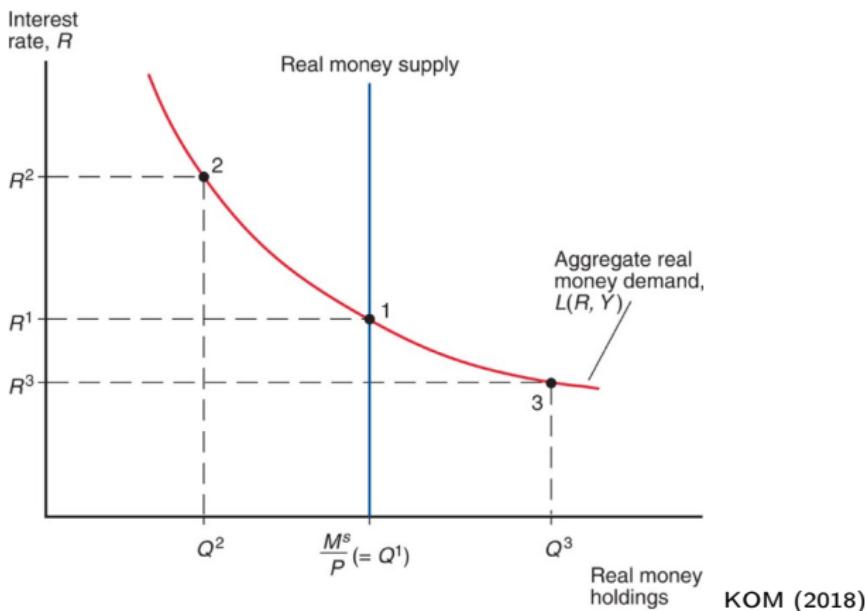
- According to the classical views of the economy, the long run level of output and employment is determined by its resource constraints, productivity and institutions.
- Whereas price and output fluctuations is caused by short run AD-AS shocks such as government policies, cyclical climate conditions, or various social and political events.
- Thus, we model the economy with a vertical long run aggregate supply curve (LRAS) and short run AD-AS curves.
- Monetary policy and fiscal policy can shift the AD but not LRAS curve. An expansionary monetary policy can increase output in the short run but the economy may end up with a higher price level in the long run.

Quantity Theory of Money

The AD-AS Model _(w)

<https://larspsyll.wordpress.com/category/economics/>

Keynesian Money Demand: Liquidity Preference

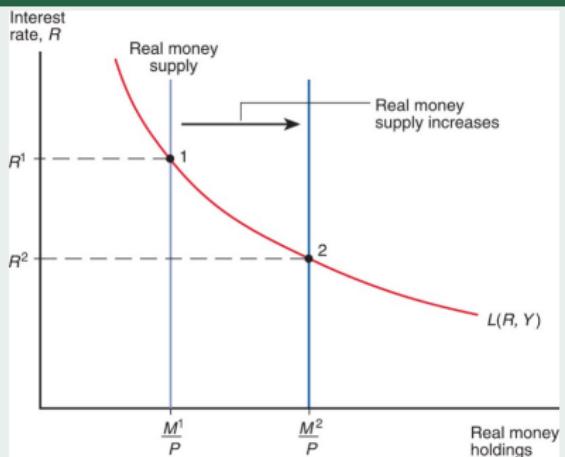


$$M_D/P = L(R, Y) = M_S/P$$

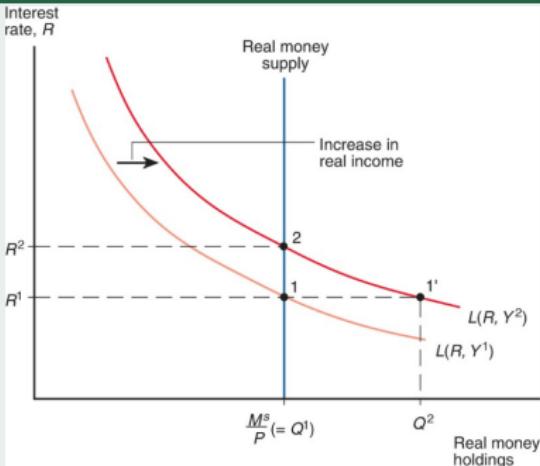
Quantity Theory of Money

Keynesian Model: Money Market Equilibrium

Increase in Money Supply

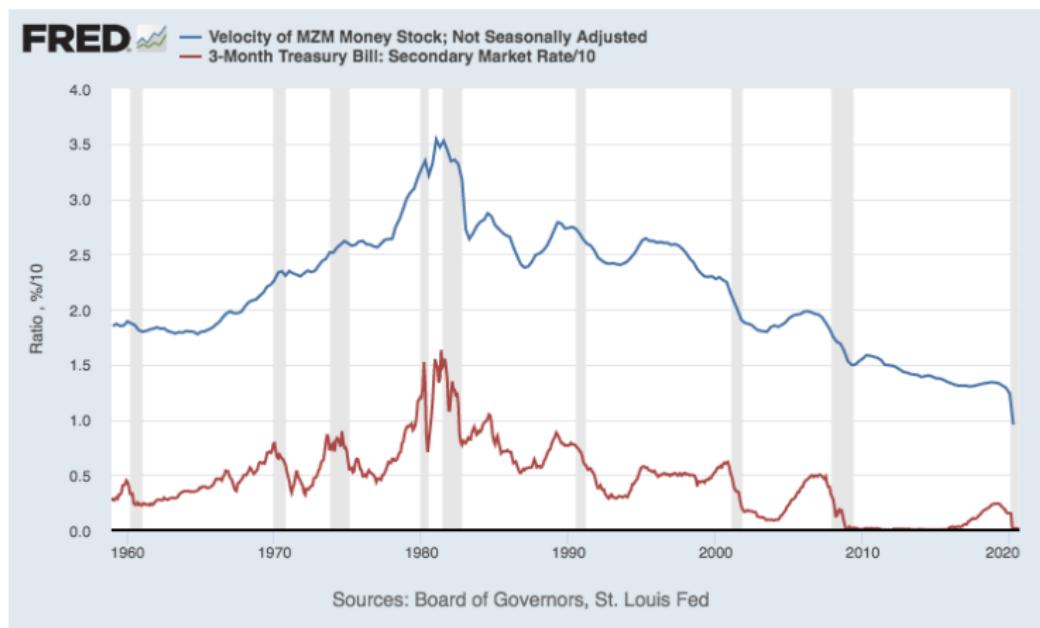


Rise in Real Income



Source: KOM (2018)

Quantity Theory of Money

Money Velocity and Interest Rate ^(w)

Income, Capital and Interest

Outline

1 Introduction

2 Price Theory

- The Law of Demand and Supply
- The Demand and Supply Model

3 Money Theory

- Function and Measurement
- Quantity Theory of Money

4 Interest Theory

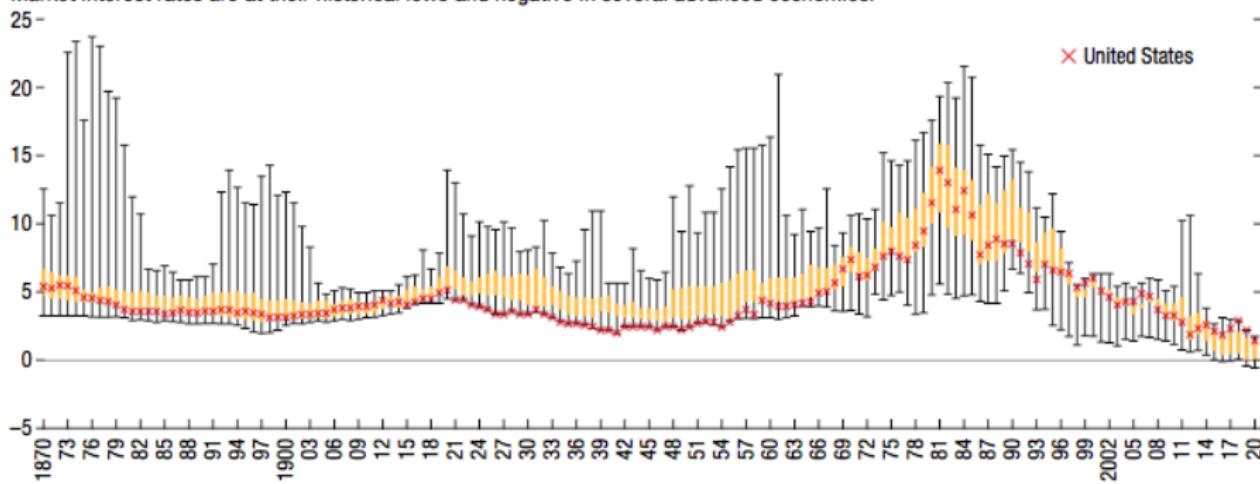
- Income, Capital and Interest
- Money and Financial Markets

5 References



Historical Long-Term Interest Rates 1870-2020

Market interest rates are at their historical lows and negative in several advanced economies.



Sources: Jordà-Schularick-Taylor Macrohistory database (Jordà and others 2019); and IMF staff calculations.

Note: The sample includes Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States. The figure shows the interquartile range (yellow bars) and the 10th and 90th percentiles (whiskers). Red markers signify the United States. Data for 2020 are through the end of March.

Note: 10-Year Government Bond Yields

Classification of Incomes

Irving Fisher, 1930, The Theory of Interest: as Determined by Impatience to Consume and Opportunity to Invest it. Macmillan, New York [\(w\)](#)

- Income is a series of event. It is real and varies over time.
- Enjoyment income consists of agreeable sensations and experiences.
- Money is of no use until it is spent. All money received and readily available and intended to be used for spending is money income. That all one spends on his living measures real income.
- The total cost of living, in the sense of money payments, is a negative item, being outgo rather than income; but it is our best practical measure of the positive items of real income for which those payments are made.
- Real income is a quantity measure of different goods. In modern macroeconomics, it can also be measured in terms of monetary values netting out the aggregate price fluctuations.

Relations among the Incomes

- Enjoyment income is a psychological matter, and hence cannot be measured directly.
- So we look to real income invested; but even real income is a heterogeneous jumble. It includes quarts of milk, visits to the moving picture house, etc., and in that form cannot be measured easily or as a whole.
- Here is where the cost of living comes in. It is the practical, homogeneous measure of income in place of enjoyment income, or real income.
- In all cases, income is the alpha and omega of life. Money measures and stores real income.

Consumption and Investment

- Money income practically never conforms exactly to real income because either savings raise money income above real income, or deficits push money income below real income.
- Spending (consumption) and investing (investment) differ only in degree, depending on the length of time elapsing between the expenditure and the enjoyment.
- To spend is to pay money for enjoyments which come very soon. To invest is to pay money for enjoyments which are deferred to a later time.
- Investment is the balancing of consumption over time.
- For most human beings and creatures, consumption is joyful while investment is painful.

Income, Capital and Wealth

- Capital generates income. Or, income is derived from capital.
- The value of any property, or rights to wealth, is its value as a source of income and is found by discounting that expected income. Or, the value of the capital is derived from the value of income.
- Wealth consists material objects owned by human beings (including, if you please, human beings themselves). Income is the potential consumption without trenching on wealth.
- The bridge or link between income and capital is the rate of interest, defined as the per cent of premium paid on money at one date in terms of money to be in hand one year later.
- Interest is the cost of borrowing and return to lending.

Example: Apple Farm's Income and Capital

Suppose a farmer plants 100 apple trees in his orchard this year. After one year of hardwork taking care of his orchard, he harvests 10,000 apples. He keeps 100 apples for his family and sells the rest. To expand his business, he then use the sales revenue to acquire more land and plant more apple trees.

- What is the farmer's annual income? real income?
- What amount goes to his consumption? and investment?
- What is the farmer's capital? and wealth?
- Challenging question: what is his capital worth? (capital value)

Example: Apple Farm's Price and Interest

The apple farmer agrees to exchange 100 apples with his neighbor for 150 oranges. What is the exchange rate? What is the price for an apple? the price for an orange? Why exchange would occur?

The apple farmer agrees to lend 100 apples to his neighbor for 6 months. In return, the neighbor is willing to pay back 110 apples, or 165 oranges.

- What is the difference here? Why exchange would occur?
- What is the annual interest in this exchange? interest rate?
- What determines the amount of interest? interest rate?

What Determine Interest and Interest Rate?

The nature of interest had been mysterious and contentious in history. According to Wikipedia, in many historical societies including ancient Christian, Jewish, and many modern Islamic societies, usury meant the charging of interest of any kind and was considered wrong, or was made illegal. Religious and legal practices aside, why does interest exist ever on earth? Consider the following questions:

- ① Which do you prefer, an apple today or the same apple next month?
- ② Which money do you prefer, \$100 today or \$100 one year after?
- ③ Are the answers fundamentally different across space over time?
- ④ Why does interest exist? What determine its size?

Sources: usury ([Wikipedia](#)) and charging interest ([Bible](#))

What Determine Interest Rate? Time Preference

- Impatience to consume (time preference): preference for immediate as opposed to future income.
- All else equal, the more impatience to consume today, the higher the interest rate. On the other hand, the more patient to delay consumption today, the lower the interest rate.
- What would happen to market interest rates if tomorrow is the end of the world?
- The manner in which a spendthrift will react to an income stream is very different from the manner in which the shrewd accumulator of capital will react to the same income stream.
- Subject to great variation and change: a) his foresight; b) his self-control; c) habit; d) the prospective length and certainty of his life; e) his love of offspring and regard for posterity; f) fashion.

Time Preference: Evidence

- Where, as in Scotland, there are educational tendencies which instill the habit of thrift from childhood, the interest rate tends to be low.
- Where, as in ancient Rome, at the time of its decline, there is a tendency toward reckless luxury, competition in ostentation, and a degeneration in the bonds of family life, there is a consequent absence of any desire to prolong income beyond one's own term of life, and interest rate tends to be high.
- Where, as in Russia, under the Czars, wealth tended to be concentrated and social stratification to be rigid, the rate of interest is likely to be unduly high.

What Determine Interest Rate? Opportunity to Invest

- The opportunity to invest: arrange, modify and adjust one's total income stream other than by merely lending or borrowing.
- Society as a whole cannot borrow or lend as an individual can. Yet it can and does vary and control the total income stream according to investment opportunity.
- If future income is added, the increment so added is a return on and at the cost of a decrement in less remote income.
- It may effect the present cost by exerting more present labor or by abstaining more from present consumption; and it may realize the future return over that cost either in the form of more future consumption or of less future toil.

Opportunity to Invest: Causes and Effects

- If the capital instruments of the community are of such a nature as to offer a wide range of choice, the rate of interest will tend to be steady; If the range of choice is narrow, the rate of interest will tend to be variable.
- If the range of choice is relatively rich in future income as compared with the more immediate income, the rate of interest will tend to be high; If the range of choice tends to favor immediate income as compared with more remote future income, the rate of interest will tend to be low.
- Range of choice:
 - a) a progressive increase or decrease in resources;
 - b) the discovery of new resources or means of developing old ones;
 - c) political conditions.

Opportunity to Invest: Evidence

- For the United States during the 19 century, its resources were of such a character as to favor future income, interest rates tend to be high. This is true, for a time at least, in every undeveloped country. The same is true of countries recovering from war.
- During the 1800-1850, the exploitation of Stephenson's invention of the locomotive, by presenting the possibility of a relatively large future income at the cost of comparatively little sacrifice in the present, tended to keep the rate of interest high. As the period of extensive railroad building is drawing to a close, this effect is becoming exhausted, and the tendency of the rate of interest, so far as this particular influence is concerned, is to fall.

Interest Theory: Summary

- ① Income is the alpha and omega of economic life.
- ② Investment is the balancing of consumption over time.
- ③ Capital generates income. Income is derived from capital.
- ④ The value of capital is derived from the value of income.
- ⑤ Interest is paid for immediate consumption at the cost of future consumption, the size of which is determined by consumption impatience and investment opportunity.
- ⑥ Interest rate is the cost of borrowing and return to lending.
- ⑦ Nominal interest rate equals real interest rate plus a risk premium.
- ⑧ The price, or the present value, of an asset is the discounted sum of all its expected future cash flows, adjusting for risks.
- ⑨ Market interest rates and asset prices are ex-ante risk signals.

Six Principles for Market Equilibrium

- **Two Impatience Principles:** i) the character of the various individuals concerned and on each individual's prospective income, its size, time-shape and risk; ii) marginal harmonization with the market rate of interest.
- **Two Opportunity Principles:** i) opportunities to change the character of his prospective income stream; ii) at the margin of choice, any additions to an individual's future income at the cost of more immediate income constitutes a return over that cost, crystallized into the market rate of interest.
- **Two Market Clearing Principles:** i) the market must be cleared and cleared with respect to every interval of time; ii) all debts must be paid.

Characterize the Equilibrium

- Demand and supply strike a balance between immediate income and remote income in the economy.
- Demand side: More impatient to consume immediate income \Rightarrow demand curve shifts to the right; more opportunity to invest today in return for higher future income \Rightarrow demand shifts to the right.
- Supply side: More impatient to consume today \Rightarrow less savings available \Rightarrow supply shifts to the left; more opportunity to invest today \Rightarrow supply shifts to the left. Both can drive up interest rates.
- Market equilibrium as the intersection of two income curves and as a dynamic process.

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Monetary World v.s. Real World

- Money is a standardized medium of exchange and a metric of exchange value. Interest is most commonly expressed in monetary units.
- Fisher's theory of interest applies more generally even to a world without money. In a world where there is no money, interest still exists because of time preference and investment opportunity.
- Interest rate, in real terms, measures the percentage rate an individual would like to pay to obtain immediate income at the cost of future income. Or, the willingness to invest considering opportunities available.
- Introducing money into our society, all goods and services (or real income) are measured in terms of currency unit.
- Therefore, as a standardized metric of exchange value, the money itself becomes vital for the inter-temporal exchange of income or trade.

Nominal v.s. Real Variables

In economics, nominal value is expressed in monetary terms (in units of a currency). By contrast, real value adjusts nominal value to remove the effects of price level change in the economy. More fundamentally, a real variable is measured in terms of the quantity of goods and services. The five most pivotal real variables in macroeconomics and finance are:

- ① Real income (NI/P): goods and services produced in a period.
- ② Real wage (W/P): the amount of goods and services that the monetary or nominal wage can afford.
- ③ Real money balance (M/P): the purchasing power of money in terms of the amount of goods and services.
- ④ Real exchange rate ($RE = E * P_F/P_H$): the amount of domestic goods and services that a foreign currency can purchase.
- ⑤ Real interest rate ($r = i - \pi$): the rate of return for goods and services, which equals nominal interest rate minus inflation rate.

Real Return vs Nominal Return

A farmer has two investment opportunities. Invest in 100 apples and harvest 5 apples per year. Or, invest in 100 bananas and harvest 10 bananas per year.

- Which are the rates of returns on apples and bananas, respectively?
- Which asset should the farmer invest in? Should the farmer always invest more in the asset with a higher rate of return?

Suppose, a year after, the apple price is \$1 each and banana price is \$0.4 each.

- What is the monetary return on apples? On bananas?
- Which asset should the farmer invest in? Should the farmer always invest more in the asset with a higher monetary rate of return?

What is the difference between real RoR and nominal RoR? Which matters?

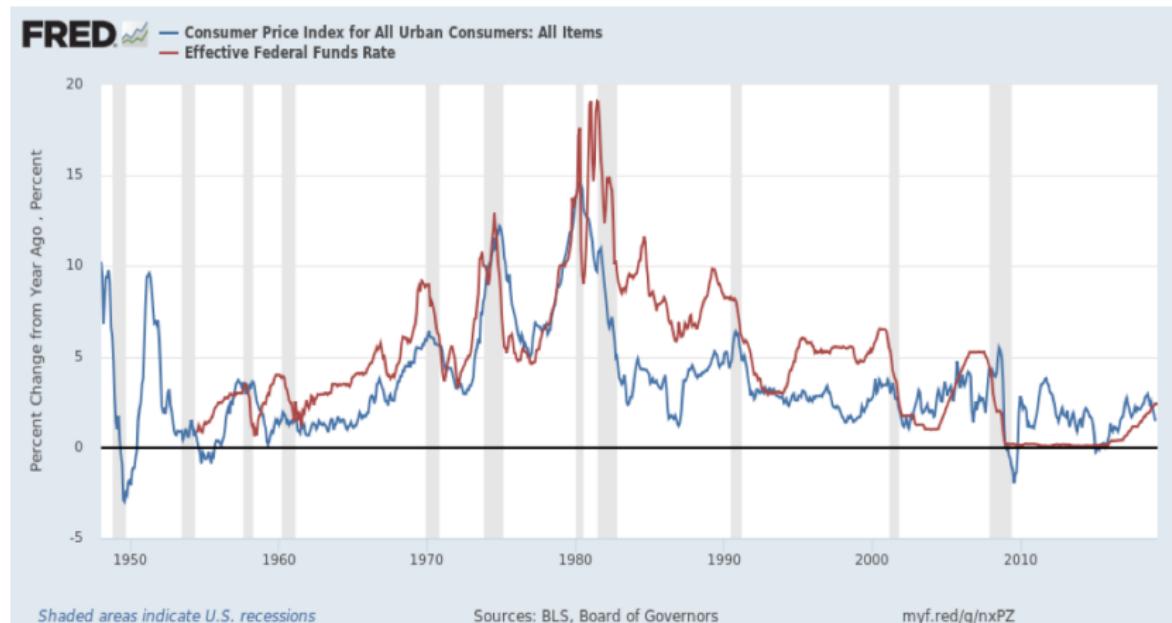
Nominal and Real Interest Rates

- To recap, nominal and real variables differ because of money.
- The real interest rate is the rate of interest an investor expects to receive after allowing for the change in monetary value. It equals nominal rate minus expected future inflation rate.
- In other words, since inflation impairs the value of money, the nominal interest rate the bank offered should compensate for future inflation that prevails in the contracting period.
- **The Fisher equation:** $i \approx r + \pi^e$, why approximately?
- Notice there is no risk assumed in Fisher's economy and expected inflation rate π^e is an ex-ante estimate.

Fisher Equation: Derivation and Application

- Assuming no transaction cost, deposit 1 dollar in a bank for one year shall earn enough interest to maintain market real return and offset the adverse impact of future inflation.
- Equilibrium (no arbitrage) condition:** $(1+i) = (1+r)(1+\pi^e)$.
- Fisher equation: $i = r + \pi^e + r\pi^e \approx r + \pi^e$ if $r, \pi^e \approx 0.00$.
- Application: Calculating inflation from GDP deflator.
 - N_t : Nominal GDP in year t, so is N_{t-1} defined
 - R_t : Real GDP in year t, so is R_{t-1} defined
 - $D_t = N_t/R_t$: GDP deflator in year t
 - Real GDP growth equation: $R_t = R_{t-1}(1+g)$
 - Nominal GDP growth rate: $N_t = N_{t-1}(1+g)(1+\pi)$
 - Solve for $\pi = \frac{N_t/R_t}{N_{t-1}/R_{t-1}} - 1 = \frac{D_t}{D_{t-1}} - 1 = \frac{D_t - D_{t-1}}{D_{t-1}}$

Fisher Equation: U.S. Interest Rate and Inflation Rate



Principles of Pricing Financial Assets

The fundamental principle of finance is that the true or correct price of an asset equals the present value of all cash flows that the owner of the asset expects to receive during its life.

$$PV = \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \dots + \frac{CF_T}{(1+i)^T} = \sum_{t=1}^T \frac{CF_t}{(1+i)^t}$$

- PV is present value or the market price of the financial asset.
- CF_t is the expected cash flow in year t ($t = 1, 2, \dots, T$)
- T is the maturity of the financial asset
- i is the appropriate interest rate for discounting

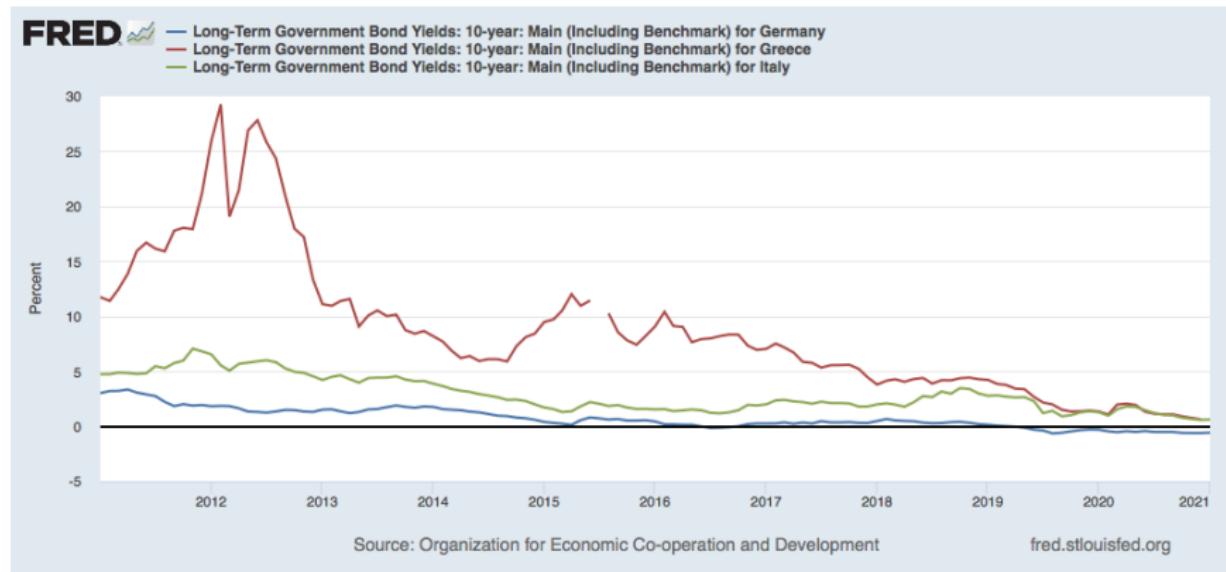
The Appropriate Discount Rate (Implied by the PV)

The appropriate discount rate ADR is the rate of return that the market or the consensus of investors requires on the asset.

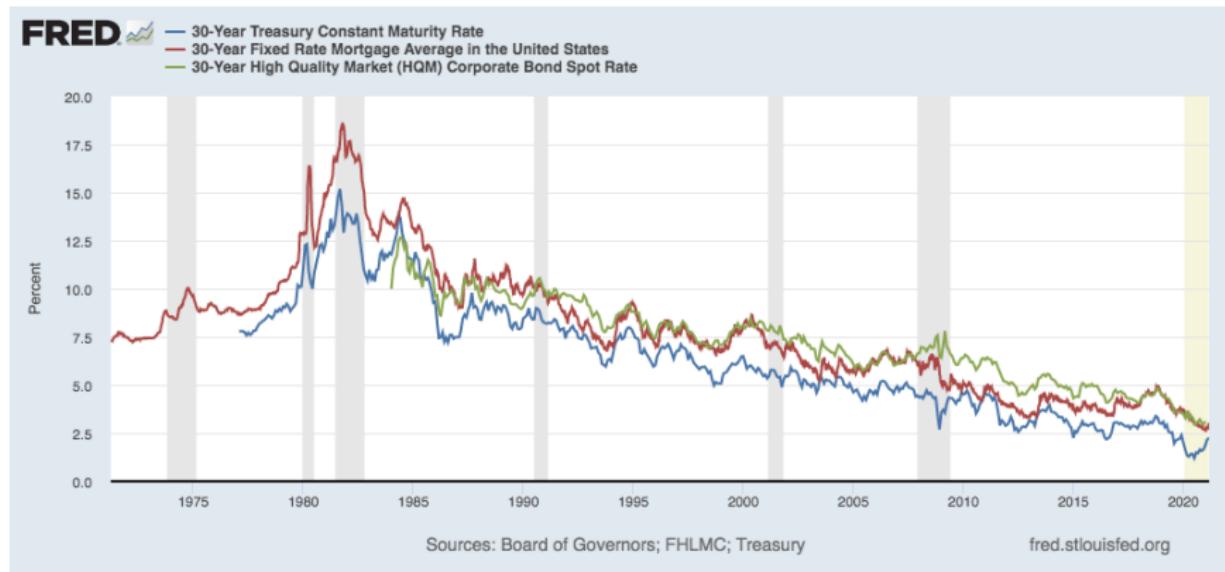
$$ADR = RR + IP + DP + MP + LP + CP$$

- RR the real rate of return
- IP the inflation premium
- DP the default premium
- MP the maturity premium
- LP the liquidity premium
- CP the currency premium

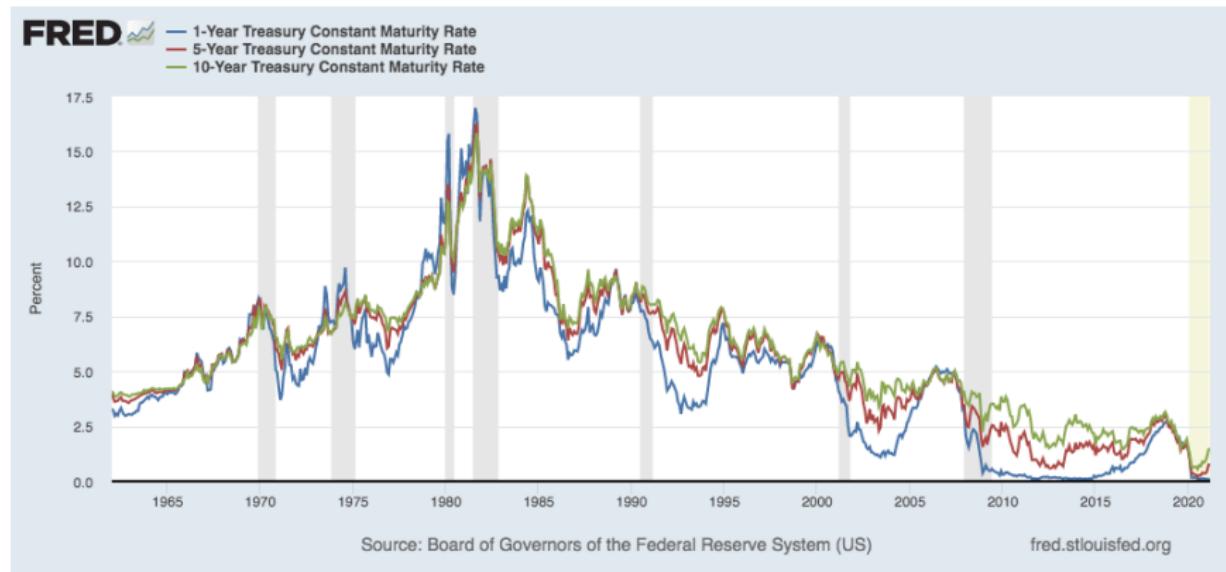
Interest Rate Sovereignty Debt Risks



U.S. Interest Rate Credit Structure Risks



U.S. Interest Rate Term Structure Risks



U.S. Interest Rate Statistics H.15 (w)

- The Board of Federal Reserve System publishes the H.15 statistics on daily interest rates for selected U.S. Treasury and private money market and capital market instruments.
- **Money Market** Rates (less than 1 year): Federal Funds, Commercial Paper, Certificates of Deposit, Eurodollar Deposits, Bank Prime Loans, U.S. Government Treasury Bills
- **Capital Market** Rates (equal or over 1 year): Interest Rate Swaps, U.S. Government Treasury Notes and Bonds, Corporate Bonds, Municipal Bonds, Residential Mortgage Loans.
- The H.15 statistics contains pivotal information on **the risk and term structure of interest rates** in the U.S. economy.

U.S. Interest Rate Risk Structure: H.15 Statistics (w)

Instruments	2021 Feb 25	2021 Feb 26	2021 Mar 1	2021 Mar 2	2021 Mar 3
Federal funds (effective) 1 2 3	0.07	0.07	0.07	0.07	0.07
Commercial Paper 3 4 5 6					
Nonfinancial					
1-month	0.06	0.06	0.06	0.06	0.06
2-month	0.07	0.07	0.06	0.06	0.06
3-month	0.08	0.08	0.07	0.06	0.07
Financial					
1-month	n.a.	0.09	0.07	0.08	n.a.
2-month	n.a.	n.a.	n.a.	n.a.	n.a.
3-month	0.12	0.15	0.10	0.11	0.17
Bank prime loan 2 3 7	3.25	3.25	3.25	3.25	3.25
Discount window primary credit 2 8	0.25	0.25	0.25	0.25	0.25
U.S. government securities					
Treasury bills (secondary market) 3 4					
4-week	0.04	0.04	0.03	0.04	0.04
3-month	0.04	0.04	0.05	0.04	0.05
6-month	0.06	0.05	0.07	0.06	0.07
1-year	0.09	0.08	0.08	0.08	0.08

<https://www.federalreserve.gov/releases/h15/>

U.S. Interest Rate Term Structure: H.15 Statistics (w)

Instruments	2021 Feb 25	2021 Feb 26	2021 Mar 1	2021 Mar 2	2021 Mar 3
Treasury constant maturities					
Nominal 9					
1-month	0.04	0.04	0.03	0.04	0.04
3-month	0.04	0.04	0.05	0.04	0.05
6-month	0.06	0.05	0.07	0.06	0.07
1-year	0.09	0.08	0.08	0.08	0.08
2-year	0.17	0.14	0.13	0.13	0.14
3-year	0.34	0.30	0.27	0.26	0.29
5-year	0.81	0.75	0.71	0.67	0.73
7-year	1.23	1.15	1.12	1.08	1.14
10-year	1.54	1.44	1.45	1.42	1.47
20-year	2.25	2.08	2.11	2.09	2.12
30-year	2.33	2.17	2.23	2.21	2.25
Inflation indexed 10					
5-year	-1.53	-1.64	-1.69	-1.76	-1.72
7-year	-1.06	-1.16	-1.19	-1.26	-1.21
10-year	-0.60	-0.71	-0.71	-0.78	-0.74
20-year	-0.03	-0.18	-0.14	-0.18	-0.17
30-year	0.22	0.06	0.12	0.08	0.10
Inflation-indexed long-term average 11	0.05	-0.09	-0.03	-0.07	-0.05

<https://www.federalreserve.gov/releases/h15/>

Financial Markets: Classification

Financial market is an institution where financial assets are exchanged.

① By Nature

- Debt market
- Equity market

② By Maturity

- Money market
- Capital market

③ By Seasoning

- Primary market
- Secondary market

① By Delivery

- Cash (spot) market
- Derivatives market

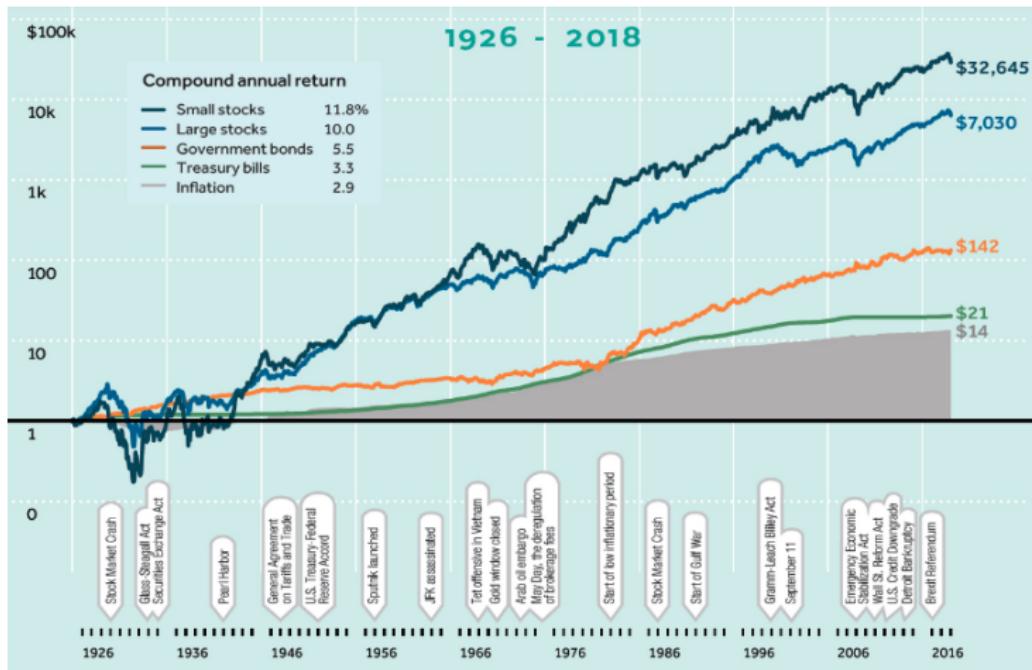
② By Organization

- Auction market
- Over-the-counter market

③ By Trading System

- Order-driven market
- Quota-driven market

U.S. Long-Term Asset Returns (w)



<https://graycelladvisors.com/smallcap/>

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