

Lecture 3:

The Behavior of Interest Rates

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- Introduction
- Determinants of asset demand
- The bond demand, supply and equilibrium
- Shifts in the demand of bonds
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- Changes in the interest rate due to expected inflation: The Fisher effect
- Changes in the interest rate due to a business cycle expansion
- The liquidity preference framework
- Changes in equilibrium interest rates in the liquidity preference framework
- Money supply and interest rates

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Readings



- Mishkin (2015), *The Economics of Money, Banking, and Financial Markets*, 11th edition, Pearson, Chapter 5.
- Cecchetti and Schoenholtz (2014), *Money, Banking, and Financial Markets*, 4th edition, McGraw-Hill, Chapters 4 + 6.

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Interest rates - Local currency government bond rates – August 2015



TRADING ECONOMICS		CALENDAR	COUNTRIES	INDICATORS	MARKETS	FORECAST	Search	
Major		Actual	Change	Daily	Weekly	Monthly	Yearly	Date
United States	USGG10YR	2.20	0.01	0.49 %	0.04	-0.19	-0.21	22:05:30
China	GCNY10YR	3.52	0.00	-0.06 %	-0.01	-0.01	-0.73	Aug/17
Japan	GJGB10	0.38	0.00	-0.27 %	0.02	-0.05	-0.14	Aug/19
Germany	GDBR10	0.65	0.00	0.47 %	0.04	-0.12	-0.36	Aug/19
United Kingdom	GUUK10	1.86	-0.02	-0.96 %	0.06	-0.20	-0.64	Aug/19
France	GFRN10	0.98	0.03	3.60 %	0.05	-0.06	-0.41	Aug/19
Brazil	GBU10Y	13.65	0.01	0.10 %	0.16	1.19	2.01	Aug/18
Italy	GBTPGR10	1.82	0.00	0.11 %	-0.01	-0.09	-0.97	Aug/19
India	GIND10YR	7.73	-0.02	-0.25 %	-0.05	-0.09	-0.78	22:05:30
Russia	RUGE10Y	11.16	0.01	0.09 %	0.06	0.71	1.92	Aug/17
Canada	GCAN10YR	1.39	-0.01	-0.43 %	-0.01	-0.19	-0.68	Aug/19
Australia	GACGB10	2.74	0.00	0.00 %	0.08	-0.17	-0.67	22:05:30
Spain	GSPG10YR	2.00	0.00	0.15 %	0.03	0.06	-0.42	Aug/19
Mexico	GMXN10YR	6.05	0.04	0.72 %	0.02	0.05	0.38	Aug/18
Netherlands	GNTH10YR	0.84	0.00	0.48 %	0.06	-0.08	-0.49	Aug/19
Switzerland	GSWISS10	-0.18	-0.01	4.62 %	0.00	-0.23	-0.64	Aug/19
South Africa	GSAB10YR	8.22	0.05	0.61 %	0.05	0.16	0.14	Aug/17
Greece	GGBB10YR	9.31	-0.03	-0.27 %	-1.02	-1.93	3.36	22:05:30

<http://www.tradingeconomics.com/bonds>

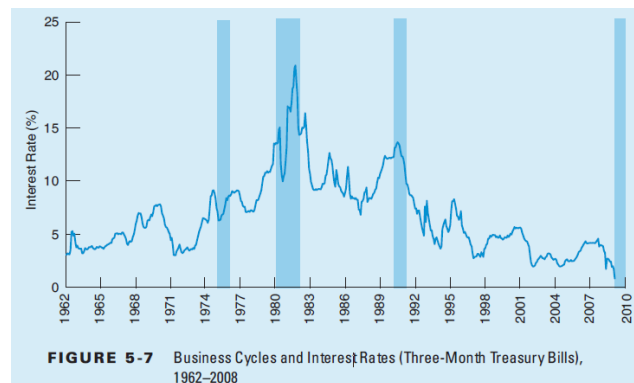
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Introduction



What is the explanation for the interest rate fluctuations in the figure?

In this lecture, we will look at the behaviour of interest rates



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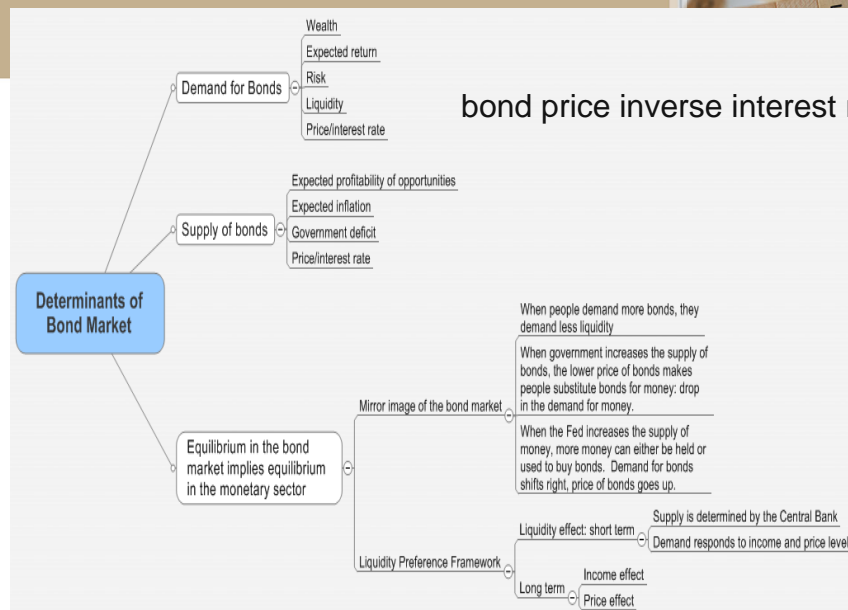
Introduction



- Interest rates are negatively related to the price of bonds, so if we can explain why bond prices change, we can also explain why interest rates fluctuate.
- We can make use of supply and demand analysis for bonds and money to examine how interest rates change.
- Because interest rates on different securities tend to move together, in this lecture we will act as if there is only one type of security and one interest rate in the entire economy.
- In the following lecture, we expand our analysis to look at why interest rates on different types of securities differ.

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bond price inverse interest rate



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Determinants of Asset Demand



- **Wealth:** the total resources owned by the individual, including all assets
- **Expected Return:** the return expected over the next period on one asset relative to alternative assets
- **Risk:** the degree of uncertainty associated with the return on one asset relative to alternative assets
- **Liquidity:** the ease and speed with which an asset can be turned into cash relative to alternative assets

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Theory of Portfolio Choice



Holding all other factors constant:

1. The quantity demanded of an asset is positively related to wealth
2. The quantity demanded of an asset is positively related to its expected return relative to alternative assets
3. The quantity demanded of an asset is negatively related to the risk of its returns relative to alternative assets
4. The quantity demanded of an asset is positively related to its liquidity relative to alternative assets

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Summary Table 1 Response of the Quantity of an Asset Demanded to Changes in Wealth, Expected Returns, Risk, and Liquidity



Response of the Quantity of an Asset Demanded to Changes in Wealth, Expected Returns, Risk, and Liquidity

Variable	Change in Variable	Change in Quantity Demanded
Wealth	↑	↑
Expected return relative to other assets	↑	↑
Risk relative to other assets	↑	↓
Liquidity relative to other assets	↑	↑

Note: Only increases in the variables are shown. The effect of decreases in the variables on the change in quantity demanded would be the opposite of those indicated in the rightmost column.

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Supply and Demand in the Bond Market



- At lower prices (higher interest rates), ceteris paribus, the quantity demanded of bonds is higher: an inverse relationship
- At lower prices (higher interest rates), ceteris paribus, the quantity supplied of bonds is lower: a positive relationship

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Demand for Bonds



- In boom times wealth (and income) rise. Demand for bonds will rise, too. During recessions demand for bonds will fall.
- If interest rates in the future are expected to fall, long-term bonds will have capital gains and increased returns, raising the demand for bonds.
- If the prices of bonds become more volatile, the demand for bonds will fall.
- If bonds became more liquid relative to other assets, the demand for bonds will increase.

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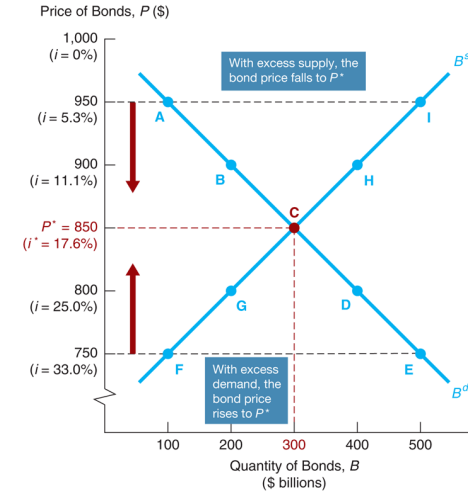
Supply of Bonds



- Increased confidence of producers means higher expected profits: they tend to borrow more.
 - Increase supply of bonds = Increase demand for loanable funds
- A rise in the expected inflation, given nominal interest rates, would lower the cost of borrowing (real interest rate).
 - Increase supply of bonds = Increase demand for loanable funds
- Higher government deficits are financed by government borrowing.
 - Increase supply of bonds = Increase demand for loanable funds

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Figure 1 Supply and Demand for Bonds



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Market Equilibrium



- Occurs when the amount that people are willing to buy (demand) equals the amount that people are willing to sell (supply) at a given price
- $B^d = B^s$ defines the equilibrium (or market clearing) price and interest rate.
- When $B^d > B^s$, there is excess demand, price will rise and interest rate will fall
- When $B^d < B^s$, there is excess supply, price will fall and interest rate will rise

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Changes in Equilibrium Interest Rates

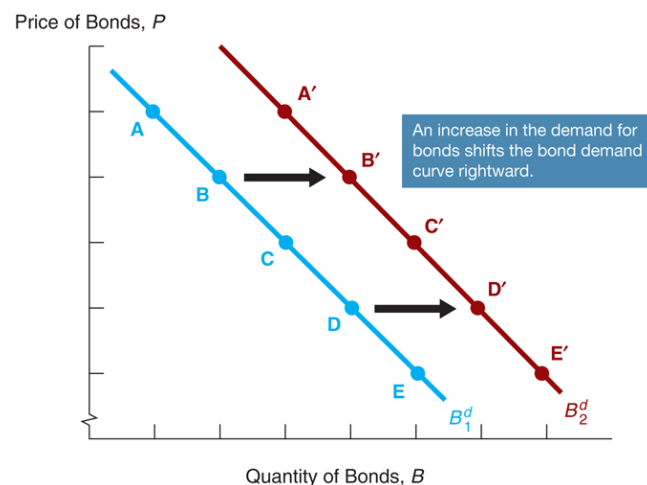


Shifts in the demand for bonds:

- Wealth: in an expansion with growing wealth, the demand curve for bonds shifts to the right
- Expected Returns: higher expected interest rates in the future lower the expected return for long-term bonds, shifting the demand curve to the left
- Expected Inflation: an increase in the expected rate of inflation lowers the expected return for bonds, causing the demand curve to shift to the left
- Risk: an increase in the riskiness of bonds causes the demand curve to shift to the left
- Liquidity: increased liquidity of bonds results in the demand curve shifting right

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Figure 2 Shift in the Demand Curve for Bonds



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Summary Table 2 Factors That Shift the Demand Curve for Bonds

Factors That Shift the Demand Curve for Bonds			
Variable	Change in Variable	Change in Quantity Demanded at Each Bond Price	Shift in Demand Curve
Wealth	↑	↑	
Expected interest rate	↑	↓	
Expected inflation	↑	↓	
Riskiness of bonds relative to other assets	↑	↓	
Liquidity of bonds relative to other assets	↑	↑	

Note: Only increases in the variables are shown. The effect of decreases in the variables on the change in demand would be the opposite of those indicated in the remaining columns.

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Shifts in the Supply of Bonds

- Expected profitability of investment opportunities: in an expansion, the supply curve shifts to the right
- Expected inflation: an increase in expected inflation shifts the supply curve for bonds to the right
- Government budget: increased budget deficits shift the supply curve to the right

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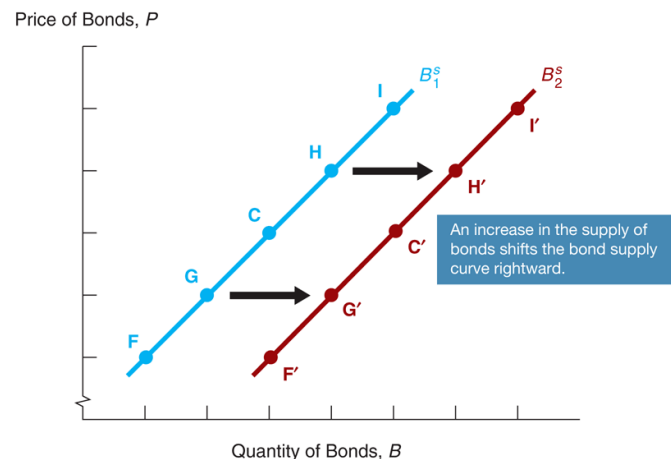
Summary Table 3 Factors That Shift the Supply of Bonds

Factors That Shift the Supply of Bonds			
Variable	Change in Variable	Change in Quantity Supplied at Each Bond Price	Shift in Supply Curve
Profitability of investments	↑	↑	
Expected inflation	↑	↑	
Government deficit	↑	↑	

Note: Only increases in the variables are shown. The effect of decreases in the variables on the change in supply would be the opposite of those indicated in the remaining columns.

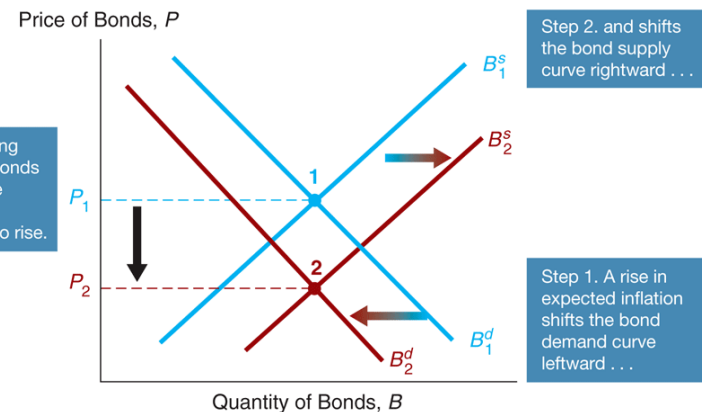
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Figure 3 Shift in the Supply Curve for Bonds



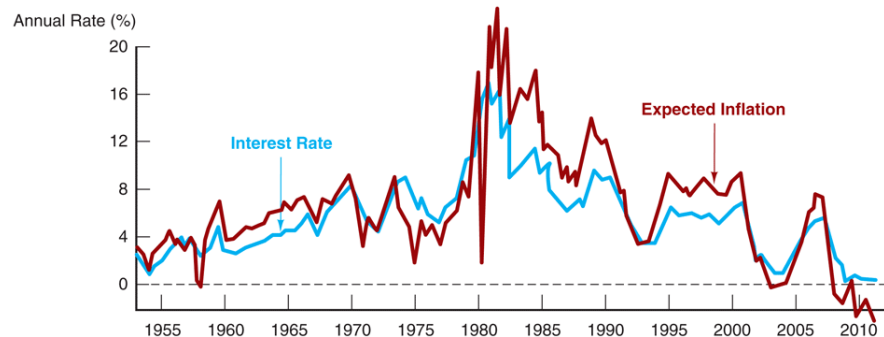
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Figure 4 Response to a Change in Expected Inflation



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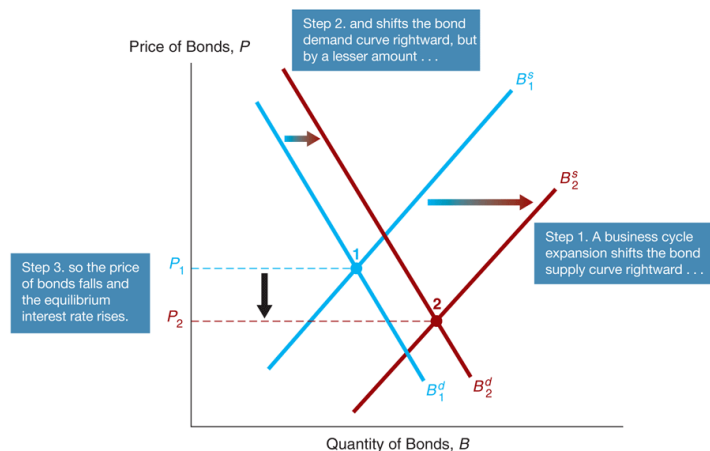
Figure 5 Expected Inflation and Interest Rates (Three-Month Treasury Bills), 1953–2011



Source: Expected inflation calculated using procedures outlined in Frederic S. Mishkin, "The Real Interest Rate: An Empirical Investigation," Carnegie-Rochester Conference Series on Public Policy 15 (1981): 151–200. These procedures involve estimating expected inflation as a function of past interest rates, inflation, and time trends.

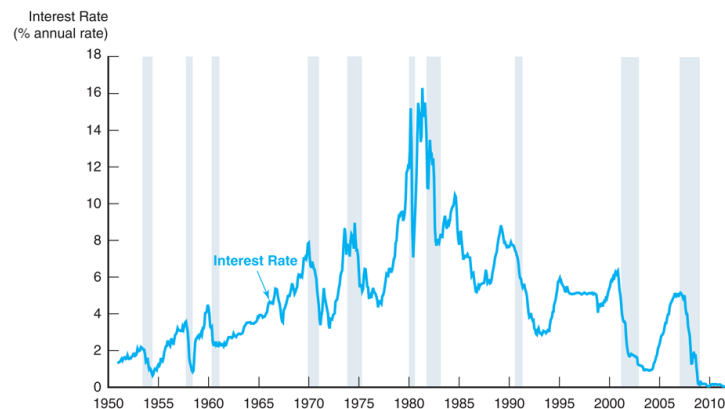
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Figure 6 Response to a Business Cycle Expansion



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Figure 7 Business Cycle and Interest Rates (Three-Month Treasury Bills), 1951–2011



Source: Federal Reserve: www.federalreserve.gov/releases/H15/data.htm.

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Japan

- Japan experienced a prolonged recession for two decades.
- Demand and supply of bonds both fell, raising the price of bonds and lowering the interest rate.
- Prolonged recession created deflation, making the expected return on real assets negative.
- Money (cash) became more desirable. Bonds less desirable than money but still preferable to real assets.
- Interest rates in Japan were close to zero.

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Impact of Low Savings on Interest Rates

- US personal savings rate (Personal income - Consumption) was at all time low in 1999-2000.
- Low savings imply shrinking of lender-saver funds.
- As loanable funds shrink the demand for bonds falls.
- The price of bonds falls and interest rate rises.

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Liquidity Preference Framework

- We have seen that interest rates can be determined using the equilibrium in the bond market or its mirror image, loanable funds market.
 - Those who buy bonds are the ones who loan funds and those who sell bonds are the ones who borrow.
- If bonds and money are the two categories of assets people use to store wealth, then equilibrium in bond market will imply equilibrium in the market for money.

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Supply and Demand in the Market for Money: The Liquidity Preference Framework



Keynesian model that determines the equilibrium interest rate in terms of the supply of and demand for money.

There are two main categories of assets that people use to store their wealth: money and bonds.

$$\text{Total wealth in the economy} = B^s + M^s = B^d + M^d$$

$$\text{Rearranging: } B^s - B^d = M^s - M^d$$

If the market for money is in equilibrium ($M^s = M^d$), then the bond market is also in equilibrium ($B^s = B^d$).

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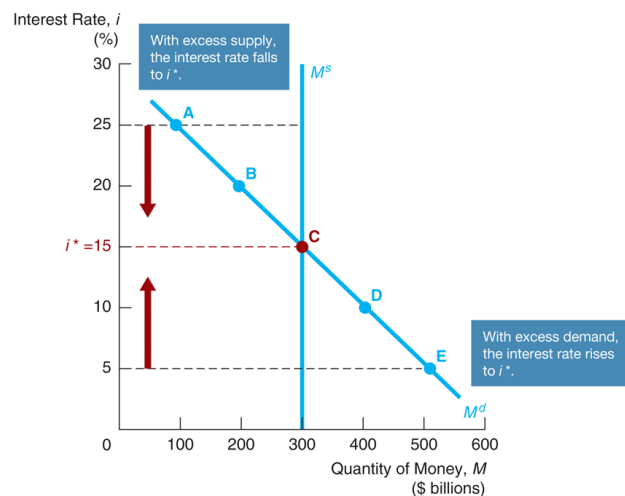
How To Divide Assets Into Money and Bonds



- | | |
|-------------------|--------------------|
| • Money | • Bonds |
| – Currency | – Savings deposits |
| – Demand deposits | – Time deposits |
| | – Bonds |
| | – Stocks |

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Figure 8 Equilibrium in the Market for Money



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Equilibrium in Bond Market = Equilibrium in Money Market



- Total supply of wealth has to equal to total demand for wealth:
 - $M^s + B^s = M^d + B^d$
- If the bond market is in equilibrium, $B^s = B^d$.
- Therefore, the market for money must be in equilibrium, $M^s = M^d$.

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Bond vs. Money Market



- Equilibrium in the bond market determines bond prices and interest rates, since each bond price is associated with a unique interest rate.
- Equilibrium in the market for money also determines the interest rate.
- The approaches are interchangeable, though the effects of some variable changes are easier to observe in one approach over the other.

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Liquidity Preference



- Why do people want to hold money?
 - To conduct purchases; for transaction purposes.
 - Keynesian definition of money concentrates on the medium of exchange function and assumes that the return on money is zero.
- What makes people to hold more money?
 - Income increases.
 - Price level increases.
 - Interest rate drops.
 - Opportunity cost of holding money drops.

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Demand for Money in the Liquidity Preference Framework



- As the interest rate increases:
 - The opportunity cost of holding money increases...
 - The relative expected return of money decreases...
- ...and therefore the quantity demanded of money decreases.

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Changes in Equilibrium Interest Rates in the Liquidity Preference Framework



- Shifts in the demand for money:
 - **Income Effect:** a higher level of income causes the demand for money at each interest rate to increase and the demand curve to shift to the right
 - **Price-Level Effect:** a rise in the price level causes the demand for money at each interest rate to increase and the demand curve to shift to the right

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Shifts in the Supply of Money

- Assume that the supply of money is controlled by the central bank
- An increase in the money supply engineered by the Federal Reserve will shift the supply curve for money to the right

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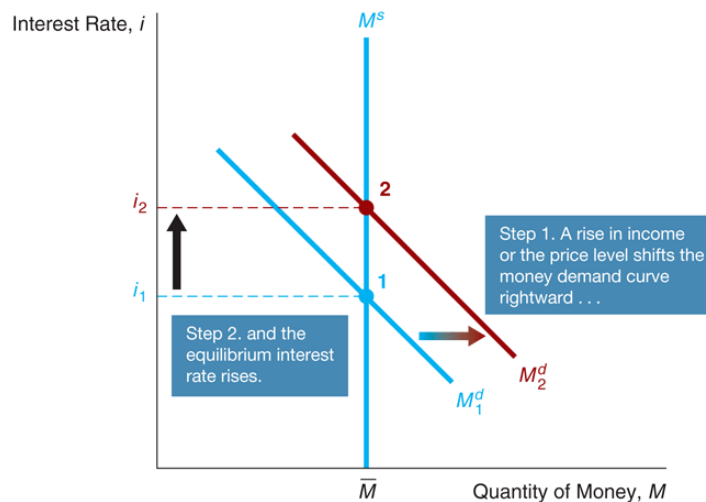
Summary Table 4 Factors That Shift the Demand for and Supply of Money

Variable	Change in Variable	Change in Money Demand (M^d) or Supply (M^s) at Each Interest Rate	Change in Interest Rate
Income	↑	M^d ↑	↑
Price level	↑	M^d ↑	↑
Money supply	↑	M^s ↑	↓

Note: Only increases in the variables are shown. The effect of decreases in the variables on the change in demand would be the opposite of those indicated in the remaining columns.

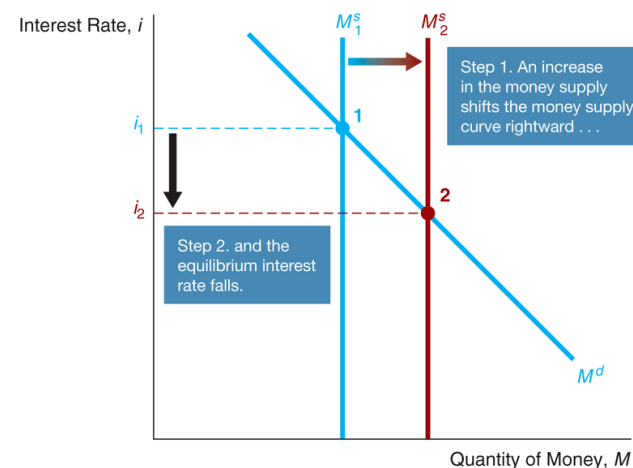
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Figure 9 Response to a Change in Income or the Price Level



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Figure 10 Response to a Change in the Money Supply



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Price-Level Effect and Expected-Inflation Effect



- A one time increase in the money supply will cause prices to rise to a permanently higher level by the end of the year. The interest rate will rise via the increased prices.
- Price-level effect remains even after prices have stopped rising.
- A rising price level will raise interest rates because people will expect inflation to be higher over the course of the year. When the price level stops rising, expectations of inflation will return to zero.
- Expected-inflation effect persists only as long as the price level continues to rise.

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Does a Higher Rate of Growth of the Money Supply Lower Interest Rates?



- Liquidity preference framework leads to the conclusion that an increase in the money supply will lower interest rates: the **liquidity effect**.
- **Income effect** finds interest rates rising because increasing the money supply is an expansionary influence on the economy (the demand curve shifts to the right).

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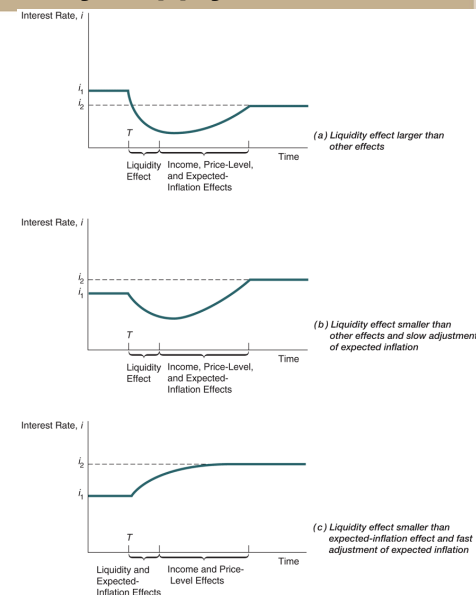
Does a Higher Rate of Growth of the Money Supply Lower Interest Rates? (cont'd)



- **Price-Level effect** predicts an increase in the money supply leads to a rise in interest rates in response to the rise in the price level (the demand curve shifts to the right).
- **Expected-Inflation effect** shows an increase in interest rates because an increase in the money supply may lead people to expect a higher price level in the future (the demand curve shifts to the right).

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Figure 11 Response over Time to an Increase in Money Supply Growth



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Figure 12 Money Growth (M2, Annual Rate) and Interest Rates (Three-Month Treasury Bills), 1950–2014

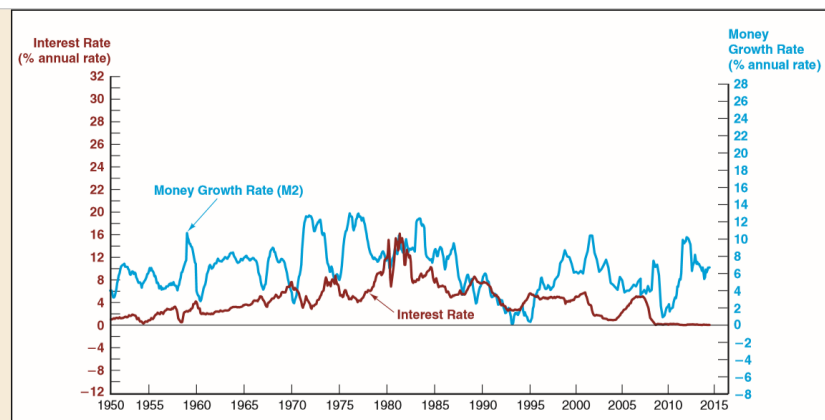


FIGURE 12 Money Growth (M2, Annual Rate) and Interest Rates (Three-Month Treasury Bills), 1950–2014
When the rate of money supply growth began to climb in the mid-1960s, interest rates rose, indicating that the liquidity effect was dominated by the price-level, income, and expected-inflation effects. By the 1970s, both interest rates and money growth reached levels unprecedented in the post–World War II period.

Source: Federal Reserve Bank of St. Louis FRED database: <http://research.stlouisfed.org/fred2/>

Other readings

Readings:

- Why a U.S. Subprime Mortgage Crisis Is Felt Around the World:
<http://www.nytimes.com/2007/08/31/business/worldbusiness/31derivatives.html?pagewanted=all>
- Kuttner (2010), Monetary Policy Surprises and Interest Rates: Evidence from the Fed Funds Futures Market:
http://www.newyorkfed.org/research/staff_reports/sr99.pdf
- Shulman, The Downside of the Fed's Zero Interest Rate Policy:
<http://www.usnews.com/opinion/blogs/economic-intelligence/2012/04/30/the-downside-of-the-feds-zero-interest-rate-policy>
- NY Times, Flights to Safety Can't Hide the Dangers:
<http://www.nytimes.com/2012/05/13/your-money/investors-flights-to-safety-cant-hide-the-danger.html>
- The collapse of Lehman Brothers:
<http://www.investopedia.com/articles/economics/09/lehman-brothers-collapse.asp#axzz225rbHwB6>
- Times, Three Lessons of the Lehman Brothers Collapse,
<http://www.time.com/time/business/article/0,8599,1923197,00.html>