

Bond Market (2)



Investing in Bonds

- Bonds are the most popular investment apart from stocks for long-term investing.
- Even though the bonds of a corporation are less risky than its equity, investors still have risk: interest rate risk

Interest Rate risk : the possible reduction in returns associated with changes in interest rates

Corporate Bonds: Characteristics of Corporate Bonds

Secured Bonds

- Mortgage bonds
- Equipment trust certificates

Unsecured Bonds

- Debentures
- Subordinated debentures
- Variable-rate bonds

Junk Bonds

- Debt that is rated below BBB
- Often, trusts and insurance companies are not permitted to invest in junk debt
- Michael Milken developed this market in the mid-1980s, although he was convicted of insider trading

Corporate Bonds: Debt Ratings

TABLE 10.2 Debt Ratings

Standard and Poor's	Moody's	Average Interest Rate* (%)	Definition
AAA	Aaa	5.47	Best quality and highest rating. Capacity to pay interest and repay principal is extremely strong. Smallest degree of investment risk.
AA	Aa	5.81	High quality. Very strong capacity to pay interest and repay principal and differs from AAA/Aaa in a small degree.
A	A	5.99	Strong capacity to pay interest and repay principal. Possess many favorable investment attributes and are considered upper-medium-grade obligations. Somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions.
BBB	Baa	6.39	Medium-grade obligations. Neither highly protected nor poorly secured. Adequate capacity to pay interest and repay principal. May lack long-term reliability and protective elements to secure interest and principal payments.
BB	Ba		Moderate ability to pay interest and repay principal. Have speculative elements and future cannot be considered well assured. Adverse business, economic, and financial conditions could lead to inability to meet financial obligations.
B	B		Lack characteristics of desirable investment. Assurance of interest and principal payments over long period of time may be small. Adverse conditions likely to impair ability to meet financial obligations.
CCC	Caa		Poor standing. Identifiable vulnerability to default and dependent on favorable business, economic, and financial conditions to meet timely payment of interest and repayment of principal.
CC	Ca		Represent obligations that are speculative to a high degree. Issues often default and have other marked shortcomings.
C	C		Lowest-rated class of bonds. Have extremely poor prospects of attaining any real investment standard. May be used to cover a situation where bankruptcy petition has been filed, but debt service payments are continued.
CI			Reserved for income bonds on which no interest is being paid.
D			Payment default.
NR			No public rating has been requested.
(+) or (-)			Ratings from AA to CCC may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories.

*Average interest rates are reported in the *Bulletin* only for the top four risk categories.

Source: Federal Reserve Bulletin, Table 1.35, Lines 27–30. March 2007.

Financial Guarantees for Bonds

- Some debt issuers purchase *financial guarantees* to lower the risk of their debt.
- The guarantee provides for timely payment of interest and principal, and are usually backed by large insurance companies.

1. Rocket Raccoon Company bond with 11.75 percent, semi-annually coupon payments with 6 years to maturity. In case investor demands 10.50 percent return for the first 3 years and 12.50 percent for the next three years. What is the current price of this bond? What is the yield-to-maturity of this bond?



Zero-Coupon Bond

- Deep discount bond
 - Bond that has zero coupon payment
2. What is the price of zero-coupon bond with 10 years to maturity? Yield-to-maturity equals to 12.70 percent; semi-annually compounded.
 3. What are the current yield and capital gain yield in each year of a three-year bond with no coupon payment; this bond yields 9.24 percent?



Treasury STRIPs

- Treasury STRIPs: the coupon and principal payments are “stripped” from a Treasury security and sold as individual zero-coupon bonds.

Example

Mr. Wolf, an investment banker, purchased 5 years 5.50 percent T-notes which it intends to create STRIPs. Explain how Mr. Wolf STRIPs.

Floating Rate Bond

- Bonds make interest payments that are tied to some measure of current market rates
4. 6-year Floating-rate bond uses 1-year Treasury rate as reference rate plus 30 basis points with 7.00 percent Cap and 4.50 percent floor

Period	T-Bills	Floating Rate
1st Year	6.10 percent	
2nd Year	6.90 percent	
3rd Year	5.70 percent	
4th Year	5.00 percent	
5th Year	4.10 percent	
6th Year	4.40 percent	

TIPS

- Treasury Inflation-Indexed Securities: the principal amount is tied to the current rate of inflation to protect investor purchasing power
5. Treasury Inflation-Indexed bond has 7.50 percent coupon paid annually. Given inflation rate of 2.75 percent and 3.20 percent in 1 year and 2 years, respectively. Compute coupon payment for each year.

6. Treasury Inflation-Indexed 2-year bond has 5.60 percent coupon paid semi-annually. Given inflation rate every six-month equals to 1.50 percent, 2.10 percent, – 0.75 percent and 1.60 percent, respectively. What is the current price of this TIP given 7.25 percent yield-to-maturity?

Consol Bond

- Perpetual bond with no maturity date and no repayment of principal
7. Han Solo Corporate bond which has 12.50 percent coupon paying semi-annually coupon; this bond is a consol bond. What is the price of Han Solo bond at 10.50 percent yield-to-maturity?



8. What is the yield-to-maturity Tribal bond that has coupon interest rate of 21.00 baht per quarter with no maturity, currently selling at 1,150.00 baht?



Municipal Bond

- Issued by local, county, and state governments
 - Used to finance public interest projects; e.g., revenue bond
 - Tax-free municipal interest rate = taxable interest rate $\times$ (1 – marginal tax rate)
9. You have two bonds which have comparable risk:
 - Taxable bond with 12.75 percent yield-to-maturity
 - Municipal bond with 10.50 percent yield-to-maturity (which is tax-free)

Which bond would be more attractive given you are in tax-bracket of 30.00 percent?
What is the break-even tax rate?

Key Determinants of Bond Yield

- The discount rate (r^i) is the opportunity cost of capital, i.e., the rate that could be earned on alternative investments of equal risk.

Yield-to-Maturity

$$(1 + \text{YTM}) = (1 + r^*)(1 + \pi)$$

$$(1 + \text{YTM}) = (1 + r^*)(1 + \pi)(1 + \text{MRP})$$

$$(1 + \text{YTM}) = (1 + r^*)(1 + \pi)(1 + \text{MRP})(1 + \text{DRP})$$

$$(1 + \text{YTM}) = (1 + r^*)(1 + \pi)(1 + \text{MRP})(1 + \text{DRP})(1 + \text{LP})$$

YTM =	Real Return	Inflation Risk Premium	Maturity Risk Premium	Default Risk Premium	Liquidity Premium
Treasury Bills					
Treasury Bonds					
Large Corporate Short-Term Bond					
Large Corporate Long-Term Bond					
Small Corporate Short-Term Bond					
Small Corporate Long-Term Bond					

10. Given following required returns:

- Risk-free return = 3%
- Inflation rate = 2%
- Default risk premium = 1.50%
- Maturity risk premium = 2.50%
- Liquidity premium = 4.00%

Compute price of following bonds:

- Treasury bills with 6 months maturity.
- Treasury Notes 3.75 percent coupon with 8 years maturity
- 9-month company limited bond with 12.00 percent coupon
- 1-year listed company bond with 8.00 percent coupon
- 10-year listed company 10.20 percent coupon bond
- 20-year company limited with 14.30 percent coupon bond

Behaviour of Interest Rates

Determining the Quantity Demanded of an Asset

- **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

Theory of Asset Demand

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

SUMMARY		
TABLE 1 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.		

Supply and Demand for Bonds

- 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

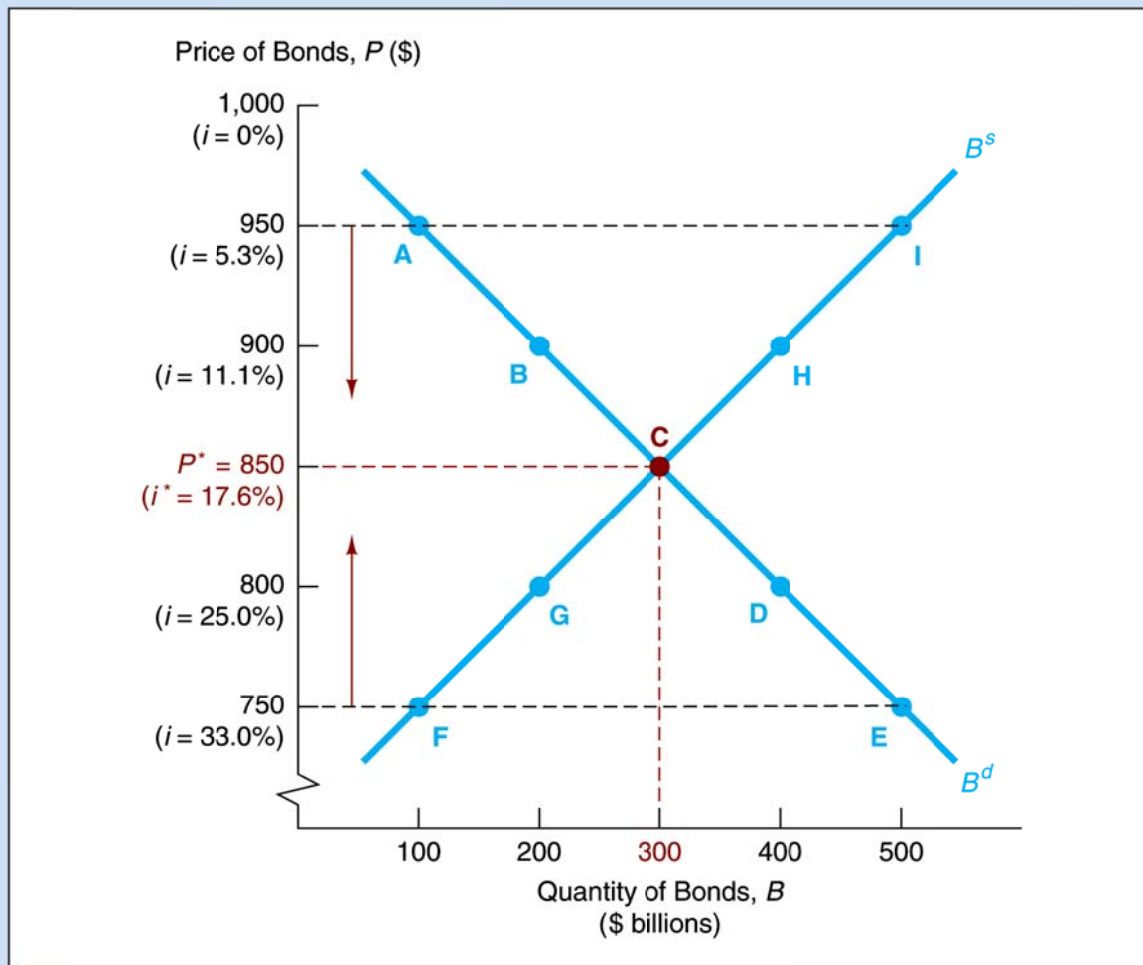


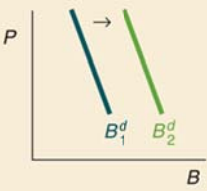
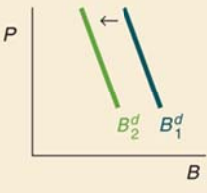
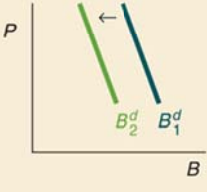
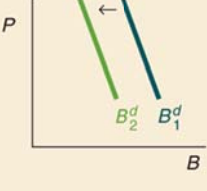
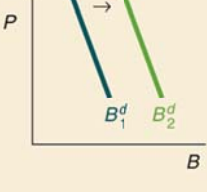
FIGURE 1 Supply and Demand for Bonds

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
- When $B_d^d = B_s^s \Rightarrow$ the equilibrium (or market clearing) price and interest rate
- When $B_d^d > B_s^s \Rightarrow$ excess demand $\Rightarrow$ price will rise and interest rate will fall
- When $B_d^d < B_s^s \Rightarrow$ excess supply $\Rightarrow$ price will fall and interest rate will rise

Shifts in the Demand for Bonds

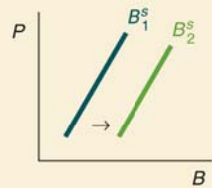
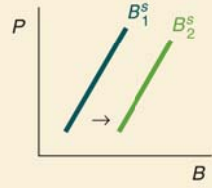
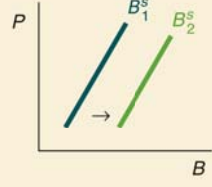
- **Wealth**—in an expansion with growing wealth, the demand curve for bonds shifts to the right
- **Expected Returns**—higher expected interest rates in the future lower the expected return for long-term bonds, shifting the demand curve to the left
- **Expected Inflation**—an increase in the expected 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

SUMMARY		TABLE 2 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.

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

SUMMARY		TABLE 3 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.

Loanable Funds Framework

One disadvantage of the supply and demand framework for bonds is that the bond price is on the vertical axis and the interest rate is determined only indirectly from the equilibrium price of bonds (as the equilibrium price goes up the interest rate goes down). Because economists are typically more concerned with the value of interest rates than with the price of bonds, it would be nice to have a diagram in which the interest rates are on the vertical axis. However, putting interest rates on the vertical axis presents us with a problem. Our demand curve for bonds, points A through E, now looks peculiar because it has an upward slope. This upward slope is, however, completely consistent with our usual demand analysis, which produces a negative relationship between price and quantity. The inverse relationship between bond prices and interest rates means that in moving from point A to point B to point C, bond prices are falling and, consistent with usual demand analysis, the quantity demanded is rising. Similarly, our supply curve for bonds, points F through I, has an unusual-looking downward slope but is completely consistent with the usual view that price and the quantity supplied are positively related.

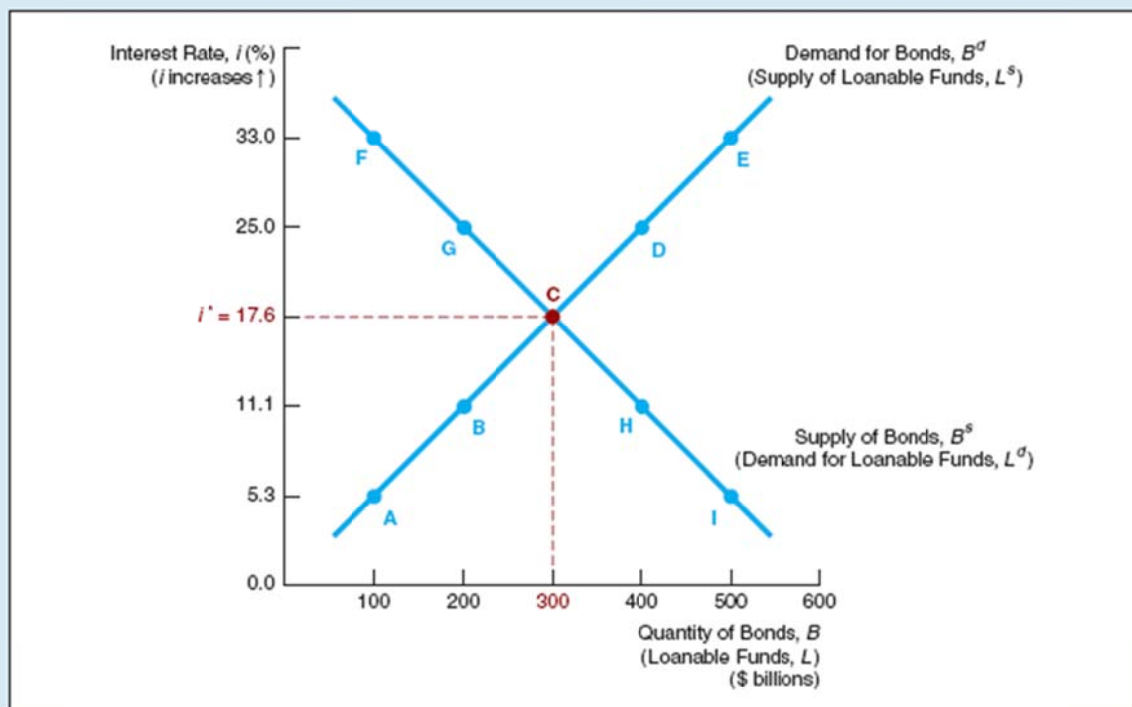


FIGURE 1 A Comparison of Terminology: Loanable Funds and Supply and Demand for Bonds

The demand for bonds is equivalent to the supply of loanable funds, and the supply of bonds is equivalent to the demand for loanable funds. (Note: i increases as we go up the vertical axis, in contrast to Figure 1 in the text, in which the opposite occurs.)

The Liquidity Preference Framework

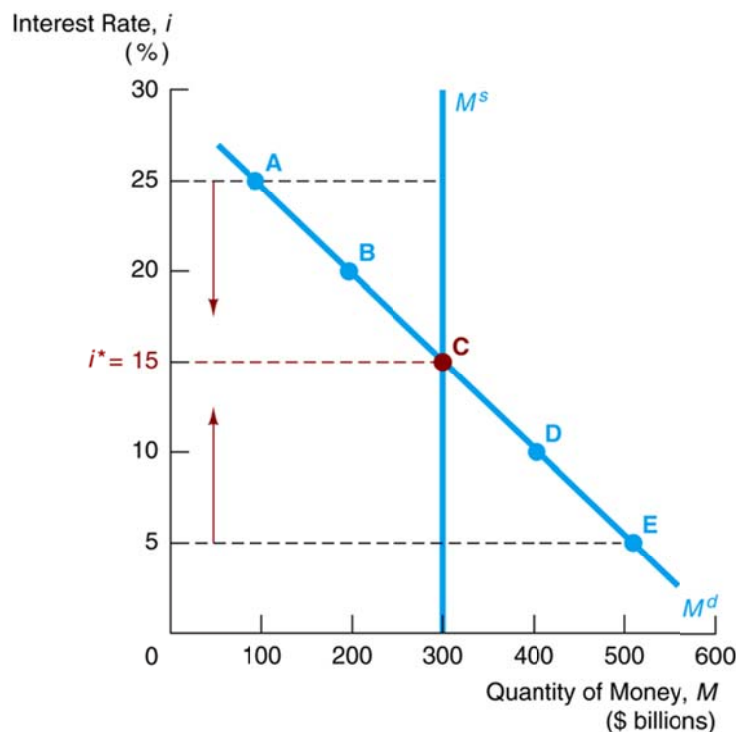
Keynesian model that determines the equilibrium interest rate in terms of the supply of and demand for money. There are two main categories of assets that people use to store their wealth: money and bonds.

$$\text{Total wealth in the economy} = B^S + M^S = B^D + M^D$$

$$\text{Rearranging: } B^S - B^D = M^D - M^S$$

If the market for money is in equilibrium ($M^S = M^D$) then the bond market is also in equilibrium ($B^S = B^D$).

Equilibrium in the Market for Money



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.

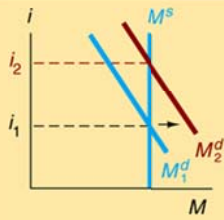
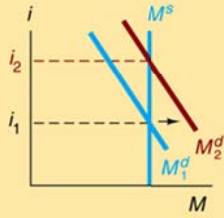
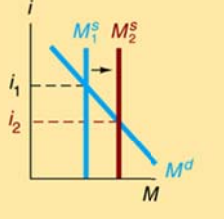
Shifts in the Demand for Money

- 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

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

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

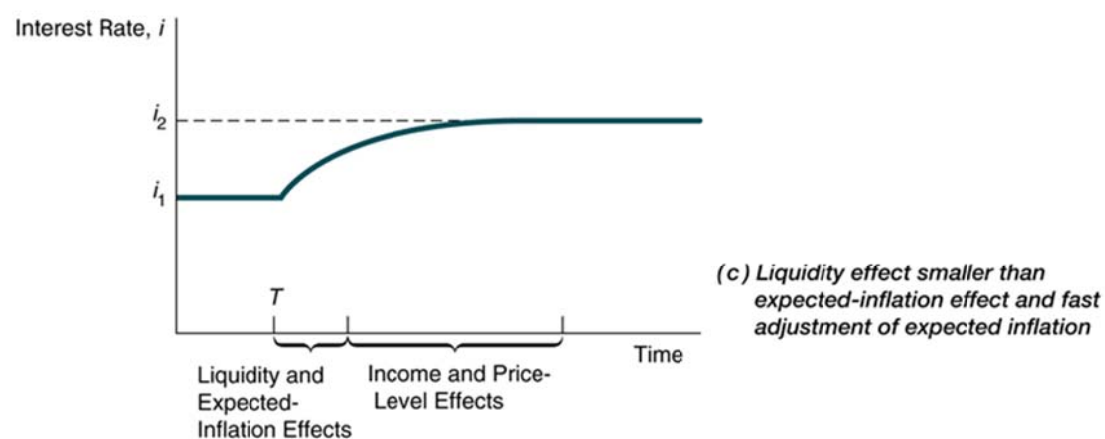
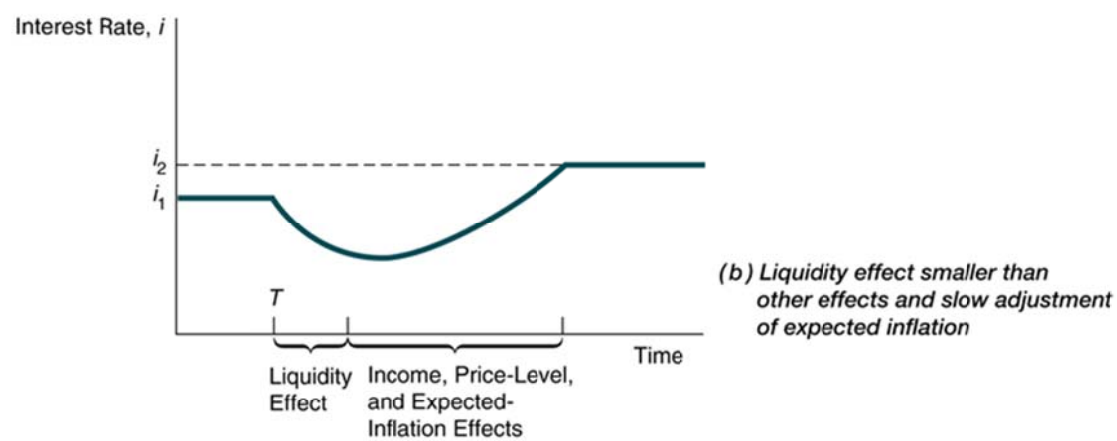
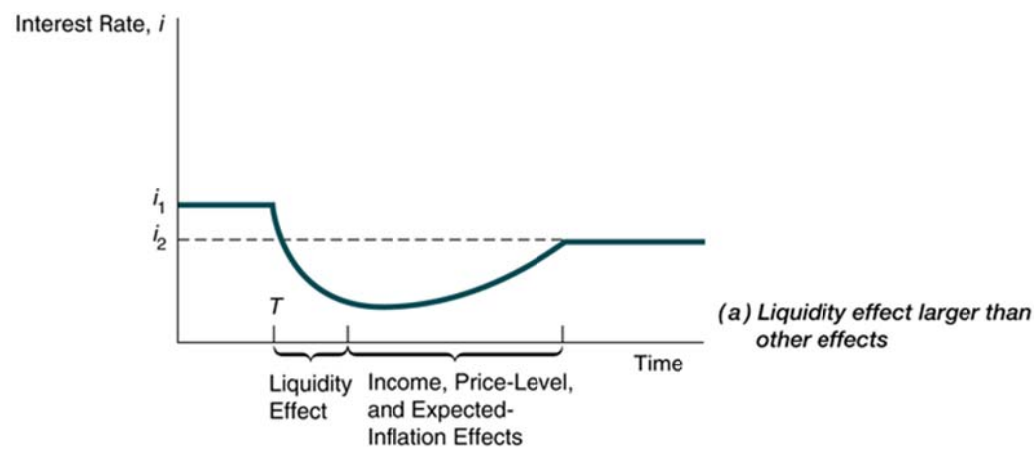




Note: Only increases in the variables are shown. The effect of decreases in the variables on the change in demand would be the opposite of those indicated in the remaining columns.

Everything Else Remaining Equal?

- 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).
- 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).

Response over Time to an Increase in Money Supply Growth



Exercise

Suppose you visit with a financial adviser, and you are considering investing some of your wealth in one these three investments: stock, bond, or commodity. Your financial adviser provides you with the following data:

Stock		Bond		Commodity	
Probability	Return	Probability	Return	Probability	Return
0.25	12%	0.6	10%	0.2	20%
0.25	10%	0.4	7.5%	0.25	12%
0.25	8%			0.25	6%
0.25	6%			0.25	4%
				0.05	0%

- Which investment should you choose to maximise your expected return?
- If you are risk-averse and had to choose between stock or bond investments, which would you choose? Why?