سمه تعالی

مبانی اقتصاد

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دانشکده مدیریت و اقتصاد
گروه اقتصاد
Asset and Money Market
LM Curves
Portfolio Allocation and the Demand for Assets

- How do people allocate their wealth among various assets? The portfolio allocation decision
Portfolio Allocation and the Demand for Assets

*Expected return*
  
  *Rate of return = an asset’s increase in value per unit of time*
    
    *Bank account: Rate of return = interest rate*
    
    *Corporate stock: Rate of return = dividend yield + percent increase in stock price*
  
  *Investors want assets with the highest expected return (other things equal)*
  
  *Returns not known in advance, so people estimate their expected return*
Portfolio Allocation and the Demand for Assets

- Risk
  - Risk is the degree of uncertainty in an asset’s return
  - People don’t like risk, so they prefer assets with low risk (other things equal)
Portfolio Allocation and the Demand for Assets

• Liquidity
  • Liquidity: the ease and quickness with which an asset can be traded
  • Money is very liquid
  • Assets like automobiles and houses are very illiquid—long time and large transaction costs to trade them
  • Stocks and bonds are fairly liquid
  • Investors prefer liquid assets (other things equal)
Portfolio Allocation and the Demand for Assets

- **Time to maturity**
  - Time to maturity: the amount of time until a financial security matures and the investor is repaid the principal
  - Expectations theory of the term structure of interest rates
    - The idea that investors compare returns on bonds with differing times to maturity
    - In equilibrium, holding different types of bonds over the same period yields the same expected return
Portfolio Allocation and the Demand for Assets

- **Time to maturity**
  - Because long-term interest rates usually exceed short-term interest rates, a risk premium exists: the compensation to an investor for bearing the risk of holding a long-term bond
Portfolio Allocation and the Demand for Assets

- **Types of assets and their characteristics**
  - People hold many different assets, including money, bonds, stocks, houses, and consumer durable goods
    - Money has a low return, but low risk and high liquidity
    - Bonds have a higher return than money, but have more risk and less liquidity
    - Stocks pay dividends and can have capital gains and losses, and are much more risky than money
    - Ownership of a small business is very risky and not liquid at all, but may pay a very high return
    - Housing provides housing services and the potential for capital gains, but is quite illiquid
Portfolio Allocation and the Demand for Assets

• Types of assets and their characteristics
  • Households must consider what mix of assets they wish to own
  • Table 7.2 shows the mix in 2006 and 2009, and illustrates the large declines in the value of stocks and housing
# Table 7.2 Household Assets, 2006 and 2009

<table>
<thead>
<tr>
<th></th>
<th>Amounts in trillions of dollars</th>
<th>Percentages of total assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real estate</td>
<td>24.3</td>
<td>19.9</td>
</tr>
<tr>
<td>Consumer durables</td>
<td>4.3</td>
<td>4.6</td>
</tr>
<tr>
<td>Currency and checkable deposits</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Time, savings, and other deposits</td>
<td>6.5</td>
<td>7.6</td>
</tr>
<tr>
<td>Bonds</td>
<td>4.2</td>
<td>5.2</td>
</tr>
<tr>
<td>Stocks</td>
<td>13.9</td>
<td>8.4</td>
</tr>
<tr>
<td>Proprietors’ investment in unincorporated businesses</td>
<td>8.7</td>
<td>7.3</td>
</tr>
<tr>
<td>Pension funds</td>
<td>12.7</td>
<td>9.9</td>
</tr>
<tr>
<td>Other assets</td>
<td>2.0</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td>76.7</td>
<td>65.2</td>
</tr>
</tbody>
</table>

*Note: Numbers may not add to totals owing to rounding.*

Portfolio Allocation and the Demand for Assets

- In touch with data and research: the housing crisis that began in 2007
  - People gained tremendous wealth in their houses in the 2000s
  - As house prices rose, houses became increasingly unaffordable, leading mortgage lenders to create subprime loans for people who wouldn’t normally qualify to buy houses
  - Most subprime loans had adjustable interest rates, with a low initial interest rate that would later rise in a process known as mortgage reset
Portfolio Allocation and the Demand for Assets

- The housing crisis that began in 2007
  - As long as housing prices kept rising, both lenders and borrowers thought the subprime loans would work out, as the borrowers could always sell their houses to pay off the loans
  - But housing prices stopped rising as much, leading more subprime borrowers to default, so banks began to tighten their lending standards, reducing the demand for housing and leading housing prices to start falling (text Fig. 7.1)
Figure 7.1 Increase in home prices from one year earlier, 1976-2009

Portfolio Allocation and the Demand for Assets

• The housing crisis that began in 2007
  • Many homeowners lost their homes and financial institutions lost hundreds of billions of dollars because of mortgage loan defaults
  • Because many mortgage loans had been securitized and were parts of mortgage-backed securities, the increased default rate on mortgages led to a financial crisis in Fall 2008, as many investors simultaneously tried to sell risky assets, including mortgage-backed securities and stocks
Portfolio Allocation and the Demand for Assets

- **Asset Demands**
  - Trade-off among expected return, risk, liquidity, and time to maturity
  - Assets with low risk and high liquidity, like checking accounts, have low expected returns
  - Investors consider diversification: spreading out investments in different assets to reduce risk
  - The amount a wealth holder wants of an asset is his or her demand for that asset
  - The sum of asset demands equals total wealth
The Demand for Money

- The demand for money is the quantity of monetary assets people want to hold in their portfolios
  - Money demand depends on expected return, risk, and liquidity
  - Money is the most liquid asset
  - Money pays a low return
  - People’s money-holding decisions depend on how much they value liquidity against the low return on money
The Demand for Money

- Key macroeconomic variables that affect money demand
  - Price level
  - Real income
  - Interest rates
The Demand for Money

- Price level
  - The higher the price level, the more money you need for transactions
  - Prices are 10 times as high today as in 1935, so it takes 10 times as much money for equivalent transactions
  - Nominal money demand is thus proportional to the price level
The Demand for Money

- Real income
  - The more transactions you conduct, the more money you need
  - Real income is a prime determinant of the number of transactions you conduct
  - So money demand rises as real income rises
The Demand for Money

- Real income
  - But money demand isn’t proportional to real income, since higher-income individuals use money more efficiently, and since a country’s financial sophistication grows as its income rises (use of credit and more sophisticated assets)
  - Result: Money demand rises less than 1-to-1 with a rise in real income
The Demand for Money

- Interest rates
  - An increase in the interest rate or return on nonmonetary assets decreases the demand for money
  - An increase in the interest rate on money increases money demand
  - This occurs as people trade off liquidity for return
The Demand for Money

- Interest rates
  - Though there are many nonmonetary assets with many different interest rates, because they often move together we assume that for nonmonetary assets there’s just one nominal interest rate, \( i \)
The Demand for Money

• The money demand function
  • $M^d = P \times L(Y, i)$ (7.1)
    • $M^d$ is nominal money demand (aggregate)
    • $P$ is the price level
    • $L$ is the money demand function
    • $Y$ is real income or output
    • $i$ is the nominal interest rate on nonmonetary assets
The Demand for Money

- The money demand function
  - As discussed above, nominal money demand is proportional to the price level
  - A rise in $Y$ increases money demand; a rise in $i$ reduces money demand
  - We exclude $i^m$ from Eq. (7.1) since it doesn’t vary much
The Demand for Money

- The money demand function
  - Alternative expression:
    \[ M^d = P \times L(Y, r + \pi^e) \] (7.2)
  - A rise in \( r \) or \( \pi^e \) reduces money demand
  - Alternative expression:
    \[ M^d / P = L(Y, r + \pi^e) \] (7.3)
The Demand for Money

- Other factors affecting money demand
  - Wealth: A rise in wealth may increase money demand, but not by much
  - Risk
    - Increased riskiness in the economy may increase money demand
    - Times of erratic inflation bring increased risk to money, so money demand declines
The Demand for Money

- Other factors affecting money demand
  - Liquidity of alternative assets: Deregulation, competition, and innovation have given other assets more liquidity, reducing the demand for money
  - Payment technologies: Credit cards, ATMs, and other financial innovations reduce money demand
### Macroeconomic Determinants of the Demand for Money

<table>
<thead>
<tr>
<th>An increase in</th>
<th>Causes money demand to</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price level, $P$</td>
<td>Rise proportionally</td>
<td>A doubling of the price level doubles the number of dollars needed for transactions.</td>
</tr>
<tr>
<td>Real income, $Y$</td>
<td>Rise less than proportionally</td>
<td>Higher real income implies more transactions and thus a greater demand for liquidity.</td>
</tr>
<tr>
<td>Real interest rate, $r$</td>
<td>Fall</td>
<td>Higher real interest rate means a higher return on alternative assets and thus a switch away from money.</td>
</tr>
<tr>
<td>Expected inflation, $\pi^e$</td>
<td>Fall</td>
<td>Higher expected inflation means a lower real return on money and thus a switch away from money.</td>
</tr>
<tr>
<td>Nominal interest rate on money, $r^n$</td>
<td>Rise</td>
<td>Higher return on money makes people more willing to hold money.</td>
</tr>
<tr>
<td>Wealth</td>
<td>Rise</td>
<td>Part of an increase in wealth may be held in the form of money.</td>
</tr>
<tr>
<td>Risk</td>
<td>Rise, if risk of alternative asset increases</td>
<td>Higher risk of alternative asset makes money more attractive.</td>
</tr>
<tr>
<td></td>
<td>Fall, if risk of money increases</td>
<td>Higher risk of money makes it less attractive.</td>
</tr>
<tr>
<td>Liquidity of alternative assets</td>
<td>Fall</td>
<td>Higher liquidity of alternative assets makes these assets more attractive.</td>
</tr>
<tr>
<td>Efficiency of payments technologies</td>
<td>Fall</td>
<td>People can operate with less money.</td>
</tr>
</tbody>
</table>
The Demand for Money

- Elasticities of money demand
  - How strong are the various effects on money demand?
  - Statistical studies on the money demand function show results in elasticities
  - Elasticity: The percent change in money demand caused by a one percent change in some factor
The Demand for Money

- Elasticities of money demand
  - Income elasticity of money demand
    - Positive: Higher income increases money demand
    - Less than one: Higher income increases money demand less than proportionately
    - Goldfeld’s results: income elasticity = \( \frac{2}{3} \)
  - Interest elasticity of money demand
    - Small and negative: Higher interest rate on nonmonetary assets reduces money demand slightly
  - Price elasticity of money demand is unitary, so money demand is proportional to the price level
The Demand for Money

- Velocity and the quantity theory of money
  - Velocity (V) measures how much money “turns over” each period
  - \( V = \frac{\text{nominal GDP}}{\text{nominal money stock}} = \frac{PY}{M} \) (7.4)
  - Plot of velocities for M₁ and M₂ (Fig. 7.2) shows fairly stable velocity for M₂, erratic velocity for M₁ beginning in early 1980s
Figure 7.2 Velocity of M1 and M2, 1959-2009

Source: FRED database of the Federal Reserve Bank of St. Louis, research.stlouisfed.org/fred2, series M1SL, M2SL, and GDP.
The Demand for Money

• Velocity and the quantity theory of money
  • Plot of money growth (text Figure 7.3) shows that instability in velocity translates into erratic movements in money growth
Figure 7.3  Growth rates of M1 and M2, 1960-2009

Source: FRED database of the Federal Reserve Bank of St. Louis, research.stlouisfed.org/fred2, series M1SL and M2SL.
The Demand for Money

• Velocity and the quantity theory of money
  • Quantity theory of money: Real money demand is proportional to real income
    • If so,
      \[ \frac{M^d}{P} = kY \]  
    • Assumes constant velocity, where velocity isn’t affected by income or interest rates
The Demand for Money

- **Velocity and the quantity theory of money**
  - But velocity of M1 is not constant; it rose steadily from 1960 to 1980 and has been erratic since then
    - Part of the change in velocity is due to changes in interest rates in the 1980s
    - Financial innovations also played a role in velocity’s decline in the early 1980s
  - M2 velocity is closer to being a constant, but not over short periods
Asset Market Equilibrium

- Asset market equilibrium—an aggregation assumption
  - Assume that all assets can be grouped into two categories, money and nonmonetary assets
    - Money includes currency and checking accounts
      - Pays interest rate $i^m$
      - Supply is fixed at $M$
    - Nonmonetary assets include stocks, bonds, land, etc.
      - Pays interest rate $i = r + \pi^e$
      - Supply is fixed at $NM$
Asset Market Equilibrium

• Asset market equilibrium occurs when quantity of money supplied equals quantity of money demanded
  • \( m^d + nm^d = \text{total nominal wealth of an individual} \) (7.6)
  • \( M^d + NM^d = \text{aggregate nominal wealth} \) (from adding up individual wealth)
  • \( M + NM = \text{aggregate nominal wealth} \) (7.7) (supply of assets)
  • Subtracting Eq. (7.7) from Eq. (7.6) gives
    \[
    (M^d - M) + (NM^d - NM) = 0 \] (7.8)
Asset Market Equilibrium

- So excess demand for money \((M^d - M)\) plus excess demand for nonmonetary assets \((NM^d - NM)\) equals 0.
- So if money supply equals money demand, nonmonetary asset supply must equal nonmonetary asset demand; then entire asset market is in equilibrium.
The asset market equilibrium condition

\[ \frac{M}{P} = L(Y, r + \pi^e) \]  

real money supply = real money demand

- \( M \) is determined by the central bank
- \( \pi^e \) is fixed (for now)
- The labor market determines the level of employment; using employment in the production function determines \( Y \)
- Given \( Y \), the goods market equilibrium condition determines \( r \)
Asset Market Equilibrium

• The asset market equilibrium condition
  • With all the other variables in Eq. (7.9) determined, the asset market equilibrium condition determines the price level
    \[ P = \frac{M}{L(Y, r + \pi^e)} \]  
    \hspace{1cm} (7.10)
  • The price level is the ratio of nominal money supply to real money demand
  • For example, doubling the money supply would double the price level
Money Growth and Inflation

- The inflation rate is closely related to the growth rate of the money supply
  - Rewrite Eq. (7.10) in growth-rate terms:
    \[ \frac{\Delta P}{P} = \frac{\Delta M}{M} - \frac{\Delta L(Y,r + \pi_e)}{L(Y,r + \pi_e)} \]  
    (7.11)
  - If the asset market is in equilibrium, the inflation rate equals the growth rate of the nominal money supply minus the growth rate of real money demand
Figure 7.4 The relationship between money growth and inflation

Source: Money growth rates and consumer price inflation from *International Financial Statistics*, February 2003, International Monetary Fund. Figure shows European countries in transition for which there are complete data.
LM Curve
The LM Curve: Asset Market Equilibrium

- The interest rate and the price of a nonmonetary asset
  - The price of a nonmonetary asset is inversely related to its interest rate or yield
    - Example: A bond pays $10,000 in one year; its current price is $9615, and its interest rate is 4\%, since \( \frac{10,000 - 9,615}{9,615} = 0.04 = 4\% \)
    - If the price of the bond in the market were to fall to $9524, its yield would rise to 5\%, since \( \frac{10,000 - 9,524}{9,524} = 0.05 = 5\% \)
  - For a given level of expected inflation, the price of a nonmonetary asset is inversely related to the real interest rate
The *LM* Curve: Asset Market Equilibrium

- The equality of money demanded and money supplied
  - Equilibrium in the asset market requires that the real money supply equal the real quantity of money demanded
  - Real money supply is determined by the central bank and isn’t affected by the real interest rate
  - Real money demand falls as the real interest rate rises
  - Real money demand rises as the level of output rises
  - The *LM* curve is derived by plotting real money demand for different levels of output and looking at the resulting equilibrium
Figure: Deriving the *LM* curve

(a) Real money supply, $MS$

- Real money demand, $MD$ (Y = 5000)
- $MD$ (Y = 4000)

(b) Output, $Y$

- $LM$

**Graph Details**
- Real interest rate, $r$
- Real money supply, $M/P$
- Real money demand, $M^d/P$
The *LM* Curve

- By what mechanism is equilibrium restored?
  - Starting at equilibrium, suppose output rises, so real money demand increases
  - The rise in people’s demand for money makes them sell nonmonetary assets, so the price of those assets falls and the real interest rate rises
  - As the interest rate rises, the demand for money declines until equilibrium is reached
The $LM$ Curve

- The $LM$ curve shows the combinations of the real interest rate and output that clear the asset market
  - Intuitively, for any given level of output, the $LM$ curve shows the real interest rate necessary to equate real money demand and supply
  - Thus the $LM$ curve slopes upward from left to right
The *LM* Curve

- Factors that shift the *LM* curve
  - Any change that reduces real money supply relative to real money demand shifts the *LM* curve up
    - For a given level of output, the reduction in real money supply relative to real money demand causes the equilibrium real interest rate to rise
    - The rise in the real interest rate is shown as an upward shift of the *LM* curve
  - Similarly, a change that increases real money supply relative to real money demand shifts the *LM* curve down and to the right
The **LM Curve**

- Summary Table lists the factors that shift the *LM* curve
  - The *LM* curve shifts down and to the right because of
    - an increase in the nominal money supply
    - a decrease in the price level
    - an increase in expected inflation
    - a decrease in the nominal interest rate on money
    - a decrease in wealth
    - a decrease in the risk of alternative assets relative to the risk of holding money
    - an increase in the liquidity of alternative assets
    - an increase in the efficiency of payment technologies
  - The *LM* curve shifts up and to the left when the opposite happens to the eight factors listed above
### Summary

**Factors That Shift the LM Curve**

<table>
<thead>
<tr>
<th>An increase in</th>
<th>Shifts the LM curve</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal money supply, $M$</td>
<td>Down and to the right</td>
<td>Real money supply increases, lowering the real interest rate that clears the asset market (equates money supplied and money demanded).</td>
</tr>
<tr>
<td>Price level, $P$</td>
<td>Up and to the left</td>
<td>Real money supply falls, raising the real interest rate that clears the asset market.</td>
</tr>
<tr>
<td>Expected inflation, $r^e$</td>
<td>Down and to the right</td>
<td>Demand for money falls, lowering the real interest rate that clears the asset market.</td>
</tr>
<tr>
<td>Nominal interest rate on money, $r^m$</td>
<td>Up and to the left</td>
<td>Demand for money increases, raising the real interest rate that clears the asset market.</td>
</tr>
</tbody>
</table>

In addition, for constant output, any factor that increases real money demand raises the real interest rate that clears the asset market and shifts the LM curve up and to the left. Other factors that increase real money demand (see Summary table 9, p. 255) include:

- an increase in wealth;
- an increase in the risk of alternative assets relative to the risk of holding money;
- a decline in the liquidity of alternative assets; and
- a decline in the efficiency of payment technologies.
The \textit{LM} Curve

- Changes in the real money supply
  - An increase in the real money supply shifts the \textit{LM} curve down and to the right
Figure: An increase in the real money supply shifts the LM curve down and to the right.
The \textit{LM} Curve

- Changes in the real money supply
  - Similarly, a drop in real money supply shifts the \textit{LM} curve up and to the left
  - The real money supply changes when the nominal money supply changes at a different rate than the price level
The $LM$ Curve

- Changes in real money demand
  - An increase in real money demand shifts the $LM$ curve up and to the left
  - Similarly, a drop in real money demand shifts the $LM$ curve down and to the right
Figure: An increase in the real money demand shifts the $LM$ curve up and to the left.
References

- Slides from the Book: Macroeconomics by Bernanke and Abel: Copyrighted: 2011 Pearson Addison-Wesley