Learning Outcomes

➢ Quantity Theory of Money

➢ Classical Dichotomy & Money Neutrality
  ➢ Say’s Law
  ➢ Walras’s Law

➢ Money in general equilibrium

➢ Patinkin & the real balance effect

➢ General equilibrium framework
5.1 Key Concepts
5.1 Quantity theory of money

Key Idea
5.1.1 Quantity theory of money

- The equation of exchange essentially states that the nominal money balances in the economy must equal the value of the goods and services which it is used to purchase

\[ MV = PT \]

Key assumptions

- \( V \) is taken as exogenous, being determined by various institutional features of the economy,

- \( M \) is, in a at money economy, determined by the government

- \( T \), the number of transactions, is determined by real variables such as preferences, endowments and technology,
5.1.1 Disaggregation of quantity theory of money

- There is a direct relationship between money supply and the price levels in the economy.

- Inflation cannot occur without a commensurate increase in the supply of money.
5.1.2 Velocity of money

- Measures how many times a unit of money is used to purchase goods and services per period.
- A measure of the stability of the money demand equation.
5.1.2 Velocity of money
5.1.2 Velocity of money – Key results

- There generally is an inverse relationship between money holdings and the velocity of money
  - Example: A doubling of the velocity leads to a halving of the average money holdings

- One consequence of high interest rates may then be that any money balances are spent more quickly, implying an increase in velocity.
5.1.3 Quantity theory of money – Cambridge view

\[ M = kPY. \]

- Expressed the equation from a flow to a stock equation
- The amount of money one held was equal to a proportion of the number of transactions, or alternatively, income, \( Y \).
- In the general expression it is assumed that the velocity of money is held constant
5.2.1 Classical Dichotomy & Money Neutrality

- According to the `Classical Dichotomy' only real variables (preferences, endowments and technology) determined real outcomes (quantities and relative prices)

- The quantity of money, on the other hand, determined the absolute price level or the value of goods in terms of monetary units, from the equation of exchange.
5.2 Key Theories
5.2.2 Say’s Law

Key Idea => supply creates its own demand.
5.2.2 Say’s Law

Key arguments

• In a barter economy, you need to first produce in order to demand goods and services

• The value of what we buy is equal to the value of what you produce

• General glut – A surplus of one good.

• General gluts in food production is what leads to Boom & bust cycles.

• “If certain goods remain unsold, it is because other goods are not produced.”
5.2.2 Say’s Law

Model

- Assume a barter economy and therefore there are no monetary prices.

\[ \sum_{i=1}^{n-1} p_i D_i = \sum_{i=1}^{n-1} p_i S_i \]

- Market laws imply that there cannot be a ‘general glut’. If there exists an excess demand for one good then there must be an excess supply of another.

- **Key result** => there cannot be a general excess demand or general excess supply at the aggregate level
5.2.3 Walras’s Law

Key Idea => Excess demand in one market should be matched by an excess supply in another market such that in aggregate markets are in equilibrium.
5.2.3 Walras’s Law

- In a market for n-1 goods, if there is equilibrium in n-2 goods, there must be equilibrium in the final market n-1 market.

- If all markets except one clear, the last market must clear also.

- This also implies that the n-1 markets are not independent. At least N-2 equations are independent which is sufficient to work out the relative prices of the goods.

$$\sum_{i=1}^{n-1} p_i E D_i = 0.$$
5.2.4 Introduction of Money & its implications

A new good, money is introduced into the system => N goods in the system

All relative prices are now expressed in terms of the price of money => Pn

\[ \sum_{i=1}^{n-1} p_i D_i + p_n D_n \equiv \sum_{i=1}^{n-1} p_i S_i + p_n S_n. \]

\[ ED_i = f_i \left( \frac{P_1}{P_n}, \frac{P_2}{P_n}, \ldots, \frac{P_{n-1}}{P_n}, Y \right) - S_i^* \]
5.2.4 Introduction of Money & its implications

Key results

• **Walras’s law holds** - If there is equilibrium in the n -1 goods markets then there must be equilibrium in the money market.

• **Say’s law does not necessarily hold** - There can exist a general excess supply in the n-1 goods markets;

• **Absolute Vs Relative Prices** - A change in the absolute price of money will leave relative prices unchanged

• **Money Supply** - A change in money supply will have no impact on the real economy.
Say’s Law at Work
## Supply creates its own demand

<table>
<thead>
<tr>
<th>Gold Supply</th>
<th>500</th>
<th>1000</th>
<th>700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upkeep per unit</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Max no of Units (Supply)</td>
<td>25</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>Target No of units (Demand)</td>
<td>20</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Gold Demand</td>
<td>400</td>
<td>800</td>
<td>800</td>
</tr>
</tbody>
</table>
Changes in absolute vs relative prices

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Minerals =100</th>
<th>Minerals =200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infantry</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Ranged</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Support</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>
5.3 The Classical Dichotomy & money neutrality

- **Relative Price** => Real variables
- **Absolute Price** => Nominal variables

- Excess demand dependent on *relative prices*
- Overall money demand depends on *absolute price levels*

- It can be shown that absolute price changes are independent of relative price changes

- This is caused due to the assumption of homogeneity also known as **Money neutrality**
5.3 Patinkin & the real balance effect

- Addressed the problem that real theory of relative prices and a monetary theory of the level of prices are treated as separate problems.

- Proposed Solution – Include the value of real money balances in the demand identity.

\[
ED_i = f_i \left( \frac{P_1}{P_n}, \frac{P_2}{P_n}, \ldots, \frac{P_{n-1}}{P_n}, Y, \frac{S_n}{P_n} \right) - S^*_i.
\]

- Real money balances are the ratio between nominal money balances and the price level.
5.3 Patinkin & the real balance effect

Price of Goods → Real Money Balances → Demand for Goods → General Price

Money supply → Real Money Balances → D > S → General price
5.3 Patinkin transmission mechanism

- Money Supply
- Excess Supply of money
- Interest Rates
- Excess Demand for Goods

- Price of Goods
- Demand for Money
- Interest rates
5.3 Patinkin transmission mechanism

\[ M_d = (1 + t) P_0 L(r, Y_0) \]

\[ M_d = P_0 L(r, Y_0) \]

\[ M_d = M_s \]

Fig. 29.1
5.3 Patinkin & the real balance effect

**Key Results**

- Under this transmission mechanism, demand for goods change even though relative prices remain unchanged.

- Real balances provide a bridge between the real and monetary sectors of the classical system and dispose of the classical dichotomy.

- However money still remains neutral in this framework. i.e Doubling of money leads to doubling of prices while interest rate remains unchanged.
5.2 Generalized Model for Money
5.4 A Simple general equilibrium framework

Key Identities

Household budget constraint =>

\[ PX + M \leq PX_0 + M_0. \]

Household optimization problem =>

\[
L = X^{1/2} \left( \frac{M}{P} \right)^{1/2} + \lambda \left( X_0 + \frac{M_0}{P} - X - \frac{M}{P} \right)
\]

Optimal Demand =>

\[
X = \frac{X_0 + M_0/P}{2} \quad \text{and} \quad M = \frac{PX_0 + M_0}{2}
\]

Equation for price level =>

\[ P = \frac{M_0}{X_0}. \]
5.4 A Simple general equilibrium framework

Implications

• Real output of households is fixed at X0 as it depends on endowments

• In this framework money is neutral - a change in the money supply will only lead to a proportional increase in prices.
Recap & Learning outcomes

- define and explain the term ‘neutrality of money’
- describe the essential features and predictions of the quantity theory of money
- describe the main features of the classical system and the classical dichotomy
- discuss the implications of Walras’ law in the determination of general equilibrium
- state the nature and importance of Patinkin’s real balance effect for the internal consistency of the classical dichotomy.
End of Chapter Questions
Further Reading

Journals & Notes

• Detailed note on Patinkin Real Balance effects
• Laidler – Quantity theory of money is always and everywhere a controversial one

Videos

• Overview of Say’s Law
• Walras’s Law
• Overview of Economic schools of thought