Chapter 3

The demand for money
Learning Outcomes

➢ Determinants of money demand

➢ Modelling Money demand - Micro
  ➢ Keynes’ – Liquidity preference model
  ➢ Baumol-Tobin – Inventory Theoretic model
  ➢ Tobin – Portfolio Selection

➢ Modelling Money demand - Macro
  ➢ General set of money demand equations

➢ Empirical evidence of money demand functions – The case of missing money
Why do people demand money?
3.1 Determinants of the demand for money

- Interest rate Differentials
- Transaction costs
- Price Uncertainty of assets
- Expected pattern of expenditure and receipts
### 3.1 Determinants of the demand for money

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Demand For Money</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interest Differentials</td>
<td></td>
</tr>
<tr>
<td>2. Transaction Costs</td>
<td></td>
</tr>
<tr>
<td>3. Price Uncertainty of assets</td>
<td></td>
</tr>
<tr>
<td>4. Expected pattern of expenditure and receipts</td>
<td></td>
</tr>
</tbody>
</table>
3.2 Keynes – Drivers of demand

Transaction Motive

Precautionary Motive

Speculative Motive
Modelling money demand - Micro
Two Views on Money

1. Keynes liquidity preference model

2. Baumol – Tobin Inventory Theoretic Model

3. Tobin’s portfolio selection model
3.2 Model 1 - Keynes liquidity preference model

Assumptions

- Individuals held their expectations of interest rate movements with certainty.
- People want to hold as little money as possible given the lower return

Conclusion

- People Will either hold as little cash as possible or everything as cash
3.2 Keynes liquidity preference

The Problem => The Plunger Problem
3.2 Shortcomings of Keynes’s model

- **Weakness 1** - Interest rates are sticky

- This may be due to the high transaction costs involved in moving money in and out of bonds

*Source: Tobin (1958) – Liquidity preference as behavior towards risk*
3.2 Shortcomings of Keynes's model

• **Weakness 2** - Differences of opinion on the interest rate

*Source: Tobin (1958) – Liquidity preference as behavior towards risk*
3.3 Model 2 - Baumol – Tobin - Inventory theoretic approach

**Setup**

- The Individuals has to meet a Total expenditure \((T)\) which is pread equally over a given period

- The individual salary is held in the Bank in the form of bonds which earns an interest rate of \(i\) per period.

- In order to meet expenses the individual visits the bank and withdraws amount \(Z\) as Cash

- The objective is to choose the number of times she transfers between the stock of bonds and cash that maximises profits, or equivalently minimises costs.
3.3 Model 2 - Baumol – Tobin- Inventory theoretic approach

The Costs of Visiting the Bank

- Transactions Costs per Visit \((b)\)
- Interest rate foregone \((i)\)

Objective

- The objective is to choose how much money is withdrawn each time you visit the bank in order to minimize the cost.
3.3 Baumol – Tobin- Inventory theoretic approach

Key identities

\[
\min_z C = \frac{bT}{Z} + \frac{iZ}{2}.
\]
3.3 Baumol – Tobin- Inventory theoretic approach

Key identities

\[ M = \frac{Z}{2} = \sqrt{\frac{bT}{2i}}. \]

The effect on optimal money demand

- Brokerage Fee
- Interest Rates
- Income
Question 12

A treasurer has to manage the cash position of a small London college. At the beginning of the year the college receives £5 million in tuition fees. The college is expected to spend all of that money in the year, at an approximately constant daily rate. The treasurer can either hold the financial wealth of the college in bonds, yielding an interest rate of 4% or in cash, which is assumed to not receive any interest. The accrued interest on the bond holdings is received at the end of the year and is not compounded inbetween. The brokerage fees of exchanging bonds for money are £1,000 per transaction. Note that the first transaction takes place at the beginning of the year, when the treasurer buys bonds, the transactions during the rest of the year will compose of selling bond holdings. The treasurer wants to minimize the costs of cash management, \( C \), which are composed of the interest foregone on the cash holdings and the brokerage fees.
**Application – Activity 3.1**

**Activity 3.1** A taxi driver takes £15,000 net over the course of a year, at an approximately constant daily rate. He spends 80% of his takings on consumption goods, also at an approximately constant daily rate, but saves the remainder to pay for a world cruise at the end of the year. He can hold his savings in a deposit account in a bank paying 4% per annum, with costless deposits and withdrawals, or he can purchase bonds paying a known yield of 7%. The brokerage fee in purchasing or selling bonds is £5 per transaction. Assume the taxi driver manages his finances optimally by making \( n \) transactions, \( n - 1 \) of these being purchases of bonds spaced equally through the year, and the \( n \)-th transaction being the sale of bonds at the end of the year to pay for the world cruise.

(a) Draw the time profile of the taxi driver’s holdings of deposits and bonds.

(b) What is the optimal value of \( n \)? (Note that \( n \) must be a whole number.)

(c) What is the taxi driver’s ‘demand for money’, or average deposit balance? (For Feedback, see the end of this chapter.)
3.3 Baumol – Tobin- Inventory theoretic approach

Shortcomings of the model

- Assumes that the pattern of expenditure and receipts is known perfectly

- Does not correspond with the micro level empirical evidence of the balances held by the firms – Miller & Orr (1966)
3.3 Baumol – Tobin - Inventory theoretic approach

Miller & Orr (1966) – A Hybrid model

- Cash is allowed to wander freely until an upper or lower bound is reached, at which point cash is restored to the optimal level.
3.4 Model 3 - Tobin- Portfolio selection

Setup

The individuals objective is to determine the optimal weight to be placed in money and bonds in order the risk adjusted return

- **B** – Weight placed in bonds
- **1-B** - Weight placed in Money

\[
\text{Money} \sim (0, 0) \\
\text{Bonds} \sim (\mu, \sigma^2).
\]

\[
\text{Portfolio} \sim (0 \cdot (1 - B) + \mu \cdot B, 0 \cdot (1 - B)^2 + \sigma^2 B^2) = (\mu B, \sigma^2 B^2).
\]
3.4 Tobin- Portfolio selection

- The individual maximize wealth at the point where the individuals utility function is tangent to the budget constraint
3.4 Tobin- Portfolio selection

Advantages

- Solved the Keynes plunger problem
- Captures the economic reality that people diversify their wealth into more than just one asset.
3.4 Tobin- Portfolio selection

Other Issues

• Risk Aversion
  • Diversifiers – Concave upward sloping
  • Plungers – Convex or linear upward sloping

• Changes to Interest rates
  • Substitution Effect
  • Income Effect

• Changes in perceived risk
Modelling money demand - Macro
3.5 Review – LM Curve

Money Demand =>

\[ \frac{M^d}{P} = h_0 + h_1 Y - h_2 i, \quad h_1 \geq 0, \quad h_2 \geq 0 \]

- positively related to income and negatively related to the nominal interest rate.

Money Supply = >

\[ \frac{M^s}{P} = \frac{M}{P}, \]

- assumed to be independent from the interest rate and directly controlled by the central bank.
3.5 LM Curve

\[ i^* = \frac{1}{h_2} \left( h_0 - \frac{M}{P} \right) + \frac{h_1}{h_2} Y^*. \]

- H1 – Sensitivity of Money demand to income
- H2 – Sensitivity of money demand to interest rates.

Scenarios
- H2 high – Shallower LM curve
- H2 Low – Steeper LM Curve
- H2 zero – LM curve vertical – Classical Case
- H2 => infinite – LM curve Horizontal – Liquidity trap
3.5 Macroeconomic determinants of money demand

Money Demand = \[ M^d = f(Y, R_i, W). \]

- Y acts as a proxy for the level of transactions undertaken
- Ris represent the opportunity cost of holding money
- Wealth (W) is included as it forms the budget constraint on which the choice of money holdings depends but since wealth is capitalised current and future income, it is not independent of Y
3.5 Macroeconomic determinants of money demand

Common Log linear function of Money demand

\[
\left( \frac{M}{P} \right)^d = g(y, R_i) = \Rightarrow m_t - p_t = ay_t - bR_t
\]

Where a & b are the elasticity's with respect to income and the interest rate

Views on elasticity

- **Classical** => low b => Steep LM curve => Monetary Policy more effective
- **Keynesian** => High b => Shallow LM curve => Fiscal Policy more effective
3.6 The stability of the money demand function

- The Money demand function is only useful so long as money demand is stable

- The stability of money demand can only be determined by statistical analysis of the relevant data
The mystery of the Missing Money

“I seek it here, I seek it there; That demand for money, it’s just nowhere.”

- Robert Lawrence
3.7 The mystery of the Missing Money

STEPHEN M. GOLDFELD
Princeton University

The Case of the Missing Money

The relation between the demand for money balances and its determinants is a fundamental building block in most theories of macroeconomic behavior. Since it is also a critical component in the formulation of monetary policy, it is not surprising that the money-demand function has been subjected to extensive empirical scrutiny. The evidence that emerged, at least prior to 1974, suggested that only a few factors (essentially income and interest rates, with due allowance for lags) were needed to explain adequately the quarterly movements in money demand. There were episodes that, during their course, gave the impression that the money-demand function was shifting. On the whole, however, in the time allowed for final data revisions by a “wait and see” attitude, the apparent puzzles tended to clear up.¹
3.7 The case of the Missing Money

Goldfeld (1973) model specification

\[
\ln \left( \frac{M}{P} \right)_t = b_0 + b_1 y_t + b_2 R_t + b_3 \ln \left( \frac{M}{P} \right)_{t-1} + u_t
\]

- Initial results were promising - The conventional equation exhibits no marked instabilities, in either the short run or the long run
### 3.7 The case of the Missing Money

Table 2. Actual and Forecast Values and Simulation Errors for Conventional Money-Demand Equation, Quarterly, 1974:1–1976:2

<table>
<thead>
<tr>
<th>Year and quarter</th>
<th>Currency plus demand deposits, $M_1$</th>
<th>Error</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual</td>
<td>Forecast</td>
<td>Dynamic</td>
</tr>
<tr>
<td>1974:1</td>
<td>244.4</td>
<td>245.6</td>
<td>-1.2</td>
</tr>
<tr>
<td>2</td>
<td>241.2</td>
<td>244.1</td>
<td>-3.0</td>
</tr>
<tr>
<td>3</td>
<td>236.7</td>
<td>242.5</td>
<td>-5.8</td>
</tr>
<tr>
<td>4</td>
<td>232.3</td>
<td>241.8</td>
<td>-9.5</td>
</tr>
<tr>
<td>1975:1</td>
<td>226.9</td>
<td>241.6</td>
<td>-14.7</td>
</tr>
<tr>
<td>2</td>
<td>228.6</td>
<td>242.6</td>
<td>-14.0</td>
</tr>
<tr>
<td>3</td>
<td>228.7</td>
<td>243.8</td>
<td>-15.1</td>
</tr>
<tr>
<td>4</td>
<td>226.1</td>
<td>245.4</td>
<td>-19.4</td>
</tr>
<tr>
<td>1976:1</td>
<td>225.9</td>
<td>248.2</td>
<td>-22.3</td>
</tr>
<tr>
<td>2</td>
<td>227.9</td>
<td>250.3</td>
<td>-22.3</td>
</tr>
</tbody>
</table>

Source: Based on equation in first row of Table 1. Figures are rounded.

Source: Goldfeld, The Case of the Missing Money
3.6 The case of the missing money

Possible Explanations

• **Financial Innovation** – Brokerage fees associated with transacting money declined leading people to hold lower money balances.

• **Oil Shocks** – This meant that the opportunity cost of holding money increased and was eventually so large that it became worthwhile for cash managers to find more efficient ways of holding cash balances, allowing more wealth to be put into interest-earning assets.

• **Misspecified Model** – This is a reduced form equation.

• **Structural Breakdown** – Shift in the monetary policy stance in the U.S.
Recap & Review
Recap & Learning outcomes

- explain why it is important to study the demand for money
- describe the four main microeconomic determinants of money demand
- outline the inventory theoretic model of Baumol–Tobin and the portfolio selection model of Tobin
- discuss why Tobin’s model solves the ‘plunger’ problem of the demand for money model of Keynes
- describe the general set-up of macroeconomic money demand equations
- discuss empirical evidence on money demand functions, especially on the income and interest elasticities
- describe what happened and what is meant by ‘the case of the missing money’ and give reasons for the breakdown of the estimated money demand equations.
Further Reading

Journals

- **Baumol** – Inventory Theoretic Model
- **Tobin** – Liquidity preference model
- **Miller, Orr** – Determinants of Money demand
- **Goldfeld** – The case of the missing money

[https://core.ac.uk/download/pdf/6252317.pdf](https://core.ac.uk/download/pdf/6252317.pdf)
End of Chapter Questions