Lecture 15: The Demand For Money

- The Quantity Theory of Money
- Liquidity Preference Theory
- Baumol-Tobin Model

### Big Concepts

- The Classical View of the Demand for Money
- The importance of Velocity
- The Liquidity Preference View
- Tobin’s (Transaction) View
- Friedman’s modern rendition of the Quantity Theory

**Quantity Theory of Money (Revisited)**

- Irving Fisher (1911): examined the relationship between the total quantity of money, and the total (nominal) amount of spent on final goods and services

- The Cambridge Equation (or “Equation of Exchange”):
  \[ MV = PY \]

- where \( M \) is money, \( V \) is Velocity, \( P \) is the average Price Level, and \( Y \) is real GDP

**Velocity**

Recall our definition:

Velocity, \( V \), represents the number of times per year that a dollar is used in buying the total amount of goods and services produced in the economy

\[
V = \frac{P \times Y}{M}
\]
Classical View of Quantity Theory

- Irving Fisher: Velocity constant in the short run
  \[ M \overline{V} = PY \]
- With V constant:
  - Nominal income, PY determined by M
- Classical View: No rigidities in economy, i.e. wages and prices are flexible. Hence aggregate output, Y, determined by real side of economy.
- Implication: Changes in M determines changes in P

Note: These lecture notes are incomplete without having attended lectures

Quantity Theory of Money Demand

\[ M = \frac{1}{V} \times PY \]

- Re-writing the Cambridge equation as above, shows how it is a theory of the demand for money.
- Since in a money market equilibrium \( M^S = M^d \), we can replace M (=\( M^S \)) in the equation above for \( M^d \) and rewrite is as: \( M^d = k \times PY \)
- Fisher’s Quantity Theory implies that the demand for money, is purely a function of income; interest rates have no effect on the demand for money.

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Cambridge Approach

Question: Is velocity constant?

- Classicals thought V constant because they didn’t have good data
- After Great Depression, economists realized velocity far from constant

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Change in Velocity: 1960–2010

Observe: 1) Large short run fluctuations in velocity
(2) Long run stability
Money Demand

Two types of theories
- **Transactions theories**
  - emphasize “medium of exchange” function
  - relevant for \( M_1 \)

- **Portfolio theories**
  - emphasize “store of value” function
  - relevant for \( M_2, M_3 \)
  - not relevant for \( M_1 \). (As a store of value, \( M_1 \) is dominated by other assets.)

Keynes’s Liquidity Preference Theory

Liquidity Preference Theory: why do people hold money?

Recall functions of Money:
- Medium of Exchange
- Unit of Account
- Store of Value

Demand for Real Money Balances

- Three motives for people holding money:
  1. Transactions motive (arising from medium of exchange function):- related to \( Y \)
  2. Precautionary motive: - related to \( Y \)
  3. Speculative motive (arising from store of wealth function):-
     A. related to Wealth and \( Y \)
     B. negatively related to \( i \)

- Liquidity Preference Function:
  \[
  \frac{M^d}{P} = f\left( i, Y \right)
  \]

Keynes’s Liquidity Preference Theory

Implication: Velocity not constant
\[
\frac{P}{M^d} = \frac{1}{f(i, Y)}
\]

Multiply both sides by \( Y \) and substitute in \( M = M^d \)
\[
V = \frac{PY}{M} = \frac{Y}{f(i, Y)}
\]

1. \( i \uparrow, f(i, Y) \downarrow, V \uparrow \)
2. Change in expectations of future \( i \), change \( f(i, Y) \) and \( V \) changes
Baumol-Tobin Model of Transactions
Demand: The Intuition

A transactions theory of money demand

Assumptions:
- Income of $1000 each month
- Can hold two assets:
  - Money
  - Bonds

If keep all income in cash:
- Yearly income = $12,000
- Average money balances = $1000/2
- Velocity = $12,000/$500 = 24

Trade-off of keeping less cash:
- Income gain = $500/2
- Increased transactions costs

The Baumol-Tobin Model

- Notation:
  - $Y$ = total spending, done gradually over the year
  - $i$ = interest rate on savings account
  - $N$ = number of trips consumer makes to the bank to withdraw money from savings account
  - $F$ = cost of a trip to the bank (e.g., if a trip takes 15 minutes and consumer’s wage = $12/hour, then $F = $3$)

Money holdings over the year

Money holdings

$Y$

1

Time

Average

$N = 1$

$= \frac{Y}{2}$

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Money holdings over the year

Money holdings over the year

The cost of holding money

Finding the cost-minimizing $N$

- In general, average money holdings = $Y/2N$
- Foregone interest = $i \times (Y/2N)$
- Cost of $N$ trips to bank = $F \times N$
- Thus,

  \[
  \text{total cost} = i \times \frac{Y}{2N} + F \times N
  \]

- Given $Y$, $i$, and $F$, consumer chooses $N$ to minimize total cost
Finding the cost-minimizing $N$

\[
\text{total cost} = i \times \frac{Y}{2N} + F \times N
\]

- Take the derivative of total cost with respect to $N$, set it equal to zero:

\[
-\frac{iY}{2N^2} + F = 0
\]

- Solve for the cost-minimizing $N^*$

\[
N^* = \sqrt{\frac{iY}{2F}}
\]

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The money demand function

- The cost-minimizing value of $N$:

\[
N^* = \sqrt{\frac{iY}{2F}}
\]

- To obtain the money demand function, plug $N^*$ into the expression for average money holdings:

\[
\text{average money holding} = \sqrt{\frac{YF}{2i}}
\]

- Money demand depends positively on $Y$ and $F$, and negatively on $i$.

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The money demand function

- The money demand function:

\[
(M/P)^d = \sqrt{\frac{YF}{2i}} = L(i, Y, F)
\]

So, the Baumol-Tobin (B-T) money demand:

- shows how $F$ affects money demand.
- implies:
  - income elasticity of money demand = 0.5,
  - interest rate elasticity of money demand = −0.5

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Conclusions:

- The higher is $i$ and income gain from holding bonds, the less likely to hold cash: Therefore $i \uparrow$, $M^d \downarrow$

- Higher is income, $Y$, the higher is the demand for money, $M^d$

- The higher is the cost of a trip to the bank, $F$, the higher is the demand for money, $M^d$

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EXERCISE: The impact of ATMs on money demand

During the 1980s, automatic teller machines became widely available.

How do you think this affected $N^*$ and money demand? Explain.

Financial Innovation, Near Money, and the Demise of the Monetary Aggregates

• Examples of financial innovation:
  ➢ many checking accounts now pay interest
  ➢ very easy to buy and sell assets
  ➢ mutual funds are baskets of stocks that are easy to redeem - just write a check

• Non-monetary assets having some of the liquidity of money are called near money.

• Money & near money are close substitutes, and switching from one to the other is easy.

Financial Innovation, Near Money, and the Demise of the Monetary Aggregates

• The rise of near money makes money demand less stable and complicates monetary policy.

• 1993: the Fed switched from targeting monetary aggregates to targeting the Federal Funds rate.

• This change may help explain why the U.S. economy was so stable during the rest of the 1990s.

Precautionary Demand $Md$

Precautionary Demand

Similar tradeoff to Baumol-Tobin framework:
• Benefits of precautionary balances
• Opportunity cost of interest foregone

Conclusion:

$i \uparrow$, opportunity cost $\uparrow$, hold less precautionary balances, $Md \downarrow$
Speculative Demand $M^d$

Problems with Keynes’s framework:
Hold all bonds or all money: no diversification

Tobin’s Model

Tobin Model:
1. People want high $R^e$, but low risk
2. As $i \uparrow$, hold more bonds and less $M$, but still diversify and hold $M$

Problem with Tobin model: No speculative demand because T-bills have no risk (like money) but have higher return

A Simple Portfolio Theory

• Demand for money depends on expected return vis a vis other assets

\[
(M/P)^d = L(r_s, r_b, \pi^e, W),
\]

where
- $r_s$ = expected real return on stocks
- $r_b$ = expected real return on bonds
- $\pi^e$ = expected inflation rate
- $W$ = real wealth

Friedman’s Modern Quantity Theory

Theory of asset demand: $M^d$ function of wealth ($Y_p$) and relative $R^e$ of other assets

\[
\frac{M^d}{P} = f(Y_p, r_b - r_m, r_e - r_m, \pi^d - r_m)
\]

Differences from Keynesian Theories:
1. Other assets besides money and bonds: equities and real goods
2. Real goods as alternative asset to money implies $M$ has direct effects on spending
3. $r_m$ not constant: $r_b \uparrow, r_m \uparrow, r_b - r_m$ unchanged, so $M^d$ unchanged: i.e., interest rates have little effect on $M^d$
4. $M^d$ is a stable function
Friedman’s Modern Quantity Theory

• Implication of 3:

\[ \frac{M^d}{P} = f(Y_P) \Rightarrow V = \frac{Y}{f(Y_P)} \]

• Since relationship of \( Y \) and \( Y_P \) predictable, 4 implies \( V \) is predictable: Get Quantity theory view that change in \( M \) leads to predictable changes in nominal income, \( PY \)

Empirical Evidence on Money Demand

Interest Sensitivity of Money Demand
Is sensitive, but no liquidity trap

Stability of Money Demand
1. \( M1 \) demand stable till 1973, unstable after
2. Most likely source of instability is financial innovation
3. Cast doubts on money targets

Summary

1. Fisher’s Quantity Theory implies that the demand for money, is purely a function of income; interest rates have no effect on the demand for money.

2. The demand for money depends on
   – Transaction motive
   – Precautionary motive
   – Speculative Motive

3. Various theories of demand for money can be classified as either:
   – Transaction theories
   – Portfolio theories

4. The Baumol-Tobin model
   – A transactions theory of money demand, stresses “medium of exchange” function
   – Money demand depends positively on spending, negatively on the interest rate, and positively on the cost of converting non-monetary assets to money

5. Portfolio theories of money demand
   – Stress the store of value function
   – Posit that money demand depends on risk/return of money & alternative assets

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