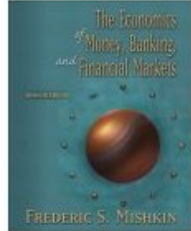


ECON 354  
Money and Banking

Professor Yamin Ahmad

Lecture 7: 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

Note: These lecture notes are incomplete without having attended lectures

## 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

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## 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

$$V \equiv \frac{T}{M} \approx \frac{P \times Y}{M}$$

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## Classical View of Quantity Theory

- Irving Fisher: Velocity constant in the short run

$$M\bar{V} = PY$$

- 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

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## 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<sup>S</sup>) in the equation above for M<sup>d</sup> 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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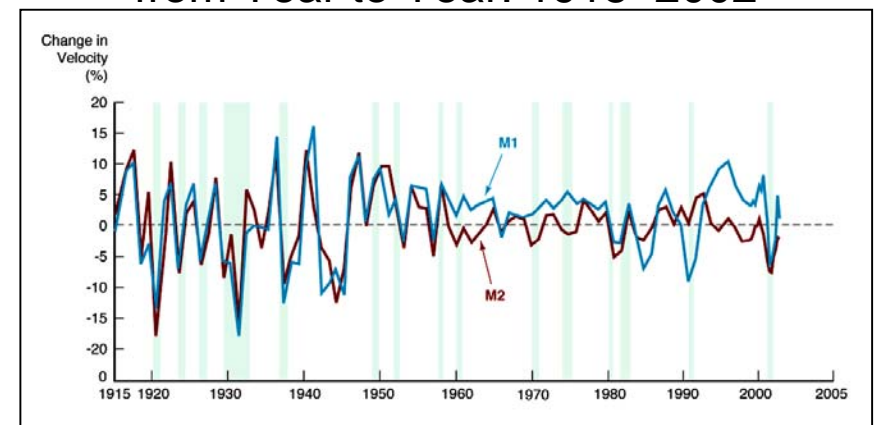
## Cambridge Approach

Question: Is velocity constant?

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

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## Change in Velocity from Year to Year: 1915–2002



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

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# Money Demand

## Two types of theories

- **Transactions theories**
  - emphasize “medium of exchange” function
  - relevant for  $M1$
- **Portfolio theories**
  - emphasize “store of value” function
  - relevant for  $M2$ ,  $M3$
  - not relevant for  $M1$ . (As a store of value,  $M1$  is dominated by other assets.)

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# 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

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# 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:  $\frac{M^d}{P} = f\left(\begin{matrix} i \\ - \\ Y \\ + \end{matrix}\right)$

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# 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

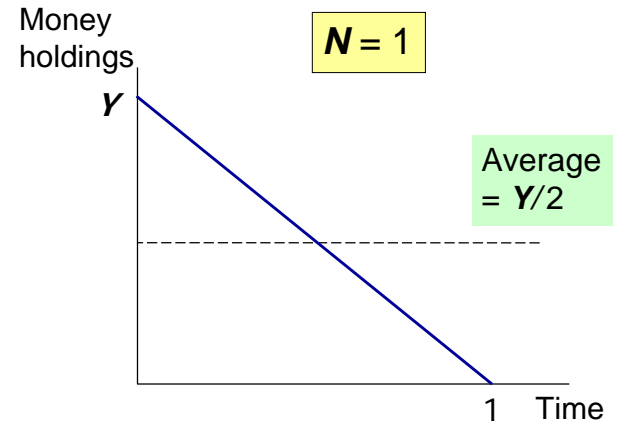
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# The Baumol-Tobin Model

- 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  $F = \$3$ )

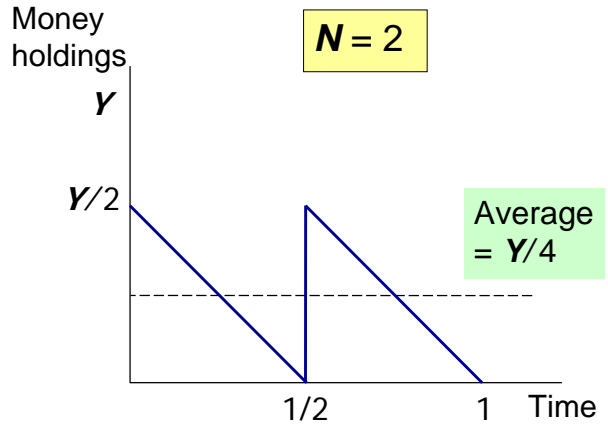
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# Money holdings over the year



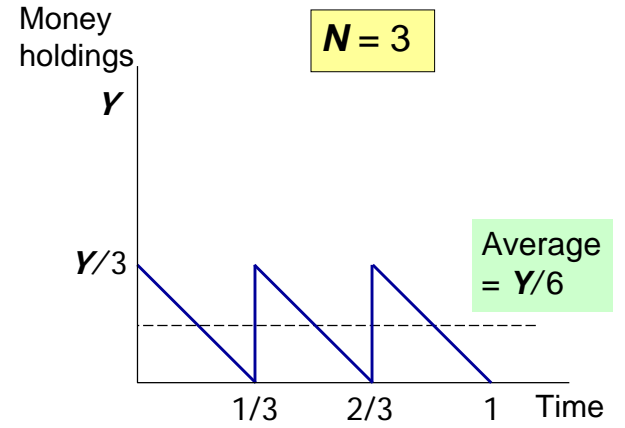
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# Money holdings over the year



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# Money holdings over the year



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## The cost of holding money

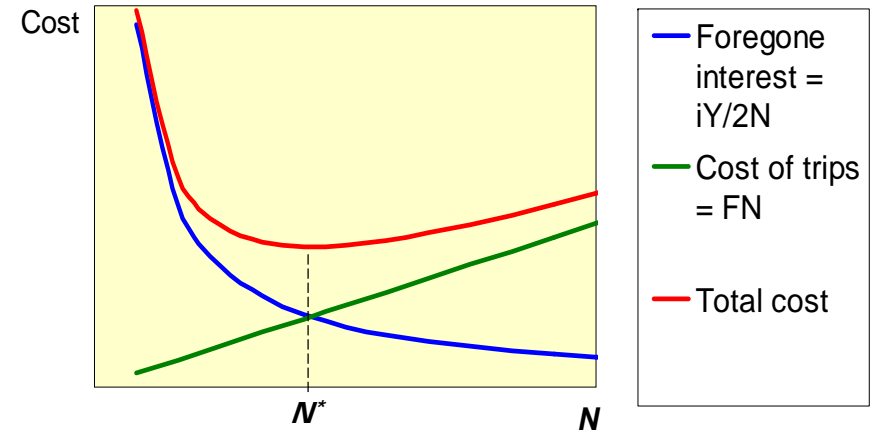
- In general, average money holdings =  $Y/2N$
- Foregone interest =  $i \times (Y/2N)$
- Cost of  $N$  trips to bank =  $F \times N$
- Thus,

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

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

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## Finding the cost-minimizing $N$



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## 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 Baumol-Tobin 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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## Baumol-Tobin Model

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

### 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.

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#### 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.

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## 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.

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## Precautionary Demand $M^d$

### 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,  $M^d \downarrow$

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## 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

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## A Simple Portfolio Theory

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

$$(M/P)^d = L(\underset{-}{r_s}, \underset{-}{r_b}, \underset{-}{\pi^e}, \underset{+}{W}),$$

where

$r_s$  = expected real return on stocks

$r_b$  = expected real return on bonds

$\pi^e$  = expected inflation rate

$W$  = real wealth

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## Friedman's Modern Quantity Theory

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

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

### 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

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## 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,  $PY$

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## 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

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## 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

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## Summary

### 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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