

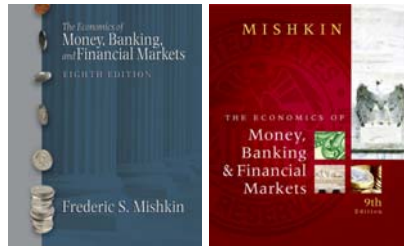


ECON 354 Money and Banking

Professor Yamin Ahmad

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

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

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

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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^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

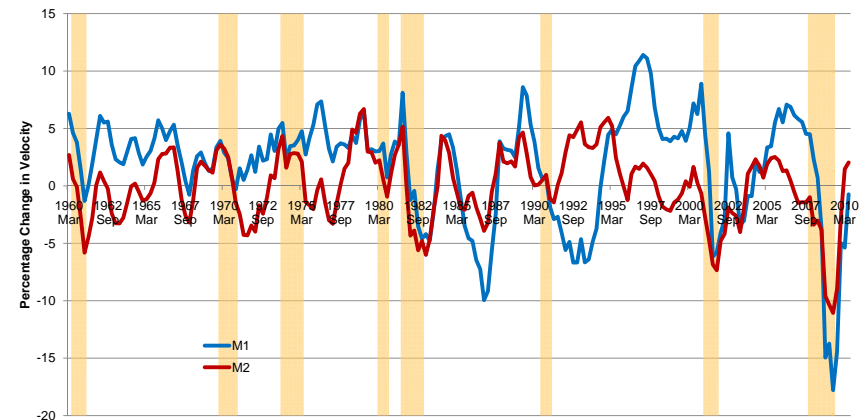
Question: Is velocity constant?

- Classicals thought V constant because 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

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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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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

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Baumol-Tobin Model of Transactions Demand: The Intuition

Keep only 1/2 payment in cash:

- Yearly income = \$12,000
- Average money balances = \$500/2 = \$250
- Velocity = \$12,000/\$250 = 48

Trade-off of keeping less cash:

- Income gain = $i \times \$500/2$
- Increased transactions costs

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The Baumol-Tobin Model

• Notation:

Y = total spending, done gradually over the year

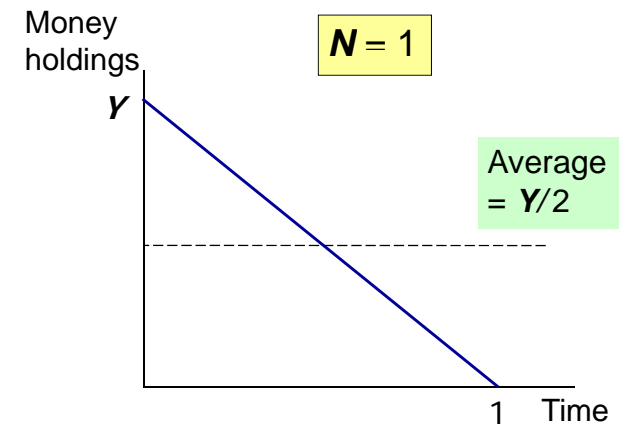
i = interest rate on savings account

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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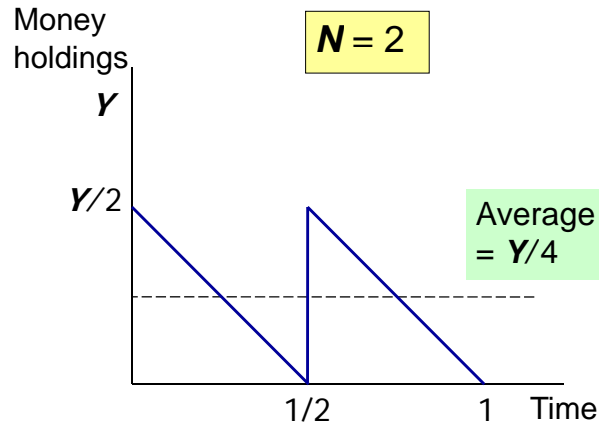
Money holdings over the year



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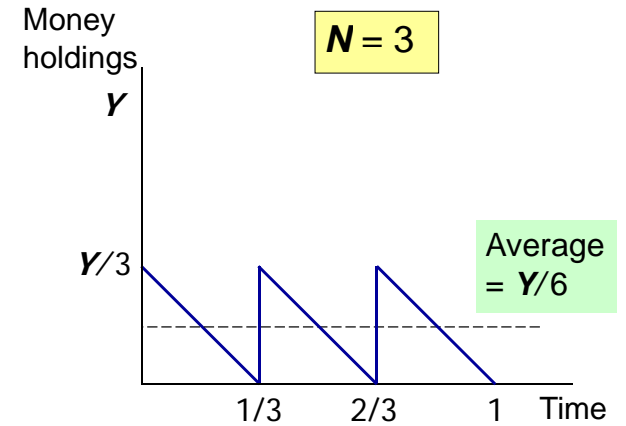
Money holdings over the year



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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,

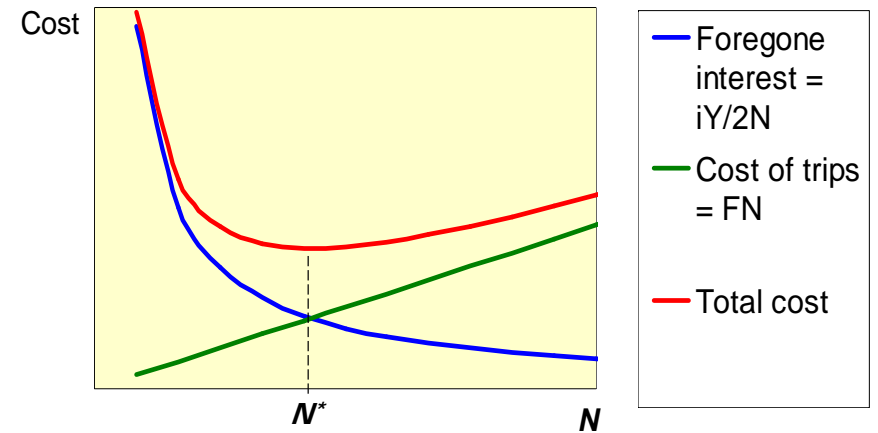
$$\text{total cost} = i \times \frac{Y}{2N} + F \times N$$

- 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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Speculative Demand M^d

Problems with Keynes's framework:

Hold all **bonds** or all **money**: no diversification

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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

π^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

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

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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