

ECON 352 - MONEY, BANKING, PRICE, AND MONETARY POLICY

(See Williamson Ch. 12)

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INTRODUCTION

- ▶ Thus far our model is “real”—no money
- ▶ But money helps overcome frictions and itself may open the door to new frictions
- ▶ So let's try to put in money
- ▶ Most important relationship between real and nominal worlds: the Fisher relation
- ▶ But first: what is money?

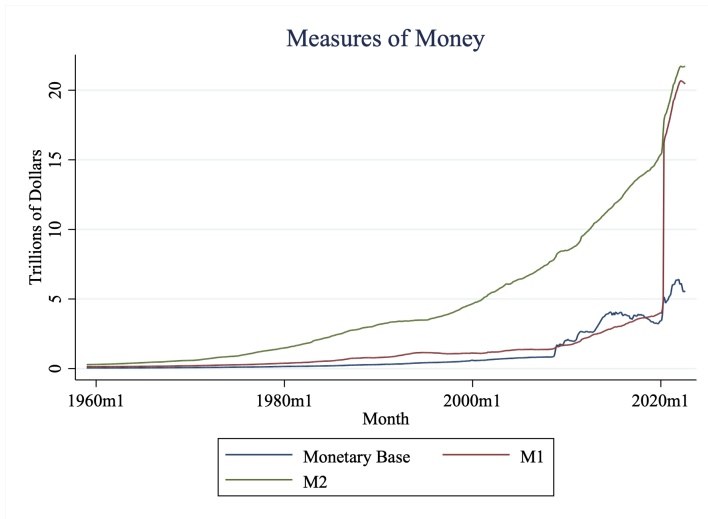
WHAT IS MONEY?

- ▶ Money has three functions:
 1. Medium of exchange: it's used to transact
 2. Store of value: money today can be used tomorrow
 3. Unit of account: we measure things in it
- ▶ The most important role is as a medium of exchange—stocks & bonds are stores of value
- ▶ How do we measure it?

DEFINITIONS OF MONEY

- ▶ Many measures of money
 - ▶ M0, physical currency
 - ▶ Monetary Base: physical currency + bank deposits at Fed
 - ▶ M1: M0 + demand deposits at bank
 - ▶ M2: M1 + savings deposits, money market mutual funds
- ▶ Let's look at MB, M1, M2

MONEY OVER TIME



Monetary base was higher than physical currency & demand deposits briefly, because bank deposits at Fed (unrelated to demand deposits) were higher

QUANTITY OF MONEY

- ▶ While the amounts of money have risen precipitously, it isn't a major focus of central bankers, as we'll see
- ▶ Instead, M will be treated as residual of another choice, rather than something to be controlled directly
- ▶ Rather than thinking about money demand directly, we'll first establish a relationship between real interest rates, nominal interest rates, and inflation, then about money demand

FISHER RELATION

- ▶ Now, we have dollar assets.
- ▶ Call the “real” rate of interest r , the “nominal” rate of interest R , and the inflation rate i .
- ▶ Define the net inflation rate as the net change in the price level:

$$i = \frac{P' - P}{P}$$

- ▶ Invest \$1 today, get back $1+R$ dollars tomorrow. In real terms, invest real $1/P$ real goods today to get $(1+R)/P'$ tomorrow:

$$1 + r = \frac{\frac{1+R}{P'}}{1/P} = \frac{1+R}{\frac{P'}{P}} = \frac{1+R}{1+i}$$

- ▶ This is known as the Fisher relation, which we sometimes write as:

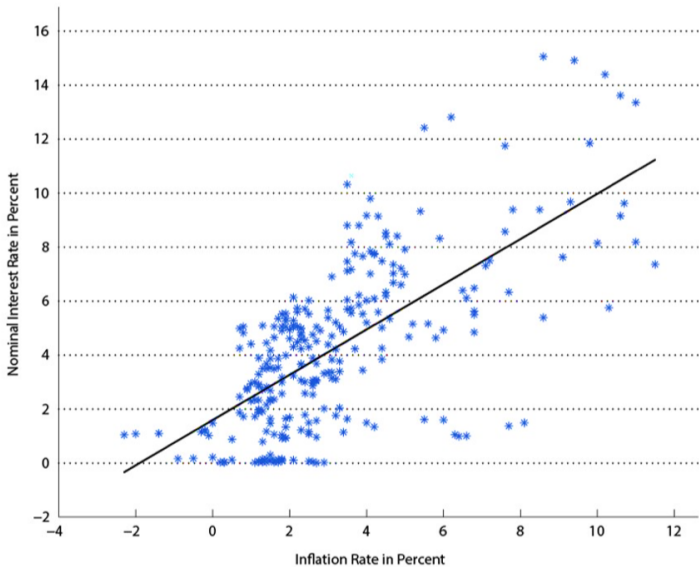
$$r = R - i$$

- ▶ This is a definition! Now the effect.

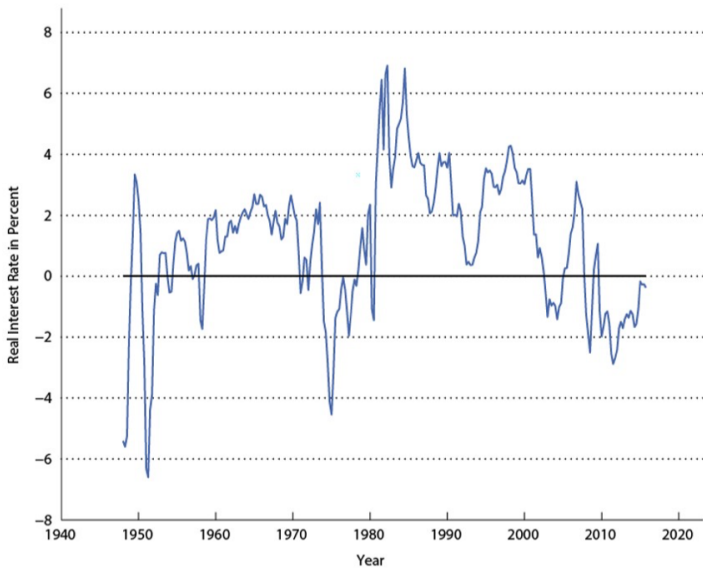
FISHER EFFECT

- ▶ Fisher effect: $\frac{dR}{di} \Big|_{r=\bar{r}} = 1$, nominal interest rates will follow inflation, if real rates are set by real economy/MPK
- ▶ Let's do a scatterplot with i on the x-axis and R on the y-axis
- ▶ We'll also show the real interest rate, calculated as $r = R - i$

FISHER EFFECT



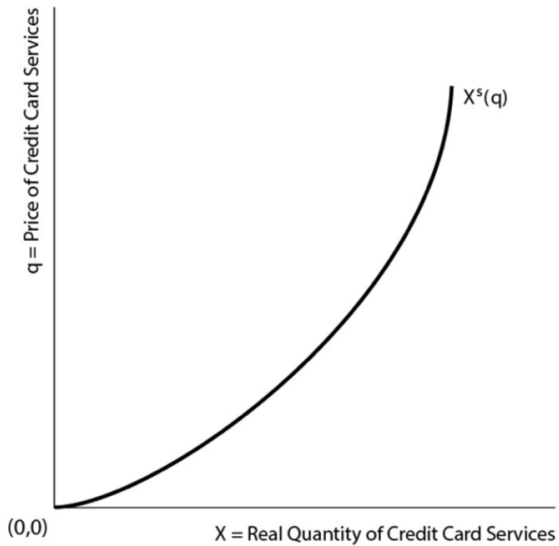
REAL INTEREST RATE



BANKS AND METHODS OF PAYMENT

- ▶ We need a market for money
- ▶ But there are many definitions of money!
- ▶ We'll have two big ones: actual currency (dollars and cents) and “other”
- ▶ Other means checks (15%), debit cards (38%), credit cards (21%), prepaid cards (7%), and ACH transfers (18%)
- ▶ We'll collapse all those “other” into “credit cards,” which just means banks acting as an intermediary to create IOUs
- ▶ Credit cards cost money to operate, and so sell for some price q . Credit card supply curve is thus $X^s(q)$

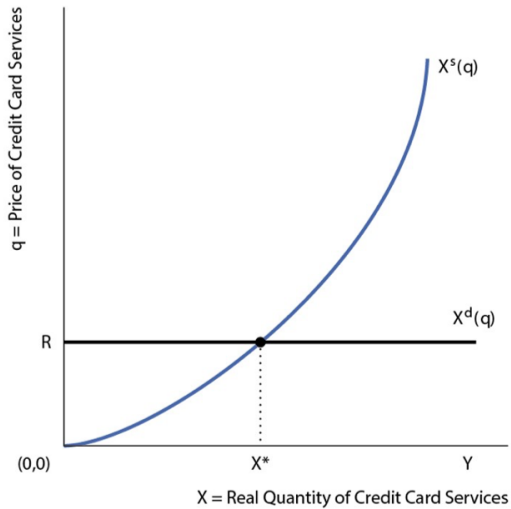
CREDIT SUPPLY



CREDIT DEMAND

- ▶ Households have spending Y , and purchase $X^d(q)$ of it with credit cards, and $Y - X^d(q)$ in cash
- ▶ What is marginal benefit, marginal cost of credit?
- ▶ If purchase with credit, then over course of month make $P(1 + R)$, but must pay $P(1 + q)$ units to the credit card company
- ▶ Can see that for households to be on interior solution (do both) need $q = R$, perfectly elastic demand
- ▶ Now we have equilibrium

CREDIT SUPPLY & DEMAND



EQUILIBRIUM

- ▶ What happens when nominal interest rates rise?
- ▶ Benefit to using credit increases
- ▶ Demand shifts up, so we shift out on the credit supply curve
- ▶ And we can write money demand as the amount of dollars we need for our non-credit transactions, where X^* is the equilibrium credit demand/supply:

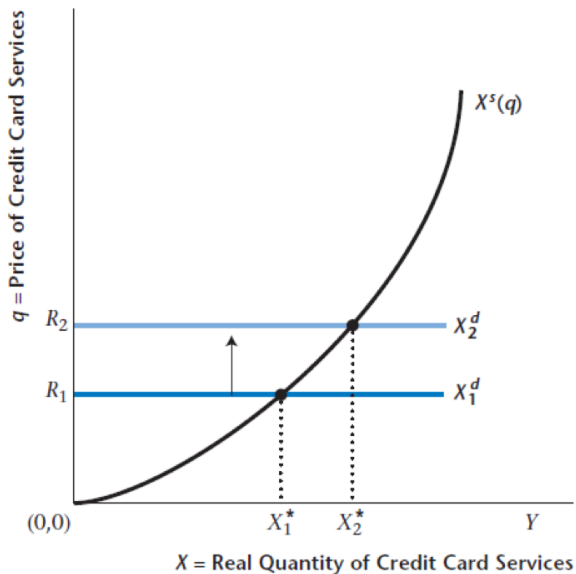
$$M^D = P(Y - X^*(R))$$

- ▶ Which we can instead write using the real money demand function L as:

$$M^D = PL(Y, R)$$

- ▶ Money demand is increasing in Y and decreasing in R

EFFECT OF NOMINAL INTEREST RATE ON CREDIT



MONEY DEMAND

- ▶ Money demand is:

$$M^D = PL(Y, R)$$

- ▶ Or:

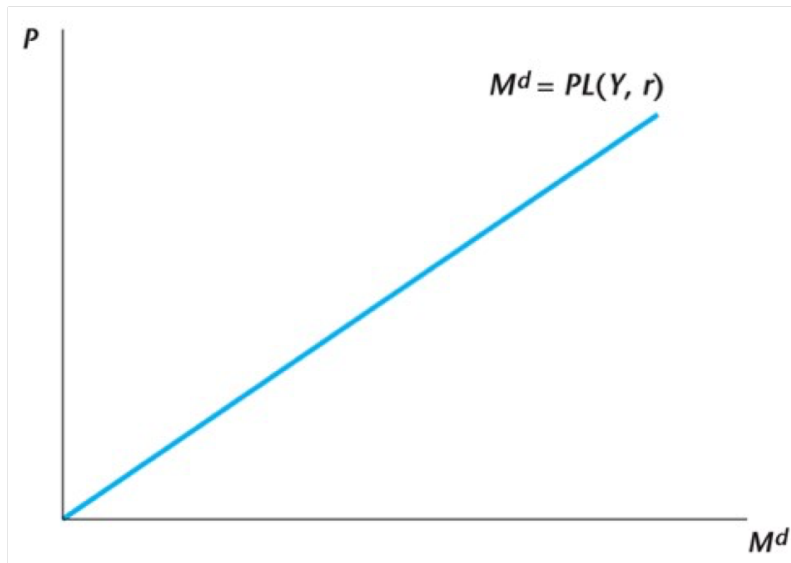
$$M^D = PL(Y, r + i)$$

- ▶ For now, ignore i (assume zero) and just look at r :

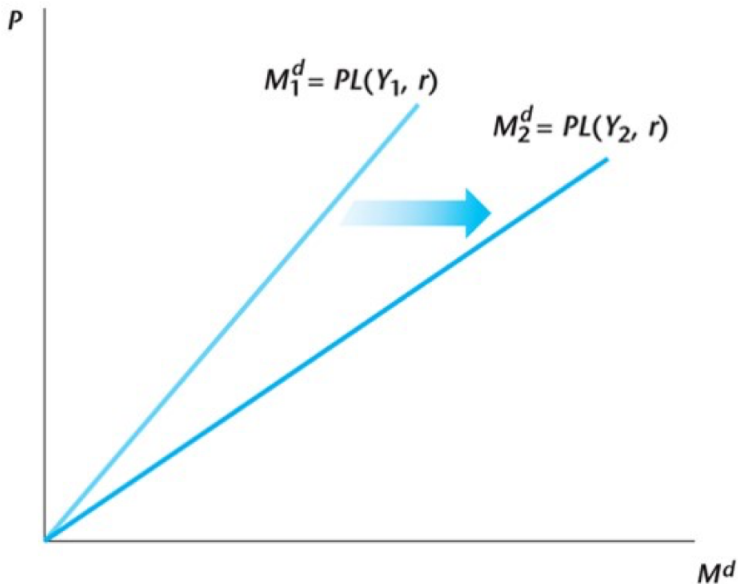
$$M^D = PL(Y, r)$$

- ▶ Graph out P as a function of M^d and how it shifts when Y increases

MONEY DEMAND



INCREASE IN MONEY DEMAND



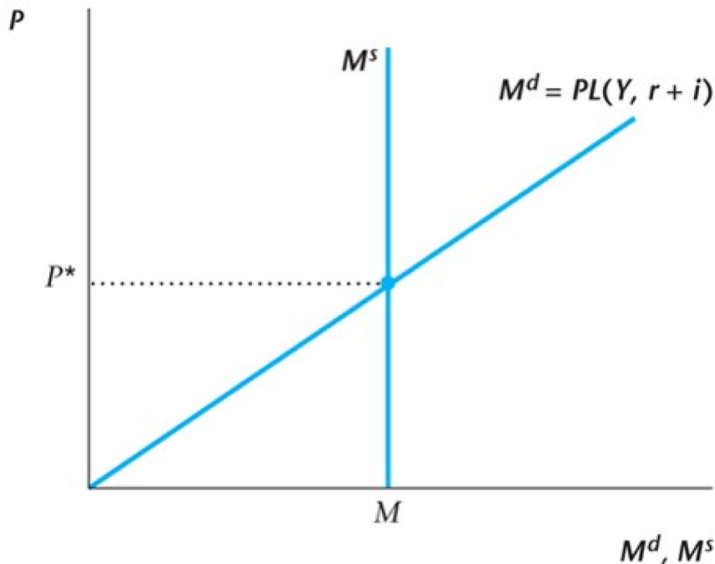
MONEY SUPPLY

- ▶ We assume government prints money M
- ▶ Government budget constraint:

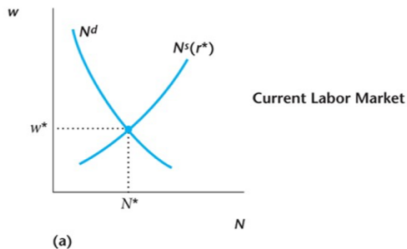
$$PG + (1 + R^-)B^- = PT + B + M - M^-$$

- ▶ Where PG is nominal expenditure
- ▶ $(1 + R^-)B^-$ is retired debt+interest on last period's bonds
- ▶ PT is nominal taxes
- ▶ B is newly-issued bonds
- ▶ $M - M^-$ is newly-issued money
- ▶ Now we have money creation and a source for money supply
- ▶ In equilibrium, $M^s = M$, and the price level is determined

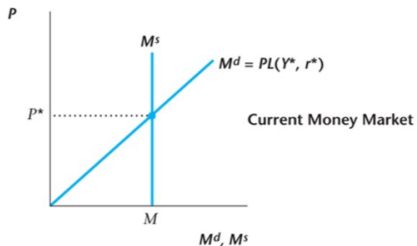
MONEY SUPPLY=MONEY DEMAND GIVES PRICE LEVEL



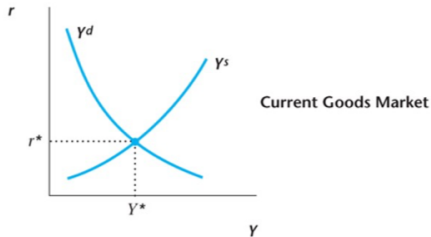
ADDING IN THE PRICE LEVEL TO OUR INTERTEMPORAL MODEL



(a)



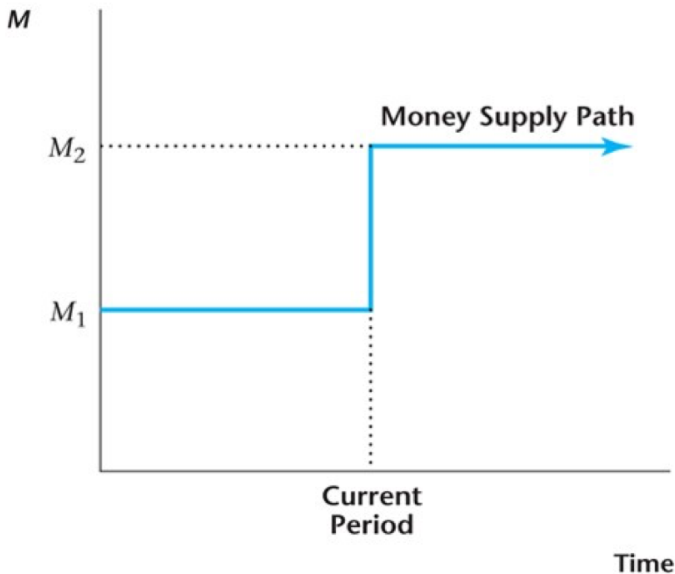
(c)



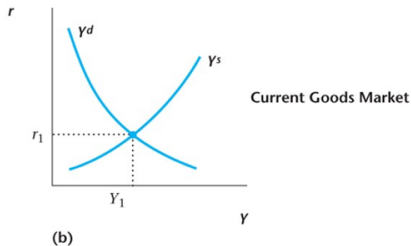
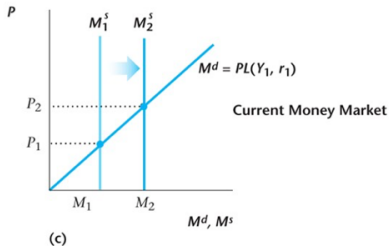
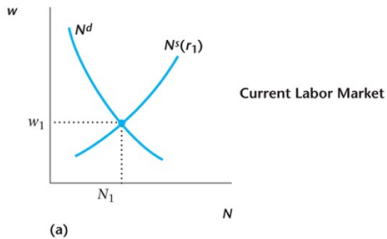
(b)

MONETARY NEUTRALITY

- ▶ Let's run a one-time experiment of money creation



MONETARY NEUTRALITY



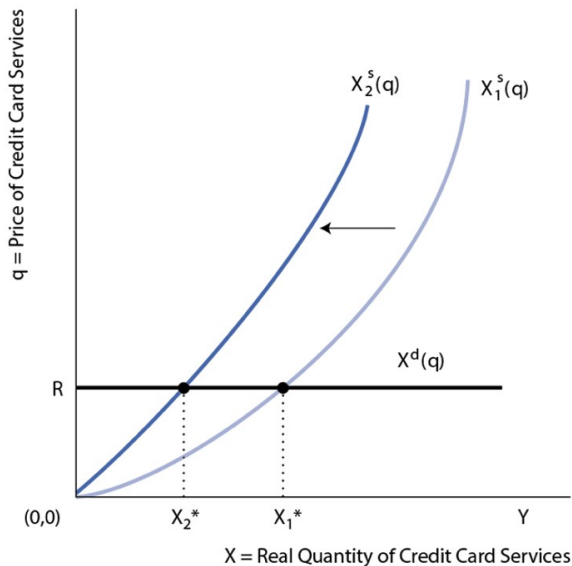
MONETARY NEUTRALITY

- ▶ Q: Why is money neutral?
- ▶ A: It doesn't enter into any of the decisions people make, which are based on *real* considerations (real wage, real interest rate)

SHIFTS IN MONEY DEMAND

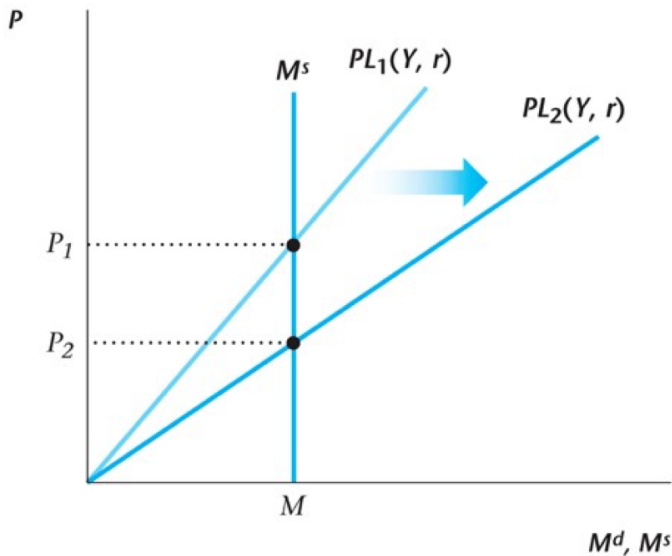
- ▶ What happens when there's a shift in money demand? For instance, because the supply of credit becomes tighter
- ▶ Higher demand for money
- ▶ Price level falls

A SHIFT IN THE SUPPLY OF CREDIT CARD SERVICES



Higher costs of credit decreases credit use

DEMAND FOR MONEY INCREASES WHEN CREDIT BECOMES TIGHTER



SHOCKS TO MONEY DEMAND

- ▶ What might shock the money demand function?
 - ▶ New information technologies like ATM's
 - ▶ New financial instruments like sweep accounts
 - ▶ Changes in government regulations
 - ▶ Fear of banks
 - ▶ Day-to-day fluctuations (treasuries purchased that day, for instance)

SHOCKS TO MONEY DEMAND

- ▶ Okay, so we have a model of price, and how it relates to credit services and money demand and supply
- ▶ It seems like the central bank can control P by controlling M , so why did we say it doesn't target/“think about” M very much?
- ▶ Let's look at $L(Y, R)$ in the data

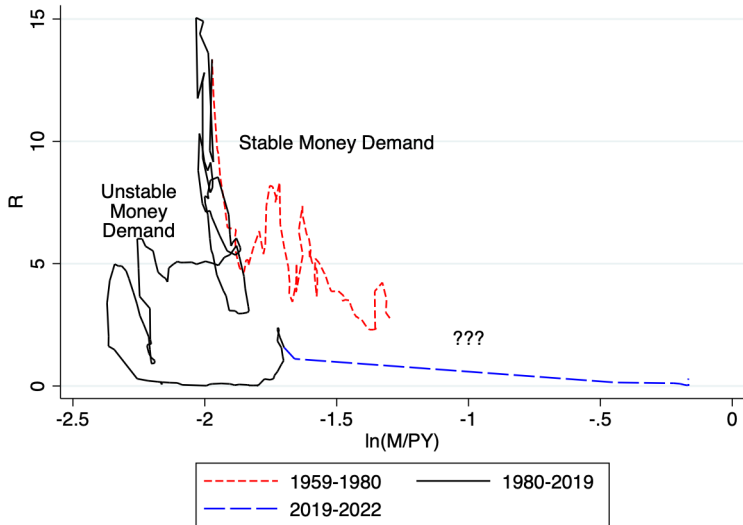
FITTING THE MONEY DEMAND FUNCTION

- ▶ Let's say we want to match theory and data to answer the question: "is money demand stable?"
- ▶ Let's try to fit: $L(Y, R) = Ye^{aR}$, where a is a parameter to be estimated
- ▶ Then in equilibrium: $M = PYe^{aR}$, or taking logs:

$$\log\left(\frac{M}{PY}\right) = aR$$

- ▶ Let's graph it!

MONEY DEMAND INSTABILITY

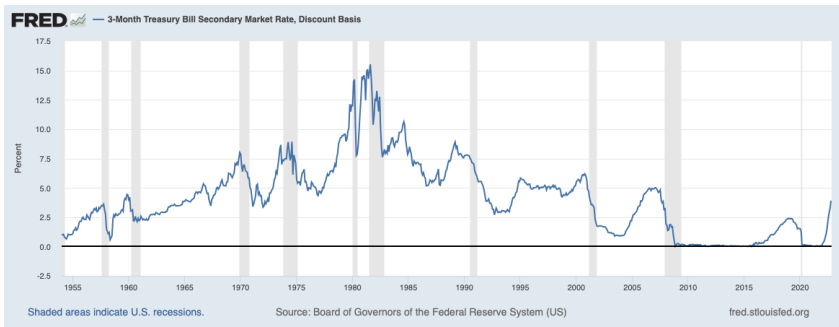


Money demand is not very stable post-1980!

MORE MODERN MONETARY POLICY

- ▶ 1970's were dominated by high money supply growth and high inflation
- ▶ “Monetarists” called for reducing money supply growth to control inflation
- ▶ This occurred, and inflation cooled—but the instability in money demand meant money supply wasn't a fine tool for controlling inflation
- ▶ Now: eight Federal Open Market Committee Meetings/year, choose the “federal funds rate”, (short-term R)
- ▶ Buy/sell treasuries until market R is target R .
- ▶ But, a problem—what if target $R < 0$? “zero lower bound”

WE HIT THE “ZERO LOWER BOUND”



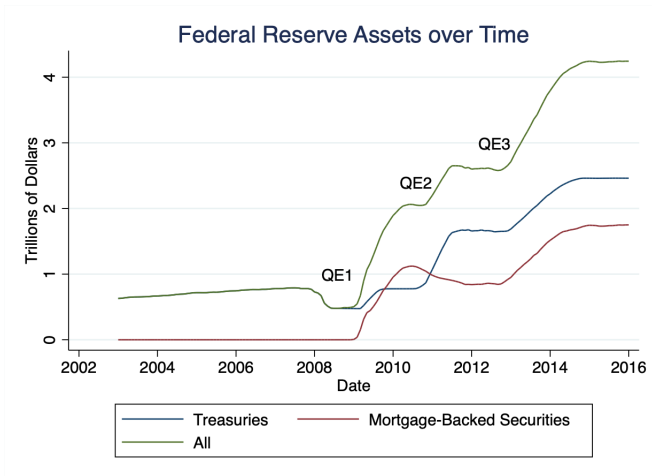
ZERO LOWER BOUND

- ▶ Targeting R worked well for a while
- ▶ But, a problem—what if target $R < 0$? “zero lower bound”
- ▶ Bank can't force people to accept less than zero—otherwise just hold cash
- ▶ When $R = 0$, then bonds and money are the same (both return zero) so Fed can't do anything by switching bonds and cash: open market operations are useless

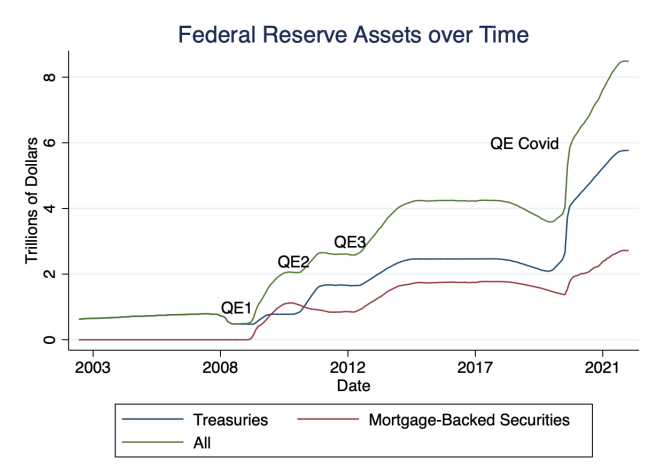
QUANTITATIVE EASING

- ▶ What can we do at the zero lower bound? Short-term B and M are equivalent
- ▶ Could exchange longer-term B for M!
- ▶ This is the heart of “quantitative easing,” purchasing longer-term securities (shifting demand for such assets out) to drive down prices (interest rates)

QE



QE-NEW!



SUMMARY

- ▶ Now we have money in our model!
- ▶ But it doesn't do much...monetary neutrality!
- ▶ Evidence monetary neutrality is true!
- ▶ Can analyze the effects of different shifts on the price level
- ▶ Can discuss monetary policy: OMO, QE