The Quantity Theory of Money

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Outline

- Equation of Exchange
- Facts about velocity
- Quantity Theory of Money
- Neutrality
- Evidences
- Money Demand stability
- Current issues in US

Equation of Exchange

- Equation of Exchange

$$M_t V_t = P_t y_t$$

where M_t is the stock of money in the economy (say $M1$), P_t is the aggregate price level, y_t is Real GDP and V_t is the VELOCITY of money.

- V_t represents the number of times M_t circulated during that year.
- This is an economic IDENTITY. V_t is defined by this equation.

Equation of Exchange

- It would beunfortunate to take the QTM and the equation of exchange as interchangeable.
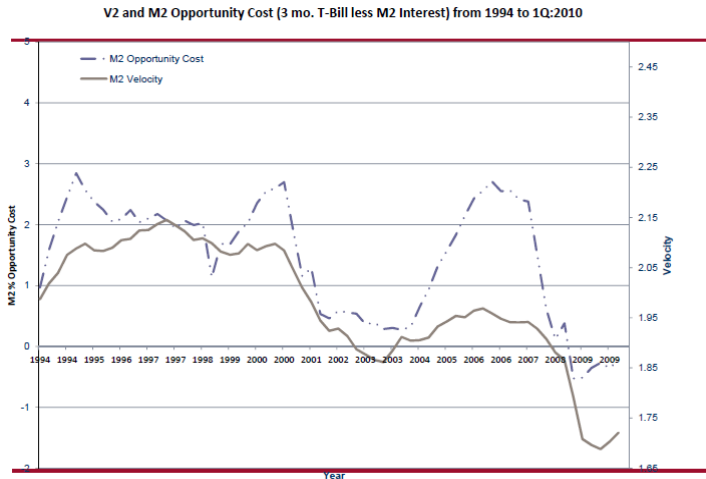- The equation of exchange is an identity.

Facts about Velocity

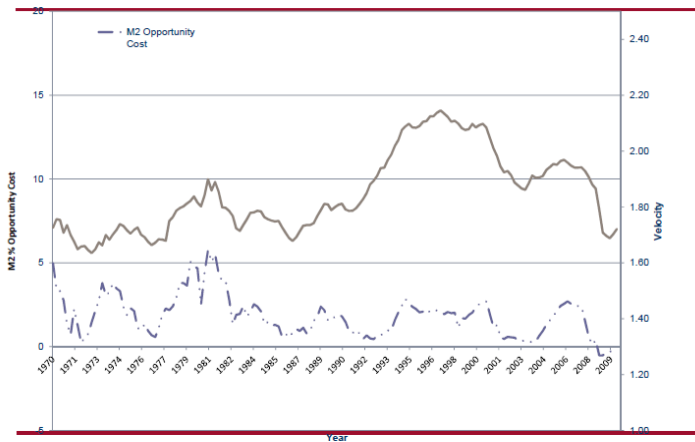- Velocity of M2 is almost constant in the long run.

Velocity from 1948 to 1Q:2010
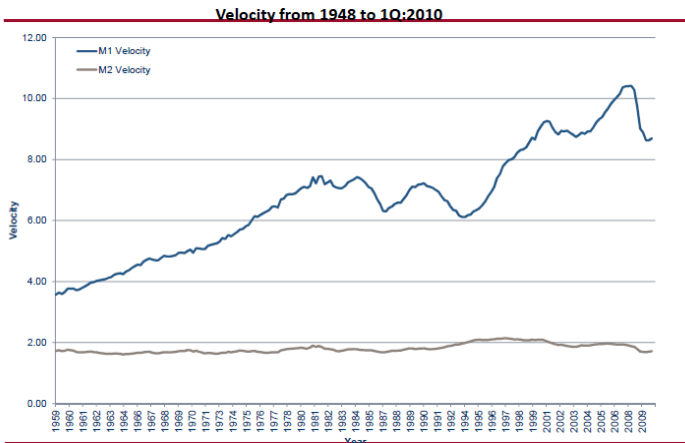
Facts about Velocity

- Velocity moves with interest rates (opportunity cost of money)

V2 and M2 Opportunity Cost (3 mo. T-Bill less M2 Interest) from 1994 to 1Q:2010

Facts about Velocity

V2 and M2 Opportunity Cost (3 mo. T-Bill less M2 Interest) from 1970 to 1Q:2010

Quantity Theory of Money

- Equation of Exchange in growth terms

$$g_t^M + g_t^V = \pi_t + g_t^Y$$

- Assume $g_t^V \approx 0$
- Neutrality: given GDP growth rates, if $g_t^M > g_t^Y$ then $\pi > 0$.

$$\pi_t \approx g_t^M - g_t^Y$$

- QTM states that money supply has a direct, proportional relationship with the price level. For example, if the currency in circulation increased, there would be a proportional increase in the price of goods

Neutrality

- Money Neutrality: A change in the stock of money affects only nominal variables with no effect on real variables.
- Money Super Neutrality: A change in the growth rate of money (Money path) affects only nominal variables with no effect on real variables.

QTM and Money Neutrality

- Proposition is that if a change in the quantity of (nominal) money were exogenously engineered by the monetary authority, then the long-run effect would be a change in the price level (and other nominal variables) of the same proportion as the money stock, with no change resulting in the value of any real variable.1 This proposition pertains to "long-run" effects; that is, effects that would occur hypothetically after all adjustments are completed.

QTM and Money Neutrality

- Indeed, long-run monetary neutrality is dependent on homogeneity properties holding across the private sector's main behavioral relations. Basically, private agents' objective functions and technology constraints should be formulated entirely in terms of real variables — there is no concern by rational private agents for the levels of nominal magnitudes.

- Implied supply and demand equations will also include only real variables; they will be homogenous of degree zero in nominal variables

Quantity Theory of Money Evidence

- However, in the LONG RUN, there is substantial evidence that inflation is a monetary phenomena, and that money is neutral.
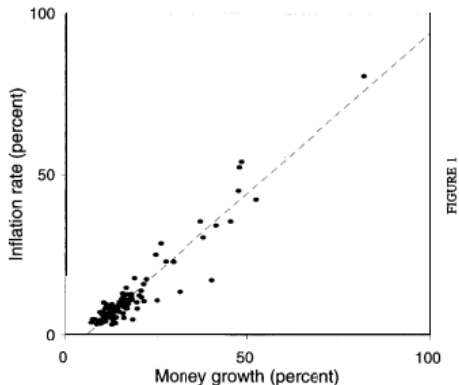
Inflation and money growth for 100+ countries over 1965-1995.

Quantity Theory of Money Evidence

Bennett T. McCallum and Edward Nelson

Table 3.1 M1 Growth/ CPI Inflation Relationship Using Different Degrees of Time Aggregation, United States, 1955–1975

Dependent variable	Explanatory variable	Sample period	Coefficient on money growth term	R^2
Annual inflation	Annual money growth	1955–1975	0.515 (0.236)	0.200
Five-year moving average of inflation	Five-year moving average of money growth	1960–1975	0.832 (0.134)	0.732
Annual inflation	Annual money growth lagged two years	1955–1975	0.809 (0.178)	0.518
Annual inflation	Annual money growth lagged two years	1960–1975	0.829 (0.214)	0.517

Note: The annual data underlying the regressions are for four-quarter growth rates of M1 and the CPI for the second quarter of the year.

Quantity Theory of Money Evidence

- More striking for hyperinflation countries ($>100\%$ for 3 years).
- In some sense hyperinflation is easy to diagnose and remedy.
- Every single instance of hyperinflation followed the same story:
  - The prevailing government has unsustainable debt.
  - The government prints money to repay it's debts.
  - This extra money generates inflation.
- Remedy: possible bankruptcy, change currency and fiscal austerity.

22 سال گذشته در یک نگاه
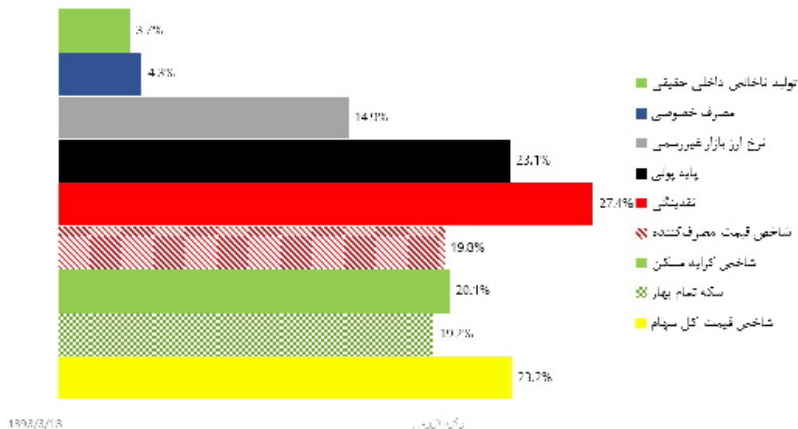
Quantity Theory of Money Summary

- Common beleif: QTM and Money neutrality hold in the long run.
- QTM in the short run and the Money Super Neutrality is a matter of debate.

Quantity Theory of Money Summary

[T]hough the high price of commodities be a necessary consequence of the increase of gold and silver, yet it follows not immediately upon that increase; but some time is required before the money circulates through the whole state.. . . In my opinion, it is only in this interval of intermediate situation, between the acquisition of money and rise of prices, that the increasing quantity of gold and silver is favourable to industry.. . . [W]e may conclude that it is of no manner of consequence, with regard to the domestic happiness of a state, whether money be in greater or less quantity...
David Hume (1752)

- PRICE adjustment is crucial for neutrality:

$$g_t^Y = g_t^M - \pi_t$$

- if $g_t^M \uparrow$ but π_t remains constant, then $g_t^Y \uparrow$.

EE in the Short run

- Friedman and Schwartz theory of the Great depression:
    - The FED reduced M1 by 25% in the period 1929 ∼1933.
    - They documented several reasons for why prices did not adjust downwards:

1. Government increased taxes.
2. Price and wage controls imposed by the government.
3. Tariffs on imported goods increased.

- If we combine these two than this imply $y \downarrow$.

QTM, EE and Money demand function

- QTM as a short run theory
  - Fisher:
    - Constant velocity
  - Keynes $\frac{M^d}{P} = f(y, i)$
    - Transactions motive
    - Precautionary motive
    - Speculative motive
  - Friedman (Modern QTM): $\frac{M^d}{P} = f(y_p, r_b - r_m, r_e - r_m, \pi_e - r_m)$
    - the spread between returns will also be stable since returns would tend to rise or fall all at once, causing the spreads to stay the same. So in Friedman's model changes in interest rates have little or no impact on money demand. This is not true in Keynes' model.

Money Demand Empirical Findings

- Sensitive to interest rates
- Stable M1 before 1975
- Stabe M2 before 1990
- Introduction of MZM (Money Zero Neutrality)
    - M2 less small-denomination time deposits plus institutional money funds.
    - Its velocity has historically been the most accurate predictor of inflation
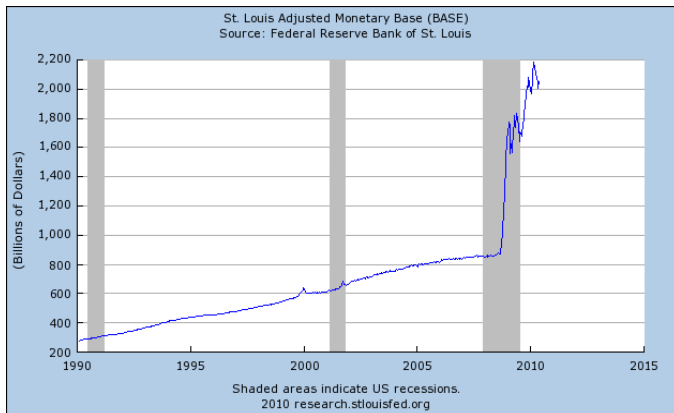   - Assets included in MZM are essentially redeemable at par on demand

- Inflation concerns in the US.
  - Public debt in the US is approaching 100% of GDP.
  - This is causing some to fear that the government will monetize this debt.
  - This would lead to in ation as the model predicts.

- However, there are no visible signs of inflation increasing

QTM and current issues

- Why is inflation not increasing?
- The US is not Greece: economic recovery is expected.
  - The economist Ray Fair predicts that in 2015 real GDP will be 16% higher than it was in 2008.
- Part of the increase in debt is temporary due to the recession:
  - In recessions, gov revenues decrease (fewer sales) but expenditures increase (e.g. unemployment insurance).
  - This would revert in a recovery.
- The problem with US debt is more in the long term:
  - Aging population + social security + medicare.
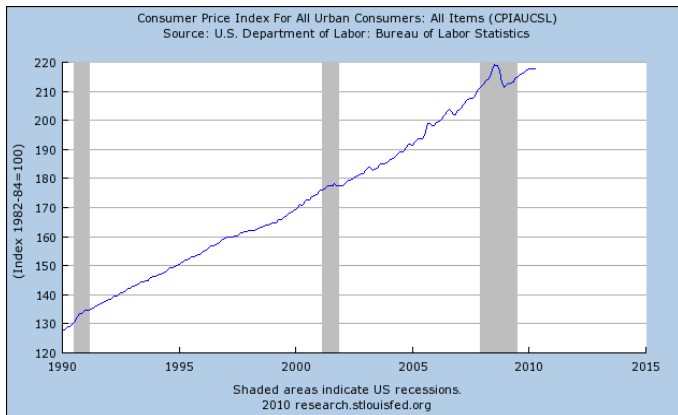
QTM and current issues

- Many people are now worried:
- The first reason is due to public debt.
- The second is due to the FED policy:
    - Right now we are in a very unusual period.
    - M is increasing wildly, but π is not increasing
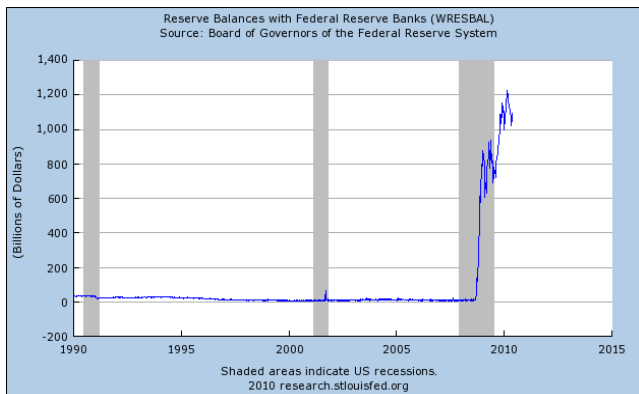   - Does it contradict with QTM?

- Money

QTM and current issues

- Prices

Consumer Price Index For All Urban Consumers: All Items (CPIAUCSL)
Source: U.S. Department of Labor: Bureau of Labor Statistics

Shaded areas indicate US recessions.
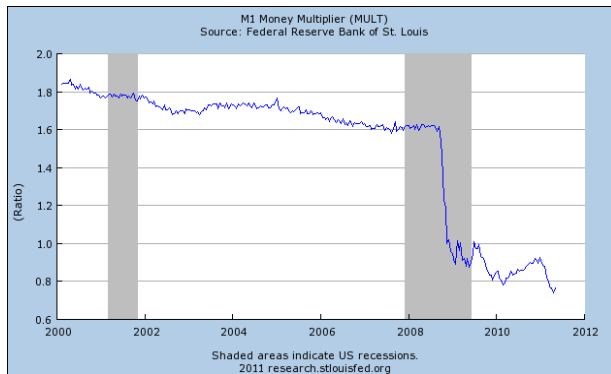2010 research.stlouisfed.org

- Then why is such high $M \uparrow$ not causing inflation?
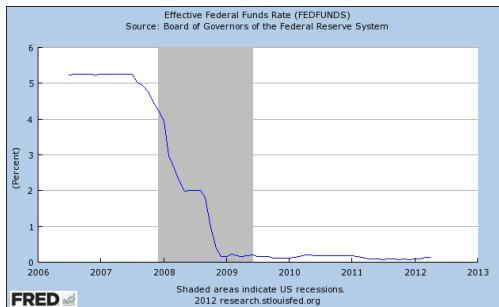
Banks are not lending!

Thus, mm collapsed.

QTM and current issues

- Why are banks holding so much excess reserves?
- These are voluntary money reserves that banks deposit on the federal reserve.

1. Starting Oct. 2008 the FED started paying interest on these reserves.
2. Interest rates are nearly zero
3. Combine that with large uncertainty in the economy, cause the banks to choose safety.

Effective Federal Funds Rate (FEDFUNDS)
Source: Board of Governors of the Federal Reserve System

Shaded areas indicate US recessions.
2012 research.stlouisfed.org

Summary

- Quantity Theory of Money
  - Talks about a long run relationship of money and price.
  - QTM is about the nominal homogeneity of money and relates to the money neutrality.
  - Money growth rate only induces inflation and not output growth: QTM implies a ceteris paribus unitary relationship between inflation and money growth

Summary

- Velocity of money
  - is rather constant over long term.
  - moves with the opportunity cost of money
  - changes in the interest payment on different types of money moves liquidity between M0, M1 and M2.

- Fisher Equation

- Europe and US recent crises
  - Fear of inflation? Fed's actions to prevent it.
  - What are the real worries?