

Money Supply, Velocity and Asset Prices: Evidence from US Economy

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Abstract

This paper revisits the equation of exchange from the quantity theory of money, expanding the definition of the purchasing power of money to capital and property investment. Based on this new equation, empirical data on US Economy from 2009 to 2019 enable to show that money velocity is the main determinant of asset transactions and prices. Finally, the concept of velocity is reexamined to integrate the marginal propensity of money to inflate prices.

Keywords: Equation of Exchange, Asset Inflation, Money Velocity, Money Supply

JEL Classification Codes: E31, E41, E44, E51, E58

1. Introduction

For the past ten years, there have been academic and public debates around the impact of monetary policy on asset prices [1][2]. Indeed, in major economies like the United States, Europe and Japan, central banks have kept interest rates at historically low levels and have introduced so-called quantitative easing measures. Meanwhile, market prices of stocks, bonds and houses have significantly increased, raising the question of negative externalities affecting social stability [3]. While the quantity theory of money established a relation between the amount of money in circulation and the general price of goods and services [4][5], this paper seeks to expand the equation to prices of real estate and financial assets. Based on data on US economy from 2009 to 2019, it is possible to show that money velocity is the main determinant of asset transactions and prices. More interestingly, empirical evidence invites us to rethink this concept of velocity in order to integrate the marginal propensity of money to inflate prices.

2. Model

One unit of currency can be spent for goods and services purchasing, but also for real estate and capital investing. For instance, in the specific case of households, disposable income would be spent for consumption, housing and savings. Thus, purchasing power is not just the value of a currency expressed in terms of the amount of goods and services that one unit of currency can buy, but also the ability to buy a property, and the ability to invest in shares or bonds with one unit of currency.

Assuming this larger definition of the purchasing power of money, the equation of exchange [5] can be rewritten as follows:

$$MV^* = P^{*T}Q^* \quad (1)$$

where, over a given period:

M is the total nominal amount of money supply in circulation on average in the economy.

V^* is a new measure of the so-called velocity of money, the number of times that the average unit of currency is used among the three sources of spending.

P^* is a column-vector of the prices p_i^* of goods and services, houses, bonds and equity shares.

Q^* is a column-vector of the numbers of transactions q_i^* on goods and services markets, on real estate markets, on capital markets and on private equity markets.

3. Results

As a reminder, the traditional equation of exchange in monetary economics is limited to prices and transactions on goods and services, and is expressed as follows:

$$MV = P^T Q \quad (2)$$

Considering variation over a given period time, the former equation leads to the following approximation:

$$\Delta M + \Delta V = \sum_j \Delta p_j + \sum_j \Delta q_j \quad (3)$$

Applying the same method to the new equation of exchange (1) with financial and property assets:

$$\Delta M + \Delta V^* = \sum_i \Delta p_i^* + \sum_i \Delta q_i^* \quad (4)$$

In this paper, the empirical focus is set on US economy from 2009 to 2019. $\sum_j \Delta p_j$ is assumed to be the variation of the consumer prices index (CPI). Note that this index integrates rents of primary residence but not home ownership costs [6]. Such costs are integrated in $\sum_i \Delta p_i^*$, and so are variations of prices on domestic capital markets and private equity markets. The same logic applies to variations of transactions $\sum_j \Delta q_j$ and $\sum_i \Delta q_i^*$.

Using M2 as a proxy for money supply, historical data show that a significant increase of M over the period [7] did not translate into an equivalent increase of $P^T Q$ (see Appendix 1) [6][8]. The reason lies in the decrease of V , raising the question of such a liquidity trap [9].

Meanwhile, housing market was characterized by sharp price inflation (see Appendix 1) [10], as well as growing volume sales [11][12]. Moreover, prices of financial assets like stocks grew at double-digit rates [13], which more than offset the decline in daily volumes [14][15]. Therefore, it is reasonable to state that:

$$\sum_i \Delta p_i^* + \sum_i \Delta q_i^* > \sum_j \Delta p_j + \sum_j \Delta q_j \quad (5)$$

and thus,

$$\Delta V^* > \Delta V \quad (6)$$

As a result, the main difference between model (1) and model (2) lies in the respective values of money velocity. In other words, inflation is not just a function of money supply, but a function both money supply and velocity. Because of that, increasing money supply in the US had little impact on the demand of goods and services but had a more significant impact on the demand of assets.

4. Discussion

Those results show that the common definition of velocity is somehow misleading. Indeed, significant price inflation occurred on capital markets from 2009 to 2019, whereas the number of transactions did not increase. Thus, V^* does not only depend on the marginal propensity of one unit of currency to generate new transactions in the economy, but also on the marginal propensity of one unit to inflate prices. Said differently, money velocity could be expressed as a function of two variables:

$$V^* = f(MPT, MPP) \quad (7)$$

where f would be a positive function, MPT the marginal propensity of money to increase transactions, and MPP the marginal propensity to increase prices.

Going further, there should be as many different functions as different types of markets in the economy. For example:

$$V^* = f(MPT_{GS}, MPP_{GS}, MPT_{PM}, MPP_{PM}, MPT_{CM}, MPP_{CM}) \quad (8)$$

where GS is related to goods and services market, PM to property markets, and CM to capital markets.

Interesting work has been achieved to identify factors affecting the traditional measure of money velocity V (i.e. determinants of MPT_{GS} and MPP_{GS}) [16][17][18]. So, the question becomes, what could affect marginal propensities for real estate and financial investment?

Inequality (6) tells us that over the period MPP had increased for most asset classes. Why had one extra unit of currency led to higher prices for assets like stocks, bonds or houses? It is possible to think of factors such as eased financial conditions from 2009 to 2019 (e.g. low interest rates environment), but also of psychological reasons like high price expectations and low risk aversion leading to so-called positive feedback loops.

Then, what would happen if investors' confidence suddenly dropped because of an economic shock and/or a brutal psychological shift like in 1929 [19]? According to relation (8), V^* might decrease because of lower values of MPT and MPP , ceteris paribus. Thus, asset prices might also drop. It is worth noting that in theory this situation could occur despite an increase in money supply.

5. Conclusion

The definition of the purchasing power of money could be expanded and include the ability of one unit of currency to invest in assets, leading to a new equation of exchange. Based on data on US economy from 2009 to 2019, such new monetary model invites us to rethink the concept of money velocity. Indeed, an increase in

the monetary base might result in various outcomes based on the marginal propensity of money to stimulate transactions and its marginal propensity to inflate prices. Besides, marginal propensities might also vary depending on the nature of the underlying market. In the specific case of assets, additional work should be required to deepen the question of factors behind transactions and price inflation on real estate and financial markets given a level of money supply in the economy.

6. Acknowledgement

I thank Justine, Rose and Suzanne for their continuous support.

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Appendix 1

Indicator	2009-2019 Compound Annual Growth Rate
M2	+6.8%
Consumer Price Index	+1.9%
Annual Real GDP	+2.5%
S&P 500 Index	+11.1%
S&P 500 Daily Average Volume	-4.1%
House Prices	+3.6%
New Home Sales	+6.9%
Pending Home Sales	+0.3%