US Income Velocity – A Primer

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Often when discussing inflation prospects with both economists and non-economists I find that people raise the subject of income velocity. Usually it is mentioned as part of an attempt to undermine the case for money growth being a reliable predictor of nominal income or inflation. People say, "Velocity is unstable," or "Velocity has declined so much that it has offset the increase in M2".

However, the record of historical evidence both across the world and in the US is entirely clear: the rule is that income velocity (1) has a gradual downward slope, and (2) it varies moderately around a stable trend – unless there has been some major disturbance, monetary or otherwise.

What is income velocity and why does it have a stable downward trend? In economics income velocity is defined as the ratio of nominal national income or GDP to broad money[1]. It derives from the well-known quantity theory of money, which, in its modern version, links money to nominal GDP. The equation is usually written as $MV = Py$, where M is money, P is the price level and y is real income. Py is nominal income when prices are defined to be consistent with GDP. Algebraically, $V = Py/M$, which can be thought of as the number of dollars or pounds or euros of income generated in any given period by a unit of the currency, or how many times money must be "turned over" to generate a unit of income. Hence the term income velocity of circulation.

However, if the fraction is inverted it can also be thought of as the amount of money that the population wishes to hold relative to total nominal income, M/Py. In this sense it is easier to understand and to think of as a behavioural variable. In 2021 Q1 US citizens and companies held 46.3 weeks of income in the form of money (M2), substantially more than they held a year ago in 2020 Q1 when they held just 37.7 weeks of income in the form of money.

This also helps to explain why velocity has a downward slope. As incomes rise, people tend to hold more financial assets relative to their income, and money is one of those financial assets. The annual decline in velocity reflects their desire to hold larger money balances relative to income.

Starting with the record of non-US economies, Figure 1 displays income velocity for Japan, the eurozone and the UK from 1997. In all cases we use the broadest official definition of money that is available.[2] The chart also shows the trend values for each country. The steady downward slopes for the three selected economies are by no means unique. Here is a list of

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[1] The reason for selecting broad money rather than any other definition of money is that money balances are part of overall financial asset portfolios, not simply a means for conducting transactions.
[2] In some economies the official definition of broad money is not the best measure and we find better relationships when we use corrected, broader measures. However, here the discussion of the US data is limited to the official M2 definition of money, although we prefer the now discontinued M3.

five developed economies and their average annual decline in income velocity since 1999: Canada (-2.3% p.a.), Australia (-1.7% p.a.), New Zealand (-2.1% p.a.), Sweden (-2.7% p.a.), Switzerland (-1.6% p.a.). Emerging economies also tend to exhibit annual declines of velocity, but their declines are larger because their populations are accumulating money balances relative to income at a faster rate in the early stages of financial development: China (-3.0% p.a.), India (-2.6% p.a.), Indonesia (-2.2% p.a.), Brazil (-3.6% p.a. since 2003), Mexico (-3.3% p.a.) and many others also have steadily declining velocities. Velocity, wrote Lawrence Klein, is one of the five great ratios of economics.[3]

In Figure 1, the unweighted average annual decline in our three selected cases since the start of the Eurozone in 1999 is -2.1% p.a. Although we only show data going back to 1997 in the chart, the relation holds over far longer periods in most economies – unless there have been significant monetary disturbances -- such as the boost to money growth after the pandemic or episodes of very high inflation -- or other real disruptions such as wars.

Figure 1: The General Trend of Velocity Outside the US is Downwards
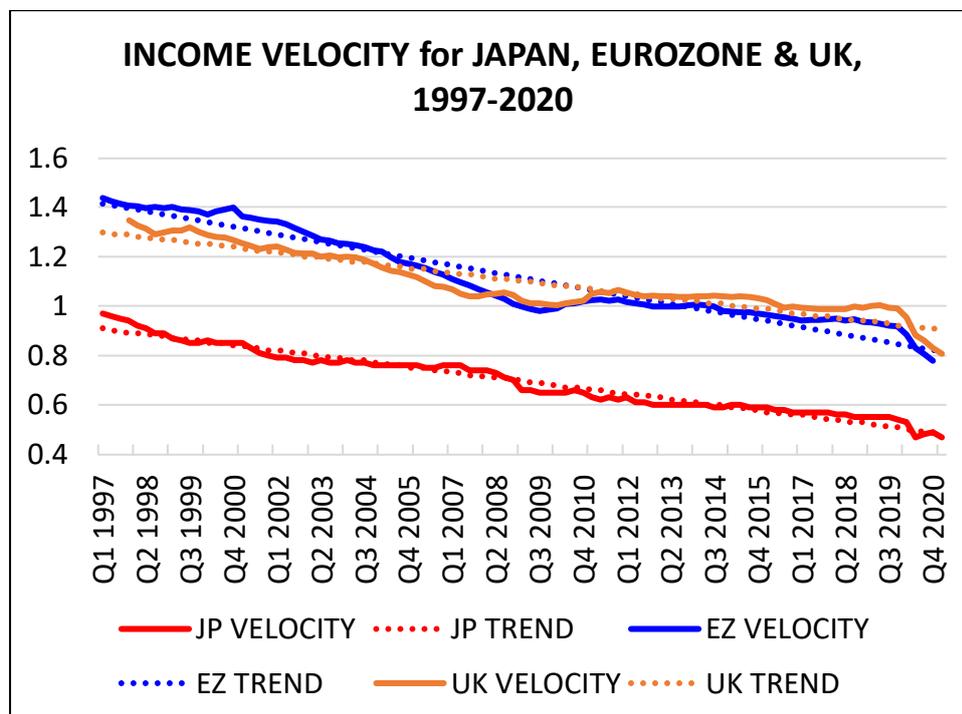

Turning to the historical record of the US, we find that the pre-World War 2 trend of velocity was also downwards-sloping, as shown in Figure 2. Although the quality of the data for

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[3] 1962, https://www.jstor.org/stable/2554231?seq=1

nominal GDP (calculated many years later) was probably not very reliable, the average annual decline in income velocity from 4.57 in 1869 to 1.16 in 1946 was -1.5% p.a., quite similar to the result for our three economies in Figure 1.

Figure 2: Historically, US Income Velocity Has Trended Downwards

US INCOME VELOCITY of M2
1869-1960
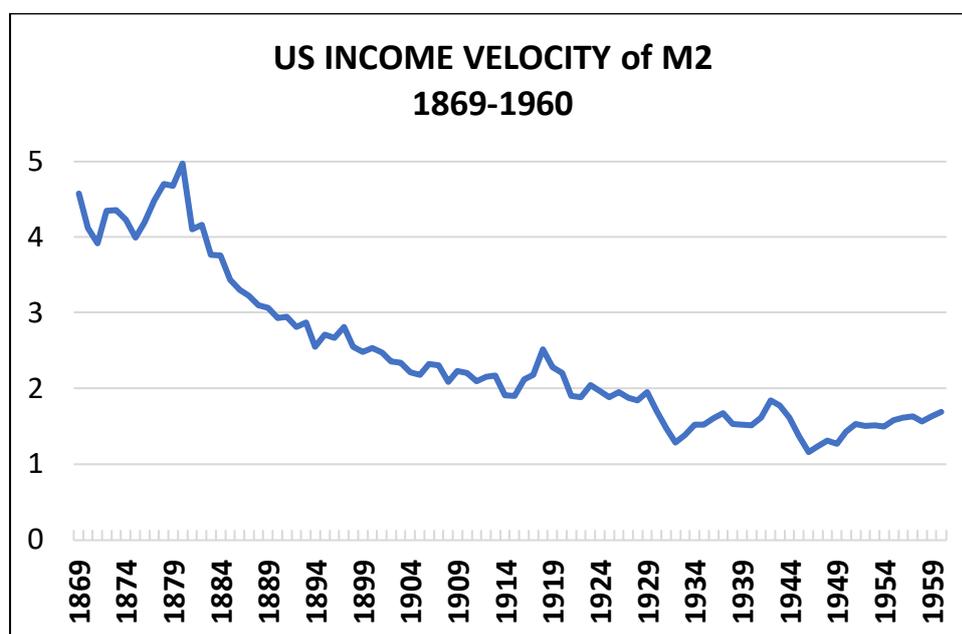
However, although the pre-World War 2 record was of steadily downward trending velocity, during significant parts of the post-war period the US has not experienced the steady downward slope that characterizes most other economies. In this sense the post-war record of the US is an anomaly. Having experienced rising velocity after World War 2 between 1946 and 1960 (associated with excess money growth during the war and the release of price controls afterwards), the US then experienced broadly flat velocity from 1960 to 1990 (for M2)—see arrow (1) in Figure 2, and a rise between 1990 and 1997. Subsequently US velocity has resumed a downward trend comparable to other economies although there have been a couple of significant deviations from the trend which need to be understood.

Since each of the deviations for M2 velocity in the US has a specific explanation, this means that despite superficial claims by prominent central bankers[4] and economists[5] that monetary analysis does not seem to apply in the US, it does in fact work well.

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[4] Powell Congressional testimony, https://www.reuters.com/article/us-usa-fed-powell-econ-idUSKBN2AN2EM Reuters, Feb 23, 2021.
[5] P. Krugman, New York Times, May 13, 2021.

Figure 3: US Income Velocity for M2 (Nominal GDP/M2), 1959-2021
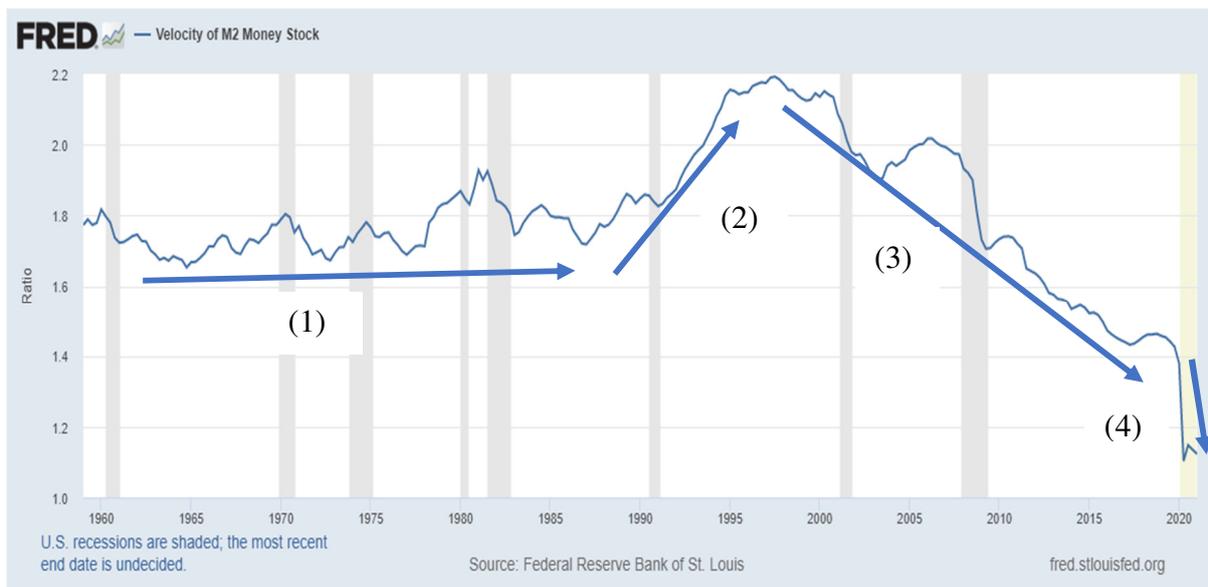
The history of US M2 velocity since 1960 can be summarized in four parts.

- **First,** for the period 1960-1990, velocity was roughly flat as shown by arrow (1) in Figure 3. This followed the rising trend after the Second World War and can be viewed as a part of the gradual return to normality, although there were several regulatory changes that affected money holdings during these years.
- **Second**, for much of the 1990s (1990-97) velocity for M2 increased, as indicated by arrow (2). The reason was that, partly due to the S&L crisis, and partly due to the introduction of 401(k) plans, there was widespread switching from long term savings accounts into tax-advantaged retirement schemes, i.e. out of "money" assets into other financial assets such as bonds and equities. People wanted to hold less money relative to income than previously.
- **Third**, from 1997 to 2019 income velocity for M2 declined at an average annual rate of -1.7% p.a. (3), very much in line with the experience of other leading economies. In my view, after all the deregulation of the 1980s and 1990s, US income velocity was finally returning to trend.
- **Fourth,** in 2020 with the lockdown of the economy due to the coronavirus pandemic nominal GDP (in the numerator) plunged while M2 (in the denominator) surged by over 20%, producing (4) an abrupt decline in velocity of 23% between 2019 Q4 and 2020 Q2.

As all economists know, the relation between money and nominal GDP is much better in the long run than it is in the short run. This is due to the famous "long and variable" lags -- i.e. the real component of nominal GDP lags changes in money growth by about a year, while the inflation component of nominal GDP lags changes in money growth by two years or more.

As an illustration of this phenomenon – a good *long-term* relation between money and nominal GDP – consider how close the M2 and Nominal GDP growth rates are both over *successive decades* since 1960 and over the *entire period* in Table 1.

Table 1: Average Growth Rates of M2, Nominal GDP and Implied Velocity, 1960-2020

	M2	Nominal GDP	Implied Annual Velocity Change
1960 – 2020	**6.80%**	**6.32%**	**-0.48%**
1960 – 1970	6.76%	7.08%	+0.32%
1971 – 1980	9.89%	10.30%	+0.41%
1981 – 1990	7.69%	7.66%	-0.03%
1991 – 2000	4.07%	5.57%	+1.50%
2001 – 2010	6.08%	3.90%	-2.90%
2011 – 2020	6.22%	3.42%	-2.80%

Sources: Monthly M2 from the Federal Reserve. Nominal GDP from IIMR, IMF database, as at April 2021.

Since the "normal" relation between M2 and Nominal GDP is for a fairly steady decline in velocity, following the abrupt decline in velocity at the onset of the pandemic, we should expect the normal relation to be resumed at some point in the future. Figure 4 assumes that velocity will return from its abnormally low current level to its trend line by 2024 Q4, i.e. after a 5-year deviation. In practice this means that velocity will be gradually rising between now and 2024 Q4.

Figure 4: Trend of M2 Velocity with Projections from 2021 Q2
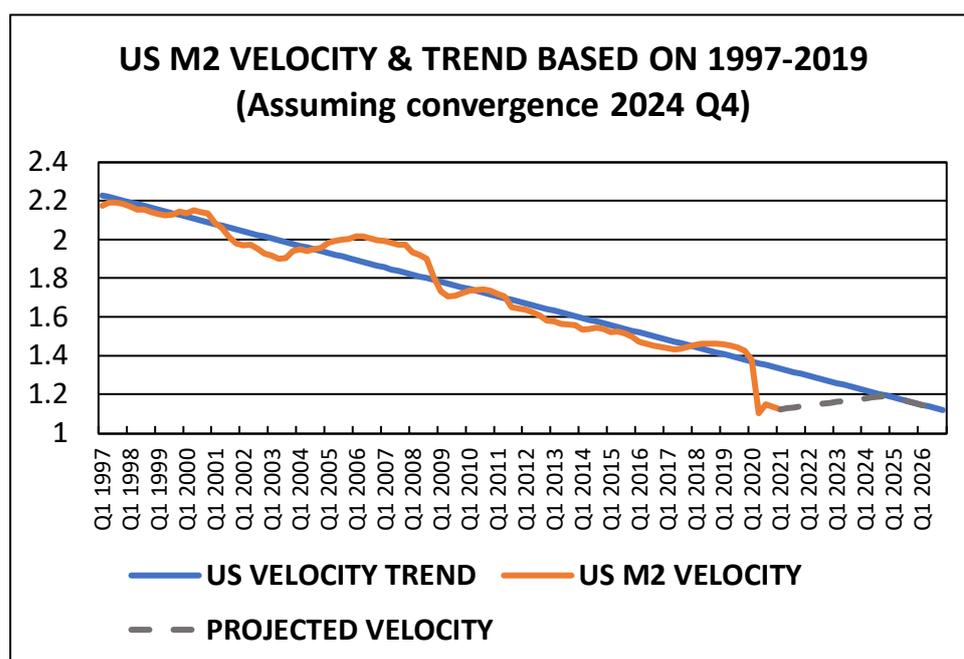
What does this trajectory for income velocity imply for nominal GDP growth and inflation in the period 2021-2024?

In Figure 5, M2 is assumed to slow gradually from its current double-digit growth rate of 24% year-on-year to 6.0% year-on-year by 2022 Q1, continuing at that rate until 2026 Q4. Nominal GDP is obtained as the product of M2 times velocity (converging to trend in 2024 Q4). These data are shown in pictorial form in Figure 5.

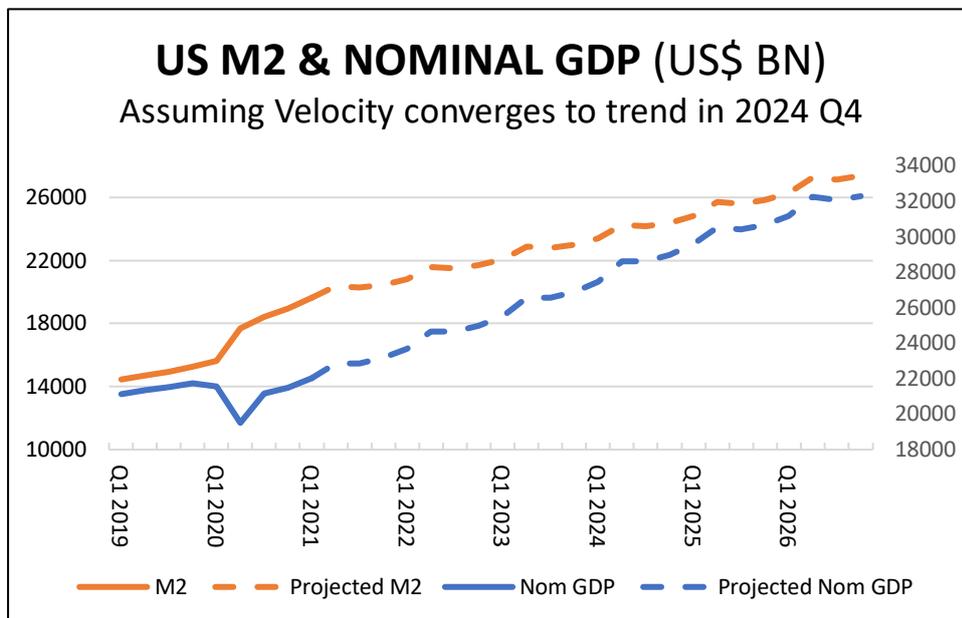**Figure 5: M2 and Nominal GDP, with Projections from 2021 Q2**

Figure 6 below translates the data in Figure 5 into year-on-year percentage changes. Nominal GDP is derived as velocity (in Figure 4) times M2 as assumed in Figure 5. Under the above assumptions, nominal GDP will grow rapidly for the remainder of 2021 and 2022 Q1, slowing to 7.8% p.a. until 2023 Q1, then to 7.7% until 2024 Q4 (blue dashed line).

Next, if we make some assumptions about the US real GDP growth rate (using Bloomberg consensus forecasts), we can estimate the inflation rate as the difference between projected nominal GDP and real GDP (as in Figure 6). On this basis, if real GDP grows at 4% in 2022 and slows to 2% from 2023 Q1 onwards, the numbers in this projection imply inflation will be 4.7% in 2022 and 5.7% p.a. in both 2023 and 2024. Inflation then slows to 4.7% in 2025 and 3.5% in 2026.

Figure 6: M2 & Nominal GDP Growth, with Projections from 2021 Q2
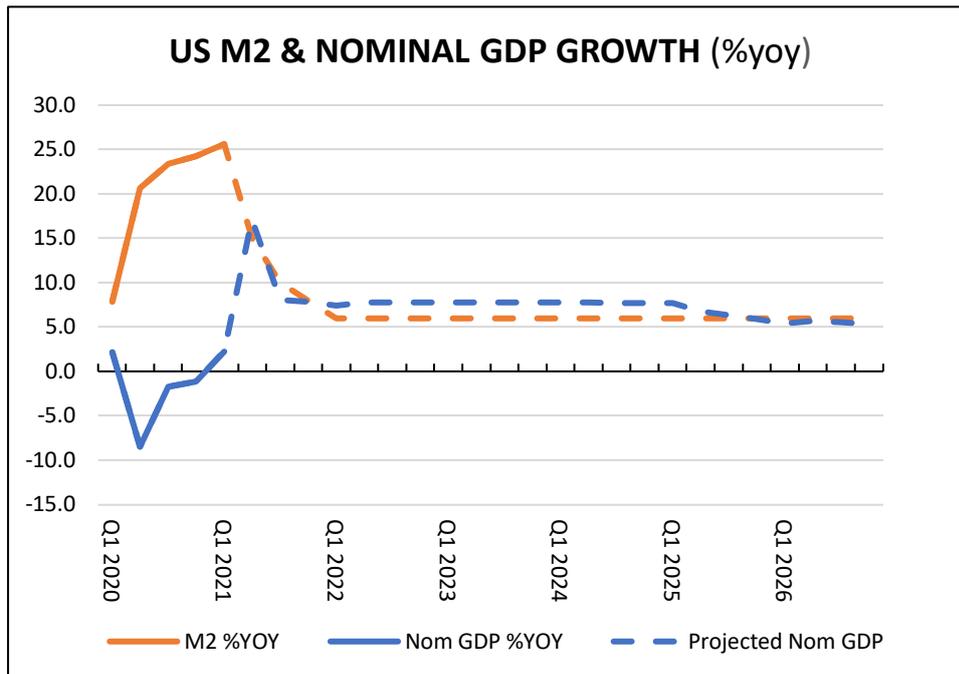
Finally, we can also calculate an implied inflation rate over several years by using the average annual growth rates of our dataset as inputs to the variables in the quantity theory equation over the entire period and solving for the inflation rate. If we select the period 2020 Q2 to 2024 Q4 (the data points to 2021 Q1 are actual, anything later is assumed), we have:

$$\Delta P = \Delta M + \Delta V - \Delta y, \text{ where the deltas indicate average annual rates of change.}$$
$$\Delta P = 10.5 + (-3.4) - 3.0 = 4.1$$

In words, an assumed average annual increase in M2 between 2020 Q2 and 2024 Q4 of 10.5% and average annual declines in velocity of 3.4% p.a. (which includes both the big decline in 2020 and the subsequent reversion back up to trend by 2024 Q4) will produce 3.0% p.a. real GDP increases (real GDP data obtained from actual or Bloomberg consensus forecasts). The result will be an _**average**_ annual 4.1% p.a. increase in the price level between 2020 Q2 and 2024 Q4. Already we have had several quarters with inflation rates lower than 4.1%. This implies we are almost certain to see several quarters with substantially higher inflation rates over the period to 2024 Q4.

To conclude, based on careful study of the behaviour of velocity in many countries and different eras, it can only be concluded that velocity in the United States is neither unstable

nor does it behave differently from velocity in other countries. The recent 23% downward lurch in velocity was caused by the combination of lockdown which prompted nominal GDP (in the numerator) to fall and the extraordinary measures taken by the Fed resulting in a huge increase of M2 (in the denominator).

Given the tendency for velocity to trend downwards over time, it is highly likely that US velocity will revert to trend over the next few years. In turn, this means that US nominal income is also likely to experience a significant increase in growth during the reversion. Since real GDP has limited upside potential in the short run, the excess of nominal growth over real growth will show up in the form of higher inflation.