Money and its velocity matter: the great comeback of the quantity equation of money in an era of regime shift

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Abstract

The velocity of money (V) depends on P = the general price level, T = the total amount of goods and services produced and M = the total amount of money in circulation, and can be expressed by the formula $V = PT/M$.

Since the late 90s, the velocity of money has continued to fall and the Covid-19 crisis has exacerbated this trend, reflecting a low level of activity, together with monetary and budgetary support. At the same time, the velocity of money in the financial sphere has trended higher, as reflected by increases in asset prices.

However, if we consolidate the financial and real spheres into one unique notion of V, the velocity of money looks higher than traditionally measured.

In the next sequence, we expect that excess liquidity will be absorbed and that prices for goods and services will increase.

Longer term, however, a regime shift will materialise. This will be characterised by governments taking over control of money while maintaining widespread and double-digit monetary growth for several years, as part of a broader transition from free market forces, independent central banks and rule-based policies to a command-orientated economy. Additional money creation, for example to finance the energy transition, could build the conditions for a simultaneous financing and expansion of both the financial and real spheres and will lead to an increase in asset prices and in the prices of goods and services for at least some time.

This scenario could introduce another lag between rising inflation and low interest rates, as rates would be capped for some time (resulting in financial repression), before the authorities lose control of yield curves, thus leading to a new monetary order (another feature of the new regime).

In addition, inflation have a critical psychological dimension that could have significant implications on money and its velocity and their impact on activity, prices and interest rates. Powerful forces of memory and forgetfulness drive the psychological sphere. Short-term memory exerts a persistence effect (for example the recollection of secular stagnation could have led to the underestimation of inflationary persistence in 2021), while forgetfulness has its highest influence at both the top and the bottom of cycles. As inflation proves more persistent and disinflation/deflation memories fade, market attention will return to past inflationary episodes, such as the '70s.

This process is not linear; it can be brutal at times and self-sustaining. In a regime shift, characterised by deviations from a "normal, reference, stable" environment, there can be a rapidly increased focus on the most recent data and to confirm any divergence from previous patterns. This is precisely where we are today with inflation.

At some point in time, the forces of money and the relevance of the monetary equation will come back into focus, but this will come with a loss of control and credibility for central banks. This will be the time when the regime shift becomes a reality and will determine a reordering of risk premia.

About the author

Pascal BLANQUÉ

Pascal Blanqué is Group CIO of Amundi and Member of the Executive Committee since 2005. He has also been heading the third party distributors business since 2010 up to 2016 and the Institutional Business since 2010 up to 2017. He started his career in finance with Paribas in 1991 and joined Crédit Agricole in 2000, where he was Head of economic research and Chief Economist until 2005.

As an economist and a financial historian Pascal Blanqué is the author of several contributions. His research interests and his academic work focus on monetary issues, the functioning of financial markets and the philosophical foundations of economics. His books include Money, Memory and Asset Prices, The Social Economy of Freedom, Philosophy in Economics, Essays in Positive Investment Management and The Economic and Financial Order. He is a member of the French Société d'Economie Politique and of The 300 Club.

Pascal Blanqué was awarded European CIO of the Year 2013, 2018 and 2021 by Funds Europe Magazine. He also received the Manager Lifetime Achievement Award 2016 by Institutional Investor.

Pascal Blanqué graduated from the Ecole Normale Supérieure and Sciences Po in Paris and holds a PhD in finance from Dauphine University.

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if properly measured, it still works

I.1. Setting the scene with Money Velocity definition

The velocity of money (V) has fallen and has not been revived by the sharp acceleration of monetary stimulus measured by the increase in the total amount of money in circulation (M). Based on the quantitative equation:

$$MV = PT$$

Where P=general price level and T=total amount of goods and services produced.

Consequently:

$$V = PT/M$$

Where PT represents some proxy of the activity level, i.e., transactions in the real sphere or transactions of goods and services per unit of money. **The velocity of money in the real sphere has not sent early signs of a future acceleration of the inflation for goods and services (i.e., in the real sphere).**

Figure 1. US velocity of money
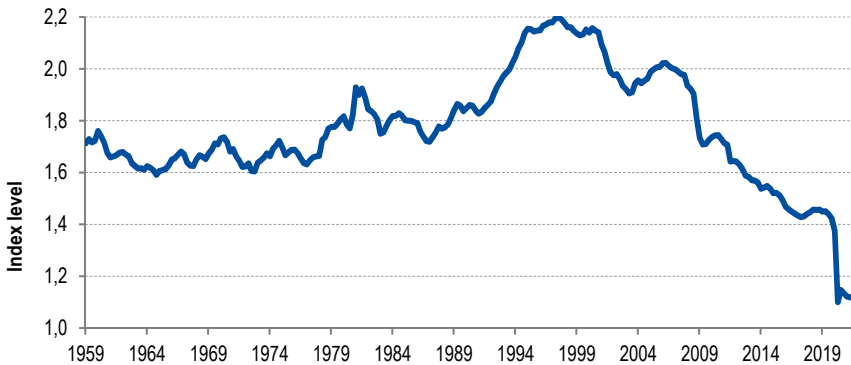
Source: Amundi, Bloomberg. Data is as of 18 November 2021. Data refers to the Bloomberg velocity of money M2 money supply index. The index measures the average number of times a unit of money (as measured by a monetary aggregate) turns over during a specified period of time.

At the same time, the short-term evolution of nominal interest rates has been consistent with the increase in M. In the short run, the initial correlation is negative, with the liquidity effect (Keynes) being dominant.

The questions for investors are:
- Can the unparalleled monetary stimulus witnessed with the Covid-19 crisis -- and, more generally, the impressive cumulative stimulus started in the aftermath of

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the 2008 Great Financial Crisis (GFC) and, even longer term, inaugurated with the disinflation era, symbolically initiated by the arrival of Paul Volcker at the Federal Reserve -- be considered as inflationary?

- Is this inflationary process likely to revive inflation in the traditional sense, i.e., in the real sphere of goods and services? And to drive interest rates higher, consistent with a positive relationship between M and interest rates over the medium to long term?

We have entered a period where M has returned with a vengeance to the intellectual and operational landscape. Focus on the main 'competitor' (debt-to-GDP ratio) should diminish, at least on a relative basis (the second derivative matters), as an increasingly large share of debt is held on central bank balance sheets, while nominal interests rates are fundamentally presumed to remain very low ('natural' interest rate, see Blanchard and Summers) and are cyclically under the control of non-orthodox, QE-type monetary policies. We make this distinction since it is unclear whether the interest rate situation is forced and artificial or fundamentally grounded and justified. This ambiguity is a distinctive feature of the environment, of policies, and of the uncertainty degree for investors.

At the same time, the focus on M should see a revival, not only because of the increase in M but, more critically, because much will depend on the dynamics of M, i.e., the liquidity's journey through the channels of both the financial sphere -- where money is injected into contemporary economics -- and the real sphere -- where eventually it ends up, or not. This is the velocity of money and its distortions and dynamics. The focus is back on the velocity of money as a paradox, since the notion has been criticised, denied, and even forgotten, due to volatility and instability.

I.2. Think total money velocity and total inflation

We assert that the low velocity of money in the real sphere (transactions in goods and services per unit of money) does not account for the effectiveness of the inflationary process at work, that this inflationary process is effective also in the financial sphere, and that, in order to capture the dual aspect of inflation, we must accept the idea that the velocity of money is itself dual in nature. **This means that money can circulate both in the financial and the real spheres.** As such, we should read the quantitative equation as:

$$MV' = P'T'$$

Where V' is the sum of the velocity in the real and in the financial sphere and T' is the sum of transactions in the real sphere (goods and services) and transactions in the financial sphere (financial assets).

According to this approach, **the velocity of money most often commented upon is perceived as low and no longer correlated with price changes, because the velocity of money in the financial sphere has been ignored.** In fact, V' -- a function of V_f (financial sphere) and V_r (real sphere) -- has been substantially higher than the initial

V presented above, where $V = V_r$). It is also because the definition of prices or inflation has been limited to goods and services. **In fact, the acceleration of the velocity of money in the financial sphere has resulted in an increase in financial asset prices.**

If both the real and financial spheres are taken into account, the total velocity of money has shown a profile consistent with theoretical expectations, that is, an upward profile where, like a set of mirrors reflecting off each other, **what has risen in the financial sphere has acted as a form of counterpart and as the price to pay for the low level of volatility and general stability (decreasing trend) in the real sphere, positively correlated with total inflation, if both the financial and the real spheres are taken into account.** Total inflation looks different, when adjusted for asset prices. The quantitative equation has not failed. It can be said that **the inflationary process has been effective or has effectively taken place, that this process has transited temporarily throughout the financial sphere -- where liquidity is injected and can remain trapped for some time -- before, at some point, reaching the real sphere.**

According to this approach and based on the ratio between activity (transactions) and money, when transactions increase at a slower pace than the money available, there is excess liquidity. If this is the case for both financial and real transactions, it will result in total excess liquidity (global cash balances will be up). **If this is the case for the real sphere only due to low activity, the excess liquidity in the real sphere could be deployed in the financial sphere.**

As such, there will be transfers of liquidity from the real sphere to the financial sphere.

Transfers must occur between the two spheres for the financial sector to finance the increase in asset prices. As long as these transfers are possible, **price increases can be sustained in the financial sphere until this process slows down or stops, which often occurs when monetary policy is tightened, in a situation that can be described as an anaesthesia of the financial sphere.**

This reasoning is based on the idea of a constant and defined pool of liquidity, which is available for both the financial and real spheres. Macro financing in one sphere implies less financing in the other. Extra liquidity can also be provided, so that simultaneous financing of both spheres is possible**.**

When activity (transactions) picks up in the real sphere, the excess liquidity is absorbed by the real sphere. As a consequence, interest rates rise and the excess liquidity available for financial assets is sucked back into the real sphere.

I.3. Preliminary conclusions

From the quantitative equation of money (the Fisherian identity), **the concept of money velocity can be proxied as the ratio between transactions and money (T and M in the equation).** This can also be described as the demand for cash balances in relation to aggregate nominal spending and expressed by the notion of relative demand for money, that is, the ratio between nominal demand for money (a proxy

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for M) and aggregate nominal spending (a proxy for D, activity or production). **This ratio is the inverse of the velocity of money defined above by the T/M ratio.** These notions are expressed in the works of Milton Friedman, Phillip Cagan or Maurice Allais.

So, extracted from the quantitative equation of money, **the concept of velocity of money is effective in estimating a form of balance of the levels of power, pressure, and energy as between activity (transactions, demand, spending) and money (demand for money, demand for cash balances).**

We have a T/M (or Y/M) ratio which defines the velocity of money (income-velocity or transaction-velocity) and a D/M (or M/T or M/Y) ratio which defines the relative demand for money in the sense used by Allais, adopting that of Cagan and Friedman. The two ratios are two sides of the same coin, the second being the inverse of the first.

It is the intensity and speed of circulation of money in the economy that is estimated in this proxy for the velocity of money, the former being proxied here by the level of transactions per unit of money. **This is coupled with the idea that the greater the velocity, the greater the changes in prices (inflation).**

The greater the ratio between the proxy for activity, transactions, income, and spending – proxied by T in our approach – and M (the greater the velocity of money), the greater the level of absorption of excess liquidity (that is, money or demand for cash balances in excess of what is needed to fund transactions or spending); ultimately, the greater the price variations.

When the general level of activity is low in relation to M, there is excess liquidity, associated with an increase in M, due to monetary accommodation and a decrease in interest rates. When there is an increase in the general level of activity in relation to M, the excess liquidity is absorbed by the funding for a higher level of activity that goes hand-in-hand with a rise in interest rates.

In this approach, monetary expansion is initially accompanied by a decrease in interest rates and in price variation. This fits with the idea of a low level of activity at this point in the cycle, where T is low in relation with M (changes and variations), i.e., the velocity of money is low and falling. This is Keynes' **'liquidity effect'.**

Then, in a different sequence, the increase in activity in relation to M (i.e., higher velocity of money) reduces the excess liquidity, which gets absorbed by a higher level of activity. This is reflected by higher price variations and an increase in interest rates. This is Irving Fisher's revenue/production effect.

In summary, **the concept of velocity of money extracted from the quantitative equation of money is effective for investors to gauge and estimate trends in activity (T) in relation to M, the excess liquidity in the economy, its evolution and how it is channelled, and the demand for cash balances.**

It can be used to estimate future trends in rates and inflation. This concept of velocity of money is effective and useful if there is a total definition of, or approach to, V and P (velocity and inflation), i.e., which embraces both the financial and the real spheres.

II. Why the great disconnect between inflation and rates will not last forever

On this basis, developments have been broadly consistent. The velocity of money in the real sphere has been low and has decreased, reflecting an environment with a low level of activity after the eruption of the Covid-19 crisis, together with monetary and budgetary support. This means that the T/M ratio has been trending lower, together with low or decreasing interest rates and price changes (excess liquidity). **Simultaneously, the velocity of money in the financial sphere has trended higher, reflected mostly by increases in asset prices and variations therein (changes in asset prices), as the excess liquidity made available in the real sphere (due to weak activity) has been transferred to (absorbed by) the financial sphere.**

If we consolidate the financial and real spheres into one unique notion of V, it can be said that the velocity of money has been higher than is normally thought to be the case or as traditionally measured.

As, in a second and different sequence, activity (T) picks up in relation to M, **we could expect upward pressure on (first) nominal interest rates, as excess liquidity is absorbed, and the appearance of a rise in prices for goods and services, driving price expectations higher.**

These features have started to become apparent in the immediate post-Covid-19 crisis sequence.

However, there is one caveat. This assumes that central banks will not try to cap nominal interest rates, while, in fact, we know that they did -- and continue to do so -- at least for some time. Ultimately they may decide to remove stimulation through some kind of tapering process or, more likely, they will lose control of the curve and of nominal rates, due to pure market forces.

This scenario has played out in the recent sequence and may play out for some time yet, while there is a disconnection between changes in inflation (price variations) and changes in nominal interest rates.

Another caveat is that, for some reason (probably related to some form of cyclical growth deceleration, as can be seen from the most recent figures), **monetary and budgetary accommodation is prolonged, which means there will likely be only a tiptoe into tapering.**

Monetary accommodation may even be increased at some point.

Both caveats (cap on nominal rates disconnected from risky inflation and prolonged monetary or budgetary accommodation) would support an extension of the market sequence that is favourable to risky assets.

Despite these forces, the rebalancing rationale and dynamics behind the financial and real spheres -- and their relative velocities of money -- would play out more rapidly and more effectively. We consider that, over and beyond these delays and counterforces, the adjustment scenario will play out and any delay could not change the end game.

Figure 2. The great disconnect, between inflation and rates, will not last forever
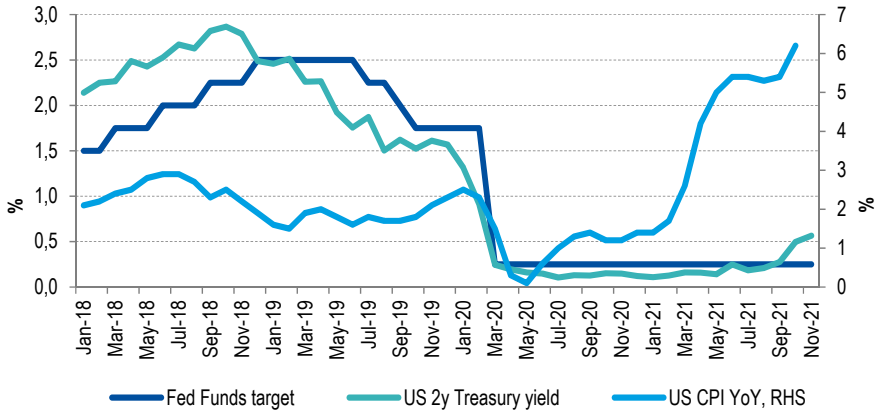
Source: Amundi, Bloomberg. Data is as of 1 December 2021.

II.1. Four key take aways

1. **We have moved to a different macro-financial regime,** where M and, above all, its velocity, will prove critical for the assessment of economic and financial developments and a critical gauge for investors; M will dethrone the famous debt-to-GDP ratio.

2. **The concept of V, as properly defined – embracing both the financial and real sphere -- has been effective and useful.** When adjusted for asset prices -- and some critical ones, such as housing prices and rents, as evidenced by their fast-rising trend in the United States – inflation, as it should have been understood (i.e., total inflation) and the velocity of money (including both financial and real sectors) have effectively trended higher than expected. Only conventions (such as the one excluding house prices and rents from CPI calculations) have been able to mask this reality.

3. In addition, **the traditional inflation component of goods and services is now showing lasting increases which are spreading beyond the pure, post-Covid-19 crisis base effects;**

3. **This process -- as regards some of its consequences (firstly, nominal rates) -- has been distorted and delayed by a monetary policy stance that aims at dissociating systematically nominal interest rates from rising inflation trends and at maintaining real interest rates in negative territory (financial repression framework), lifting all boats in financial markets. This divergence cannot last for ever.**

III. Monetary phenomena (and inflation) have a psychological dimension

We argue that, for a given increase in M, the final inflationary impact will depend upon the psychological referential, whether or not the key variables that structure the psychological referential are igniting – or likely to ignite -- an inflationary process: i.e., duration, memory, and forgetfulness (see Blanqué).

III.1. Influence of the past

One aspect is the role of the past. The past, the way we remember and forget, can be taken as a proxy for the expectation process, with the analogy that we anticipate the future in the same way we remember or forget the past. Under such approach, we have the weighted averages of past inflation rates (when turning to the inflation question), together with a rate of forgetfulness or a rate of memory decay – and weightings which decrease over time. This is the way that Cagan looked at the question of hyperinflation or how Fisher formulated his approach.

As an extension of this approach, **we can take the weighted averages of past growth rates as a key determinant of the economic environment and of its perception when turning to expectations, or, alternatively, of the risk for a bondholder.**

The past can also be taken as exerting some hereditary influence on the present. It is a sort of psychological and exogenous force which imposes itself (Allais). **According to this approach, there is a psychological interest rate -- a sort of pure rate of interest which sets the (future) trend in interest rates --** equal to a rate of forgetfulness (or, more appropriately, a rate of memory decay) that is linked to the perception of the economic environment.

In turn, the latter is conditioned by the memory of past rates of nominal spending (weighted averages) together with a rate of memory decay: the further back in the past, the higher the memory decay. **Overall, psychology enters the game through the role of memory. Whether it is a pure, deterministic, hereditary dimension -- i.e., the influence of the past on the present -- or some proxy for expectations of the future, economic agents and investors perceive their (economic) environment based on and fuelled by memory of the past.**

III.2. The impact of money depends on what happens in the psychological referential

Psychology (the Psyche) is important when assessing monetary topics and dynamics in relation to expectations.

The traditional assessment of monetary phenomena takes place within a unique referential, which we can call the real referential, and uses a unique definition of time, that is the ordinary time of clocks, which we are familiar with and which we can call **physical time. We think that a better understanding of monetary phenomena**

can be achieved by adding the dimensions of a psychological referential and of psychological time.

Psychological time is a time that is perceived or felt.

The important point here is that what happens to money (M) and its velocity within the real referential will produce more or less of an impact (or no impact) on activity, prices, and interest rates, depending on what happens in the psychological referential. This psychological referential -- a combination of individual and collective dimensions -- is essentially made up of duration, memory, and forgetfulness. **The rate of memory decay (rate of forgetfulness), which is neither constant nor unchanging, is very important. The length of memory is more or less pronounced.**

The idea here (see Allais) is that within a stationary regime (state) or at some kind of equilibrium, there is a relatively stable rate of memory (decay). Broadly speaking, **this rate of memory reflects the perception of the environment.** Sometimes it has been proxied by the weighted average of past rates of variations in nominal spending (see Allais), with the assumption that **variations in nominal spending will have a more limited influence on the perception of the environment the further back in the past they occur.**

It follows that the memory decay decreases or increases at a rate that is not constant. Such rate will depend upon the past values of the anticipated variable.

Consequently, **when the rate of variation increases, the rate of memory decay also increases (the rate of forgetfulness), with greater weight being given to the most recent values as compared to the longer (past) values.** In other words, the coefficient of revision of expectations is not constant. Rather, it is an increasing function of average past rates of variations in nominal spending ("coefficient of psychological expansion" for Allais). The higher this coefficient, the quicker the adjustment of the expected value to the realised value.

It follows that **memory shortens with the persistence of phenomena. Accordingly, memory decay is highest at the top and bottom of cycles, or when memory is shortest or forgetfulness is highest.**

This psychological approach can be enriched by two dimensions (see Blanqué):

1. **One is the adjunction of memory recalls,** when some present development ignites a sudden, or even brutal, memory recall of some past events in the psychological timescale, such as the Spanish flu in the Covid-19 crisis or the 1970's inflationary period afterwards. This can also be a more or less sudden forgetting process (they may go hand-in-hand), over and above the chronological succession of events in physical time (in the psychological referential of time, there is no chronology or succession of events as we understand the same within the physical timescale). Suddenly, some weight may be given to a past event or, conversely, the forgetting process may be maximum. This adds a dimension to the approach in which memory is a linear

process of weighted averages of past rates of variation, with an exponential decrease in weights over time. **The dynamics of the psychological referential allow some additional weight to be given to very remote events in the past, irrespective of the physical time distance.** This applies in particular to long-term and collective memory shapes and patterns that are deeply anchored and buried, in relation to narratives, beliefs, or discourses.

2. The other dimension is the extension or broadening of the memory matter beyond what is, strictly speaking, past nominal spending as a proxy of the environment perception. **It encompasses shapes and patterns, or building blocks of the memory structure, such as narratives in relation to beliefs and discourses. This approach to memory as a language, together with the new powerful means of big data and artificial intelligence (AI), opens up new territories (Blanqué).**

Conclusions: what may lie ahead?

1. M and its velocity are central variables in the ongoing regime shift

We argue that M and its velocity will be central variables of the new macrofinancial regime. Its relative importance will prove greater than debt-to-GDP ratios.

This change in focus is, in fact, one distinguishing feature of what we call the **regime shift. While there is no way of denying the growth in M, its implications are downplayed.** The unlearning of monetarism plays its role, with the episodes of the 1970s remote in a now distant past. Memory decay (forgetfulness) has done its job. Furthermore, velocity of money is dismissed. Velocity, as traditionally measured, has fallen in the crisis aftermath, with financial innovation and digital technology playing a key role in reducing it and casting shadows and profound doubts on any remaining link with future inflation and the pattern of interest rates. **The narrative of a 'temporary' upturn in inflation has gained ground.**

We argue that, according to properly measured and integrating developments in both the financial and real spheres, the relationship between V and total inflation has not broken down. The intellectual framework is still valid. If this is the case, then V is higher than often thought.

The reference framework may have lengthened recently (in the last three decades), under the combination of powerful, but not enduring, factors that cannot be extrapolated and which seem, one-by-one, to reverse themselves (second derivatives are important). This is the case of demand, supply, demographics, reversal of globalisation 1.0 features, global trade, cheap Asian labour, etc (see *The Road Back to the 70's. Implications for Investors*).

Nevertheless, there is nothing which enables us to assert with any degree of certainty that the framework dynamics have ceased to be effective. **After all, asset price inflation comes first** -- money is injected into financial markets in contemporary economics -- **and then activity is expected to follow, albeit with a time lag and, ultimately, after another time lag, inflation in the broader sense will spread.**

This seems to fit with the idea of a regime shift, where governments are taking over control of money while maintaining widespread and double-digit growth of money for several years, as part of a broader transition from free market forces, independent central banks and rule-based policies to a command economy.

This could introduce another lag between rising inflation and low interest rates, as rates would be capped for some time (resulting in financial repression), before the authorities lose control of yield curves, thus leading to a new monetary order. Central to this case is the assumption that the velocity of money should mean revert, to some extent. We argue that, in the same way that inflation is a monetary phenomenon (Friedman), monetary phenomena have a psychological dimension.

2. The perception of the environment is very important in (economic) monetary matters

Memory dilates and contracts depending upon the circumstances, and with a rate of memory decay (forgetfulness).

While in a stationary state, in a normal, stable environment (equilibrium), one unit of physical time equals one unit of psychological time, things may change in more troubled times (when 20 minutes is perceived as being equivalent to 1 day of normal time).

There is a link between the memory of the past, that is the perception of the environment, and monetary behaviour – i.e. the relative demand for money, as defined by Nobel prize winner, Allais, or the ratio between desired cash balances (nominal demand for money) and aggregate nominal spending.

In a normal stable environment, memory is long and equal to the sum of past rates. The more normal or stable the environment, the longer the memory (e.g. low growth and low inflation (secular stagnation)). The perception of time is that one unit of physical time equals one unit of psychological time (or at least a ratio of $\sim$ 1).

In a changing environment, i.e. one which deviates from a "normal, reference or stable" environment, there is a rapidly increasing focus on more (the most) recent developments, i.e. a change in the weightings of past rates of variables in production or prices, or the distortion of psychological time in relation to physical time.

The rate of memory decay is higher (forgetting process). Memory shortens. The perception of time changes, with the same period of physical time now being perceived as longer in psychological terms. At the peak and the bottom of the curve and the cycle (maximum deviations from the stationary state), the rate of memory decay is at its maximum and memory is filled by only the most recent developments (inflation, deflation).

At this point, sudden links often occur with some elements of the long-term memory (Spanish flu, 70's ...). They also represent sudden connections with long-term narratives.

In normal, stable conditions, i.e. when memory is relatively long and the weightings of past rates of variations are stable (i.e. when the rate of memory decay is stable or constant and when the further it is in the past, the higher the rate of memory decay), the relative demand for money, i.e. the ratio of desired cash balances (the demand for money) to aggregate nominal spending, is high/increasing.

When there is an acceleration in activity and prices, there is a decrease in the relative demand for money. Desired cash balances fall in relation to aggregate nominal spending.

As there is an inverse relationship between the relative demand for money and the velocity of money, the latter accelerates while the former decreases (money velocity is a decreasing function of desired cash balances in relation to aggregate nominal spending).

So money velocity is likely to accelerate, when the ratio between desired cash balances and aggregate nominal spending is likely to decrease, that is when memory of the past changes, is modified or undergoes some form of modification, i.e. when changes occur to the weightings of the past rates of variations in aggregate nominal spending (production and prices), i.e. a bigger focus on recent developments and deviations from a longer-term average, which signifies some change in the perception of time (a unit of physical time is now equivalent, in psychological terms, to X units in a more normal environment).

There is a change in the way the influence of the past on the present (which can be taken as a proxy for expectations, a sort of coefficient of expectations) **is discounted** (in the same way that the traditional discount rate can be used to measure the influence of the future on the present), i.e. a change in the psychological interest rate, a form of pure interest rate that plays a role in setting the trend for all (observable) market interest rates.

The weighted average of past rates of variation in aggregate nominal spending (production, prices), with weightings that decrease at an exponential, constant rate (rate of memory decay) (which has been the basis for some traditional approaches to some proxies for adaptive expectations (Cagan)) is not, therefore, satisfactory and must take account of variable weightings of past rates of variation in aggregate nominal spending (depending on the circumstances) and, hence, of a variable rate of memory decay.

It follows that the perception of the environment is very important, in the same way as that which happens in the psychological referential – made up of duration (psychological time), memory and forgetfulness.

This helps us understand why an increase in M – even if spectacular, and irrespective of its amplitude and magnitude – is not enough for the inflationary

dynamics to operate throughout money velocity. There has to be some form of modification or change in the psychological referential (duration, memory and forgetfulness), which we have described here as contractions/dilations of the psychological referential and its dimensions – and which has been described (Allais) as a distortion of timescales as between physical and psychological times (changes in money velocity and the relative demand for money, which are two inversely correlated sides of the same coin) – and which reflect/are determined by changes in the perception of the environment, i.e. changes in the ratio of psychological/physical time, the value of a unit of physical time in relation to a unit of psychological time. This is a relativistic postulate (Allais).

Changes and variations in the weightings of past rates (i.e. memory coefficients/ rate of memory decay) are very **important in the way that memory plays out.** Memory dynamics are subject to (sudden) memory recalls, as some current, on-going development awakens some element of the long-term "stock" of memory – whether real or imaginary – that is suddenly projected to the forefront, beyond (and irrespective of) the chronological order (the psychological referential ignores physical clock time).

The irruption of images and narratives of the Spanish flu or the Second World War during the very early stages of the Covid pandemic provides one compelling example. The reference to the 1970's in the episode of resurfacing inflation is another.

This is where narratives (and their constellation of words, discourses and images) are particularly relevant for the identification of memory structures. It is, for example, unlikely that we will see an inflationary dynamic process occurring, whether an increase in M, an upturn in the velocity of money or a decrease in the ratio of desired cash balances to aggregate nominal spending, without some form of dominance by an inflationary narrative, whose structural elements are interlinked with images and discourses from a powerful, past event that is deeply buried within memory and is forgotten, and is then brought back to the forefront (memory recall) – whether or not it is justified – and that this recall, *per se*, will produce an impact on the economy and the markets.

Sudden and abrupt forgetting processes (in French, *mises en oubli*) also happen along the same lines – as memory offers two faces, two sides of the same coin: memory recall and memory decay *(mise en oubli)*.

At equilibrium, i.e. a stationary state, can be found a constant value of memory and forgetfulness coefficients (within the psychological referential). This is the theoretical view. In real life, some stable value of these coefficients defines a regime. This is indeed one of the key factors of any macro-financial regime and its shifts.

It follows that memory matter goes further than (indeed far beyond) the simple and pure economic environment proxied by production and prices (or aggregate nominal demand). Everything that is linked to memory structures, concerning the perception of the (economic) environment, then becomes eligible.

3. In the regime shift, features and recalls of the 70s become evident, money velocity reaccelerates

We argue that the long sequence, initiated symbolically with P. Volker's arrival at the Fed, coincided with a macro-financial regime of low growth and low inflation – which was stable and with limited volatility –, and which has been framed as a narrative of secular stagnation, providing a link with the long-term memory of the situation which has existed in developed economies for centuries – a form of the so-called "Great Moderation".

We argue that, within this sequence of a stable environment with reasonably low growth and inflation, a longer form of memory (in the sense used above) existed, with a reasonably stable and low rate of memory decay. In other words, the weighted average of past rates of variations in aggregate nominal spending (production, prices) has proved stable (weightings of past rates of variations have proved stable) and weights can be viewed as having decreased exponentially at a sort of constant rate (rate of memory decay) or, if not constant, at a very stable rate that has characterised the regime – with the furthest/most distant growth rates in nominal, aggregate spending having the least influence. **The secular stagnation regime and narrative have settled down.**

We argue, as a consequence, that,
- Consistent with the relationships described above, **desired cash balances have risen in relation to aggregate nominal spending, i.e. that, at trend, the velocity of money has decreased,** although less so if total velocity is considered and properly measured, in both the financial and real spheres, in relation to a measure of total inflation – both real and financial;
- **Unsurprisingly, the correlation between the evolution of M and that of prices and inflation has been weak and even disconnected** – although a closer look at the structure of total velocity (in both the financial and the real spheres) reveals a distortion in relative prices which is very specific to some features of this regime, to its institutions and market structures (which continue not to show a failure of V but, on the contrary, an internal evolution in the structure of V).

Consistent with this pattern/framework, the **psychological interest rate** (which discounts the influence of the past and the present and can also be seen, to some extent, as a proxy for expectations of the future) has seen a **downward trend to low levels, setting the trend for nominal (and real), observed market interest rates.**

We provide an interpretation of the regime that links the real referential (real sphere), the psychological referential and the associated narrative.

Now, we argue that, one by one, some key factors/determinants of the regime are being reversed. On the surface, so to speak, numbers – whatever the angle, and at least on the second derivative basis – are starting to turn and shift (there is a long list of both demand and supply factors that have been central to the disinflation of globalisation 1.0 – global value chains, global trade, overcapacities, cheap Asian labour supply, output gaps).

At the monetary core of the regime (from a pure monetary standpoint), following the lines presented above, we argue that the odds are high that memory (in the sense used above) shortens somewhat, as persistently higher numbers in aggregate nominal spending (production, prices) refocus attention and perception on the most recent, current data, leading to changes in the weightings of past rates of variations in nominal aggregate spending, resulting in turn in a change/variation in the rate of memory decay, as the weighted average of past rates of variations in aggregate nominal spending itself takes a new trajectory and profile. **This would, in turn, revive – and has indeed already begun to do so – the sudden memory recall of powerful narratives relating to past events which are deeply entrenched in the long-term memory (like the 70's) and, symmetrically, the (more or less rapid) process of forgetting the narrative of secular stagnation.**

For sure, it will take (physical) time to set the new trend and framework (there is a degree of stickiness in the process), and to disentangle the so-called temporary from the new structural.

We argue that we may be at a critical juncture, where the desired cash balances will decrease in relation to aggregate nominal spending, which will materialise in the form of an increase in money velocity (the latter is the inverse of the former) consistent with a rise in the psychological rate of interest.

In other words, as explained above, psychological time in relation to physical time would begin to change from (i) a somewhat low and stable ratio between a physical and a psychological time unit to (ii) a higher ratio, where one unit of physical time will be equivalent in psychological terms to a bigger number in "normal" conditions (20 minutes in times of inflation is equivalent in psychological terms to one day in "normal conditions").

4. The sequence matter: additional monetary expansion may still justify both financial asset and good inflation, up to an inflection point in which nominal and real rates disconnect will close determining a reordering of risk premia

It remains to be seen whether or not the upturn in money velocity in the real sphere will be accompanied by a form of symmetrical decrease in velocity in the financial sphere – reversing what was observed in the previous macro-financial regime. This is what one would expect from a rebalancing of the liquidity pool from the financial to the real sphere – the latter reabsorbing the excess liquidity with rising interest rates.

This would be accompanied by a reordering of relative risk premia across asset classes throughout a potentially noisy and corrective transition phase. This reordering would inaugurate the revised risk premia attached to the new macro-financial regime. However, this reasoning is based on a sort of constant level of liquidity being allocated to either the real or the financial sphere, i.e. a dynamic of cross-transfers. If **a continuous (or extended) form of money creation were added to the pool, for any reason, this**

would create the conditions for a simultaneous financing and expansion of both the financial and real spheres with, at least for some time, a simultaneous increase in asset prices and prices for goods and services.

Undoubtedly, so long as the nominal interest rate is removed from market forces – and it has been forcefully removed, and still is – **the divergence observed between rising inflation and capped nominal rates may persist, delaying the still effective forces of money and the relevance of the quantitative money equation.**

This is arguably the first time, in the modern, contemporary era, that the latter is confronted/faced with abnormal, continuing market conditions and policies. We would argue that, at some point in time, the forces will reassert themselves with a vengeance – accompanied by a more or less sudden loss of control and credibility. At that point in time, the shift in regime will then become a reality.

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Table 1

Allais' framework. Key propositions.
The relative demand for money.

For Allais, the relative demand for money is a psychological value that is intrinsically stable within the psychological time referential. The observed variation in the real (physical) time referential reflects the distortion of time scales as between psychological and physical time.

The relative demand for money is defined by the ratio between the nominal demand for money (i.e. desired cash balances) and global aggregate nominal spending. This ratio is the inverse of the velocity of money (Allais, Friedman). It decreases (increase) with the increase (decrease) in the coefficient of psychological expansion. The higher (lower) the rate of memory decay, the lower (higher) the relative demand for money and the higher (lower) the velocity of money.

The relative demand for money is linked to the "coefficient of psychological expansion" (Allais) (i.e. the weighted average of past rates of variations in global nominal spending, with exponentially decreasing weights over time, at a constant rate of decrease – a form of expectations function), which is itself linked to the rate of memory decay in the psychological referential, which is in turn linked to the psychological interest rate, a sort of pure rate that sets the future trend of market-observed interest rates.

Desired cash balances depend on the variation/gap between the *neutral* value of the relative demand for money (ratio between the nominal demand for money and aggregate nominal spending) – i.e. at a stationary level, when the psychological coefficient of expansion is zero/stable – and the observed current value. They decrease with the increase of the psychological expansion coefficient.

Table 2

Allais' framework. Key propositions. The psychological interest rate and the rate of memory decay.

The psychological interest rate and the rate of memory decay (which are the same concepts) are constant within the psychological referential but they are variable within the physical time of the real referential, because they depend upon what Allais calls the coefficient of psychological expansion (i.e. the weighted average of past rates of variations in nominal spending with exponentially decreasing weights over time at a constant rate of decrease).

The influence of events is more attenuated, the more distant they are in the past.

A theory of the demand for money seeks to explain the variability of the velocity of money.

"Our appraisal today depends on the cumulative, hereditary effect of past rates of growth of aggregate expenditure" (Allais).

The rate of memory decay is per unit of physical time.

The rate at which the memory of past events fades away.

It is a "psychological time for a whole society" (Allais).

The psychological interest rate and the relative demand for money depend upon the psychological expansion coefficient.

The rate of memory decay is variable over time. Depending upon periods of time, memory of the past is more or less long. Allais's first version was without psychological time, i.e. a constant rate of memory decay within physical time. The introduction of a psychological referential allows the variability of memory and forgetfulness rates to be taken into account.

The relative demand for money has two components. A structural one, i.e. the value in a stationary regime (psychological neutrality) and a psychological component (coefficient of psychological expansion).

The rate of memory decay varies along the physical timescale in proportion to the ratio between physical and psychological time that depends upon the coefficient of psychological expansion.

Cagan's model (adaptive expectations) did not account for the variability of the rate of memory decay.

"People look far back in time in forming expectations (long memory) when changes have been slow, but pay more and more attention to recent events as the pace of change speeds up" (Cagan).

The variability in the rate of memory decay (Allais). The pattern of the weighting coefficients of the past rates is variable over time. The variability depends upon the (variability of) the past rates of growth of aggregate nominal expenditure.

Since the rate of memory decay includes the rate of variation in the general level of prices and production, the coefficient of psychological expansion (and the psychological interest rate) depend upon past variations in the general level of prices (as for Fisher).

The higher the rate of memory decay, the lower the demand for money (desired cash balances).

Central banks cannot directly control the psychological interest rate.

There is a delay in the adjustment of the market rate to the psychological rate of interest (the latter captures the trend, since it is a form of pure rate).

It takes (physical) time for the behaviour (expectations) of economic agents/investors to change. It follows that in a period which is "running normally or is stable", memory is long.

There is no contradiction between the negative correlation between M and the market interest rate in the short-term and the positive correlation between the two variables in the long-term. The first liquidity effect is followed by a revenue effect (through profits and capital demand). Keynes pointed to a paradox (Gibson's paradox) – the quantitative equation extended to financial assets would imply that an expansion of M would lead to a fall in interest rates and a rise in prices, which is not in fact what is observed. Keynes elaborated with regard to a liquidity effect. Fisher mentioned the long and complicated process of adjusting the interest rates to the variations in the level of prices.

Table 3

Allais' framework. Key propositions. Psychological time and physical time.

The psychology (psyche) of economic agents/investors is conditioned/determined by past events whose influence is spreading and decreasing over time – through a hereditary process of memory decay (forgetfulness) and memory of the past. This memory varies depending on the circumstances.

In an economy/regime with a downward trend of low growth and low inflation, monetary behaviour (desired cash balances) is, to a large extent, determined/influenced by a longer memory – compared, for example, with a situation of fast-growing activity and (fast-rising) inflation, where memory is shorter.

The term 24 hours in a normal situation is equivalent, in the psychological referential, to the term 24 minutes in hyperinflation. In Germany, in 1923, one day was perceived/felt as equivalent to 6 months of a normal stable environment (contraction of time). This can be described as the contraction and dilation of perceived time (Allais), i.e. within the psychological referential (Blanqué). Perceived time has a duration that increases (decreases). Time dilates and contracts in economic and financial phenomena due to changes in perception.

The hereditary and psychological approach helps reconcile both dimensions with the introduction of a rate of memory decay which depends upon the perception of the environment. When there is a long memory – i.e. when the rate of memory decay or forgetfulness is low, the interest rate is linked to the level of prices and helps explain the positive correlation between the market interest rate and the level of prices. When memory is short (high rate of memory decay), there is a positive correlation between the interest rate and the price variation (an explanation of the so-called "Gibson's paradox").

The perception of time in a period of stability (of the environment) is different from the perception of time in a period of pronounced fluctuations in prices and aggregate nominal demand. It follows that there is something akin to a monetary psychology, where the perception and the measure of time are peculiar – i.e. there is some distortion between psychological and physical time, some deviation from an initial stationary (equilibrium) state or regime, where physical time flows at a speed of one unit of physical time per unit of psychological time.

Deviations from the stationary state occur with the variations in the coefficient of psychological expansion (Allais) that is determined by the weighted

average of past rates of variations in nominal aggregate spending. The rate of memory decay in physical time is variable, since the patterns of the weighting coefficients of past rates is variable over time, depending on the variability of past rates of growth of aggregate nominal expenditure.

In a stationary regime, physical durations equal psychological durations. Physical time flows at a speed of one unit of physical time per one unit of psychological time. The relationship between one unit of physical time and one unit of psychological time is important.

The relationship between both timescales determines the variations in demand for money within the physical time referential (assuming that it is constant in the psychological referential).

"Duration with respect to a particular system of reference" (Einstein). Here it is duration with respect to a given (economic) environment. The approach is relativistic.

The psychological referential – and psychological time – is dynamic. Duration, memory and memory decay (forgetfulness) are key sources of the dynamic.

A day of cash balance holdings would correspond to a longer psychological duration in a period of hyperinflation than in a normal period of stability of the economic environment. The idea with psychological time is that "durations along the physical timescale, which are equal, are not necessarily experienced as equal durations by the collectivity of economic agents" (Klabi). This depends upon the perception of the economic context. The perception of time is context-dependent.

At equilibrium, one day in physical time is perceived as one day in psychological time. The perception of time is important (in fact, psychological time is the fundamental matter of consciousness – and perception – that is duration in the psychological sense).

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