

Inflation

History, Cause and Implications

By
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Inflation is a hot topic. After the huge quantitative easing by central banks around the world between 2008 and 2013, most economists are asking themselves if there are inflationary consequences. The aim of this paper is to enable the reader to understand the arguments around inflation, what it is, its long term and short term causes, and possible effects. After carefully reading this book, you should be able to keep up with all the arguments in the press, and even trump a few. The book is broken up into eight sections:

Introduction

What is inflation?

Long Term Inflation

Short Term Inflation

Costs and Effects of Inflation

Inflation as a Policy Tool

Hedging Inflation

Our Legacy of Inflation

Introduction

In Nikolai Gogol's seminal unfinished work, *Dead Souls*, the main character is advised that 'the pennies won't betray you in any difficulty' and that they are 'the most reliable of all things'. In reality, however, the phenomenon of inflation undermines this precept. In Weimar Germany prices rose to such an extent that a new number had to be created so that mark paper notes could be valued; and so the billiard, 1,000,000,000,000,000, came into being. Inflation in Weimar Germany is perhaps the most famous inflationary episode due to the absurdity of the figures involved and the role it played in the rise of Hitler. Nevertheless inflation, even at moderately high levels, is not the exception, it is the rule. It can wreak havoc in an economy and wholly undermine our financial security, and we must therefore study and understand the phenomenon, even if we can't seek to control it.

Inflation has existed in some form or other for as long as human society. When farming truly began with the Neolithic revolution 10,000-7,000 years ago, there would have been the need for trade and bartering, particularly given the limited specialisation in the proto-economy. Trade of any kind, including - and maybe even especially - barter is implicitly subject to inflation, albeit a slightly different form of inflation from that which we know today; there is no aggregated 'price level' in a barter economy since the relative value of goods in terms of other goods changes, as opposed to the whole price level changing. For example, the price of a calf in

terms of grain would fall, but the 'aggregated' price of a calf would remain stable. This type of inflation has existed since the Neolithic revolution and represents part of our human heritage.

Recorded inflation first appears during the classical period. The value of the gold aureus and silver denarius were constantly undergoing changes in value. The value of the denarius, in particular, was ravaged by the impact of inflation. Such was the pervasiveness of the problem that in 301 AD, Diocletian used price controls to try to curb the rampant inflation¹. Diocletian's *Edict on Maximum Prices* is the first known example of the policy of price controls, a policy that is still prevalent today². Though the Roman age is the first period where we can see and study inflation over an extended period of time, the first recorded prices had emerged much earlier. Archaeologists have found evidence of prices being recorded in ancient Babylon, almost four thousand years ago.

One of the oddities of inflation and one of the reasons for its abstract nature is that it emerges from seemingly ethereal changes in the relationship between prices. Prices represent something of a challenge to the economist because they represent a nominal value rather than a real value. For example the relative price of a calf in terms of grain represents its real price, as it is given by the comparative value of these goods. Nominal prices don't necessarily relate to a good's actual value since they only reflect the actual price at which a good is sold. A cow that costs a million pounds may seem expensive, but it is relatively cheap if the cost of a bushel of grain is also a million pounds.

Most consumer prices are nominal and are therefore arbitrary. Part of the difficulty in evaluating the phenomenon of inflation stems from this dichotomy. This is illustrated by the events in Weimar Germany; prices rose significantly, but the actual real values of goods didn't change by much at all. German inflation effectively represented a nominal change in prices, and yet this had hugely damaging effects on the German economy and psyche, which still resound to this day.

A further difficulty in evaluating inflation is that most authors to whom one might look for a historical account of the phenomenon tend to have their own political and economic ideology. For example, Milton Friedman's comment 'inflation is always and everywhere a monetary phenomenon'³ can be juxtaposed with the views of Karl Helfferich, a politician of the Weimar Republic, who claimed that there was no inflation in Germany in the early 1920s⁴. Therefore when looking at the various theories of inflation, it is important to seek out their complementarities in order to attain a rudimentary understanding of the phenomenon.

¹ A good study of prices and inflation in the Roman period is 'Inflation under the Roman Empire' by A.H.M Jones in the *Economic History Review*, 1953.

² The US government subsidises oil prices, due to the perceived threat to their popularity from expensive fuel.

³ *The Counter-Revolution in Monetary Theory*, Friedman (1970)

⁴ For the full anecdote and a good exposition on exactly why Helfferich was wrong, *The Economics of Inflation* by Constantino Bresciani Turrone, Chapter IV, p155-182.

What is inflation?

The definition of inflation is an increase in the aggregate price level, a price being the measure of the costs of commodities, goods and services as they change hands in the market. Therefore inflation is dynamic whereas the relative value of prices is static. Prices themselves will tend to be of one of three types: commodities, goods (that is to say products manufactured from commodities) or services. This is worth remembering because on a basic level different types of price tend to trend slightly differently given that the time taken to expand production initially leads to a time lag between changes in commodity prices and the prices of manufactured goods as a result of increases in demand.

On a second level prices can be seen as a measure of the value of money. This is because if the price level doubles, then the value of a given currency will halve since it can buy half the volume of goods or services. Economists generally take a change in the value of money to be the meaning of inflation, as the value of money is inextricably linked with changes in price. The usefulness of exchange rates emerges from the idea of prices reflecting the relative value of money. An exchange rate is a valuation of one country's currency, and implicitly economy, in terms of another country's currency. Through this relationship, inflation is negatively correlated to exchange rates, i.e. inflation is correlated to depreciation, via the mechanism of the changing value of the currency.

A third, more abstract, view of prices is that they can inform us about the systems of production and the structures of exchange in an economy. The price of any good contains a premium for the cost of exchange, mostly transport costs and tariffs, and the cost of production. Prices are a proxy measure of these costs, and do not offer a straightforward quantitative value for the costs of exchange and production. This is one of the more interesting aspects of prices and inflation; the change in prices arises from an agglomeration of different causes reflecting the fine balance (or imbalance) of supply and demand in any given market, and the factors that effect this relationship. Therefore from a historical perspective, trends in prices and inflation may allow us to visualise the change in the relationship based on historical events. From a cursory glance at the price history of the UK or the US, the impact of the Napoleonic wars or the Civil War, respectively, leap out at the observer: it may be possible that beyond simply reflecting upon the historical event, price movements themselves may be at the centre of the process⁵ - the relationship of the cause and the effect must be analysed.

Inflation is also an abstract, and some would say hidden, form of taxation⁶. Specifically, inflation is a tax on cash holdings, nominal wealth and financial assets, essentially taxing the nominal side of the economy. Inflation only taxes wealth if it is caused by an expanded money supply, whereas inflation caused by a supply shock leads to a redistribution of wealth⁷. How the

⁵ An idea explored further in the Long-Term Inflation section.

⁶ This tax is known as seigniorage.

⁷ The reason for this is that if the government increases the money supply, revenue flows to them, so there is revenue that they have gained from inflation. Whereas if a supply shock causes higher prices there is no revenue

process acts as a tax is best illustrated by an example. Consider an economy where the quantity theory relationship holds perfectly⁸, i.e. there is a 1:1 relationship between changes in the money supply and inflation. If the government increases the money supply by 10% to fund spending, this will cause 10% inflation. This 10% inflation will mean that any given amount of money will only be 90% as valuable, as it can only buy 90% of the goods it could buy before the inflationary action. Essentially, the government has funded their spending by reducing the value of money. It can be thought of in another way; if there was 10% inflation, and the size of the nominal economy was £10 million, then over any given period the nominal economy seemingly remains the same. However, if you consider 'post-inflation pounds' and 'pre-inflation pounds' as two discrete currencies, then it is easy to see that the real economy has fallen from £10 million to £9 million in 'pre-inflation pounds'. The same effect would be seen if a 10% tax were levied on the nominal economy but because the order of events is reversed, i.e. the spending occurs which is then paid for by inflation, the effect is less obvious⁹. The reason that inflation only taxes the nominal economy is because changing prices don't affect the real value of goods as they are always priced according to their relative value. An important factor in 'real' price is income, or the price of labour. In the long run, incomes should grow at least as fast as inflation¹⁰ and therefore inflation should not act as a tax on income; clearly if this relationship breaks, then inflation may become a tax on income.

Inflation can also act as a form of wealth redistribution. This is because the principal of debt is a nominal value, and so will be eroded by inflation, unless it is indexed. This means that in inflationary periods, debtors will be better off but creditors will be worse off. This emphasises the fact that inflation is generally a redistributive force, or put another way, inflation is Pareto-neutral¹¹.

The more abstract definitions of price and inflation are of importance to the historian seeking to study of the phenomenon of long-term inflation over a period of hundreds of years. However, in the study of short term inflation, it is prices as the cost of goods at the point of exchange, prices as the value of money and the idea of seigniorage that are important. This paper will now discuss the differences between long term and short term inflation.

gain for the government, creditors are worse off and debtors better off but the government extracts no revenue from the process.

⁸ See the first part of the Short Term Inflation section for a full explanation of what this means.

⁹ This is why seigniorage is sometimes referred to as a 'secret' tax, because it is easy to not realise that one is being taxed at all.

¹⁰ This is distorted by very high inflation, i.e. when prices start to change over days and weeks, because wages can't rise regularly enough, as was the case in Weimar Germany. The effective problem in the case of high and hyper inflation is that prices change continuously whereas wages can only be changed discretely, the problems caused by prices being continuous can be great. The ability for incomes to adjust is also affected in the short run by unexpected inflation, because the wage setting happens at the start of a period based on expected inflation, but this will be corrected for in the long run.

¹¹ Discussed further in the section on inflation as a policy tool.

Long Term Inflation

Long term inflation is the measure of changes in price over a century or more. Looking at inflation over the long term makes it easier to see the underlying inflationary trends without the noise of the peaks and troughs that can distort the impression of the direction of inflation. Indeed, when seen in the context of the great price movements in history, these small changes pale in comparison. Due to the limits on the amount of reliable data, the 'history' of inflation extends from the mid-middle ages (1050-1100AD) to the present day. Systematic records of anything, let alone prices, are scarce before about 1000AD. In the Roman period, before roughly 300AD, the only systematically recorded prices were of wheat, which is not a reliable measure of the aggregate price level in a complex economy. For these reasons our 'history', as concerns inflation, begins with 11th century Europe. The geographical scope of available history increases as data for more countries becomes available, such that by the 16th century, Latin America and parts of Asia join, by the 18th North America and the rest of Asia join and finally by the late 19th century Africa and the rest of the world¹².

The quantity of literature of the patterns of prices over this period is limited in volume, but this compensated for by its quality. The foremost work is *The Great Wave* by David Hackett Fischer. This study of inflationary trends, and through this historical 'change regimes', is a fascinating and remarkable study of the inexplicably ignored phenomenon of long-term inflationary cycles. The other volume which supplements this is *This Time is Different* by Carmen Reinhart and Kenneth Rogoff. Although it is primarily about the history of crises and debt accumulation, it is a superb quantitative account of the last 800 years and sheds some light on the nature and frequency of inflationary crises. The reason for the paucity of studies over this time frame is to do with the nature of the evidence. Although there are quantitative studies of prices or cost of living throughout most of the world for this period, they are somewhat disparate, both in geographical and chronological scope, and as a result it is a long and challenging task to bring them all together in a way that elucidates rather than obfuscates. Where this has been done successfully, in these two works, the results are very compelling.

A study of the price level in the world over the last 800 years reveals that prices have followed a fairly predictable pattern; prices have tended to rise for a period, then stagnate, then rise again and so on. Fischer describes the periods of rising prices as price revolutions and the periods of stagnation as price equilibria. Fundamentally there have been four price revolutions and three price equilibria over the period of inflationary history¹³. Fischer shows that the boundary

¹² A full list of sources of price data, for countries where it is available, can be found in the index of *This Time is Different* by Reinhart and Rogoff.

¹³ The revolutions, equilibriums and crises are as follows (the dates are approximate):

- The Medieval Price Revolution: 1180-1350
- The 14th Century Crisis: late 14th century
- The Renaissance Equilibrium: 1400-1470
- The Price Revolution of 16th century: 1470/80-c. 1650
- The 17th century crisis: 1590s-1650s
- The Enlightenment Equilibrium: 1660-1730

between an equilibrium and a revolution is a smooth transition from no underlying inflation to underlying inflation. On the other hand he shows that the boundary between the revolutions and equilibriums are generally marked by an extended period of crisis and greater than usual price volatility. However, the revolutions and equilibriums do not occur over fixed periods of time, and because of their extended nature and the noise of short term inflationary trends, it is impossible to know where one is in the cycle without hindsight. Therefore it is possible that the world is in any one of revolution, crisis or early equilibrium currently.

These price patterns are well documented but are more commonly recognised amongst the European intellectual community, where the idea of waves in history is much more readily accepted than in the UK or US. Once the idea of these long term price waves is accepted, the idea that the long run underlying equilibrium rate varies between around zero in equilibriums and positive rates in revolutions¹⁴ is also implicitly accepted. The question is what causes these historically significant waves of inflation.

There have been a number of views put forward. Some look at the contemporaneous events as the cause of the inflation and others see the inflation as an indicator of the changes which brought about the concurrent historical events. In understanding how this latter causal path is possible, it is important to remember the power that prices can have. Ultimately at the extremes, high or low prices can mean the difference between life and death. When people are living on the margins of society and the economy, inflation can push people over the edge. The French Revolution, Russian Revolution and the recent revolution in Tunisia (and many more besides) were all sparked by bread riots and were marked by periods of considerable inflation. When looking at inflation from a historical perspective it is important to remember the considerable power that prices exert over people.

There are eight main models that try to explain the long term patterns in inflation. These can be categorised as the monetarist, Marxist, Malthusian, neoclassical, agrarian, environmental, historicist and autogenous change models. The roots of the first seven are fairly obvious from their names; the eighth, the autogenous change model, however is the theory that Fischer puts forward to explain the price waves, and in some senses combines aspects of the other models¹⁵. In reality, it is hard to know which, if any, of these is a 'correct' model, if indeed there is a single 'correct' model. It is possible that the different cycles have different causes, though this is unlikely given the similarities between the cycles. Fischer's autogenous change model has the advantage of offering a clear, elegant and self contained explanation, yet even it suffers from the problem of assuming a certain direction of causality. Each of these different

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- The 18th Century Price Revolution: 1728-1820
 - The Revolutionary Crisis: 1789-1820
 - The Victorian Equilibrium: 1820-1896
 - The 20th Century Price Revolution: 1896-c.today.

¹⁴ The price revolutions have each seen different underlying inflation rates, the first was 0.5% p.a., the second roughly 1%, the third roughly 2% and the fourth roughly 4%. Though it should be noted that although the rate has roughly doubled each time does not mean that it follows that the next revolution will be at a rate of 8%, as this would compound very rapidly.

¹⁵ *The Great Wave* by David Hackett Fischer

explanations has their merits and offers us different insights into the process and causes of the price waves.

The first explanation of these changes is the monetarist model. This is predicated around the idea that long term changes are caused by the factors highlighted by the quantity theory of money, namely a changing money supply or velocity of money¹⁶. However, the extent to which there was sufficient money supply growth during these historical episodes is questionable. One problem is that the periods of rapid growth in the money supply don't seem to match up very well with the dates of the start of the price revolutions. For example, the 16th century price revolution began as early as the 1470s, yet the supplanting of the Aztec Empire was only completed in 1521 and it was a full 50 years after the start of the revolution that gold and silver began to flow into Europe in noticeable quantities.

The monetarist explanation also wholly fails to explain the Gibson paradox; that over the course of long run inflationary episodes, prices and interest rates move in tandem. This is not to say that monetary factors had no role, it is likely that the fact that the rate of underlying inflation rose between each revolution is due to expansions in the global money supply. The expansion at the time of the first price revolution was due to increasing trade allowing a flow of money around the globe, the second as a result of the gold discoveries in the New World, the third due to the introduction of gold-backed paper currency and the fourth as a result of the advent of true fiat money. These increases in the money supply allowed for a greater expansion of prices in each subsequent price revolution. Wilhelm Abel summed this up succinctly when he said 'long-term trends in the price of grain...cannot be explained adequately by fluctuations in the circulation of money, though that has been attempted since the time of Jean Bodin'¹⁷.

The second explanation, the Marxist explanation, takes the view that the price revolutions are a manifestation of the processes that Marx suggested would bring about the 'communist utopia'. On the surface the Marxist view may seem like a reasonable explanation, given that the latter stages of price revolutions often saw some form of social conflict, especially of a class related nature. However, the problems with this theory are multifarious - studies of the period show that the four price revolutions don't sit comfortably with the three systems of production that Marx predicted. Equally, there are certain aspects of the revolutions that do not fit with Marxist analysis and do not correlate with the Marxist reorganisation of the systems of production.

A third causal explanation which has been put forward is the Malthusian explanation. This suggests that price revolutions are caused by the imbalances between demographic and economic growth, implying that inflationary events are caused by the world falling into the Malthusian trap, leading to a greater world demand than supply and as a result inflation. A positive of the Malthusian view is that it does emphasise the role of population, which played an important role in the early price revolutions. However, since the publication of Malthus' *Essays on Population* in 1798, it has been shown that his model does not apply to modern times. There are numerous reasons as to why this is, many of which revolve around the role of

¹⁶ A full explanation of the quantity theory can be seen below, under short term inflation.

¹⁷ *Agrarkrisen and Agrarkonjunktur* by Wilhelm Abel

technology to create crop yields that can sustain a much larger world population and the advent of fossil fuels¹⁸. The fact that we have escaped the Malthusian trap and yet still suffer price revolutions suggests that rising population is an incomplete explanation.

The fourth model that has been used to try and explain long term inflation is the agrarian model. Pioneered by the work of Frenchman Ernest Labrousse this theory argues that the fluctuations are caused by bad harvests forcing up grain prices. This then causes the poor to spend more money on staple foodstuffs and reduces the market for manufactured goods, thus causing a recession. Although this model has some advantages - it works quite well in theories of the middle price revolutions and explains the patterns of wages and rents in all of the price revolutions - it also has a number of weaknesses. It is unable to explain the modern price revolutions, as there are far fewer people living on the margins in countries which have never the less seen rising prices in the long term. Equally it doesn't account for the fact that equally bad harvests had different effects at different times. For example, the effects of bad harvests in periods of price equilibrium did not set off new price revolutions.

The neoclassical approach to the problem gives further insight into the nature of the price cycles. The theories of neoclassical economics, especially as pertain to the long run interaction of aggregate demand and supply, offer an explanation for the dynamics of the price revolutions; the theory suggests that a pattern of long term excess demand causes higher prices. There are parts of this theory which are convincing, since there is seemingly a pattern of excess demand coinciding with the start of price revolutions. However, the weakness of the neoclassical theory is that it fails to explain how or why these price revolutions and equilibria start or end and cannot explain the distinctive wave patterns of long term prices.

Another theory, the environmental view, is that price revolutions are caused by broad ecological patterns. It argues that long term variations in the world's climate alter crop yields and, as a result, manifest themselves in large price rises over the long term. The main criticism of this view is that the ecological trends and the economic trends don't fit together chronologically and any overlap seems to be merely coincidental rather than causal. The historicist argument is that any given event has to be viewed in the context of its own special circumstances and with consideration of the unique historical agents. It argues that each price revolution has its own cause which stems from these unique factors. The problem with this argument is that although each price wave had its own idiosyncrasies, they follow a pattern which is too consistent to be written of as a coincidence.

The final model of the long term price patterns is Fischer's autogenous change model. The core idea of this theory is that there are certain forces within price movements that lead to changes in expectations that shift the pattern of inflation, i.e. that a period of no underlying inflation will lead to a period of underlying inflation because of the effects of no inflation. The argument is that after a period of price stability, there is social stability. This leads to rises in fertility because people are better off and a more positive cultural atmosphere prevails, changing

¹⁸ For a superb exposition on the initial escape from the Malthusian trap, the Industrial Revolution, read E.A Wrigley's book, *Energy and the English Industrial Revolution*.

spending decisions and expanding the scope of people's economic activity. This leads to aggregate demand growing faster than aggregate supply, and, as a result, rising prices. Initially prices of staples rise quicker than prices of manufactured goods. At the same time, relative prices begin to move, interest rates and rents rise and the rate of growth of real wages lags behind inflation. Over time these patterns exceed the range of variation of the equilibrium period. This leads to inflation becoming noticeable and being recognised as a new secular trend. People's behaviour changes in response to the acceptance of inflation in such a way as to further exacerbate inflation: there are potential wage-price spirals, the government expands the money supply, velocity increases as people begin to expect inflation and capitalists charge higher rates, while real wages continue to lag. These tendencies create imbalances in the social system, returns to capital rise and returns to labour fall. This increases inequality in the economy and leads to social conflict. The increasing imbalances create economic instability and lead to greater than usual volatility of prices, as a result output declines and there is greater prevalence of social disorder, violence and war. Then a small event will push the situation over the edge, leading to a straining of the social fabric and ultimately a crisis. This period of crisis then abates the forces of the price revolution and leads to a period of equilibrium as memories of the previous period govern people's actions, making them more economically conservative.

Although the explanation for the process that is described by the autogenous change theory is somewhat convoluted, it does offer an explanation of the patterns that is both accurate and consistent with the data. The core idea of the autogenous change argument is that people's expectations change depending on their point in the cycle, which then alters their behaviour. In the period after a crisis, people have an attitude which is geared towards avoiding another crisis, meaning their behaviour will tend to be more economically conservative¹⁹. However, as this memory fades, their expectations adapt to the period of relative stability and they begin to have more forward looking, positive expectations, which causes more economically expansionary behaviour and contributes to the return of inflation²⁰. The fascinating aspect of this is the extent to which the nature of the expectations, which has a key economic impact, can be seen in the intellectual, cultural and literary output of the period. Periods of equilibrium are generally marked by positivity and an expansion of thought, such as the Renaissance or the Enlightenment, whereas during price revolutions the tone is much darker and less open intellectually, such as the reformation and counter-reformation or the Napoleonic wars.

The crux of the issue of long term inflation is that our desires will always outstrip our ability to sate them. Where permitted by the state of the economy (broad price levels, incomes, interest rates and so on), our behaviour will always lead to excess demand and as a result inflation, which as it becomes expected and institutionalised spirals into crisis. However, in the shadow of such a crisis, the memory of the period constrains our desires and we are happy to avoid the

¹⁹ This is true of most post-crisis periods, it can be seen in the aftermath of the First World War in Britain's reluctance to do anything which may have led to war, ironically culminating in the policy of appeasement that played a role in causing World War Two.

²⁰ The economic importance of the shortness of our collective memory is emphasized in *This Time is Different* by Carmen Reinhart and Kenneth Rogoff, though in the context of patterns of government debt, default and economic crises.

pain of the crisis. Sadly, our memories tend to be short, thus eventually plunging us back into the inflationary cycle.

Short Term Inflation

The study of short term inflation is concerned with prices over a short, self-contained period - where prices will be tomorrow, in a week or in a year. Historical study of short term inflation looks at 'inflationary' episodes, like the Weimar hyperinflation period that lasted just 4 years. It is not a continuous study like that of long term inflation, rather it is discrete. The other important difference is that the study of short term inflation is forward looking whereas the study of long term inflation is backward looking. It is inevitable that the study of short term inflation will tend to be forward looking as its impact can be extremely harmful for a modern economy. Governments around the world spend a considerable amount of time thinking about short term inflation in an effort to pre-empt the damage it can cause. The difficulty for people trying to predict inflation is that although it follows some patterns, like those stemming from the Quantity Theory for example, inflation is a fickle mistress.

Unlike its longer term counterpart, the literature on the phenomenon of short term inflation is extensive. However, the fact that governments want to control inflation and economists want to influence governments means that very little, if any, of the literature is without an agenda. As a result, rather than moving towards a relatively overarching theory of where inflation comes from there are a series of not wholly exclusive views; the literature seems to obfuscate rather than help foster understanding. The other limitation of the literature is the almost religious focus on the hyperinflation in the Weimar Republic, for reasons already mentioned.

This period does have lessons to offer us in our study of inflation today. However, it suffers from two main limitations, which are sometimes overlooked in the scramble for answers. Firstly, it occurred during the time of the Gold Standard, a system of exchange regulations that doesn't exist anymore and had a number of interesting and unique dynamics not shared by modern exchange rate systems²¹. The second point is that the Weimar Inflation occurred after the First World War, which left Germany with exceptionally large debts and a decimated social system, after the abdication of Kaiser Wilhelm II and the decline of the Junker system. These two factors were at the heart of the causes of the inflation and represent a rather unique situation²². However, some of the best tracts on short term inflation were written at the time or about this period²³. The point is simply to keep in mind these limitations when considering the period.

²¹ The unique nature of the Gold Standards and the peculiar effect it had on global monetary policy are emphasized in *Golden Fetters* by Barry Eichengreen.

²² This was because of the disproportionately destructive Treaty of Versailles, the likes of which will probably never be seen again, mainly due to the lessons learnt from the Treaty, which greatly contributed to the rise of Hitler and the Second World War.

²³ The best contemporary writing that came about were *A Tract on Monetary Reform* by John Maynard Keynes and *The Economics of Inflation* by Constantino Bresciani Turrone. The best modern expositions on the period are *Golden Fetters* by Barry Eichengreen, *When Money Dies* by Adam Ferguson and the paper *The Ends of Four Big Inflations* by Thomas J. Sargent.

There are 7 potential causes of short term inflation: monetary expansion, expansion of aggregate demand, contractions of aggregate supply, a wage-price spiral, administered price changes, speculative bubbles and inflationary expectations. However, when pared back these 7 positions are a combination of three underlying extreme causes: the monetarist view, the Keynesian view and the expectations view. The monetarist view says that there is a causal impact of the money supply in the economy on the level of inflation, particularly in monetary expansionary periods. The Keynesian view is that real inflation is caused by a change in the real equilibrium in the economy, such that the price level is determined by the equilibrium between aggregate demand and aggregate supply. The expectations view says that future inflation is dependent on the expected level of inflation, and as such the mood of the people in the economy²⁴. The picture that emerges from these different views is a complicated one and it is therefore important to find the common ground among these theories so that a more complete explanation for the phenomenon of short term inflation can be proposed.

The most famous, and oldest, view as to the cause of inflation is the quantity theory of money. Although it was only expressed mathematically in the 20th century, as the eponymous equation of exchange. The core relationship was first expressed in 1556 when the Spanish scholar Martin de Azpilcueta wrote that 'money is worth more when and where it is scarce than when it is abundant'²⁵. The period from the late 15th century to the early 16th century also saw the ideas of the theory being expressed by scholars such as the great Polish polymath Nicolaus Copernicus and the French philosopher Jean Bodin²⁶. This renaissance quantity theory reached its pinnacle with the analysis of the subject in *Lezione delle Monete* by Bernardo Davanzati. These views came about as a result of the inflation that occurred at the same time as the influx of gold and silver from the New World²⁷, the first example of an analysable expansion of the money supply.

The modern version of the quantity theory is based around the relationship, established by the Renaissance writers, between the quantity of the money supply in the economy and the level of inflation. This has been enshrined in the equation of exchange:

$$MV = PY$$

where M is the money supply, V is the velocity of money, P is the aggregate price level in the economy and Y is the output of the economy, or the goods, which can be bought by the people

²⁴On the surface none of these explain administered price based inflation, i.e. when prices are set exogenously like oil prices by OPEC. However, in order to change prices OPEC or any other body has to manipulate the supply and demand of goods, which fits with the Keynesian view. Equally, in order for these price changes to last it has to be because expectations sustain them. The final point is that any economy where the government has total price control, the closest to a true example would be the USSR under Stalin or the autarkic Germany under Hitler, will not make a good study for inflation and here the theories are redundant. On top of this, governments can only control the nominal prices of all goods, not the real prices. For these reasons it isn't a cause that will be explored any further in this paper, as it is essentially arbitrary.

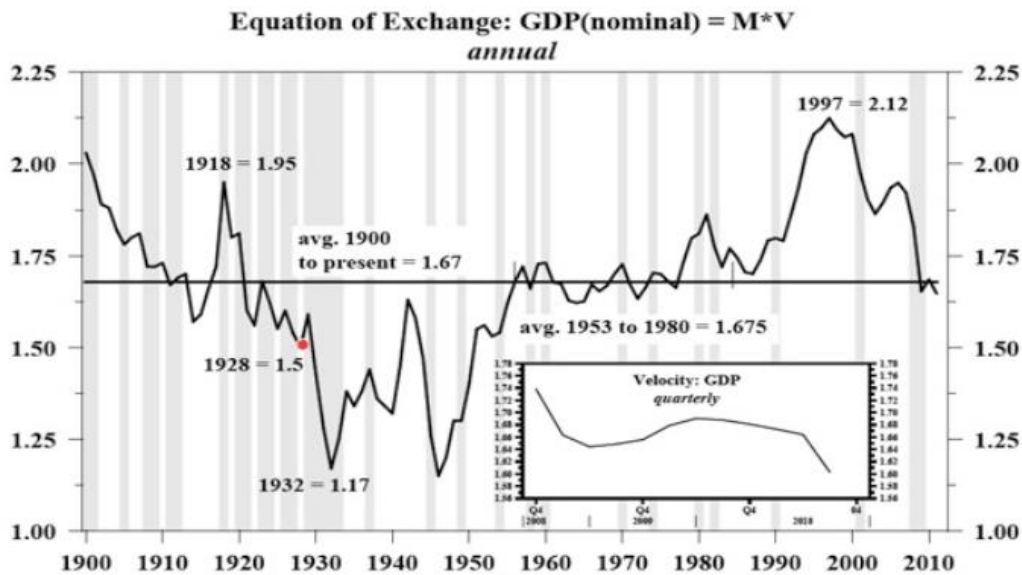
²⁵ Quoted in *The Great Wave* by David Hackett Fischer.

²⁶ In their works *Monete Cudendo Ratio* and *Réponse aux Paradoxes de M. de Malestroit touchant l'encherissement de toutes chases et des monnoyes* respectively.

²⁷ Although the recent studies have suggested that the relationship may not actually have been a causal one.

in the economy²⁸. The assumption that governs this equation is that velocity and output are constant, exogenous factors. If this assumption holds then it can be seen that any increase in the money supply will lead to a proportionate increase in the price level, at the ratio of 1:1. The validity of this assumption is worth considering: if it holds then there is a simple and useful relationship for governments to use and the problem of inflation is solved²⁹. However, the problem is that the assumption doesn't hold, as the velocity can vary. This is shown in the graph below, of US velocity since 1900.

The Velocity of Money 1900 - 2011



Source: Federal Reserve Board; Bureau of Economic Analysis; Bureau of the Census; Monetary Statistics of the United States. Through Q3 2011.

The idea behind the 1:1 relationship is that, like the marginal propensity to consume, there is an underlying equilibrium velocity that doesn't vary, which may well be true in a world with low inflation. The issue is that velocity can itself be affected by inflation, and therefore inflation can self-perpetuate. This leads to an inflation-related spiral known as the inflation-velocity spiral. The crux of this spiral is that when prices start to rise beyond a certain point money loses value whereas real goods don't, and therefore people start to spend money slightly more quickly and

²⁸ This equation can also be written as $m + v = p + y$, where m is the rate of growth in the money supply, v the rate of growth of velocity and so on. There is also another version of the equation of exchange, which is known as the Cambridge equation because it was formulated by the Cambridge economists John Maynard Keynes and Alfred Marshall in the 1920s. The Cambridge equation is $M^d = kPY$, where M^d is the demand for money, k is the Marginal propensity to consume (MPC) and P and Y are the same as in the equation of exchange. From this it can be derived that in the economy in equilibrium, i.e. $M^d = M$, then the equation can be rewritten as $\frac{M}{k} = PY$ and so the velocity of money can be seen to be the inverse of the MPC.

²⁹ Quantitative analyses of the quantity theory are given in the papers *Two Illustrations of the Quantity Theory of Money* by Robert E. Lucas, Jr., *Is Inflation Always and Everywhere a Monetary Phenomenon?* by Paul De Grauwe and Magdalena Polan and *Testing the Quantity Theory by Using Long-Run Averaged Cross Country Data* by Stefan Gerlach, as well as many others beside. Though they are econometrically sound they suffer from the fact that the numbers can be manipulated to both prove and disprove the tenets of the theory.

the velocity increases, which leads to more inflation and higher velocity and so on. This can be seen on a grand scale in the inflations of the 1920s by looking at the difference in the money supply multipliers and the price multipliers. For example in Germany between January 1922 and August 1923, wholesale prices increased by 25,723 times but the notes in circulation only increased by 5,748 times³⁰. Considering that the economy contracted during the period, these figures show that, according to the quantity theory, the velocity must have increased. This point is emphasized in a paper by Dornbusch, Sturzenegger and Wolf, who state that 'the more inflation a country has, the more inevitably it is drawn into rapidly accelerating price increases'³¹. The opposite is also true in that there is a deflation-velocity spiral, which can be seen in the experience of Japan over the last three decades, whereby falling prices lead to people postponing expenditure and the velocity of money falling.

The intuitive reasoning as to why the quantity theory relationship will occur comes from the fact that the MV expression represents the amount of money that can be used in transactions over a given period of time, say a year. The velocity of money represents the rate at which money, when spent, comes back into the liquid money supply. Another way of looking at it is that the velocity is the number of transactions in which one unit of currency can partake over a given period of time. So, the value of money that can be spent over a year depends on these two things. For example, if the money supply is £1 million and there is a velocity of 12, i.e. money returns to the liquid pool of money once a month or is spent in one transaction a month, then the effective money supply is £12 million, that is to say over a year the most that can be spent is £12 million. The other side of the equation, the PY expression represents the value of the goods that are produced in the economy, which for the sake of argument is the value of what can be bought by the people in the economy over a given period of time. It is easy to see that over a given period of time these two expressions must be in equilibrium. If MV were smaller than PY , then producers would reduce their excess output, which no one would be able to buy due to the shortage of money, or, more likely, decrease prices. Equally, if MV were greater than PY then producers would raise prices in order to take advantage of the excess money that existed in the economy.

It is clear that the relationship expressed by the identity $MV = PY$ has a clear logical basis and makes economic sense. Indeed, the fact that this relationship holds over the longer term is not a matter of contention. The issue is that on its own, that is to say without the assumption that velocity is constant, the equation of exchange doesn't actually help us in predicting the direction of price movements. The difficulty of predicting inflation stems from velocity, and to a certain extent money supply, which is hard to measure and, therefore, predict. The only variable which the government can alter, and therefore try and use to affect the extent of inflation is the money supply. But if velocity changes then they have no way of knowing or controlling the effect that it might have. Small changes in velocity may lead to an increase in the money supply having an over-inflationary effect or a deflationary effect. The other problem is

³⁰ *The Ends of Four Big Inflations* by Thomas J. Sargent.

³¹ From *Extreme Inflation: Dynamics and Stabilization* by Rudiger Dornbusch, Federico Sturzenegger and Holger Wolf, p60.

that the relationship holds over a period of time, but it is difficult to calculate what that period of time might be; we don't know on average the time it takes for money supply and price to equate.

It is clear to see that the quantity theory offers a strong causal relationship, between the money supply, the velocity and inflation. However, it leaves us with the problem that this is largely unquantifiable and as a result largely uncontrollable. It is also clear that velocity is one of the key determinants of inflation but it is not clear from the quantity theory what might influence the velocity of money, and by proxy inflation. The other issue is that the quantity theory attempts to explain inflation purely from a monetary point of view but inflation is not always a monetary phenomenon. There is, however, a view that takes a non-monetary position, namely the Keynesian position.

The Keynesian view is not, strictly speaking, the opposite of the quantity theory – it would be difficult for it to be given that Keynes was one of the pioneers of the quantity theory. The Keynesian view would just as effectively be called the 'real side' theory of inflation, in that it is concerned with the real side of the economy rather than the nominal side, like the quantity theory. In fact for this very reason the Keynesian theory is almost a complement to the quantity theory, in that they are not mutually exclusive and explain different inflationary phenomena. The reason why this view may be seen as a counterpoint to the quantity theory is that it comes as part of the group of ideas that form the 'Keynesian economic view' whereas the quantity theory is the equivalent explanation of inflation in the monetarist view. Ultimately the Keynesian view is built around the idea that nominal values are essentially unimportant and therefore all that matters in an economy are the real values. As a result the view is that inflation is influenced by the real side of the economy. The crux of the Keynesian view is that in order for there to be a change in prices, there must be something changing in the real side of the economy; either aggregate supply or aggregate demand.

This proposal bases itself on the assumption that at any given point in time there will be an equilibrium between the demand and supply in the economy, which then determines the price level and as such inflation. Subsequently, if either the supply or demand changes the price will rise or fall. Events such as commodity price shocks are good examples of how supply can affect the price level in an economy. Indeed, they can have a stark impact, which is clear from the effect on global inflation of the oil shocks in the '70s. Equally, demand shocks also affect prices, though generally over the longer term, like the effect on prices from increased real income or from demographic growth. The most noticeable effect of the Keynesian dynamic is the relationship between growth and inflation. When there is economic growth, this leads to higher incomes and resultant higher demand. This then causes inflation, though the extent of the episode will be tempered by the way in which expectations change. Equally, in the 1980s the idea of supply-side policies emerged out of trying to prevent this from occurring. The idea behind this was that if the government pursued policies to expand supply, this would lead to growth and disinflation, or falling inflation.

The problem with the Keynesian explanation is that it only explains part of the inflationary experience. There are numerous examples of inflations which appear to have no real basis, like

the inflations in Central Europe in the '20s. Equally, the dynamics of demand and supply can themselves be affected by inflation. In the '20s in the latter stages of their inflationary experience, Germany began to suffer shortages because farmers wouldn't sell their produce because the currency with which it would be bought was valueless. On top of this, many of the supply side experiences which may cause price rises would not necessarily on their own cause anything other than a very transitory rise in prices. These inflationary episodes do not last for long and prices generally return to the equilibrium level. The scope for this theory to explain the wide variety of inflationary experiences on its own is very limited. However, when it is combined with the other theories it provides a core concept in a much more complete theory of inflation.

The final theory of inflation is the expectations theory. It seems like an odd proposition to suggest that what we think inflation will be will affect the actual level of inflation, yet the relationship is a robust one. The essence of the idea is that when firms are setting wages, they must make an assumption about the future inflation rate, because the inflation rate determines what the real wage will be. Therefore, once wages have been set on the basis of expected future inflation for a period, firms must set prices at that level in order to afford the wages. If they were to keep prices too low then real wages would be higher than expected, which would lead to an increase in demand and as such higher prices. Equally if they increased prices too much then real wages would be lower, demand would fall and they would have to lower prices. This dynamic means that there is a feedback loop between inflation and expectations. Clearly there may be shocks which will alter inflation in the short run, but the rate should then revert back to the expected level, assuming it hasn't changed, in the longer run. It is for this reason that commodity price shocks usually only cause a brief spike in inflation. The other aspect of expectations is that they affect consumption behaviour; if people expect prices to fall then they will put off spending on certain items, which will lower velocity and therefore prices. Equally, if prices are expected to rise considerably then people will not postpone spending but will do it sooner, which will raise velocity and prices; this becomes an acute problem at higher levels of inflation.

Expectations also contribute to the occurrence of the most famous inflationary spiral, the wage-price spiral. If employees expect that prices will rise, they will demand a higher nominal wages. This will lead to companies raising prices which will reinforce the employees' expectation of higher prices and so they will demand even higher nominal wages. This then fuels higher prices and the spiral continues. The powerful role of expectations is without dispute, the question is what influences expectation formations.

There are two theories in economics as to how expectations are formed; the adaptive expectations and rational expectations theories. The first to be formulated was the theory of adaptive expectations, which says that our expectations are formed on the basis of past experience. On the other hand, rational expectations theory, which is currently in vogue, says that our expectations are formed on the basis of all available information, with no recourse to extrapolation from past inflation. The dichotomy is between backward and forward looking, extrapolative or predictive, expectation formations. In an ideal world, with perfect information

and total rationality, we should form our expectations on the basis of all of the available information and so be forward looking. However, it is more likely that people make an approximation between the methods of expectation formation that is neither perfectly adaptive nor perfectly rational. The reason for this is that whilst a big bank or company may be able to collect and analyse all of the necessary information and closely monitor the central bank, it is unlikely that a small business would have the resources. Therefore, they will have to make pricing decisions on the basis of a slightly more backward looking approach. In this way, the central bank and government play a key role in influencing inflation, particularly since, as discussed previously, the money supply plays a role in inflation and the central bank controls the money supply. However, in order for this to be effective policy, it must influence expectations, or it will only cause a transitory effect, like a supply shock. This is why central banks must not only conduct an effective policy, but also be seen to be committed to and honest about their policy. If they can become credible, then their policies will be effective. However, if they take action which is only partly credible, or indeed not credible, then its efficacy will be greatly reduced³².

The quantity view, the Keynesian theory and the expectations theory can be consolidated into a more compressive theory of the cause of inflation. Expectations play a central role in determining the level of inflation and, furthermore, expectations have a rational basis and are not random. Inflation is not directly caused by expectations; rather they act something like a flood gate. Flood gates do not cause floods, the wind, rain and other factors do that, but they can control the extent and timing of a flood. In the same way expectations do not cause inflation, but expectations control the timing, nature and extent of inflation. A concept which illustrates this point is the idea of inflationary pressure. It is often the case that certain factors that cause inflation will change, such as money supply or demand, but inflation will not change for a while or the size of the inflation will not be directly proportional to the change in money supply. During this lag, there is a build up of inflationary pressure; in effect there is latent inflation in the economy. The catalyst for 'latent inflation' becoming realised inflation is expectations. For example, if a government is increasing the money supply, it may not have an effect on inflation straight away, especially with institutions like the Monetary Policy Committee that try to assure constant inflation. It is possible for this pressure build up and for the flood gates to suddenly open, because of a sudden change in expectations caused by another factor, such as a supply shock or a government scandal that damages credibility. This would then lead to inflation being higher than expected, which would fuel further increases in inflation. The fact that a build up of inflationary pressure can have this effect is because of two aspects of expectations: they aren't perfectly rational in the real world and they aren't exact. Expectations generally take the form of being roughly banded, i.e. inflation will rise, or will be roughly positive or negative. If expectations were perfectly predictive then they would have no net effect on inflation and there would be no time lag; but in reality this is not the case. A period of low inflation can lead to expectations that it will continue whilst inflationary pressures

³² An excellent example of the role of credibility comes from *Lords of Finance* by Liaquat Ahamed, who follows the roles of the heads of the key central banks in the '20s and during the depression.

are slowly building in the economy. A good example of this comes from the fact that periods of growth can lead to a build up of inflationary pressure that may then have a negative effect on the economy because the growth leads to more positive expectations. It should be stressed that not all potential causes of inflation will be definitely affected by expectations. It may be that they don't build as pressure and as such have a quick effect due to expectations reacting more rapidly. Equally, some causes, like external supply shocks, will hit companies' costs and force them to raise prices. In these situations, expectations will play more of a role in deciding whether or not the shock leads to a higher inflation level for a period or prices revert to their previous level. The fact that expectations can have these seemingly random effects is part of what makes inflation such an ethereal phenomenon.

There are a considerable number of examples of how the different factors combined to have an inflationary effect. Perhaps the best example is Colombia's inflationary experience from the mid-70s to the early 90s. After a period of slow growth in the 60s, Colombia's economic growth picked up in the 70s, driven by high coffee prices. This led to an increase in demand in the economy and as a result prices rose. This then altered expectations, which in Latin America tend to be more accepting of inflation, and as a result Colombia remained in a cycle of 15-30% inflation until 1990. This was compounded by the fact that the money supply increased at a fairly constant rate over the period. However, the government took measures to ensure that the economy could continue to exist under consistent inflation; they instituted a crawling peg exchange rate system and indexed wages, in effect accepting the inflation. Yet at the same time they were rigid in their commitment to preventing inflation rising above 30% in the event of a shock. This meant that expectations of this level of inflation were strong over the period, even though the money supply grew faster and there were external shocks. This kind of situation is common when initial growth, or some other form of inflationary event, in a previously inflation prone country, where higher inflation is less of an anomaly, leads to high inflation that becomes institutionalized and expectations become anchored at a higher level.

This theory of the cause of inflation brings together the disparate parts of other theories. It says that inflation is caused by monetary factors, outlined in the quantity theory, and by real factors, outlined in the Keynesian theory. However, the extent, timing and persistence of the effects of changes in the real and monetary factors on inflation are determined by expectations. Rather like the inherently linked concept of confidence, expectations are fickle, and in that sense distinctly human, which makes them hard to control or predict. Yet tantalisingly they can be affected by the actions of governments, though perhaps not always as intended and not with any consistency. This view is summed up by Reinhart and Rogoff in *This Time is Different* (albeit they refer to confidence and crises, but if it read expectations, of which confidence is a manifestation, and inflation, the statement would still hold). They point out that 'economists do not have a terribly good idea of what kind of events shift confidence and of how to concretely assess confidence vulnerability. What one does see, again and again, ... is that when an accident is waiting to happen, it eventually does'³³.

³³ From Reinhart and Rogoff, *This Time is Different*, pxlili.

Costs and Effects of Inflation

A wide misconception is that people view inflation as a bad thing³⁴ - people assume that higher prices will make them worse off; in reality this is a fallacy. It is entirely possible for someone to benefit from a period of inflation. A young debtor, who holds their wealth in real assets and whose income adjusts to account for inflation will be better off after an inflation. Indeed, it has been argued that low levels of inflation can benefit the economy, as they allow firms more flexibility in setting wages because they can change the real wage without lowering nominal wages. Yet, in general, the effects of inflation on the economy will tend to be neutral or negative rather than positive. The effects of inflation are dependent on its nature and size, the most dangerous being hyperinflation and deflation. It has been argued that there are 6 different bands of inflation: deflation, disinflation, inflation, moderate inflation, high inflation and hyperinflation³⁵. For the sake of looking at their costs the difference between moderate and high inflation is not hugely important.

On the surface deflation may seem like a good thing, and in certain contexts it is³⁶. However, sustained deflation can have a serious, negative effect on an economy. If there is deflation then people will tend to postpone spending because they expect that prices will be lower in the future. This has the effect of lowering the velocity of money, which in turn restricts demand and slows growth in most parts of the economy, apart from in the production of staples, like foodstuffs. Ultimately, if falling prices become a part of the economy and are factored into expectations, then it can lead to a huge slowdown in economic growth, as has been the case in Japan since the 70s.

The other damaging form of inflation is hyperinflation, which may lead to a drastic shutdown of the economy. Under hyperinflation prices rise extensively, to such an extent that they may rise drastically over even the course of a single day. At one point, in December 2008, inflation in Zimbabwe was estimated at 6.5 quindicillion novemdecillion percent p.a. ($6.5 \times 10^{108}\%$). This level of inflation totally destroys the value of the currency. It doesn't take long for all debt to be wiped out and for pensions to be valueless. The loss of the value of the currency means that the economic dynamics will change and people will avoid using domestic currency, either by barter or the spread of the use of a foreign currency, such as the US dollar which effectively replaced the Zimbabwean dollar. There is also likely to be considerable shortage and hunger. On the one hand people are less able to afford staple goods, because hyperinflation will be sufficiently rapid to outpace wage rises. On the other hand, farmers, who produce staple foodstuffs, may choose not to sell them because the currency is worthless to them, whereas their crops are real

³⁴ For a full study of opinions on inflation read Robert Shiller's chapter 'Why do People Dislike Inflation?' in *Reducing Inflation: Motivation and Strategy* by Christina and David Romer.

³⁵ Dornbusch, Sturzenegger and Wolf define these as follows: deflation is falling prices, disinflation is falling inflation, inflation is price rises of 1-15% p.a., moderate inflation is 15-30% p.a., high inflation is 30-1000% p.a. and hyperinflation is 1000+% p.a.. These are the vague definitions that are assumed here. There is a considerable body of literature as to what constitutes hyperinflations, though a good rule of thumb is 50% per month.

³⁶ Namely when there is expanding capacity in the economy, then deflation increases the standard of living via higher real wages. This was the case in Britain during the Industrial Revolution.

goods that hold their value. This then leads to changes in behaviour and the breakdown of the rule of law. Hyperinflationary periods also see political unrest when the loss of a government's sovereignty over their currency undermines their political position. This was the case in Weimar Germany, where the hyperinflation led to the rise of extremist parties and the imposition of martial law. A period of hyperinflation can totally destroy an economy and alter a country's view of inflation, as has been the case with Germany³⁷. However, there is research which suggests that the negative effects on output only last during the period of hyperinflation and that countries recover rapidly from these inflationary crises. Hyperinflationary crises like these tend to be short-lived, nominal shocks that do not last long enough to change the underlying real dynamics of the economy, although they do highlight the weaknesses of the economy³⁸. This was a lesson Weimar Germany did not learn; hyperinflation highlighted the unsustainability of the gold standard, the absurdity of the reparations package and the potential strength of extremist political parties during economic strife. Despite the dire warning of hyperinflation, these would all play a role in causing the Great Depression and the Second World War.

At lower levels, inflation is more of a nuisance than an overt problem for the majority of people. At rates of under 10% the costs of inflation are minor and an economy can easily adapt to function normally. Policies like a floating exchange rate regime and interest rates that are commensurate to inflation allow an economy to function normally at these levels of inflation. In this environment industries will be able to adapt to the levels of inflation and continue to operate normally. In practice countries have adapted to much higher levels of inflation. The one sector even these low levels can affect is the financial services sector. The financial sector deals mostly in nominal values and as such is susceptible to the effects of inflation. Empirical research into the relationship between financial sector development, growth and inflation suggests that there is a negative relationship between inflation and growth at levels of inflation of above about 15%. It also shows that there is a negative relationship between the strength of the financial sector, its liquidity and willingness to lend and inflation. The conclusion from this is that in the long run inflation of above 10-15% will not be good for the growth of the economy³⁹. This means there should be a focus from governments on producing sustainable growth and looking to expand the productivity of the economy. Inflationary growth, on the other hand, is less stable and by creating inflation, it weakens the basis of the growth.

³⁷ This is just a summary of the effects and nature of hyperinflation, which deserves a study of its own. For a good example of the destructive effects of hyperinflation see *When Money Dies* by Adam Ferguson.

³⁸ A full exposition on the empirical evidence and qualitative analysis behind the possibly transitory nature of hyperinflationary growth shocks can be found in the paper *Inflation Crises and Long-Run Growth* by Michael Bruno and William Easterly.

³⁹ The research behind these figures and conclusions can be found in the paper *The Impact of Inflation on Financial Sector Performance* by John Boyd, Ross Levine and Bruce Smith. The paper *Inflation Crises and Long-Run Growth* by Michael Bruno and William Easterly demonstrates that the point at which the effect starts to become unsustainable may be around 40%. See also *Inflation and Economic Growth* by Robert Barro for another empirical study.

The nature of the mechanisms, by which inflation may be costly, is dependent on whether the inflation is anticipated or unanticipated. Anticipated inflation, which is factored into expectations, has some costs but these are relatively minor, even at low levels. These costs are a result of the need to economise on real money balances and to alter price lists⁴⁰ and also incurs costs if tax systems and debt contracts are only partly indexed. The costs of unanticipated inflation, which is not factored into expectations, are on the other hand much greater. Unexpected inflation leads to an unplanned redistribution of wealth between creditors and debtors, and a redistribution of nominal incomes between the payers and the payees. Costs also arise from future price uncertainty, which effects decisions about consumption, saving, borrowing and investment. The costs can potentially be great and may force firms to allocate more resources to pricing decisions. Unanticipated inflation also increases the cost of identifying changes in relative prices and as such makes resource allocation harder. The costs of anticipated and unanticipated inflation contribute to slower growth in inflationary situations, especially as the volatility of inflation rises with inflation, making it harder to anticipate⁴¹.

The more difficult effect to quantify is the impact of inflation on behaviour. This paper has already addressed some of the effects of inflation on people's economic behaviour, in that high inflation increases velocity and deflation decreases velocity. However, it is possible that inflation may have a deeper and more visceral impact. Reactions to price change are not always rational and amongst the less economically literate, are often based on wholly flawed views as to what inflation means and does. These behaviours are emotional and strong, and this means that there is a case to be made for inflation influencing behaviour. In *The Great Wave*, Fischer shows that during periods of high inflation, violent crime and alcohol consumption rise. He also shows that the periods of price revolutions have seen increases in the percentage of children born outside wedlock and of interpersonal violence, which otherwise shows a downward trend through history⁴². The difficulty with this data is that there is no clear causality - it is possible that it is an incidental correlation. These periods of rising prices tended to be ones of greater inequality, disenfranchisement and in their latter parts crisis. In this context higher crime and illegitimacy aren't surprising. Whether they are a result of the underlying inflation or both the trends in illegitimacy and crime and the trends in inflation are manifestations of some unknown cause is open to interpretation.

The extent to which short term inflation may affect behaviour is unclear. There is strong evidence from all of the examples of hyperinflation that it leads to social unrest and people's behaviour changing⁴³. In Weimar Germany, as prices rose, violence increased, property crimes increased and there was movement towards more radical politics from the usually moderate middle classes. Certainly inflation and the robbery and property crime rate seem to move

⁴⁰ These are known as shoe leather and menu costs respectively. The shoe leather costs come from the need to make more frequent trips in order to reduce real money balances. Menu costs are a result of shops having to regularly change prices, which may be an expensive process.

⁴¹ A full exposition on the form and nature of these costs, as well as a summary of some of the literature on the effects of inflation, is given in *The Costs of Inflation* by Clive Briault.

⁴² See appendices L, M and N in *The Great Wave* for more details.

⁴³ *When Money Dies* by Adam Ferguson is a good account of this.

together, which is unsurprising. On the other hand, studies of the link between violent crime, and the overall crime rate, have been inconclusive in establishing a short term link, though they do reinforce the view that there is a link between these factors over the long term⁴⁴.

In the long run, inflation will be an underlying trend in the economy towards excess demand, in part because our demand is infinite whereas our supply is not so. As is shown by the figures derived by Fischer in *The Great Wave* these levels are not high in comparison to the peaks and troughs of short term inflation and the costs to the economy between these levels are not onerous. However, there appears to be two tipping points, one at 0% and one at 15%, where the effects of inflation become negative and the costs begin to rise⁴⁵. Between, these two points the costs are negligible, but they increase markedly outside of the 0-15% range. During hyperinflations, the most extreme inflationary experience, the effects can be devastating and will cause huge damage to the people and the society as a whole.

⁴⁴ The difficulty with analyzing crime rates is there are many possible causal paths, with data that correlates reasonably well to the crime data. One example of this, is that in *Freakonomics* Levitt and Dubner famous showed that the data and logic supports a causal path between the rise in abortions and falls in crime. Ultimately a speculative hypothesis but one that emphasizes the difficult nature of crime data and attempts to establish causality.

⁴⁵ Though, as shown by the example of Colombia, inflation up to 15-30% can still be contained for extended periods in an economy.

Inflation as a Policy Tool

According to the quantity theory of money, the main cause of short term inflation is increases in the money supply. The dynamics of how any given change in the money supply affects inflation are controlled by the nature and patterns of expectations in the economy, but the underlying cause remains the same. Though there are other causes, like real shocks and velocity changes, the majority of inflationary episodes coincide with changes in the money supply. However, the money supply is not a *deus ex machina*; it has to be undertaken as a policy by the central bank and governments. However, this raises the question of why governments would choose to cause inflation by increasing the money supply.

There are number of possible reasons for a government to adopt inflation as a policy. The most straightforward reason is seigniorage, or the 'inflation tax'⁴⁶. Originally, seigniorage was simply a way for kings to make money from minting coins in the time of commodity money. By valuing a coin above the value of the metal content of the coin, the king could take a premium on minting the currency. The main issue with seigniorage is that it is subject to the costs of increasing inflation, as well as the usual costs associated with taxation. As Keynes points out, in order to continue using seigniorage to make money the government has to increase the money supply by a larger amount each time in order to collect the same revenue as from a previous bout of seigniorage⁴⁷. This will prove very costly to do, as inflation will soon reach the point of doing more harm than the benefit accrued from the seigniorage. The crux of the issue with seigniorage is that it is a distortionary form of tax. As Barro points out, 'if non-distortionary lump-sum taxes and subsidies are not available to the government, then raising revenue through an inflation tax ... may be no less desirable than other forms of taxation which distort economic behaviour'⁴⁸. It may seem improbable that a government would choose to bring in revenue from seigniorage, but it is not as rare as it may seem. Chile in the 1970s raised on average of over 5% of GDP from seigniorage, with a peak of 17% of GDP in 1973⁴⁹. However, despite these possibilities for collecting revenue from seigniorage, Dornbusch and Fischer show that, in general, it is not a motivation for maintaining higher than 15% inflation.

Another reason for governments becoming stuck in inflationary situations may be because the costs of ending these inflationary periods are prohibitively high. In order to deflate they have to contract the money supply and slow growth, the costs of which may be too high not only in terms of slower growth itself but also of unemployment. If this is the case, it can be preferable to bear the costs of indexation and moderate inflation instead. The issue with analysing disinflation costs is that there is some contention over the extent of disinflation's effects on the economy. It is the case that purposeful disinflation incurs some economic costs, but the question is over the size of these costs. It has been shown that disinflation is correlated with

⁴⁶ The mechanisms of seigniorage are explained in the 'What is Inflation' section.

⁴⁷ Keynes demonstrates this in a section dedicated to inflation as a tax in *A Tract on Monetary Reform*'.

⁴⁸From *Inflation and Economic Growth* by Robert Barro.

⁴⁹ There are a number of examples of Seigniorage during periods of moderate inflation in the paper *Moderate Inflation* by Rudiger Dornbusch and Stanley Fischer.

higher unemployment and slower growth, and in the 50s and 60s it was suggested that these costs may be prohibitively high, thus leading to sustained inflation. One estimate from the time was that the cost of reducing US inflation by one percentage point was \$220 billion⁵⁰. However, newer research suggests that the costs of disinflation are not prohibitively high and the benefits from lower, stable inflation outweigh the costs⁵¹. In reality, a disinflation need not even cause a recession, though this will depend on the size and duration of the disinflation. However, structured disinflations generally do cause at the very least some form of economic slowdown. The research suggests that the effects and costs of such a disinflation are not so high as to be a reason for governments enduring even moderate inflation.

Another possible incentive for governments to inflate is to manage a debt crisis. Inflation is a means of reallocating wealth from creditors to debtors, as debt is denominated nominally and inflation erodes the value of the principal. This extends to all debt that is denominated in the local currency, both domestic and foreign. In practice, there are only 4 ways to escape from a debt crisis: inflation, growth, default or defaulting on the 'social contract', i.e. cutting government spending from social projects like healthcare. In the current environment, the chosen method appears to be defaulting on the social contract, combined with incipient attempts to create growth. The problem with trying to grow out of a debt crisis is that it cannot be fuelled by funding government and domestic consumption through further borrowing, which is the usual method of creating growth. Therefore, the growth has to come from rapid expansion of aggregate supply and the productive efficiency of the economy. For this reason the only country to escape from a debt-based recession was the UK during the Industrial Revolution, after the Napoleonic wars. Defaulting on the social contract is a reasonable solution, and is the preferred remedy of the IMF. The trouble here is that it is often politically untenable, which means governments won't go through with reform rigorously enough for it to work. It also means that the recession is likely to last longer, as growth will be slower to pick up, further reducing the viability politically. This leaves governments the two historically most popular options: default or inflation. Arguably, these are really the same thing; certainly inflation can be seen as a form of default and is classified as such in *This Time is Different*. However, though the ends of these two policies may be the same, the means are different. They are comparable options, but default is likely to be less politically acceptable, especially on the international stage. This then just leaves inflation as a means of escaping a debt crisis⁵².

The extent to which inflation is a viable means of reducing the debt burden is questionable. Inflationary reduction of the debt burden has its advantages as a strategy, namely that not only does it very successfully wipe out the debt but it also brings in seigniorage revenue that the government needs to try and foster an economic recovery. The problem for the government is where to draw the line; they face the dilemma that if they over-inflate they will undermine the

⁵⁰ This figure is quoted in *The Ends of Four Big Inflations* by Thomas J. Sargent.

⁵¹ Studies of this can be found in the following papers, amongst others: *The Ends of Four Big Inflations* by Thomas Sargent, *Moderate Inflation* by Rudiger Dornbusch and Stanley Fischer and *The Genesis of Inflation and the Costs of Disinflation* by Laurence Ball.

⁵² Though the idea situation is not to get into a debt crisis at all.

process, as over-inflation will ravage the economy: damaging the banks, destroying savings and reducing tax revenue. Yet if they underinflate, the policy will be ineffectual. Indeed, over-inflation will cause more problems than solutions. Inflation is bad for creditors, as it wipes out all debt, which is why the government would seek to undertake the policy. However, banks are also creditors and as such if the inflation were too great it could harm the financial sector and lead to a financial crisis. On top of this, given that inflation over 15% begins to have a negative effect on growth as discussed previously, only countries with low starting inflation rates can use this sort of inflationary policy without a high risk of slowing growth. There are also question marks over the actual political viability of this policy in countries where it is the express mission of the independent central bank to control inflation, namely in Europe, the UK and the US. This puts the government and the central bank at cross purposes, which is a damaging situation for the economy. Although debt relief is possible as a reason for adopting inflationary policies, it is questionable to what extent it would be undertaken in a modern Western economy. The incentive of governments to inflate has also been limited by their issuance of inflation linked bonds, and the linkage of many of their liabilities, such as unemployment benefit, to CPI.

Governments may accept inflation as a necessary by product of higher growth and lower unemployment. It was certainly the case in Latin America for the majority of the second half of the 20th century that governments chose this trade-off. Inflation came to be accepted as part and parcel of growth, so governments like Brazil's and Colombia's chose to adapt to the inflation by indexation⁵³. In these countries the problem was compounded by growth being driven by high commodity prices. Although this did create growth it also created higher prices in the economy from the commodities themselves, as well as a flood of cash that led to huge jumps in demand. In this sense as well, the acceptance of inflation as part of growth may indicate that the form of growth from which the economy is benefitting is not as sustainable, as sustainable supply driven growth will be relatively uninflationary. If this Phillips curve relationship, i.e. a negative correlation between inflation and unemployment, does exist then this may be a reason for accepting inflation. There is no clear cut answer as to whether low unemployment or low inflation is more beneficial to an economy. Empirically studies can find figures to support both sides of the argument and as such offer no clear answers. Therefore, whether or not taking advantage of this policy would be advantageous to a government is a matter of economic ideology. After the First World War, the vogue was to have full employment as the main aim of policy. Yet, since the 1970s this policy has been reversed and low inflation is preferable.

The conclusion from this is that other than to raise revenue from seigniorage, which still assumes that there are only distortionary tax options, there are few reasons for governments to use inflation. The essential problem with inflation as a policy is the risk that it entails if the level is too high. On top of this there is research to suggest that even a small rise of inflation can

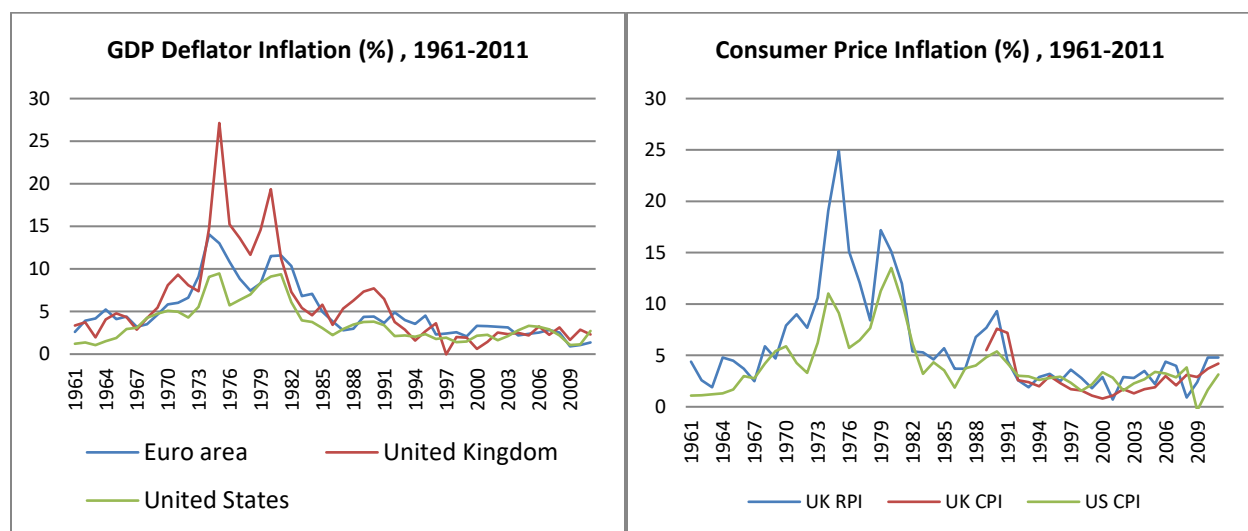
⁵³ Indexing is the process whereby values, like wages, are fixed at a level that is always indexed to inflation, thus preventing their erosion by inflation, however total indexation of the economy lead to fixed relative values, which is costly for the economy.

have an effect on growth and investment⁵⁴. The key, it would appear is to aim for price stability at a certain level of inflation, ideally under 10% but it can be higher with indexation. What would appear to be particularly harmful to economies are fluctuations in inflation, rather than necessarily the inflation itself, and an inherent part of most inflationary policy is that it causes inflation to change.

⁵⁴ In his paper *Inflation and Economic Growth*, Robert Barro suggests that a rise of inflation of 1% may have a negative effect of 0.3-0.7% on output.

Hedging Inflation

The detrimental effects on financial markets of inflation can be shown both quantitatively⁵⁵ and qualitatively. Currently, the risks are compounded by the fact that Western financial markets haven't had to operate in an inflationary environment for the last 30-40 years, which will exacerbate any effects of a return to an inflationary environment. The graphs below give an indication of the trends in inflation in a few important financial markets⁵⁶.



Source: HCM (UK) Limited

Since the high level inflation in the 1970s, which proved devastating since it combined with sluggish growth to create a period of so-called 'stagflation', inflation has been below 10%. Recent lower inflation has been driven by an increasing emphasis on the importance of controlling it, which has been marked by a series of changes in government policy, the most important of which has been the creation of independent central banks with a clear mandate to limit inflation. Periods of high inflation strengthen memories of the harm of inflation, and as such increases the resolve to stop it⁵⁷, as was the case in the 1970s where an inflationary period was the last straw for the Bretton Woods system, which had limited the effectiveness of monetary policy. Subsequently, benign low volatility inflation has been the pattern in major economic centres since the mid-80s. Lower levels of inflation and the growth of globalisation, which has greatly increased the scope and diversity of markets, has led to a period of considerable growth in the nominal sector. This growth may be threatened by the potential build up of inflationary pressure in the world economy. The advent of quantitative easing, due to the 'great recession', has caused sharp rises in the money supply. In the short term, the

⁵⁵ For an empirical analysis see *The Impact of Inflation on Financial Sector Performance* by John Boyd, Ross Levine and Bruce Smith.

⁵⁶ The sources of the data are The World Bank.

⁵⁷ The role of this mechanism influencing historical inflation is documented in the section about long-term inflation.

effects of this have been mitigated by a large fall in velocity, caused by a slowdown in lending and deflationary expectations. Inflation is also being dampened by the large amount of spare capacity in the global economy. The relatively lower levels of inflation that have persisted since the start of the 'great recession' may be contributing to a lag in expectations adjustment, further limiting inflation.

The spectre of higher inflation necessitates a search for ways to hedge against the risk to nominal holdings from higher inflation. Nominal investments and assets are susceptible to the ravages of inflation, whereas real assets will not be hit by inflation. The first possible hedge is to try and hold real assets, or assets with a strong real component. The difficulty with this option is that assets that are wholly real often have other risks that make them a less attractive hedge. The other option is to look for inflation-linked dynamics in the market and try to use derivatives that take advantage of the dynamics as a hedge. The difficulty with this option is that there hasn't been a truly inflationary environment in the developed Western markets for the last 20-30 years. This means that data relevant to the study of the performance of modern markets under inflation is limited. Instead the useful data is from older periods, like the inter-war period and the 1970s. However, this data is of limited utility because markets were less global and less complex than modern financial markets. The other difficulty is that financial instruments and engineering only really started to become a force in global finance in the mid-to-late 80s. The rise of financial engineering coincided with the decline of inflation⁵⁸ and this means that there is no data on how certain strategies and instruments would work in an inflationary environment; there is no way of empirically testing the actual effectiveness of intuitive hedging ideas.

So let us for a moment assume that tomorrow inflation will triple and inflation will hit 10% for the first time in 30 years, how should investors react to protect their wealth? The two options which can be ruled out immediately are cash and bonds. The value of cash will be eroded rapidly by higher inflation; a cash holding of \$1 million will be worth just half of that amount in 7 years. The other area that will suffer is bonds, where both the price will fall and the value of the principal will be eroded - one means by which inflation redistributes wealth away from debtors to creditors⁵⁹. One stark example of what can happen to bond holders in times of inflation is the example of the German middle class in the early 1920s. During the war many people had been persuaded to buy war bonds, as a wartime initiative to help raise funds for the war effort. Yet when hyperinflation began to bite in 1921 the value of these bonds was destroyed, along with the wealth of the middle classes.

In inflationary episodes investors seek to hedge against the effects of inflation on nominal balances, by holding inflation neutral real assets. One potential means of doing this is by

⁵⁸ It is unlikely that there is a causal link here but an argument could certainly be made that these two facts are correlated. Causally, one could argue that inflation brought about the end of Bretton Woods and the resultant liberalisation of capital movements did play a role in the financial revolution of the last 25-30 years.

⁵⁹ There are exceptions to this, like index linked bonds but the cruel irony is that the bonds bull market, and government initiative to persuade people to hold relatively risk free bonds, has greatly increased the volume of bonds that are being held, with potentially catastrophic effects if inflation rises.

holding stocks, which in theory are a proxy real value asset as the price should reflect the underlying real assets and cash flow. In theory, firms will be inflation neutral because input prices will rise but so too will output prices, which should balance out in the long run. However, empirical analysis suggests that in the short term, this will not be the case. Instead, studies suggest that the short term effect of inflation on equity markets will be to cause a spike in volatility⁶⁰. This will occur as the market adjusts to the distortions caused by the rise of inflation. Research also suggests that stocks may not be the best hedge against inflation in the medium term either, because inflation may negatively affect the other factors which determine equity prices, such as the level of demand and real activity in the economy.

Another option is commodities, which have the potential to be a good hedge of inflation because their prices should rise in line with inflation, thus being inflation neutral. However, the persistence of this effect is both questionable, dependent on the source of inflation, and self defeating. Commodities will not be an effective hedge against supply shock inflation as they are likely to be affected by the supply shock itself. After a supply shock, commodity prices will fall once supply has recovered but there is no guarantee of inflation falling at a comparative rate. If inflation does persist due to expectations, commodity prices will fall back into their usual, volatile pattern, limiting their effectiveness as a hedge against inflation. An example is Colombia's moderate inflation in the 80s and 90s, which persisted under both high and low commodity prices. If inflation is demand driven, i.e. by a wage-price spiral or a rise in demand in general, then this may lead to greater demand for commodities and mean that they are inflation neutral. The problem here, however, is that though it may raise the underlying price of a commodity, the price will still be volatile and susceptible to supply shocks. For example, in a hypothetical period of 10% inflation, if inflation were demand driven it may raise commodity prices but this would not stop a glut of corn, or any other commodity, from lowering the price. There are other costs of holding commodities, like the storage and transport costs, which mean they are less desirable, even if they are inflation neutral. The other strategy for hedging inflation that is linked with commodities is commodity futures. Research into the relationship between commodity futures and inflation shows that they have a relatively strong correlation in the short term, which means that they may be a useful device in combating the negative effects of inflation shocks. The other advantage of commodity futures is the large body of data on their performance in different environments, including the inflationary environment of the 70s⁶¹. It is a reasonable assertion that commodity futures would be a better hedge than commodities because they lower the costs from holding commodities and allow the holder to avoid some of the fluctuations in commodity prices.

Another option is property and infrastructure. These are real asset investments and should appreciate in line with inflation; property in particular has been shown empirically to be a good

⁶⁰ See *Stock Returns, Real Activity, Inflation and Money* by Eugene Fama, *The Impact of inflation on financial sector performance* by John Boyd, Ross Levine and Bruce Smith.

⁶¹ A full study of Commodity futures in general, and the effect of inflation upon them is given in a good article, *Facts and Fantasies about Commodity Futures* by Gary Gorton and K. Geert Rouwenhorst, as well as in a follow up article *Fundamentals of Commodity Futures Returns* by Gary Gorton, Fumio Hayashi and K. Geert Rouwenhorst.

inflation hedge⁶². This follows logically, given that input prices will rise for construction and house prices follow inflation fairly closely, if not exceeding it at times. The risk with using property as an inflation hedge is that it is illiquid and there is the risk of a house price bubble. For example property may have been a good inflation hedge during the early 21st century but some of these price rises turned out to be an illusory by product of the increase in mortgage lending and the government promotion of home ownership. The relative illiquidity means that property is also a fairly long term inflation hedge, which might not be desirable for some investors. There is also the risk of rent or price controls being brought in if inflation were to hit high enough levels; both Nixon in the US and Heath and Callaghan in the UK introduced controls in the 70s. Certainly under some of the more populist European governments price controls might be a risk. However, inflation may need to be high to become an issue that influences government policy on house prices, which would lower the risk of price controls. The advantages and disadvantages of infrastructure investment are somewhat similar to those of property, in that it represents a good long term inflation hedge, but it is very illiquid. On the other hand, infrastructure was the preferred investment of the Victorian and Edwardian investors, who did have to face more volatile inflation than now. However, they also benefitted from the expansions into numerous frontiers across the globe, especially in Africa, Russia and, of course, the American West, as well as arguably more political stability and a greater, if slower, freedom of movement to monitor their investments.

⁶² See *House Prices and Inflation* by Ali Anari and James Kolari,

Our Legacy of Inflation

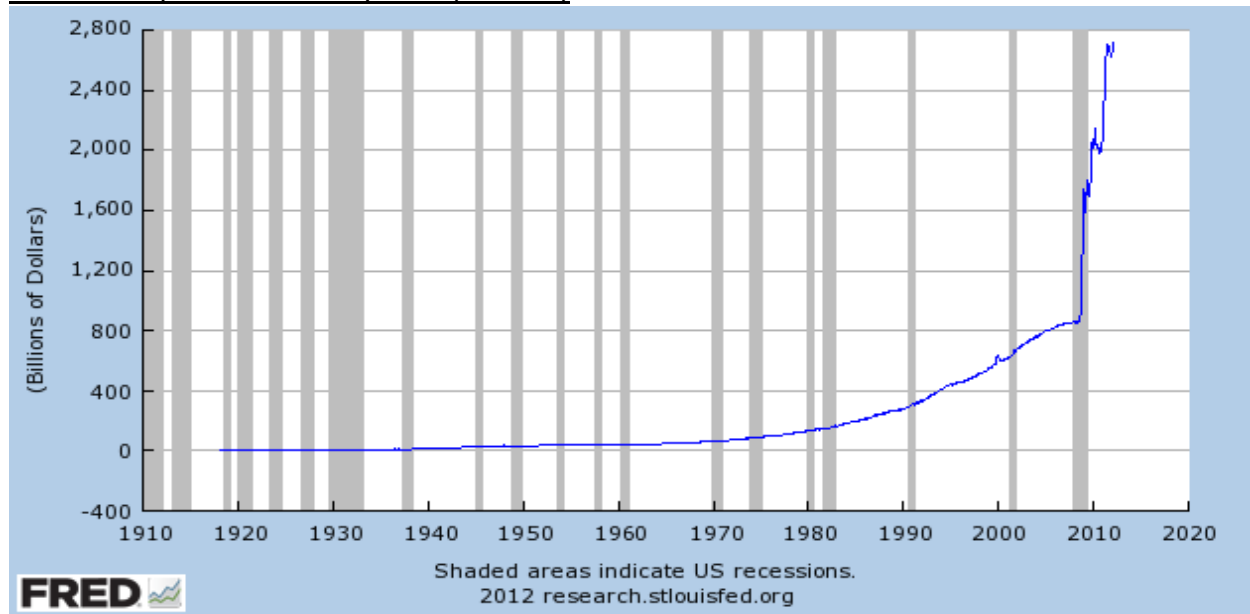
So far this report has explored the causes and effects of inflation; it has also looked at the possibility of inflation as government policy and possible ways of financially hedging against the effects of inflation, protecting the value of the economy's wealth. It is a worthwhile exercise to consider opinions on the possible future direction of inflation. Although it is not in the scope of this report to make a concrete prediction about future inflation, it is still useful to consider possible directions of future inflationary trends. As shown in the previous section, the last 25-30 years have seen unprecedented stability of inflation in the industrialised world. This was, it has been argued, the result of an active and consistent policy from the main central banks to control inflation. The persistence, or not, of stable inflation, could have a significant impact on future economic development.

The trend in inflation over the last 25 years has been 1-5%, with an average rate of about 2.5%. This trend fits with the pattern of long term inflation, in that prices are continuing on an upward trend faster than during previous price revolutions. Yet this level of price stability is, if anything, an aberrant trend when compared with the usually volatile pattern of short term price trends. The question that arises from this observation is: where has this trend emerged from and what is the likelihood of it persisting? This was the topic broached in an interesting article *Inflation Dynamics*, written by then governor of the Federal Reserve Board Fred Mishkin. The article looked at empirical studies of inflation and inflation persistence and what might be inferred from these studies for the future inflationary outlook. The interesting thing about the article, which makes it particularly relevant, is that it was written before the crisis in 2007.

Mishkin's article, and others on similar topics⁶³, are of particular interest in light of recent post-crisis trends in the money supply. The graph overleaf shows the trends in the money supply, which has grown noticeably since about 1990 and rapid growth since about 2008/9. The quantity equation implies that inflation should have exhibited similar trends, yet, remarkably, inflation has been constant over this period of money supply growth. There are a number of possible explanations for this, all of which have their strengths and weaknesses but may also have lessons for the potential future direction of inflation. I will refer to these arguments as the empirical, anchored expectation and inflationary pressure arguments.

⁶³ Another interesting paper is *Excess Money Growth and Inflation Dynamics* by Barbara Roffia and Andrea Zaghini.

St. Louis Adjusted Monetary Base (AMBNS)



Source: Federal Reserve Bank of St. Louis

The empirical argument is based around research into the strength of the quantity theory relationship, and the probability that a rise in the money supply will cause a rise in inflation. Research suggests that maybe as few as 50% of monetary 'events' will result in a rise in inflation over a 3-year horizon⁶⁴. The 3-year horizon is the 'short term' and allowed the research to look specifically at short term inflation. There are certain paths through which a rise in the money supply is translated into a higher price level, or not. In quantity theory terms, these paths are the mechanisms which cause prices to change when the money supply rises, in the case that a path is 'blocked', lower velocity will act as a drag on inflation. The paths identified were house prices, stock prices and credit conditions. The paths are intuitively coherent; tight credit conditions will lower velocity, which will mitigate the effects of the rise in the money supply. Equally, if stock and house prices are rising this will increase the chance of an increase in the money supply leading to an increase in inflation. The downside of this research is that it doesn't look at the role of monetary policy, which some people would argue has played a key role in constraining inflation. This argument suggests that the lack of inflationary response to the higher money supply is not an anomaly but to be statistically expected.

The second argument is that inflation expectations have gone from being unanchored in the 70s to being anchored at roughly 2-2.5% now as a result of consistent central bank policy creating credibility. The argument is that inflation can be divided into two components. The first component is an underlying trend aspect that follows a random walk, i.e. any change in the trend will persist, and the second is a serially uncorrelated shock, i.e. any change will revert to the trend in time. The relative importance of these two aspects can then be used to try and decode the patterns in inflation persistence. It has been argued that in the 70s and early 80s

⁶⁴ See *Excess Money Growth and Inflation Dynamics* by Barbara Roffia and Andrea Zaghini.

trend shocks tended to be more important and as such, this led to higher and persisting levels of inflation. More recently, trend shocks have become less important and so inflationary shocks have been transitory. The explanation for this is that trend inflation can be either anchored or unanchored; if it is anchored then the trend is fixed but if it is unanchored then there will be trend shocks and persistent inflationary shocks. Furthermore, the anchoring, or not, of inflation is caused by the anchoring, or not, of expectations. If expectations become anchored, then this anchors the inflation trend and reduces trend shock importance. As a result, inflationary rises will be smaller and will not persist, as has been the case since the mid-80s. Expectations can be anchored at any level of inflation. Brazil and to a greater extent Colombia⁶⁵ are good examples of when inflation expectations became anchored in the moderate to high inflation range. On the other hand, the Central European inflations of the 1920s represent a strong example of wholly unanchored inflations⁶⁶. If it is the case that expectations are anchored, and the arguments in favour of this are strong, then this offers an interesting outlook for inflation. It suggests that through consistent and clear policy-making the central banks may be able to prevent the return of 'great inflation' levels of inflation. The main issue with this argument is that the robustness of anchored expectations has not been tested by a crisis of high magnitude, such as the 'great recession'. There is also the question of the extent to which the credibility of the central banks has been eroded over the period of the financial and debt crisis. Seemingly constant revelations about the conduct of banks have harmed their credibility and this may have spilled over onto the central banks themselves.

The final argument is that the increases in money supply are building inflationary pressure but that other factors may postpone the onset of the final inflation. The argument highlights the rise in the money supply, which according to the quantity theory should have caused a rise in prices, which has not happened to date. There has also been, according to a number of different *ex post* estimates, a fall in velocity over the same time period. The crisis, and slow recovery, has led to there being an output gap, though it is difficult to quantify the exact size of this gap. Such an output gap would absorb inflationary pressure, whilst the economy grows back to its pre-crisis level. This argument suggests that there is inflation 'around the corner' when something like expectations or the velocity or output change. This is the most pessimistic view of the future.

It is a brave man who would choose to try and predict inflation, and this paper does not attempt to. There are certainly some policy lessons to be drawn from these arguments, one of which is that the credibility, and therefore actions, of the central banks will continue to be

⁶⁵ It is worth mentioning that as a case study of inflation Colombia is second only to Weimar Germany, albeit it is less used and less appreciated.

⁶⁶ It could be argued, from a rather abstracted viewpoint, that these hyperinflations represent an anchoring of the inflation of inflation, that is to say the second derivative of prices or the rate of change of inflation, in that people come to expect constantly rising inflation. This is different from say the experiences of Chile or Argentina in the second half of the 20th century, these countries represent unanchored expectations, where inflation would rise and persist, then fall and persist then rise again and persist *ad infinitum*. Rather Germany, Austria and Hungary had constantly rising rates of inflation, inflation didn't persist at a level for anytime, this suggests the possible validity of the argument for the anchoring of expectations of the rate of change in inflation.

important in the determination of expectations. These possible views are also worth considering and our current inflationary position represents an interesting case study. It is very easy to attribute the demise of inflation volatility to Volcker crushing inflation, but this doesn't offer a full view of the situation. There are ways in which as an inflationary phenomena, the 'Great Moderation'⁶⁷ represents as much of an anomaly as the Weimar hyperinflation or the inflation in Colombia. It certainly deserves the epithet 'great' more than the relatively normal 'great inflation' that hit America in the 1970s.

⁶⁷ This description of the period as the 'Great Moderation' is used in *Why has U.S. Inflation Become Harder to Forecast?* By John Stock and Mark Watson.

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