Of Gold and Paper Money

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Abstract

We consider the role of money as a means of payment, store of value and medium of exchange. I outline a number of quantitative and qualitative experiences of monetary management. Successful regimes have sprung up in a variety of surprising places, and been sustained with state (centralised) interventions. Although the link between state and money, and its standard of identity and account may be clear, particularly in earlier stages of economic development, the extent to which the state is widely felt to hold responsibility for 'sound money' is less clear in modern democracies, where there are many other public responsibilities implying ongoing trade-offs.

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"Money is not, properly speaking, one of the subjects of commerce; but only the instrument which men have agreed upon to facilitate the exchange of one commodity for another. It is none of the wheels of trade: It is the oil which renders the motion of the wheels more smooth and easy. If we consider any one kingdom by itself, it is evident, that the greater or less plenty of money is of no consequence; since the prices of commodities are always proportioned to the plenty of money..", David Hume, *Of Money*, 1752.

1. Introduction

Maintaining a credible form of money is central to the organisation of society. Money can take many forms and can be an

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actual precious metal, and hence a commodity, or a paper version that may or may not be linked to the value of a commodity and increasingly just an electronic chit. So in this paper we shall discuss the development of money, the fascination with gold and the reasons why we still need money to perform its roles in providing operational units of account, means of exchange and a store of value. What we shall see is that sorting out money is one of the most important things any government, dictator or, even builder of a nation state ought to fix. In this sense money might be thought to be a critical public good providing critical social capital.[2]

As Hume hints money, coins and even stamps represent value and a claim on goods and services. And many of us will remember looking in wonder at the many different denominations of coloured notes from childhood travels and, perhaps, wondering why they were so many types. Older readers may recall the decimalisation of Sterling in February 1971: nothing and yet everything seemed to change as decimal modernity crowded out tanners and ten bob notes.[3] In fact, what might have been more important was that the world's most important currency, the US$, was about to end its formal link to gold in August 1971. That act finally meant we had entered the era of fiat money that is money which is determined by acts and deeds rather than backed by the value of an ancient commodity.

Long before money, its rate of return (which is simply the rate at which money loses its value against a basket of goods and services, otherwise known as inflation) and its opportunity cost (the interest rate that is lost by holding money rather than income producing-assets) dominated our national agenda, it had a more prosaic aim - simply to facilitate accounting and trade. The need for some uniformity in the value of money was pretty clear, as was people's ability to spot value, and so beware any debaser in case they fell afoul of Gresham's Law, which is typically expressed as `bad money drives out good'. People have always been pretty good at working out value and Thomas Gresham spotted that if two coins, which are both legal tender, have the same nominal, or face, value but different values of actual commodity content then the one that has the largest discount between its face value and actual commodity content will drive out usage of the one that has less of a difference between its

[2]See Dasgupta (2005) on this point.
[3]With 20 shillings of 12 old pence to a pound, a tanner represented half a shilling or 6 old pence. A ten bob note was half a pound with a bob being a shilling. See Feaveryear (1931) for more on these 'lost' terms.

face value and the actual commodity content. The man who was the founder of the Royal Exchange, when envoy to Queen Elizabeth I, realised that people will be smart enough to work out, as had Copernicus before him, that they might be able to use `bad' money for the purchases and keep or save the `good' money for their nest eggs (see Shrimplin, 2017). But I think with the development of words like standard and sterling, the ultimate idea behind the development of commodity backing surely was simply to create money that could be trusted to hold its value and allow correct inference on the value of goods over time in terms of other goods. And so it is the role of money in allowing trade to be separated in time and (geographical) space that makes its essential to the understanding of modern life.[4]

What we will do in this paper is to compress a large amount of historical time into a small number of episodes or short stories, if you will, mostly with a happy ending. These stories provide parable or heuristics that we might use to think about the further developments of money. We will though also consider a number of standard problems that money is designed to solve and then summarise the implications of a well-known model from modern economics that has proved very useful for thinking about money. As money springs up in this model as a solution that avoids autarchy, starvation and a painful old age. But first let us look at some indicators of monetary performance over the long run and in and out of regimes that were related to commodity standards.

2. Prices, Interest Rates and Money.

Before we consider some historical developments and experiments in money, I would like to fix some simple facts, which sit in the collective conscience. These `facts' are well known to central bank economists but do deserve wider exposure. Let us first ask what happens to the change in the prices of goods and services not on the year-to-year basis that dominates the current pursuit of monetary stability but on an average basis over ten years. This is so we can get to grips with what levels of inflation people might reasonably have expected or experienced over a medium-term planning horizon. We are fortunate in the UK to be able to use data that allows us to examine broad trends in decennial inflation from the late 17th

[4]Spufford, 1988, provides a masterly account of these issues.

century, with appropriate splicing, to date.[5] Figure 1 shows that ten-year average inflation seems low and stable in the commodity standard periods, so much so that households and other economic agents may well not have concerned themselves with changes in the price level over the long run.

<<<<<Figure 1>>>>>

Indeed, Keynes (1923) put it rather well:

`The course of events during the nineteenth century favoured such ideas [as price stability] ... the remarkable feature of this long period was the relative *stability* of the price level. Approximately the *same* level of price ruled in or about the years 1826, 1841, 1855, 1862, 1867, 1871 and 1915. Prices were also level in the years 1844, 1881 and 1914 ... No wonder that we came to believe in the stability of money contracts over a long period.'

And yet we can see that when shocks were likely to be have been large and uncertainty heightened, an `escape clause' (Bordo and Kydland, 1992) was exercised with temporary delinking of money from its direct backing with gold, in 1797-1821 and in the period around WW1. The period following the probable terminal end of the US dollar's link to gold has been characterised by persistent inflation and attempts, with varying degrees of success, at its moderation. This achievement raises the question of why does linking money to a gold or commodity standard deliver a stable price level and why might a government or central bank consider delinking from something that seems able to guarantee some certainty in the price level when times become uncertain?

Let us now compare in Figure 2 - somewhat mixing our horizons because a policy interest rate is typically a short run rate and the inflation rate here is measured over the longer run - what that inflation series looks like compared to Bank Rate over the same period. What we note is that under the commodity standards the return on short run interest rates, which are closely linked to those rates obtained in money markets generally, tended to be greater than long run inflation, so that agents could reasonably expect strongly positive returns. In fact with long run inflation broadly zero in this period, the nominal and real interest rates were, in effect, very much the same. The

[5]See Dimsdale *et al.* (2010) for further details.

distinction between nominal prices, the cash return or requirement to buy an item and its real, or relative, price, compared to other goods and services is a crucial distinction as it is changes in relative prices that typically provides a signal to people to change their behaviour. By conflating nominal and real interest rates in a zero inflation world, the central bank does not have to concern itself with explaining the distinction to markets, firms and households. Whether central banks always want to provide clarity in the game it runs against economics agents is an issue to which macroeconomics regularly returns (Morris and Shin, 2005).

<<<<<Figure 2>>>>>

If savings in savings instruments that were closely linked to policy rates could deliver a positive real return what about fluctuations in the price of gold in the long run? Does the price of gold rise inexorably because the supply is more or less fixed? At least for the benefit of any gold bugs, who seem to be large in number and vocal in noise, we might carefully examine the relative price of gold in terms of goods and services (and then in terms of an index, so that we can broadly relate to the value, based to the sterling price of gold at the turn of the millennium)? Hardly surprisingly, when the money was directly linked to gold at a given price, if the long run price level of goods and services was broadly stable, which is a measure of the purchasing power of money, then gold prices would also not fluctuate. If money was over-issued and devalued against gold, people would be inclined to hold gold instead and swap notes for gold, this would take notes out circulation and act against the over issue and threaten the central bank's gold reserves. Maintaining gold convertibility was fundamentally important and nothing should thus threaten the exhaustion of reserves. The gold standard was essentially a statement that a fixed quantity of money could be converted to gold and that a weight of gold could be considered money: this mutually binding constraint meant that neither gold nor money could fluctuate in price very much, as we see in Figure 3

In a standard textbook model (e.g. Barro, 1979), a commodity standard is simply a statement that a given quantity of a commodity, for example, an ounce of gold can always be exchanged for a set quantity of domestic currency. In the UK, Isaac Newton

as Master of Mint in 1717 set the ratio as £3 17s 10 $\frac{1}{2}$ d an ounce. Secondly, that the quantity of domestic currency in issue is limited by some ratio to gold held in reserves at the central bank. Therefore under the gold standard money is, in effect, circulating as claims on gold. And its quantity of the medium is constrained by the quantity of monetary gold and the perceived degree to which the issue needs to be backed. As the quantity of money is fixed by the supply of monetary gold and the price fixed by the exchange rate with gold, there would appear to have been a considerable degree of automatic monetary stability.

<<<<<Figure 3>>>>>

In this context we can then try to understand the propensity of people to hold narrow money, notes and coins, relative to national income, shown in Figure 4. Under the earlier stable price period, the rate of return of money was broadly zero and remained a stable proportion of income. Many economists (starting perhaps with Goodhart and Crockett, 1970) have tried to model the demand for money, and in general models involves some view money is required to finance current expenditures and provides some liquidity insurance against unanticipated shifts in income. But what we can also see is that when inflation became positive and persistent, the demand for money began a long secular decline. With a negative rate of return on holding money, even if income is growing and liquidity still an important consideration, people simply have a great propensity to economise, increasingly so, on narrow money balances.

<<<<<Figure 4>>>>>

Broadly speaking, what we see from these charts in quite challenging. Commodity monies seemed to deliver more inflation (*a.k.a.* price) stability, short term assets seemed to provide a positive hedge against any inflation, so that real rates of interest were consistently positive, the real gold price was stable and there was a stable demand for the notes and coins when compared to income. Given the long backdrop of wars, industrialisation and the development of modernity, any monetary stability was remarkable. And at least at first blush, the subsequent absence of monetary stability looks equally as stark.

And yet after the financial crisis of 2007-8, which has been of enormous import in a world of monetary and financial reform, no-one serious thinks - quite rightly - that we ought to return to a commodity standard. Let me see if we can move towards a resolution of this puzzle. The answer lies not so much with the certainties introduced by a commodity standard where a fixed price level in terms of a precious metal will obtain unless there are large enough shocks. But the development of a theory and responsibility of the government for the quarter-to-quarter, year-to-year performance of the economy probably did for this `barbarous relic' (Keynes, 1923). Such responsibilities simply cannot be discharged with a fixed price regime. Indeed the short run volatility in prices from such a regime may itself generate much in the way of unwarranted economic fluctuations.[6]

3. Some Parables from History.

Let us move swiftly over time and space: a central banker looks for foundations and building blocks to build his or her theoretical world, or model. Naturally, as the statistician G. E. P. Box said: `all models are wrong, but some are useful'. Let us see if we can find something useful from the lessons of history. We shall look at the development of the first standard coins in Ancient Lydia and note the power that this gave to the issuer. We shall then move back and South to Mesopotamia and try to understand how credit evolved to help communities deal with shocks. Given that credit was directed by the State, I wonder whether credit was the first monetary policy? To Song dynasty China, where notes replaced cash and allowed trade to expand. Standards returned in 18th century England but rather by Newtonian accident The increasingly important state also discovered that it would temporarily tamper with monetary standards and not only get away with it but promote greater prosperity that would otherwise have obtained. Even when money disappears and trade is nearly extinguished, for example in a prisoner-of-war camp, commodities can spring up and become money. And so we find that economic and political unions require a common currency, or is it the other way around?, in the form of the Act of Union in 1707.

Croesus

The first historian, Herodotus, tells us the story of the man

[6]See Chadha and Sarno (2002) for an examination of annual inflation volatility (or uncertainty) under the gold standard, which was surprisingly high compared to postwar regimes.

who had been the wealthiest man in the ancient world, King Croesus of Lydia. Apart from a morality tale about the difference between wealth and happiness, richly illustrated by heartrending ultimate sadness, Herodotus tells us much about money. Croesus' wealth and that of Lydia stemmed not only from the naturally occurring alloys of silver and gold, electrum, but even more so from the ability to separate the alloy by a chemical process, involving common salt, that allowed coins of pure gold and silver to be minted. These coins were stamped with symbols and because they moved the valuation problem from the trader to the ruler, they allowed the Lydians to develop unchallenged financial power with their gold coins acting as the ancient world's reserve currency. Perhaps the ultimate source of this financial power was simply trust in the coinage. In an imaginary scene, a recent novel outlined a conversation between Croesus and his father, Alyattes:[7]

`Can I tell you a secret?' Alyattes pointed at the image of the lion. `Without that stamp, it is valued at whatever some metal trader tells you it is worth. With that mark, it's worth as much as *I* say it is worth.'...`It's harvest season now. The farmers are gathering their wheat from the land.' He reached out a finger and tapped the metal disc in Croesus' palm. `If I say so, one of these coins will buy the crop of a poor farmer's field. Forty of them and you've got the worth of everything that farmer will ever produce. The entire value of a common man's life...' And so the benefits of seigniorage become manifest. In this way, this first global money heralded the modern age by facilitating trade but also warned of the excesses and disasters that may follow from unfettered, centralised power. And possibly also hinted at the regular problems that economics has with the theory of value and exchange - how can one financial man at one instant and by accident of birth own the entire lifetime real output of so many other men? The tension between the financial and real sectors remains.

Babylonian Loan Contracts

The development of Babylonian mathematics (in base 60), allowed the calculation of interest, and alongside that of writing, allowed records of loan and credit markets to develop as early as the fourth millennium BC.[8] Exchanges of goods and services in an increasingly specialised economy, took place at the first in the temple but later at the palace. From such markets, which one

[7]Leach, pp84-85.

[8]See Chapter 1, The Invention of Interest - Sumerian Loans by Marc Mieroop in Goetzmann and Rouwenhorst (2005).

can think of as a general store, rations were issued to consumers in sizes ordered by the gender, age and importance of the subject. These rations were `backed' by donations made by producers, such as farmers and fisherman. Given that demand might be considered as set in advance and forecastable, it was probably negative shocks to production that lead to arrears and the need to borrow from others. A wise custodian may have promoted the build-up of inventories in good years. Interest rates on loans were some 20% for silver and 33% for barley, probably because barley was demanded before harvest and paid back afterwards when the price was likely to be lower. Without money, credit by way of clay tablets was used to record claims on producers. And these claims were traded: Babylonian asset backed securities, if you will. Once a contract was settled, the tablet was soaked in water and the clay ready to be re-used, as the `slate was wiped clean'. The remaining tablets are thus archaeological remnants of failed loans.

Under uncertainty in production, credit and loans at interest stood ready to smooth the path to consumption and these may even be thought of as the first form of monetary policy. Where we might think of a monetary policy as something that tries to limit inefficient fluctuations in output by the use of tools related to the supply of money and credit. My point is not so much that loans were some dangerous development but rather once we decide to ration and centralise demand and production, lending between families of producers might be the only way to make the system stand firm in the face of large unanticipated shifts in supply by individual farmers. An absence of credit in these conditions may have threatened social stability.

Paper Money during the Song Dynasty

By the third century BC, money had pretty much become fundamental to economic exchange in China. But rather than the precious metals favoured in the West, the imperial monetary system was based on bronze.[9] But as well as developing fiat bronze coin, it was in China that the first viable paper currency was developed. Echoing the (imagined) words of the Lydians, `Chinese philosophers and statesman...have universally asserted that money is an artefact of the supreme ruling authority. It is the ruler's stamp, not the intrinsic value of the monetary medium, that confers value.' The Song dynasty was founded in 960 and absorbed other kingdoms but there was a chronic shortage of bronze coin, which was the means by which

[9]See Chapter 4, The Origins of Paper Money in China by Richard von Glahn in Goetzmann and Rouwenhorst (2005).

tax was paid. The parallel iron currency did not help much and merchants' exchange bills (*jiaozi*) began to circulate. These bills proliferated in a chaotic manner and the right to issue was eventually restricted to 16 merchant houses by Zhang Young in 1005, the prefect of Chengdu, with standardised size and colour.

The merchants who had issued jiaozi held their own assets in (illiquid) land and luxury commodities, leaving the merchant houses vulnerable to a liquidity shock. To add to the monetary problems, significant quantities of counterfeits started to enter circulation. By 1023/4 the incoming prefect, Xue Tian created state-run currency bureau which issued notes in both restricted denomination and limited life. The note issue had to expand with the requirements for trade but in a credible manner so that the quantity of notes had some limit to their issuance as did, in this case, their life expectancy. Technology also underpinned the invention of paper money, as paper-making and printing used Mulberry paper and metal printing plates. The records allow us to observe a rapid increase in the issue and circulation of these notes with no deleterious effects on the value of money with 10mn guan in circulation in c1170 and some 270mn in circulation by the middle of the following century. In other words in order to create money of value, it was not simply that supply had to be tightly regulated but also that it also had to be carefully expanded to meet growing demand. Issuers of paper are confronted with the ever-present possibility that growing quantities of money may either reflect success and or be undermining belief in the currency.[10]

Newton's gaffe

One of the foremost intellectuals of his (or any other) day sat in his office at the Tower of London and thought hard about the correct value of money. His preferred monetary standard, silver, was becoming increasingly scarce and it was his responsibility to try and correct this matter. Gold coins were driving silver ones out of domestic existence. The question he was wrestling with was whether he could use available empirical evidence to formulate an equation that could be used to pin down the correct value of silver and thus save it as the circulating medium. He had famously accomplished this kind of task with no little success in his earlier incarnation as Lucasian Professor of Mathematics at Cambridge. For after leaving Cambridge in 1696,

[10]The issue of whether money growth reflect the demands of business or is inflationary is related to the question of the whether notes or bills "are lent in exchange for 'real bills', i.e. titles to real value or value in the process of creation", Green (1989).

Sir Isaac Newton had become Warden of the Mint and succeeded as Master of the Mint in 1699, a post he held until his death in 1727. As well as spending much of his time dealing with counterfeiting he also had to ensure that the correct quantity of coins circulated to match the demands of industry and finance.[11]

At this time both silver and gold circulated as money. But silver was set at a price in Britain that undervalued it in terms of gold relative to the value placed on it on the Continent by a small margin and relative to the East by an incredible margin. In July 1702 Newton notes to Godolphin that Gold is higher in France by around 9d. or 10d. in the Guinea, than in Holland by 11d, or 12 pence in the Guinea, then in Germany and Italy by 12d in the Guinea or above. In Spain and Portugal Gold is higher than in England by about 11 d in the Guinea,..., which implies a relative undervaluation of around 1/21 or just under 5%, given 21 silver shillings in a Guinea. Later in September 1717, he notes that in China and Japan one pound weight of fine gold is worth but nine or ten pounds weight of fine silver and in East India may be worth twelve. And this low price of gold in proportion to silver carries away all the silver from all Europe. He was clearly aware that different relative prices of gold in terms of silver was leading to international flows of silver to where it was valued most highly; these flows were exploiting the differential in silver values by a form of `round-tripping'. That is English importers of goods from the continent with bills to pay in foreign currencies linked to both gold and silver would choose to remit silver, which was more expensive there in terms of gold rather than sending gold itself.
In September 1717, Newton, as Master of the Mint, had been asked by the Lords Commissioners of His Majesty's Treasury to decide the correct rate of exchange between the two. He could devalue gold to fewer shillings per guinea and match the European price, which was typically implied an exchange rate somewhere below 21s. But he decided to set the exchange at 21 silver shillings for a guinea of British gold, which itself was priced in terms of domestic currency at £3 17s 10 $\frac{1}{2}$ d. Whilst the gold standard is typically dated to have started then, it is reasonably clear that it was not designed as such by Newton and its ultimate longevity `was largely inadvertent'.[12] Apart from

[11]Levenson, 2009, provides a hugely enjoyable telling of the tale.
[12]See Kindleberger, p57, on this point.

two war-time suspensions, from 1797-1819 and again with the breakdown of the gold standard during World War I followed by a brief resumption from 1925-1931, this price of gold remained fixed until 1931.[13] Compare that fixed price to the barely 23 months that Sterling managed to stay pegged to the Deutchemark until from October 1990 to September 1992.

Newton realised that if things be left alone till silver money be a little scarcer, the Gold will fall of itself. For people are already backward to give Silver for Gold, and will in a little time refuse to make payments in Silver without a premium, as they do in Spain, and this premium with an abatement in the value of Gold shall be lowered by the government, or let alone till it falls of itself by the want of silver money. And so he foresaw further devaluations of gold in order to bring increasingly scarce silver back into circulation. What he did not foresee nor adequately understand is that the Gold Guinea at 21s had become a prominent unit of account and means of transaction by industry, trade, banks and even tax collectors: it had become the `standard coin' and there was considerable opposition to any further devaluations.[14] The gold standard arrived because Newton's revaluation had produced a gold coin of widely useful value and simply drove silver out of circulation, so much so that by 1774 silver was demonetised.

Temporary Exit from the Gold Standard

States can be tested under extreme conditions and the monetary constitution is one of the first areas in need of attention. During the Revolutionary and Napoleonic wars, economic policy was developing at a rapid rate with large persistent deficits to fund income tax introduced. With the growth in central bank liabilities undermining the possible level of support by dwindling gold reserves, suspension of gold convertibility in 1797 allowed the Bank of England to nurture British monetary orthodoxy in extreme conditions. The Order of the Privy Council's decision to suspend gold payments on Bank of England notes afforded simultaneous protection to the government and the Bank in pursuit of the conflicting goals of price stability and war finance. The government, the Bank of England and the commercial banks formed a loose alliance drawing on due political and legal processes and also paid close attention to public opinion.[15]

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[13]There had been a minor suspension in 1745, as a result of the Jacobite invasion.

[14]Feavearyear, p156-7.

[15]See Chadha and Newby (2013) for further details.

In the 1790s, as usual perhaps in any 10-year period, the economy's volatility was expressed in a Canal Mania, an existential war involving high levels of government expenditure and an unlucky sequence of bad harvests. There were numerous reported sightings of French fleets and this led to some hoarding of gold by the public and by country banks. As would now seem to be the custom, there were bank runs in the North-East in 18 February 1797. And more of a panic after the reported landing of a handful of French soldiers at Fishguard on 22 February 1797. The result was that the Bank of England's gold reserve and the circulating money stock fell rapidly, as money was used to claim gold. On Saturday 25 February an emergency Privy Council meeting was called for Sunday and King George III, the Privy Council and Pitt met in Whitehall and issued an Order of the Privy Council:

It is the unanimous opinion of the Board, that it is indispensably necessary for the public service, that the directors of the Bank of England should forbear issuing any cash in payment until the sense of Parliament can be taken on that subject and the proper measures adopted thereupon for maintaining the means of circulation and supporting the public and commercial credit of the kingdom at this important conjuncture.

The Message from the King, 26 February 1797.

George III sent this message to the House on Monday and the Bank issued notice of suspension on the same Monday morning. The Order of the Privy Council and the House of Commons tied the Bank's hands but also and fortunately, indemnified Bank so that it could legitimately refuse to pay in gold. The Privy Council acted at Bank's suggestion and communicated to all parties simultaneously. General meetings in the City of London led to public agreement across money markets and merchants that the Suspension was the right policy for as long as the war yet to have been won.
It turned out that the ongoing solvency of the Bank of England was facilitated by suspension and allowed the Bank to continue to make substantial profits throughout the Wars. It became acceptable for merchants to continue to trade with non-convertible Bank of England notes and for the government to finance the war effort, even with significant recourse to unfunded debt. These aspects combined to create a suspension of convertibility that did not undermine the currency. Especially after the suspension and until eventual resumption, twelve Acts of Parliament were passed committing the monetary system to

resumption.

In contrast, the French monetary experiment of the assignats had led to a debacle that had cost the French monetary system its reputation. The assignats were Revolutionary notes backed by confiscated land but without appropriate controls of the quantity of issuance and hence on the scale of the backing of notes by assets of value. The resulting hyperinflation in the last decade of the 18th century meant that Napoleonic finance had to evolve within a more rigid and limiting framework. It is possible to argue that the debate on the causes of inflation and the need to return to the gold standard, the so-called Bullionist Controversy, set up much of the intellectual framework for so-called British Monetary Orthodoxy, or what we might call Sound Money, and led to consensus for early return to the Gold Standard on the cessation of hostilities at Newton's price.

Cigarettes

Radford (1945) famously tells the story of how in an economy of several thousand prisoners of war with food rations (endowments) provided by the Red Cross at regular frequency and some private parcels that entered the economy. He writes: most trading was for food against cigarettes or other foodstuffs, but cigarettes rose from the status of a normal commodity to that of currency. Prices adjusted and became known: "it was realised that a tin of jam was worth 1/2 lb of margarine plus something else; that a cigarette issue was worth several chocolate issues, and a tin of diced carrots was worth practically nothing!”. And so relative prices were known and expressed in cigarettes near observance, but not perfectly so, of the law of one price particularly for food but less so for clothes, which depended on quality, age and taste.

Segmented markets were arbitraged away by skillful intermediaries: One man capitalised upon his knowledge of Urdu by buying meat from the Sikhs and selling butter and jam in return: as his operations became better known more and more people entered this trade, prices in the Indian Wing approximated to those elsewhere. Spot and intra-week credit market priced bread and treacle on forward markets. Cigarettes were clipped or sweated and subject to Gresham's Law. With both monetary and non-monetary demand for cigarettes, as the time passed between the arrival of food parcels the price level would fall and be bolstered once new money arrived on a Monday morning. Arrivals of new prisoners - with demand - would raise prices and rumours of arrivals would have the same - sunspot -

effect but when reserves began to be built up, prices tended to be more stable. The money market, albeit in cigarettes, facilitated the matching of preferences and endowments at market clearing relative prices

The Scottish Pound

The monetary union between England and Scotland Union was an integral element of the economic and political union that Checkland (1975) states was `agreed by the two Parliaments to merge as one economy, one polity and...one society'. The Bank of England had a partial monopoly over note issue 1708 and this was gradually extended over time with the legal tender of the English pound. A key element of monetary unions has been an agreement over debt issues and fiscal transfers. This was recognised as early as 1707, when under the Act of Union with Scotland, England agreed to pay compensation for future tax liabilities. Article 15 of the Act provided the Scots with compensation for future tax liabilities (see Clapham p 60); England was to pay Scotland the Equivalent: a sum of £398,085 10s sterling. The Equivalent was a capitalised valuation of the existing revenue yield from Scotland and was envisaged as a transfer from England to Scotland. Using Gregory King's estimate of national income in 1688 of around £50 million (Mitchell, 1962), this amount was equal to around 0.5%-1.0% of English GDP. Ultimately, however, only a small proportion of this was actually paid, in part because Exchequer Bills were not acceptable north of the border! Any reverse direction of travel will require considerable unpicking.

A story we are piecing together is that money is as much part of our social relations, as our culture and language. States large or small, federations, existing monetary unions or ones about to be born that choose to ignore the need to get the monetary constitution right play fast and loose with the economy and also with the fabric of society. Central bankers learn to understand this innate link between the state and the need to maintain the stability of monetary exchange.

4. Money problems

Money is supposed to be neutral and has no impact on real output, income or expenditure or the set of relative prices that clear markets. But how can something that allows trade to be affected in the first place take no part in the final equilibrium outcome? Surely if it is valued then individuals will be prepared to pay some fraction of the good and services

they can buy with the proceeds of their labour in exchange for money?

We shall build a reply by first outlining two further key problems to which money may offer a solution. In the 1870s Jevons outlined the basic problem with barter: we need a double coincidence of wants. The person who wants to sell his goat to pay for his ale, needs to find someone he wants to sell his ale for goat. There is a related problem of verifying that the goat is healthy and the ale is good, obviously the latter is easier than the former. But if I can find someone like this, the actual cost of trade is small because we simply meet and exchange. On other hand if we have money in our system, I can sell my goat to anyone who wants a goat not just publicans and, armed with that money, can purchase ale from any publican, wine bar or off licence. In this case, I pay two sets of search costs, assuming that everyone is trained to recognise money at birth or that counterfeiting does not occur in this goat-ale world. So whilst, barter is simple if I can find a match, money is so very useful because it increases the number of people with whom I can trade and can also allow to take some time in finding the right type of ale. The more trading possibilities that there are, the more useful money will be as it increase the chance of finding a match. I still end up trading my goat for ale and so the exchange value is not changed, and so even whilst the money is neutral I am better off because my own notion of welfare is enhanced.

There is another form of trade impediment that monetary co-ordination can allay. In the early 20th century, Wicksell proposed the following problem of liquidity: investor A wants to invest on Monday and her project will not pay-back until Wednesday, investor B has money today but wants to invest on Tuesday and will get her money back on Thursday but cannot lend today to investor A and investor C will get their return from a previous investment tomorrow but want to start a new project on Wednesday from which she will get her money back on Friday. This problem has no bilateral solution as none of A, B or C in any pair can clear their supply and demand for funds.

Imagine though that all returns from investments are pooled or deposited in a national or central bank and then made available to investors on demand. In this way, the bank will transfer money from B to A on Monday, from C to B on Tuesday, from A to C on Wednesday, from B to A on Thursday and so on. The bank passes the deposit, or liability, to the new investor, as an asset, every day and its books balance. Naturally we hope these

investors make good investment decisions on the quality and timeliness of their investments otherwise should one transfer fail, the whole system of exchange will collapse. But again, the primitive demand for money and its supply is facilitated here rather than altered. Money remains neutral and yet a great facilitator.

5. Samuelson's Model.

Modern economists have developed a number of techniques for motivating money holdings in the household balance sheet. Money holdings might be held because they directly increase household utility, or because money (or cash) might be the only way households can effect transactions, or money might reduce the search costs of households for goods and services. But let us understand how the young - developed by Paul Samuelson (Samuelson, 1958) - can trade with the old. Imagine if you will an endowment economy in which a number of young people who live for two periods are given a perishable, non-storable commodity that can produce enough food for their two periods of life in a single period. Imagine in that same economy, that there are the same number of old people living alongside the young who have no endowment but will still wish to eat in their second and final period of life. How can the young `save' the endowment for their old age and how can we get some of the endowment to the old?

There is no easy solution. If the young `give' half their endowment to the `old' that may solve the problem for this period via altruism. But how can the young be sure that in the next period, when they are old, that the as yet unborn young will also be quite so generous? If the young keep and eat the whole endowment, they will grow rather fat in the first period of their lives and develop all kinds of cardiovascular problems that will make their old ages somewhat intolerable. A traditional answer might be commission a benign dictator, perhaps a Lydian or a Babylonian, to capture (or sequestrate) half of the endowment and re-allocate it to the old. But there is a well-known problem with trying to keep benign dictators from turning malign over time, as they tend to take a bigger cut for intermediation over time or start to seek priority re-allocations to friends and family.[16] It turns out that a primary issue of fiat money, perhaps from a benign dictator who then extinguishes him or herself, is the answer.

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[16]This problem is succinctly put as "quis custodiet ipsos custodes" in Juneval's Satires.

Imagine our benign dictator issues one unit of durable money to each old person and is able to declare that this money is legal tender from now until the end of time. Armed with their units of (free) money, they can now trade with the young as they can pass something to the young which will be valued after the death of the current old when the young themselves become old and will have to trade with the next generation for their food. This is a remarkable result: if the state can issue something that everyone knows will be accepted and exchanged generation after generation, you can effect trade between generations and allow the old to eat and the young to save. What will happen in this case, known as the Golden Rule, is that the young will consume half their endowment while young trade the rest for money that they will use to buy half the endowment of tomorrow's young.

If we issue sufficient money to allow trade between the young and old generations at a numeraire price of 1, we may think that there is nothing much else about which to worry but only if there is no growth in the population or the endowment. If the population and/or the endowment grow every year but the quantity of money in issue is constant, the only way that the given money stock held by the old can purchase the quantity of goods is if each unit of money goes further. That is, if the price level falls in proportion to the increase in goods available. If the price level falls, the rate of return on money is positive and the implied interest rate on money balances is positive.

We can thus note in general terms that the price of the endowment in terms of money will be determined by the supply of money (the number of old times the number of notes) and the demand for money (the number of young times the quantity of the endowment for sale). If the population starts to grow, and with it the endowment every year, and the supply of money remains fixed, prices will start to fall and each note will start to buy more endowment. Equivalently if the old start popping off early and take their money with them, the remaining old will have more spending power and the value of money will temporarily increase. If the benign dictator gets fat finger syndrome and issues more notes, then the price of the endowment in terms of money will rise in proportion to that issue. The price level that will clear the market for the money and the endowments simultaneously is equivalent to a return on money.

Note that some issues remain. The money must be issued in units that closely correspond to the value of items to be bought. Actually the supply of the correct quantity of small change in a

gold standard is rather tricky and the failure to address this problem may have been responsible for medieval currency debasements, as a shortage of small coin may have provided an incentive to debase the existing money supply (see Sargent and Velde, 2002). Prior to the suspension of convertibility in February 1797, the smallest Bank of England note in a circulation of just under £10 mn in 1796 was £5. At a time when a quartern loaf of bread cost somewhere between 8 to 10d, less than a shilling. So that a fiver would you bought you a gross of quartern loaves! Today's fiver would deliver around 1 3/4 quartern loaves, though naturally incomes have gone up in the intervening period, I am concerned here with prices and monetary quantities.[17]

There are two further issues that also emerge from this problem. What happens if the notes change or start to disappear? In this set-up there is no incentive for old people to hoard notes because they will not be alive in the next period to spend the hoard and by doing so they will go hungry and bring forward the time of their deaths. But what if a new dictator demands `that the notes that are blue are no longer true and the ones that are red can only be used to be fed'? Well if the dictator has a central bank that can swap the old blue notes for the new red, there may be little disruption to intertemporal trade. But if the central bank does not have enough red notes or cannot effect exchange quickly, so that the exchange has to take place over several periods some disruption to trade will occur and the relative prices of the endowment in blue and red notes may differ, with the prices in the latter currency somewhat lower than those of the former. And so Gresham's Law may even be reversed with good money driving out bad.

Finally, as any autonomous changes in the quantity of money may affect market clearing prices, the note issuer may have an incentive to change the stock of money if the number of young being born or the quantity of the endowment for each young person changes. Of course the note issuer may wish to let the price level adjust but it is possible to maintain stable prices by correctly anticipating changes in the demand and supply of goods. Why we might want prices to be stable is a question we leave aside for the moment. But clearly if you believe that changes in prices may lead to households holding the wrong quantity of money or admit the possibility that because of

[17]A quartern loaf represents four imperial pounds of bread and thus some 1.8kg. The ONS states that 800g of bread was £1.26 in 2012. This means that an equivalent quartern would be £2.86 and we get around 1 and three quarters of them for a fiver.

sticky price adjustment that markets may not then clear, it might be better to meet rather than frustrate expectations formed over long generational experience.

Again in general once we allow for demand to move and supply to respond, there will be a choice for the social planner as to whether prices can adjust to clear the market or whether the planner may need to alter the level of money in the system to bring about adjustment so that the old and young can calculate the rate of return on money. This is very much an easier problem is the price level is always set at 1. And this is the solution offered by a commodity, or gold, standard.[18]

6. Money and the State

Getting money to work has been the job of the state. If money can allow trade between generations, or analogously between different types of people, then it may allow common rules to be enforced that increase everyone's welfare. Economists know quite well that there are incentives for one person to disobey common rules, on the basis that he or she will gain an advantage over the rest. But if all disobey then all will lose. The tragedy of the commons is reversed with money - the common usage of money benefits all and in this world repeated devaluation of money may be the ultimate tragedy. That is probably why the gold standard and other commodity standards persisted for so long.
Samuelson in his article likened the Golden Rule that money can obtain to a stable form of Kant's Categorical Imperative. Money can complete the social compact: When economists say that one of the functions of money is to act as a store of wealth and that one of money's desirable properties is constancy of value (as measured by constancy of average prices), we are entitled to ask: How do you know this? Why *should* prices be stable? On which tablets is that injunction written? Perhaps the function of money, if it is to serve as an optimal store of wealth, is so to change its value as to create that optimal pattern of lifetime savings which could otherwise be established by alternative social contrivances.

Somewhere in the centre of a space that contains economics, history and politics there is a need for the state to control the value of money. The competence of the government in this field seems to signal something quite important about the

[18]Of course, gold prices themselves might be affected by discoveries in supply and changes in technology.

capacity of a state to deal with its collective problems. So much so that some consider sound money to be the ultimate public good -- supplied by the state but of use to all private agents in their ongoing attempt to make plans for the future hampered by so many types uncertainty. But if the State can also help agents offset shocks when uncertainty is resolved in some dimension or other, it is not such a great intellectual leap for the State to take responsibility for economic stability.

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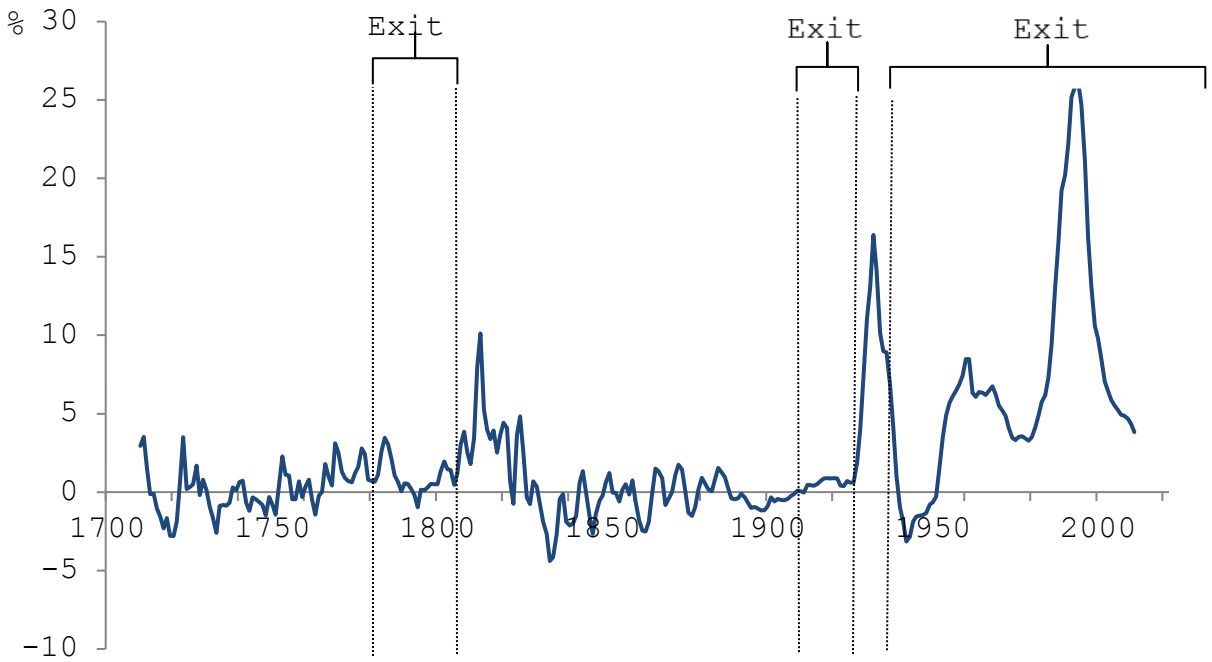

Figure 1: UK Inflation over the Long Run

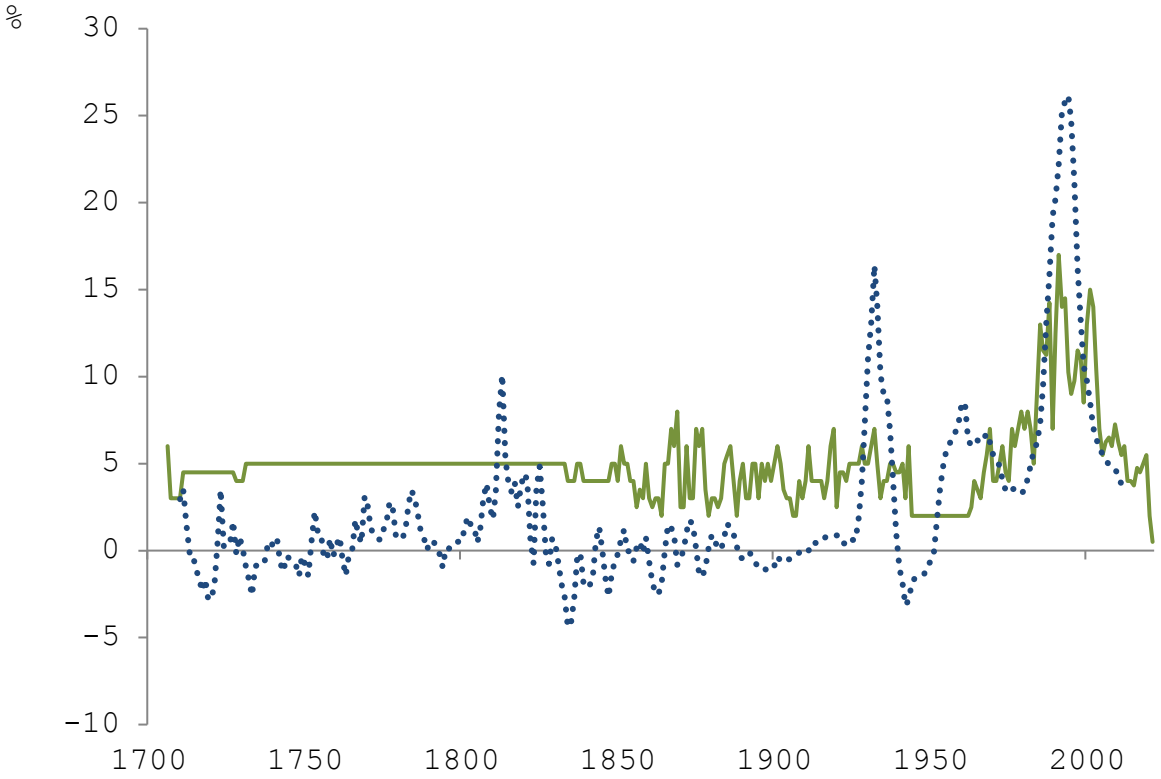

Figure 2: Ten-year rolling Inflation and Bank Rate

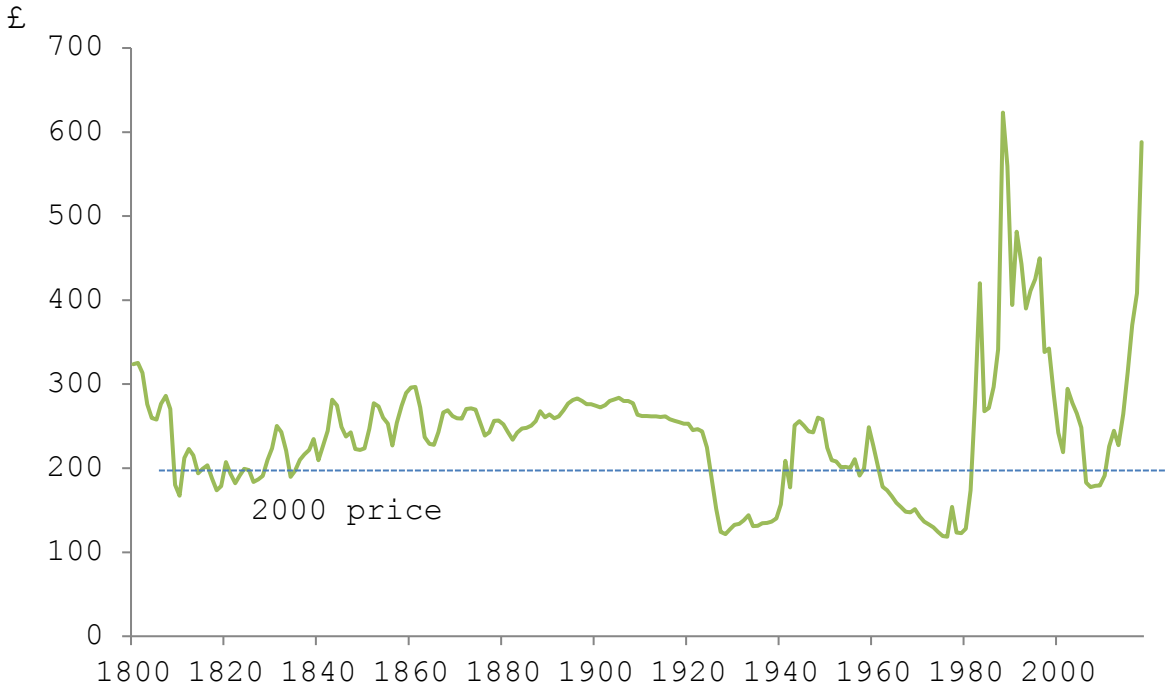

Figure 3: Gold price relative to other goods and services

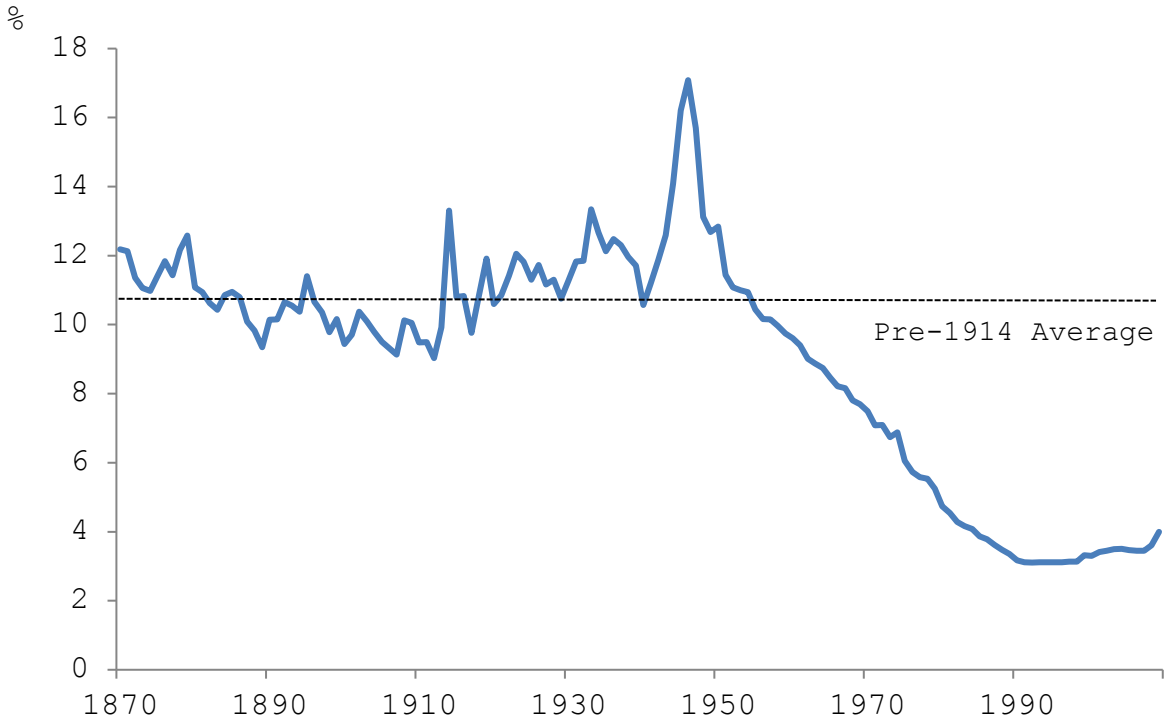

Figure 4: Narrow Money to Income Ratio