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The Suspension of Cash Payments as a
Monetary Regime*

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ABSTRACT

By setting bounds on money growth, the commodity standard is a solution to the monetary authority's time inconsistency problem, which arises from the fixed wage structure of the economy. If there is a supply shock to the backing commodity, the suspension of the commodity standard may be desirable in terms of stabilisation of production and consumption. By representing a credible commitment to return to the commodity standard, the suspension of cash payments maintains the value and circulation of money. Lessons and evidence are taken from England's experience of the suspension of cash payments between 1797 and 1821.

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Keywords: Gold standard, Suspension of Cash Payments, Monetary policy, Monetary regimes

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1 Introduction

The world's first successful paper money regime, an era of inconvertible pound, began on 27 February 1797, when the Bank of England ceased to convert its deposit notes to gold specie in order to prevent a complete drain on its gold reserves. Initially the suspension of cash payments – the Suspension Period or the Bank Restriction Period as it became known – was intended as an emergency measure to ease panic following rumours of French invasion. The public expected the suspension to continue only for a period of three weeks, or at most, until the end of the Napoleonic Wars, but it was, in fact, to last until 1 May 1821. When the war finally ended in 1815, the circulation of paper currency was so high and exchange rates unfavourable that resumption would only be possible after a period of adjustment. According to the conventional view the Bank exploited the absence of the sufficient gold backing restriction: as a private enterprise it increased its profits through discount business; and, as an agency for government finance it maximised seigniorage revenue.

The main contribution of this paper is to suggest an alternative interpretation of the Suspension Period. The suspension of cash payments did not only protect the Bank's gold reserves, it maintained paper money in circulation. By representing a credible commitment to return to the gold standard, the suspension of cash payments supported the value of inconvertible paper currency. Money was valued because people believed the resumption to be likely in the future. Furthermore, paper money was accepted by the government for tax payments and by merchants in domestic trade. If the Bank had allowed gold conversion to continue, the circulating money stock would have reduced at the same rate as monetary gold. As converted gold was put into hoards, money available for consumption purchases would have reduced. Therefore, the suspension of cash payments stabilised consumption, domestic production and asset prices during a long, exhausting war.

Narrative historiography has not recognised the importance of circulation in stabilising consumption and production, but contemporaries, such as the banker and Member of Parliament Henry Thornton, understood:

the necessity of maintaining the accustomed, or nearly accustomed, quantity of its (Bank of England's) notes, however great may be the fluctuation of its cash¹.

As the survival of the country was at stake, the Bank had to provide some accommodation and support the government's urgent war efforts by buying its short term paper. The long term interest rate, however, remained remarkably low and stable over the Suspension Period which, from the viewpoint of the conventional opinion on seigniorage, seems anomalous. The Directors of the Bank understood that 'the formidable weapon of unrestricted money creation'² had not been placed in their hands and the Bank did not use inflationary monetary policy extensively. The government met its long term financial needs through income tax and public borrowing.

The commodity standard, which had been the prevailing monetary regime in England from medieval times until the suspension, enforced a convertibility rule. Under this rule the monetary authority – the mint or the central bank – had to be prepared to maintain the value of the currency in terms of a fixed weight of gold and to buy and sell gold at a fixed price on demand. As it seemed that paper money had to be convertible into bullion for it to be accepted, the willingness of the public to use inconvertible money during the Suspension Period appears peculiar. Those who wished to convert their money had to wait for a long time: although the Napoleonic Wars ended in 1815, the suspension of cash payments continued for six additional years. Could the Bank's refusal to resume the payments immediately after the war be seen as evidence of discretionary policy-making? In this paper I suggest that as the effects of the initial shock were long lasting, these additional years played an important role in the credible return to convertibility. During these years the Bank, with the support of the Parliament, reduced issue and regulated public and private loans to ensure controlled adjustment of prices and exchange rate to the gold standard.

The motivation for this research comes from the historical evidence. Section two

¹Thornton (1802) p 67. "Cash" in context of gold standard refers to specie.

²Expression is from Andréadès (1909) p. 191 who, on the contrary, argues that the Bank did inflate the currency.

explains why the era of Pre-classical Gold Standard (1717-1797) cannot be analysed using the standard framework of the Classical Gold Standard. Then I discuss how my perspective on the Suspension Period builds on the well accepted theory of the gold standard as a contingent rule. The third section explains why economic conditions were stable between 1717 and 1790, what disturbed this stability in the 1790s and how the suspension of cash payments was used to restore stability.

The historical evidence raises the question of why the gold standard and its successor were so successful. In the fourth and fifth section I analyse this question through the lens of the dynamic stochastic general equilibrium model, which suggests that the agents must have regarded commitment to monetary stability as highly likely. Furthermore, I ask what gave the gold standard this credibility. As I am not interested in modeling gold production or hypothetical parameters such as target levels for private gold stock, I omit the commonly used static set up of Barro (1979) and build a new model of a commodity standard.

The results in section four reveal how the gold standard solves the discretionary problem which arises from the fixed wage structure. Under the gold standard the money growth rate cannot be regulated by governmental policy because the money stock can increase or decrease only if the commodity stock in monetary use increases or decreases respectively. I conclude this section by demonstrating that the finite gold endowment sets bounds on the money growth rate. As a result the price level, consumption and asset price fluctuations are also bounded.

The feasibility of any commodity standard relies on the availability of the backing commodity for monetary use. I start the section five by analysing the difficulties which arise if the commodity flow stops for some exogenous reason but the country still follows the convertibility rule. The economy would perform better in terms of stability and economic activity, if during the stoppage the government would cease the convertibility of the backing commodity and issue fiat money knowing that in the future, when the commodity is again available, the old standard will be restored. In section six I illustrate the results with calculations and in section seven I summarise conclusions and discuss the implications of results.

2 Reconsidering the Suspension Period

The question of how alterations to the commodity standard regime, such as the suspension of the convertibility rule, have been used to stabilise the economy, has not hitherto been analysed. Although for centuries the commodity standard dominated academic and political discussion in economic science, these studies primarily stressed impersonality and the automatic operations of the gold standard or examined the advantages and disadvantages between different commodity systems.

Most of the research on the commodity standard to date has been carried out under the assumption that conversion is assured now and in the future. Since its publication, Barro (1979) has been the foundation for a number of models on the commodity standard. Apart from a brief discussion, he sidesteps any possible change in the monetary structure. The results of models of this type, for example Goodfriend (1988), McCallum (1996), are probably oversimplified to some extent, as in these models the money stock and price level determination is separated from governmental policy and the results apply only to the relatively short era of the Classical Gold Standard, 1880-1914.

The recent development in the theory of macroeconomics, namely the discretionary and time inconsistency arguments of Kydland and Prescott (1977), and the vast literature that it precipitated, have not yet been fully applied to the commodity standard framework. During the time of absolutist monarchs the commodity standard was an external constraint which restricted policy decisions.³ Convertibility was a transparent principle that made the government and central bank's policies observable. Public could test the maintenance of the rule by comparing the mint price of gold to its market price⁴. If the market price were above the mint price, that was an indication of mismanagement and resulted in gold flowing from the central bank and often from the country.

Bordo and Kydland (1995) evaluate how the gold standard has restricted the conduct of monetary policy in various countries. They argue that the gold standard had a dual

³Blackburn and Christensen (1989) p. 3.

⁴Flandreau (2006).

role: it binded monetary policy over time by limiting the ability of current and future policy makers to conduct discretionary monetary policy, but during a war or other emergency the government could challenge the rule by temporarily suspending the commodity standard on the understanding that the convertibility would be restored at the original parity after the emergency had passed. The authors call the gold standard a contingent rule. Countries committed to the gold standard rule with a war or other difficult time as a contingency. Market agents would regard successful adherence as evidence of a credible commitment and would allow the authorities access to seigniorage and bond finance at favourable terms.⁵ Since the monetary rule had a contingent nature Bordo and Kydland (1995), Bordo and Schwartz (1977) and Rolnick and Weber (1998) consider the temporary paper money standards, which for example in England occurred from 1797-1821 and from 1914-1925, as a parenthesis in the context of the gold standard.

Bordo and Redish (1993) argue that during the absence of the gold backing, governments chose the rate of fiat money issue to maximise the present value of seigniorage revenue. The rule according to which the resumption must occur in old par value set a terminal condition and restricted the supply of money. In Bordo and Redish (1993) the suspension is of known duration and the terminal condition implies that the money issuer must start by reducing nominal balances below the level implied by the gold standard.

This paper stems from the literature on the time consistency and develops Bordo and Kydland's (1995) theory of the gold standard as a rule and Bordo and Redish (1993) argument about seigniorage finance in the context of the Pre-classical Gold Standard of 1717-1797 and the Suspension Period of 1797-1821. The key insight of this paper is that it identifies the gold standard and the suspension of cash payments as different monetary regimes simply because the monetary rules these regimes enforced were not identical. The gold standard regime implemented the convertibility rule. The monetary base was fixed and as the other main trade partners of England were on silver or bimetallic standard, the exchange rate was fixed in terms of fixed ratio between silver and gold. The monetary rule under the Suspension Period was to convert circulating

⁵Bordo and Kydland (1995) p. 424.

paper currency to gold at some future point. The monetary base was flexible, not tied to gold reserves, and the ratio in the price of silver and gold fluctuated. The Bank of England's operating procedures were different during the gold standard and suspension of cash payments.

The Suspension Period lasted for almost a quarter of the century – hardly a 'temporary' period as claimed by Bordo and Kydland (1995) – covering the Napoleonic wars over which the doctrines of the gold standard would not have reached. As Duffy (1982) argues, the war years were not just difficult times, but a period of constant shocks during which the Bank of England had to face problems such as bad harvests, trade blockades and high government expenditure, which in peace time arose only occasionally. The end date of suspension was unknown and resumption plans unspecific: Parliament authorised the resumption to be moved forwards ten times by the Acts that were given between 1797 and 1823. They were carefully worded and declared, for example, that resumption was not possible until 'One Month after the conclusion of the present War by a Definite Treaty of Peace'⁶.

The historical evidence does not support the argument that during the Suspension Period of 1797-1821 the objective of the government would have been to maximise seigniorage revenue. The gold standard rule itself is not immune from seigniorage finance or fiduciary note issue: monetary authorities can reduce gold content of specie or issue non-backed paper money without any monetary regime modifications. For the government the ability to borrow both at home and abroad was crucial during the time of war. If the government's objective was to maximise seigniorage it would have decreased expected return on government bonds and made the public debt harder to sell. Inflation would have increased domestic prices, encouraged imports and made exchange rates unfavorable. This would have depressed domestic production and challenged the return to the gold standard altogether.

According to Bordo and Redish (1993) the very reason for the successful survival of the gold standard during the turmoil of the nineteenth century was that it permitted the suspension of convertibility. The gold standard as a contingent rule theory suggests,

⁶Geo. III,c. 3, 9th November 1797.

however, that the suspension was a carefully planned policy action during wartime. The source of the contingency in 1797 was not a war, but availability of gold in monetary use: the historical analysis shows how in the eighteenth century England did not abandon the gold convertibility rule during every war, but only in 1797 when the maintenance of convertibility became impossible.

3 Monetary Policy under the Gold Standard and the Suspension of Cash Payments 1797-1821

The monetary policy and institutions of the eighteenth century were an outcome of an evolutionary process rather than social planning of any kind. Fetter states in the beginning of his seminal book *Development of British Monetary Orthodoxy 1797-1875 (1965)* that ‘in 1797 there was in England no generally accepted theory of a monetary and banking system’. Existing institutions and laws, he writes, ‘were inadequate and in some cases inconsistent’.⁷ For example, England went in to the gold standard by accident in 1717, when the master of the Royal Mint, Sir Isaac Newton, fixed the parity between gold and silver such that silver was slightly over valued relative to gold. The more valuable silver coins disappeared from circulation and gold became the prevailing monetary standard.

Despite these inconsistencies and constant wars, the eighteenth century was an era of economic growth, expansion of the banking system, and marked the start of the Industrial Revolution. Much of the financial stability has caused by the comparatively peaceful development of parliamentary government which started already in the seventeenth century. The Glorious Revolution of 1688 initiated the era of parliamentary supremacy. The Financial Revolution that followed secured private property rights, the right of the Parliament to monitor the executive and the monarch and gradually transferred the personal royal debt into a public debt controlled by the Parliament.⁸ In 1694 the establishment of the Bank of England as a private joint-stock bank that

⁷Fetter (1965) p. 1.

⁸Dickson (1967) p. 12 and North and Weingast (1989).

supported public finance was a part of the Financial Revolution.

The French economic historian Peter Vilar (1969) argues that the stable system of gold import and minting played a crucial part in creating monetary stability in England, which lasted until the end of the eighteenth century. As Britain did not have any gold mines of its own, the domestic demand for new gold had to be satisfied by import.⁹ Early in the eighteenth century new gold mines were found in Brazil, which between 1721 and 1780 produced 56 percent of the world's gold¹⁰. The first beneficiary of the sudden increase in Brazilian gold production and gold imports into Europe was its colonial master Portugal, but it was not able to keep possession of the metal. The Anglo-Portuguese diplomatic and military alliance during the Wars of the Spanish Succession (1701-1714), and some small scale economic complementaries, such as privilege in wine import, gave Britain a great advantage in the Portuguese gold trade¹¹. In the commercial triangle of Brazil, Britain and Portugal, the balance was always in Britain's favour and virtually free competition for British goods in Portugal and its colonies drained gold away from them.¹²

From 1717 to 1797 the fixed monetary or mint price of gold had been at £3. 17s. 10½d an ounce. Strict laws prohibited the export of English bullion, melted English specie or gold from England, but export of foreign gold was permitted. As can be seen in Figure 1 the market price of gold prior to the Suspension Period had rarely risen above the parity price and even then only by a relatively small percentage. England's principal foreign exchange operations were with Hamburg, which was on silver standard and the fluctuations in the London-Hamburg rate were linked to changes in the gold-silver ratio in Hamburg. According to Fetter the price changes were so small that the prices of gold and silver in London and Hamburg were generally used interchangeably. The stock of foreign coin and bullion in England was large and worked as a buffer in the case there was a temporary fall in the exchange rate and hence reduced the pressure

⁹Vilar (1976) p. 231.

¹⁰Schmitz (1979).

¹¹Vilar (1976) p. 225 argues that Portugal become 'if not totally dependent on England politically, at least strongly influenced by her economically, almost to exclusion of other powers'.

¹²Vilar (1976) p. 227.

on the Bank's bullion.¹³

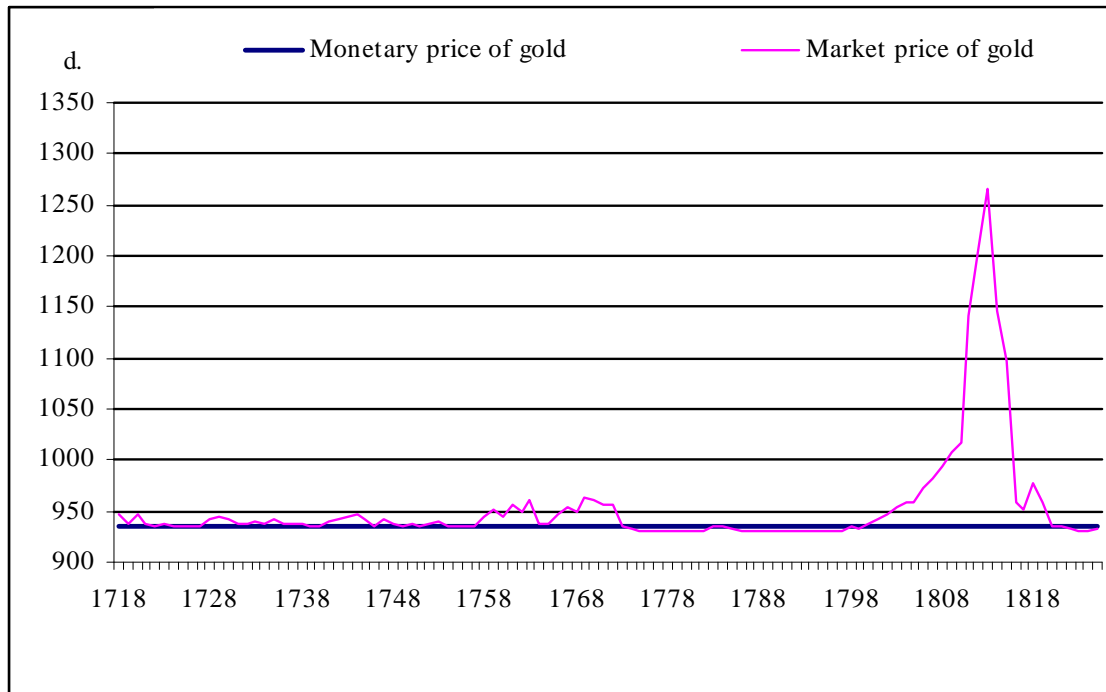


Figure 1: Monetary price of gold and market price of gold in London between 1717 and 1825, annually, measured in pennies. Lawrence H. Officer, MeasuringWorth.com, 2006.

As the gold supply conditions were stable, the Bank of England was able to support the monetary system with a relatively low gold backing rate. Figure 2 shows how, apart from an exception in 1740, the value of bullion was always below the depository notes. The Bank itself was an active gold dealer and bought gold directly from the ships to meet immediate gold demand. As the Bank had to exchange gold for its notes, buying gold did not increase the gold backing rate significantly but helped to satisfy the gold demand in the short run. The bullion reserves of the Bank fell especially during the wars when the expenditure of the government increased. The Bank was able to adjust the demand of the private sector by using unconventional measures to slow down the outflow, such as paying demand for cash in shillings and sixpences. The process of counting the small gold coin caused considerable delay, and time was thereby

¹³Fetter (1965) pp. 27-28.

gained during the worst periods of the crises.¹⁴ The adjustment mechanism could not, however, stop the drain of specie, which was caused by the government who made foreign payments in gold, especially during the time of war.

Specie and depository notes of the Bank of England by themselves were inadequate to meet the merchant and industry's growing demand for credit. Already by the beginning of the eighteenth century the paper form of money exceeded metallic money in England and Wales, as the London money market and the provincial country banks created more than half of the total money supply. The growth of the country banks, especially after 1750, increased regional money supply. The most common form of paper money was the private banker's promissory note to his client, payable either by demand or after a certain date.¹⁵ Country banks did not have reserve requirements and at that time the instability of English banks was believed to be explained by their freedom to issue small notes, not to their under-capitalisation or lack of reserves.¹⁶

Since middle ages merchants had used various short term credit instruments, bills of exchange, which themselves became like money if drawn on a trustworthy party. Both the private bills and public credit instruments such as tallies and exchequer bills could be converted to ready cash by discounting them at the Bank of England. The growing number of the London private banks and country banks were successfully able to compete with the Bank, which, by the end of the century, only discounted the bills of the London merchants and private banks.¹⁷ Compared with total volume of the private banks' discounts, the Bank of England's discounting business remained relatively small until the end of century, but it was, nevertheless, a primary way for the Bank to put its notes into circulation.¹⁸

The discount business gave the Bank income to pay its dividends and ready cash for businessmen, but it also meant that the Bank held assets in stock which had not reached their redemption date. Parliament enacted measures to control lending to the

¹⁴ Acres (1931) p. 180.

¹⁵ Pressnell (1956) p. 299.

¹⁶ Dowd (1989) p. 118.

¹⁷ King (1936) p. 12.

¹⁸ Clapham (1944) Vol I, p. 122.

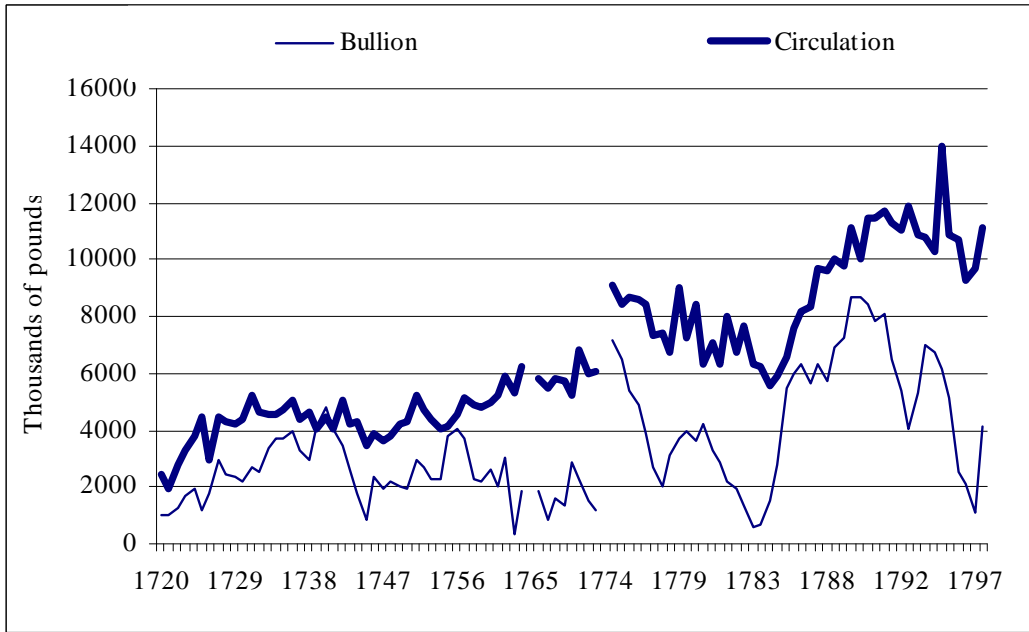


Figure 2: The Circulation of the Bank of England Notes and Bullion Reserves, annually 1720-1797. Clapham (1944) , Appendix C, pp. 295-296.

government, but commercial discounts were under the control of the Bank of England.

The usury laws, however, stood in the way of truly effective credit control. The discounts were subject to the legal prohibition of interests above five percent, even though the real market rate would have been higher. Only the rate on government consols and East India Bonds were not subject to the usury laws. The demand of the discounts specifically at the Bank of England was tightly linked to the market interest rates. If it increased above five percent, the discount business became unprofitable for lenders. The brokers of private lenders evaded the usury law widely, for example, by charging higher commission or refusing to lend money to those who did not keep high balances on their current accounts. Hence the Bank's discounts became relatively cheap when the market rate of interest rose above five percent.¹⁹

Towards the end of the century the gold demand remained unusually high for long periods of time: Firstly, the market price of the gold rose above the mint price and therefore, it was now possible to make arbitrage profits by buying gold from the Bank

¹⁹Duffy (1982) p. 67.

and smuggling it abroad. Secondly, the outbreak of war with France in February 1793 demanded large foreign expenditures and at the end of 1794 the Prime Minister Pitt made heavy calls upon the Bank to support his allies in Continental Europe by considerable sums of specie – all drawn from the vaults of the Bank. The Directors of the Bank became increasingly worried that lending huge sums of money to the government would clash with the Bank’s original charter that forbade it to lend to the government without the permission of Parliament. Thirdly, the country banks began to strengthen their own gold holdings by cashing the Bank of England notes which they had kept as a reserve. Simultaneously there were serious gold supply shocks. The Brazilian mines started to dry up and the market price of the Brazilian gold increased. The war caused disturbances at sea, increased insurance costs of shipping, and the market price of gold increased even further.

Influenced by a rumour of a French invasion farmers in Newcastle changed the notes they received on selling their cattle to specie at their local bank on 18 February 1797. A few days later the Newcastle banks suspended payments and this was followed by bank runs in the nearby towns of Sunderland and Durham.²⁰ The alarm was raised in London and the demand for Bank of England notes was high, as they were convertible on demand. The Bank’s Committee of Treasury reported on 22 February 1797, that the gold reserves of the Bank had fallen by £622,000 since 1 January and were by the end of February £1,086,170.

On Sunday 26 February, the following announcement, which came to mark the start of the Suspension Period, was given after an emergency meeting between the King, Pitt and Privy Council of the Bank:

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.²¹

²⁰Fetter (1965) p. 21.

²¹As quoted in Cannan (1925) p. xi.

Close reading of the declaration reveals how members seemed to be as concerned about the state of circulation as the bullion level of the Bank. For contemporaries the low level of bullion and the low level of money circulation and credit caused different sets of problems, at least in the short run.

On the one hand, the gold reserves facilitated convertibility which, in turn, maintained the value of the money. As can be seen from the Figure 2 the bullion levels of the Bank had been even lower earlier in the century, without causing such alarm. The Bank was more concerned about maintaining its ability to support the value of the currency through convertibility, not about the absolute size of its reserves. The value of the gold reserves was considered confidential business information which was not communicated clearly even to Pitt.²² This raises speculation as to whether the Bank notes would have fell on discount and bank runs been more frequent than they actually were in the eighteenth century if the Bank had been more transparent. The system worked until the February 1797 when the pressure on the Bank's reserves became too high.

On the other hand, according to Henry Thornton the distress arising in London, 'was a distress for notes of the Bank of England'.²³ In London, the commercial and financial centre of the country, the Bank of England notes where by far the most important medium of exchange, and the whole credit system, 'payments which are most of them promised beforehand',²⁴ had been built on them. Thornton estimates that:

A diminution, for instance, of one-third or two-fifths, might, perhaps, be sufficient to produce a very general insolvency in London, of which the effect would be the suspension of confidence, the derangement of commerce and the stagnation of manufactures throughout the country.²⁵

For a few days before the suspension the demand for the Bank of England notes was so high that interest paid on them increased to 16 or 17 percent.²⁶ As the people

²²Fetter (1965) p 61.

²³Thornton (1802) p. 113.

²⁴Thornton (1802) p. 113.

²⁵Thornton (1802) p. 114.

²⁶Thornton (1802) p. 113.

now held the Bank of England notes for gold conversion, the circulating medium used in commerce and other purchases reduced. Neither were there any real alternatives to the Bank of England notes, as no country bank or private bank notes circulated in London. Converted gold did not return to circulation as it was either smuggled from the country or put away in hoards. Sir Francis Baring, London merchant banker, in 1797 had recognised that the Bank notes were not just a substitute for money, but the basis of the monetary system.²⁷ Merchants in London were not interested in specie: ‘The quineas applied for by persons in London, was, generally speaking, account of people in the country’, Thornton explains.²⁸ The specie used in small domestic transactions was often badly clipped or copper token coins.

The fact that the suspension of cash payments was not only a crisis of gold reserves, but also a crisis in the circulation of the Bank of England notes, has been missed in much of the debates on the Suspension Period – apart from those written by contemporaries – probably because the authors have been influenced by the doctrines of the Classical Gold Standard. Fundamental doctrines of the Classical Gold Standard, such as narrow gold reserve ratio policy and automatic price adjustment mechanism, did not, however, apply into the gold standard in the eighteenth century.

While the order of the Privy Council was being published on the following Monday, 28 February 1797, the merchants and bankers of London had their own meeting. Its outcome was a declaration where they assured that:

they would not refuse to receive Bank notes in payment of any sum of money to be paid to them, and would use their utmost endeavours to make all their payments in the same manner.²⁹

The declaration was then published in the press bearing the signatures of many hundreds of leading business houses. The Directors of the Bank also published a notice assuring both the public and its proprietors that ‘the Bank was in most sound condition’.³⁰ The merchants, bankers and the Directors of the Bank of England undeniably

²⁷Fetter (1965) p. 59.

²⁸Thornton (1802) pp. 112-113.

²⁹Feavearyear (1963) p. 183.

³⁰Clapham (1944) Vol I, p. 272. Feavearyear (1963) p. 183.

had common interests. If the number of the Bank of England notes would had fallen too far, there would have been delays in payments and other obligations which would have brought down many large London houses and with them, the country banks, which in turn had close links with the local industries.

A few days after the suspension the Parliament authorised the Bank to issue previously prohibited notes of a face value less than £5 to help with the shortage of circulating medium. After the gold and silver coins had disappeared to hoards, there was no legal tender currency in circulation. Those people, who had used only coin in the past, were now introduced to the inconvertible paper money.³¹ In many regions the Bank of England notes started to circulate alongside the country bank notes for the first time. The authorities confirmed the status of the Bank of England notes as *de facto* legal tender currency by legislation. The Bank Restriction Act passed on May 3 ensured the public that:

all Sums of Money, which now are or shall become payable for any Part of the Public revenue shall be accepted by the Collectors, Receivers and other Officers at the Revenue, authorised to receive the same, in Notes of the said Governor and Company, expressed to be payable on Demand, if offered to be to paid.³²

The Bank was careful not to call the Bank of England notes legal tender currency, probably because it could have become associated in the public mind with the failed assignants in France³³ or given the impression that the monetary base had shifted permanently.

As such the transition between the monetary regimes was effected with little disturbance. The confidence towards the payment system in London and provinces was restored. Specie started to circulate alongside inconvertible paper currency and as can be seen from Figure 4, the gold reserves of the Bank increased from the lowest point of £982,000 in March 1797 to over £4,000,000 in August 1797, and continued to grow for

³¹Clapham (1944) Vol. II p. 3.

³²Act 37 Geo.III. c.45.

³³Fetter (1965) p. 59.

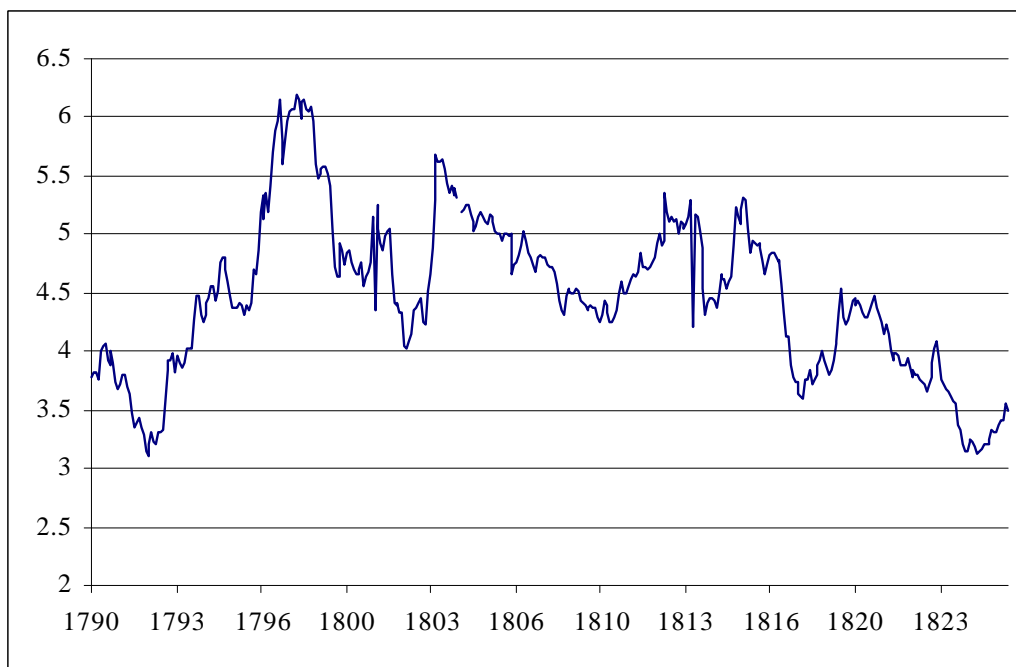


Figure 3: The Long Term Interest Rate. Gayer, Rostow and Schwartz (1953) p. 1444.

the next year and half. The exchanges with Hamburg, in Figure 5, improved almost immediately and fluctuations in the exchange rate and price of gold were hardly different from those under convertibility. The long term interest rate peaked in May 1798, as can be seen in Figure 3, but reduced to the pre-suspension level by 1799. In Parliament there were serious debates about the resumption of the gold standard in 1799, and the Bank had expressed its readiness on more than one occasion to resume the payments immediately.³⁴ The government, however, wanted Parliament to extend the Restriction Act in June and November 1797, and three times between 1802-1803³⁵ until in April 1803 a new war put an end to the discussions about the early resumption.

During the first ten years of the Bank Restriction Period, the Bank conducted a rather restricted credit policy. Economic activity was low and the Bank's private discounts increased, indicating the Bank's desire to maintain confidence immediately

³⁴Feavearyear (1963) p. 190. Clapham (1944), Vol I, p. 272.

³⁵Act 37, Geo. III, c.45, 3rd May 1797; Act 37, Geo. III, c.91, 22nd June 1797; Act 38, Geo. III, c.3, 30th November 1797; Act 42, Geo. III, c.40, 30th April 1802; Act 43, Geo. III, c.18, 28th February 1803; Act 44, Geo. III, c.1, 15th December 1803;

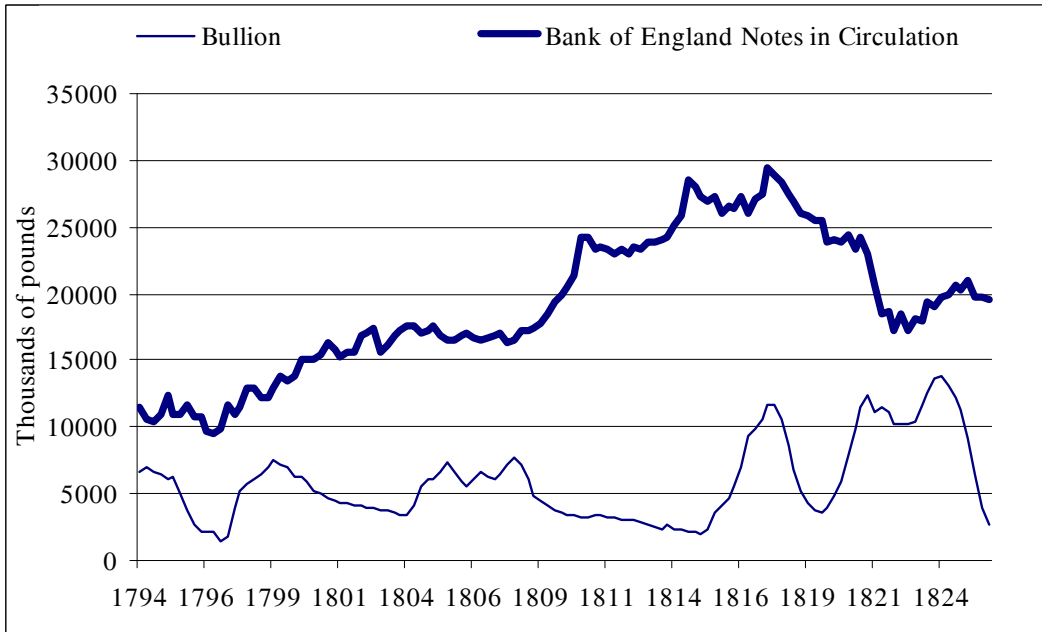


Figure 4: Bank of England Notes in Circulation and Bullion in the Bank of England 1794-1825, Quaterly. Gayer et al. (1953), Microfilm Appendix pp. 1296 and 1358.

after the suspension.³⁶ Although between 1800 and 1801, as seen in Figure 5, the pound depreciated on the Hamburg exchange, this was due to factors other than the Bank’s credit expansion such as bad harvests and deflation in Hamburg.

While the country was engaged in the war the Directors felt obliged to satisfy the urgent wartime demand of the Treasury. The Bank bought Exchequer bills often at direct requests by the Treasury brokers.³⁷ This was very convenient for the Treasury if the markets did not absorb as many Exchequer bills as the Treasury wished to dispose. The strong responsibility of the Governors was not eased by the fact that the Bank’s public advances were still subject to parliamentary control and it was technically prohibited from buying Exchequer bills or making advances to the Treasury without Parliament’s permission. During the time of war Parliament was not keen to enforce the law or limit Treasury’s needs.³⁸ Figure 6 shows the development of the public advances between

³⁶Duffy (1982) p. 69.

³⁷Clapham (1944) p. 62. Gayer et al. (1953) Microfilm appendix p. 1388.

³⁸Gayer et al. (1953) Microfilm appendix p 1386.

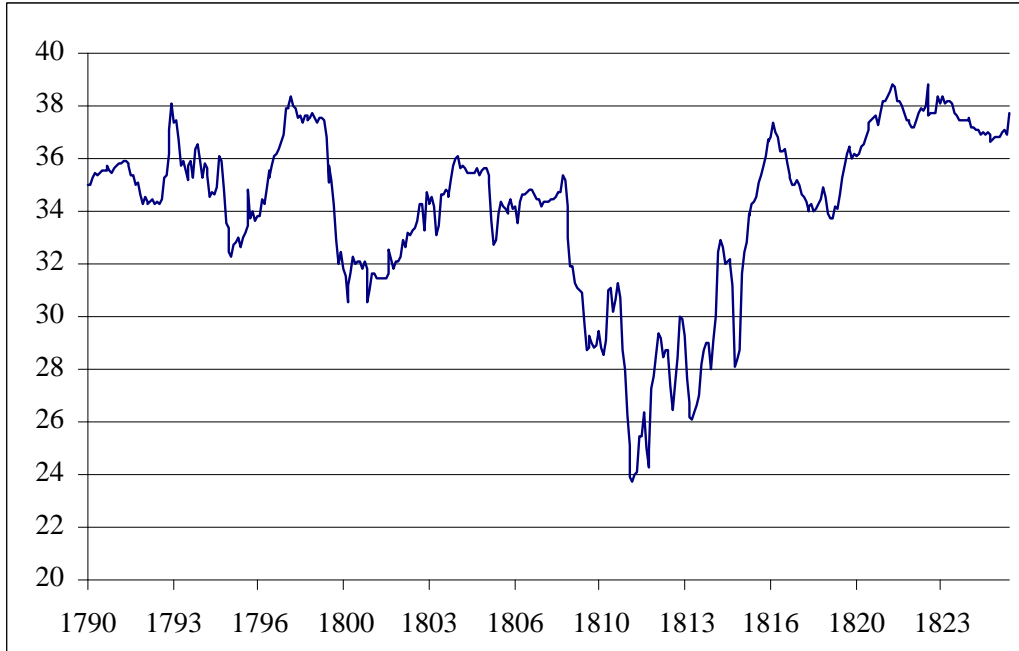


Figure 5: Price of Hamburg Bills on London, Monthly 1790-1825, shillings per pound. Gayer et al. (1953), Microfilm appendix, p. 1465-1466.

1794 and 1825. During the first decade of the Suspension Period the level of advances stays relatively low, the average of advances outstanding being about £13,500,000.

Figure 6 also includes all the assets of the Bank arising from its business with private borrowers, and it shows how the private discounts in total grew faster after the suspension compared with the public advances. However, during the first three years the growth of the discounts is still moderate. Before the suspension the Bank's note issue had been about 10 to 11 millions but it started to rise after the suspension (Figure 4), probably explained by the issue of the notes of small face value.

If during the first ten years of suspension the Bank's credit policy had been relatively restrictive, the following years were quite the opposite. Political developments in Europe and the increased sea-power of Britain opened new markets for British goods both in Continental Europe and South America, which created a commercial boom in England. As seen from Figure 4 the notes outstanding remained relatively stable from 1806 to 1808 but in 1809 the issue began to rise sharply and the peak was reached

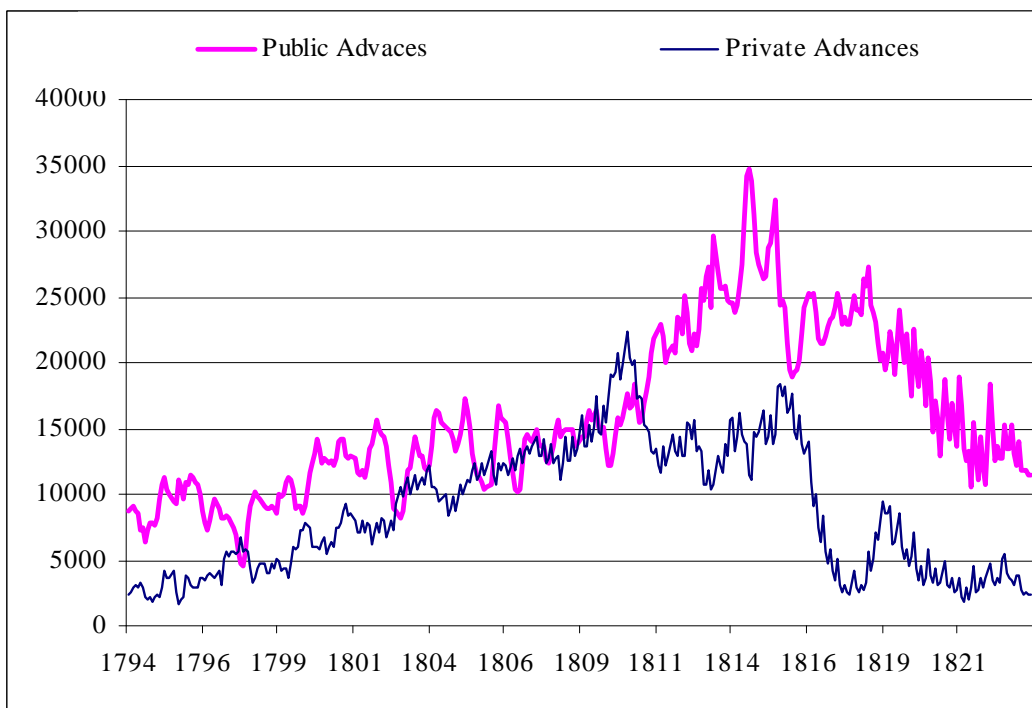


Figure 6: Bills and Notes Discounted and the Public Advances by the Bank of England, Monthly, 1794-1825, thousands of pounds. Gayer et al. (1953), Microfilm appendix, pp. 1370-1371 and 1390-1391.

in 1810. Figure 4 only includes the Bank of England notes. Data on the circulation of country bank notes is not available until 1804 and onwards when the law required stamp duties to be paid on private notes. The value of all notes stamped in 1805 was £10,700,000. Private bank notes consisted of almost 40 percent of the total paper money in circulation.³⁹

The commercial boom was, however, short lived. The exchange rate depreciated which was largely the result of domestic inflation and increased export. Holland had fallen to France and Wellington was yet to achieve victory. From late 1809 onwards bankruptcies increased and summer 1810 saw the outbreak of several economic crises.

The currency disorder, both comparable depreciation of the Bank of England's notes compared with the Continental exchanges and the 12 percent premium on gold in 1810,

³⁹Pressnell (1956) p. 188.

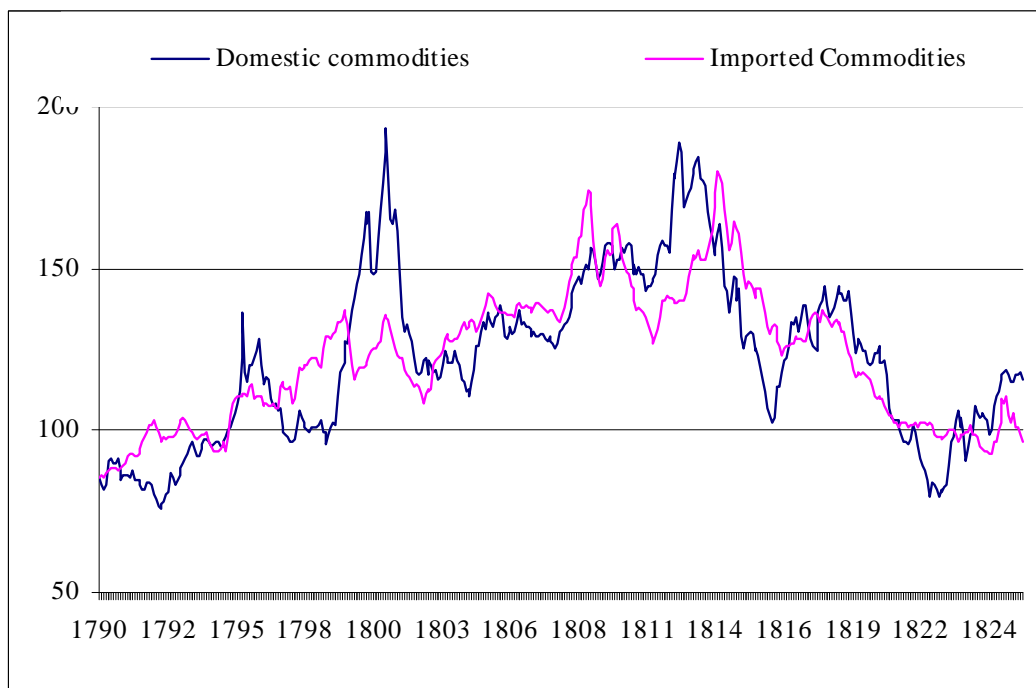


Figure 7: Domestic and Foreign Price index. Source: Gayer et al. (1953) Microfilm appendix.

received attention amongst the public and started a major debate labelled the bullion controversy. It was not a a single issue controversy, but of wide range of problems that had been brought forward by the inconvertible paper currency. Parliament appointed a Bullion Committee, which was established to inquire into the high price of gold, so as to find out whether the Bank had issued the right amount of money. Between February and May 1810 the Bullion Committee had held 31 meetings and examined 29 witnesses, including the Directors of the Bank. ‘Anti-bullionists’, the government but also some merchants and bankers in London, were more supportive towards the real-bill doctrine of the Directors of the Bank who insisted that they had not been over-issuing. By discounting real notes which represent real transactions (‘there are actual goods in existence’⁴⁰) as opposite to ‘speculative notes’, they were just serving the legitimate needs of trade, they claimed.⁴¹ Supporters of the prompt return to convertibility were

⁴⁰Thornton (1802) p. 85.

⁴¹Flandreau (2006) and Sargent and Wallace (1982).

called ‘bullionists’ and their arguments have been seen as an anticipation of the modern quantity-theory of money. Although not being a member of the Select Committee on the High Price of Bullion⁴², David Ricardo became the major expositor of the Bullionist position. The conclusion of the Bullion Report was that the rise in the price of bullion and the adverse exchanges had been caused solely by an over-issue of Bank of England’s notes. The influence of the country bank issue was noted by saying that the quantity of country bank paper dependent upon the quantity of Bank of England paper, increasing and decreasing with it and by increasing its notes, the Bank made more plentiful the reserves into which every country banker was required to redeem his own notes.⁴³ Finally, the report recommended a gradual return to specie convertibility.

Narrative historiography has accused the Bank of discounting irresponsibly or pursuing real bill policy by accepting all sound paper (non-speculative paper) without considering ‘its desirability in terms of national monetary policy’⁴⁴. The criticism, especially on the Bank’s ignorance, is simplistic as it is based on either the Bullion Committee’s report or the testimonies given by three Directors of the Bank in front of the Bullion committee. These testimonies have been seen as evidence of the lack of knowledge of any monetary theory in the Bank by a large group of historians. The testimonies, however, do not tell the whole story of the Bank’s credit policy, as the committees interrogation was very intense and the directors gave answers that exaggerated the extent of their anti-bullionism.⁴⁵ These three rather personal statements, as often stressed by the Directors themselves during the interviews⁴⁶, presented the views of the corresponding directors at that precise moment. Historiography has ignored the fact that the opinions of two of these interviewed directors changed in the following year.

According to Duffy (1982) the Bank’s regulatory policy was rather “imprecise” in nature. The Bank’s internal Discount Committee in its own report of 1810 suggested that the fault did not lie in the regulations but in their neglect by the Directors, who

⁴²Cannan (1925) p. xlii.

⁴³Bullion Report, reprinted in Cannan (1925) p. 61-66.

⁴⁴Fetter (1965) p. 41.

⁴⁵Duffy (1982).

⁴⁶Cannan (1925) p. 33.

received pressure from business and government. The Bank had sought to dampen commercial optimism by limiting the expansion of credit, but the mechanism of setting a maximum credit limit had broken down.⁴⁷

Whether or not due to mismanagement, deliberate monetary expansion or bad harvests, the pound had depreciated and the general price level increased. How did the increased money circulation, including that of the private banks, affect the real economy during the Bank Restriction Period? The answer depends largely on the ability of the economy to respond to shocks, which in the nineteenth century was, at best, very low.

Although the eighteenth century marked the start of liberalisation, the extent of the advance in flexibility during the Enlightenment is exaggerated. Hamilton (1940) argues that ‘it would be a great mistake to assume that natural liberty dethroned mercantilism in practice before the ink dried on the *Wealth of Nations*’.⁴⁸ Mercantilist institutions such as a craft guild system had still an influence on commercial life and Elizabethan laws on compulsory apprenticeship restricted the free movement of labour and wages.⁴⁹ As systematic inflation had not existed in previous centuries, rigidities had been visible only when the harvests had been poor and prices and wages had failed to adjust.

In most sectors nominal money wages were fixed for a year so that changes in price level had an immediate effect on real wages, not nominal wages. Rogers (1908) argues that as the premium on gold increased by 30 percent, the nominal wages paid in paper money would have been ‘in reality little more than two-thirds of their reputed value’.⁵⁰ The situation was probably not as grim for the majority of wage earners: In the first half of the nineteenth century agriculture was by far the main employment followed by domestic service⁵¹, that were sectors in which a part of wages were paid in food, drink and accommodation so that the changes in the price level had a smaller impact on the standards of living.

⁴⁷Duffy (1982) pp. 80-81.

⁴⁸Hamilton (1940) p. 305.

⁴⁹The craft guilds were not legally extinguished until the Municipal Reform Bill of 1834.

⁵⁰Rogers (1908) p. 425.

⁵¹Gayer et al. (1953) Microfilm appendix p. 1706.

Economic historians have devoted a considerable amount of effort to analysing the development of real wages during the Industrial Revolution. Recent econometric accounts suggest, that real wages decreased in Britain as whole between 1755 and 1819⁵². There were huge regional variations and in places where technology was particularly advanced, such as Manchester, both nominal and real wages might have risen ⁵³. Generally, however, the nominal wages failed to increase at the same rate with prices. The years between 1750 and 1820 have been called a period of ‘prolonged wage stagnation’⁵⁴.

The question of how the change in the price level and in real wages affected production has received less attention. A seminal although controversial study was conducted by Hamilton (1942). He calls the lag of wages behind prices ‘profit inflation’ and argues that it was a powerful promoter of industrial growth as profit inflation enabled a much more rapid rate of industrial growth than would have obtained under stable prices.

Since the price trend was upward for so many years during the Suspension Period, there was some adjustment in sticky nominal wages. The adjustment was not, however, equally distributed: the wages of a small number of skilled workers rose fastest and the wages of the relatively large number of unskilled workers adjusted more slowly. The wage payment pattern of factory workers and free artisans varied too. For example the cotton operative received weekly wage but the hand-loom waver was usually paid according to how many yards of yarn he had wavered. Average wages of cotton operatives employed in factories and a traditional hand-loom waver are shown below in Figure 8. The average weekly wage of the cotton operatives remains almost fixed between 1806 and 1823 but the average weekly earnings of the hand-loom waver increases from 1811 to 1814 and then decreased until 1819. The contemporaries were aware of labour market frictions and wage stickiness. In *Wealth of Nations* Adam Smith wrote about the conflict between the workers and the masters that arise from the wage - profit difference because ‘masters are always and every where in a sort of static but constant

⁵²Botham and Hunt (1987) p. 382.

⁵³Hamilton (1942).

⁵⁴Lindert and Williamson, English Worker Living Standards, as quoted in Botham and Hunt (1987) p. 383.

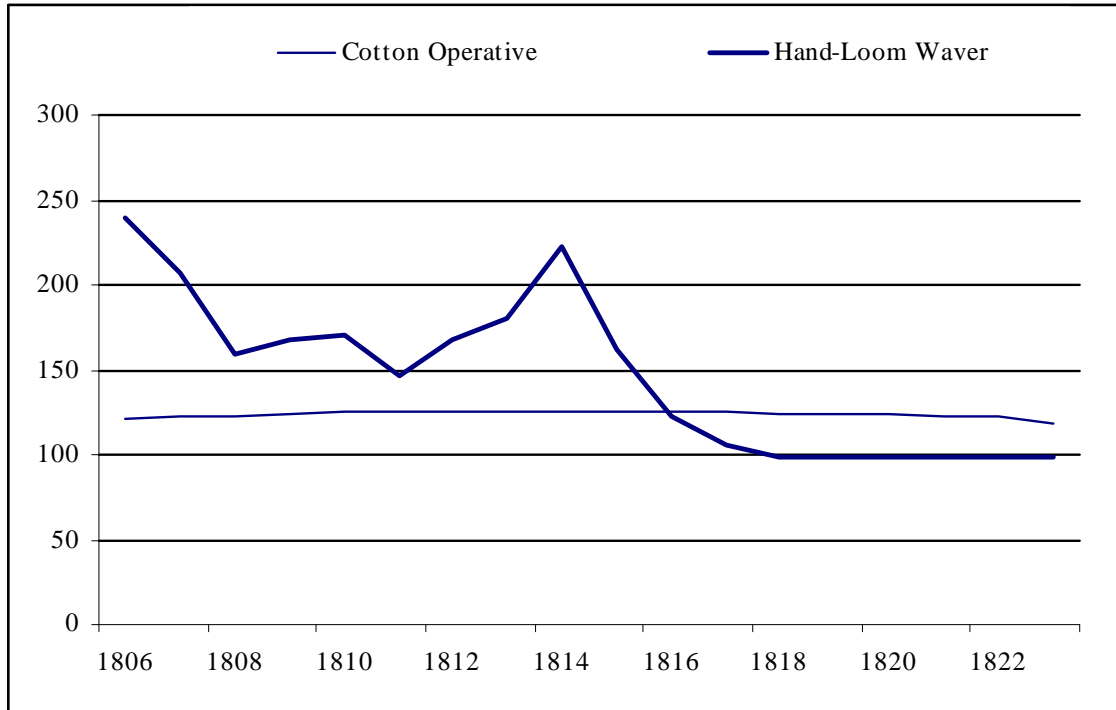


Figure 8: Average wage of cotton operatives and hand-loom wavers 1806-1823, shillings per week. Source: Gayer et al. (1953) Microfilm appendix p. 1587.

and uniform combination not to raise the wages of labour above their natural rate'.⁵⁵ Henry Thornton recognised that an excessive issue of paper does increase prices of goods, 'though not the price of labour'.⁵⁶ As a result the workers may be forced 'to consume fewer articles'.⁵⁷ His sophisticated analysis was overshadowed by Ricardo, who, on the contrary, assumed that the economy was relatively frictionless, with no short run stickiness and with high capital and labour mobility. The reduction of parliamentary intervention to a minimum served the interest of workers.⁵⁸ Authors of Bullion Report recognised that the wages were sticky, but as moneyed men were rather concerned about wage stickiness downwards. Another evil of the general excess

⁵⁵Smith (1994) Ch.8, Of the Wages of Labour in paragraph I.8.13. Available online at <http://www.econlib.org/library/Smith>.

⁵⁶Thornton (1802) p. 239.

⁵⁷Thornton (1802) p. 239.

⁵⁸Gordon (1976) p. 25.

of currency was that:

By far the most important portion of this effect appears to Your Committee to be that which is communicated to the wages of common country labour, the rate of which, it is well known, adapts itself more slowly to the changes which happen in the value of money than the price of any other species of labour or commodity.⁵⁹

Baring, one of the authors of Bullion Report, became a fierce critic of Ricardo's quantity theory, accusing Ricardo of treating the relationship of money and prices as if it were 'a mechanical operation'.⁶⁰ He warned about deflation as the attempt to maintain money wage levels would lead initially to unemployment and to social unrest in the long run.⁶¹ Robert Peel defended the workers by arguing that 'the natural result of a return to a metallic currency must be a diminution in the profits of the master, and an increase in those of the men'.⁶² It was acknowledged that the rigidities in the labour market were a problem and a series of labour market reforms were carried out already in 1814. The purpose of the legislation, such as the Combination Laws which prohibited collective bargaining, was to ensure the flexibility of labour markets downwards, but not necessarily upwards.

While labour markets were gradually made more flexible in the nineteenth century, the price rigidities increased when the Corn Laws were imposed in 1815. The Corn Laws were designed to stabilise the exchange rate fluctuations caused by a large import of wheat which depreciated the exchange rate, increased the outflow of gold and could have challenged the resumption. Another function of the Corn Laws was probably to preserve the abnormally high profits of the Napoleonic war years for the landowners. The Laws stated that no foreign corn could be imported into Britain until domestic corn cost 80d. per quarter. The high price caused the cost of food to increase and consequently depressed the domestic market for manufactured goods because people spent a large part of their earnings on food rather than commodities.

⁵⁹Cannan (1925) p.

⁶⁰Gordon (1976) p. 106.

⁶¹Gordon (1976) p. 107.

⁶²Gordon (1976) p. 149.

The dangers of deflation had been recognised by the authors of the Bullion Report who recommended gradual adjustment to convertibility. The government was in no rush to apply the recommendations and there was considerable delay before the subject was even discussed in Parliament. As long as Napoleon was in power, the Bank had little choice but to make advances that the government demanded. Although private discounts fell, the note circulation kept increasing after 1811 due to large government borrowing. As early as 1814 an act⁶³ had been hurried through Parliament which stated that ‘although resumption was highly desirable’, it should be postponed until 5 July 1816. The policy of the resumption of cash payments got complicated by the indefinite character of the first peace and the Hundred days reign of Napoleon.

After Waterloo on 18 June 1815 ‘a larger field of discretion’ was opened to the Bank⁶⁴. The start of the adjustment to the gold standard coincided with abolition of the income tax, easing the deflationary pressure on wage earners to some extent. Although the discounts were still administered according to principles which had been applied during the war, the decline of the discounts between 1815 and 1817 was mainly a product of the fall in the market rate of interest below 5 percent in 1817, and the Bank’s decision not to adjust its own rate accordingly. According to Clapham (1944), the Directors of the Bank were inclined towards the view that the Bank in normal times should not discount extensively because there would be other sources of finance available, but should be more active in discounting during difficult times.⁶⁵

The Bank and the Government were opposing any definite resumption date and even any investigation of the problem⁶⁶. In 1816 the price of gold had fallen close to par and the directors decided to experiment with the partial resumption of cash payments. There was no internal demand for gold as, according to Fetter (1965), the public was now so used to the notes and found them far more convenient than gold. Country banks preferred notes since handling gold and silver involved transmission expenses.⁶⁷

⁶³Act 54, Geo. III, c.99, 18th July 1814.

⁶⁴Fetter (1965) p. 76.

⁶⁵Clapham (1944) Vol II, p. 62.

⁶⁶Fetter (1965) p. 62.

⁶⁷Pressnell (1956) p. 156.

The demand of specie was, however, dependent on the market price of gold: In summer 1817, as can be seen in Figure 5, the exchange rate became unfavorable, and the market price of gold rose. The newly coined gold went to France and caused the failure of the partial return to convertibility. The failed experiment and the Bank's simultaneous effort to buy bullion, although at a loss, gave a strong message of the commitment of the Bank to return to the gold standard in the near future.

In early 1819 the Parliament and the Bank adopted a plan of the gradual resumption of cash payments. Parliamentary committees were established in both Houses to inquire into the expediency of resuming cash payments, and their reports in 1819 were practically identical. They recommended the resumption of gold payments at the old par value on 1 May 1821. Ricardo's idea was to resume payments through an 'ingot exchange system' that would have prevented small notes from being converted to gold. The plan that got accepted, proposed adjusting the price of the gold gradually so that on 1 February 1820 redemption was to be done in £4.1.0 per ounce and then gradually reduced to the old par value on 1 May 1823, when all restrictions upon cash payments were to expire. It became, however, evident that the resumption would not be possible without Parliament, who previously had not interfered with the government's borrowing or supported the Bank against the demands of the Treasury. In July 1819 an Act was passed in Parliament that made it illegal for the Bank to lend money to the government for more than three months without the permission of the Parliament. In order to reduce circulation and bring the gold to its par value of £3. 17s. 10½d., a substantial amount of the government's short term debt to the Bank was paid back. In 1818 the government tried finally to introduce a bill limiting note issue of private banks outside Scotland but it faced opposition from the banks and the government was forced to withdraw it.⁶⁸

During the last years of suspension the Bank of England was heavily criticised by the public. Fetter writes that 'men who were far apart on most points were in agreement that somebody was making too much money for the paper money system'. The price of corn fell very low while agricultural rents, mortgages and other private

⁶⁸Fetter (1965) pp. 67-69.

loans remained at the same level. According to Feavearyear, some men who had been most enthusiastic for a return to the gold standard began to have doubts about the desirability of resumption. It was often the very same people who firstly had accused the Bank of exploitation of people and inflation but then vigorously criticised the Bank for deflation.⁶⁹

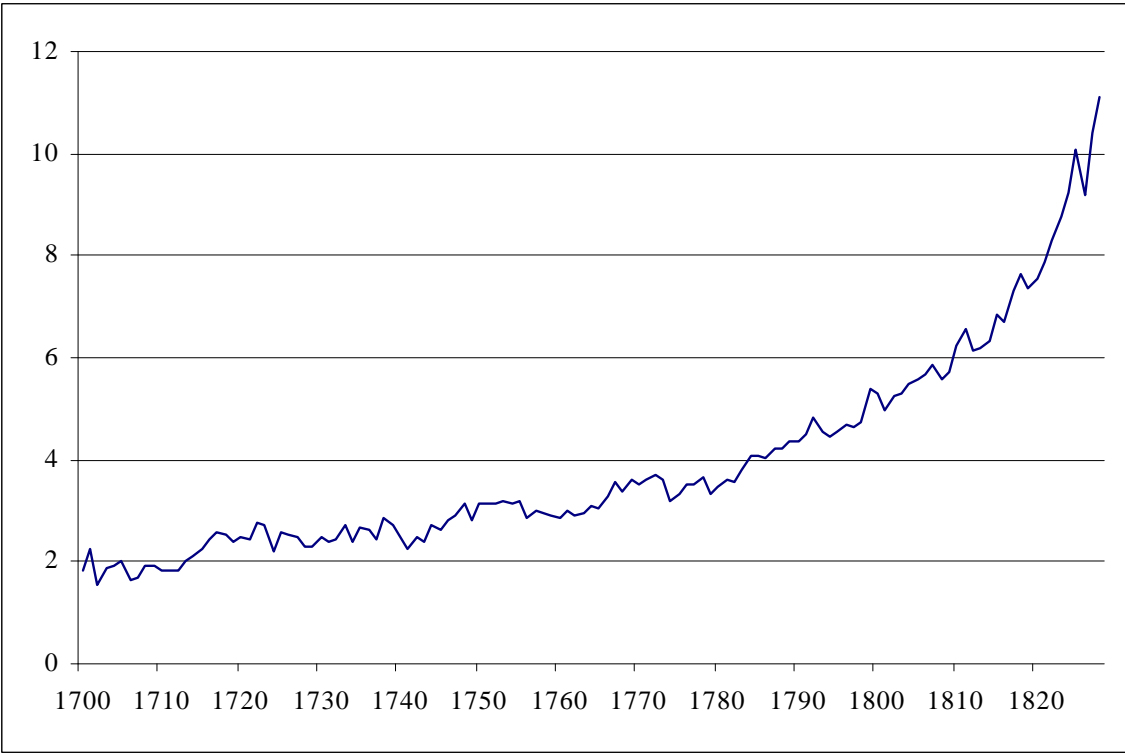


Figure 9: Revised Index of Industrial Production, 1700-1913 in Crafts et al. (1989).

Although in 1817 the partial resumption had resulted in a drain of gold from the vaults of the Bank, following the Resumption plan of the Parliament did not cause problems. Gold was almost at parity and on February 1, 1820, when the notes became redeemable for gold at £4 1s. There was no demand and only a couple of ingots were purchased – mainly for curiosity. The fact that the Bank note was legally redeemable at a fixed price of gold seems to have meant little to the public.⁷⁰ On 1 May 1821 cash payments were fully resumed and the monetary system of the country, was firmly

⁶⁹Feavearyear (1963) pp. 224-225.

⁷⁰Fetter (1965) p.96.

established.

The Suspension Period represented an enduring social commitment to monetary stability in the form of a domestic institutional framework. The Bullion Committee's report had two effects on the way monetary policy was conducted: firstly, it increased awareness of inflation and the policy of the Bank did not become too accommodating, and, secondly, the adjustment to the gold standard became shorter and sharper than would otherwise have happened. Between 1797 and 1821 the Bank of England notes were always accepted at their face value. After Waterloo the markets seem to have considered resumption very likely: the interest rate fell and gold came gradually back to par. The suspension of cash payments was also considered credible abroad. Continental merchant bankers anticipated the victory of Britain and a return to convertibility, and built their credit in London during the war. In 1816 eight to nine percent of the British national debt was held by foreigners living abroad.⁷¹ The national debt had grown from £225,000,000 in 1785 to over £880,000,000 in 1821, more than 250 percent of national income.

The Bank Restriction Period bound monetary and fiscal policy issues together. Maintaining domestic production and consumption were important because if they had fallen at the beginning of the war, the ability to pay taxes would also have decreased. Figure 9 shows, how apart from the depression caused by the deflation in 1819, the industrial production grew during the war. The Suspension Period was an era of almost continuous industrial growth when domestic production in England increased 68 percent.

4 The Well Established Gold Standard

The starting point for the formal analysis is an idealised set up that I call the well established gold standard, thus the convertibility rule has been in force for a sufficiently long time. I depart from the prevailing literature by considering an economy where only paper money circulates as a medium of exchange and gold operates as a backing

⁷¹Neal (1990) p. 216.

commodity if held by the central bank; or as a commodity good if held by the private agents. The paper focus on a commodity standard rather than a commodity money and therefore, specie does not circulate as a medium of exchange.

The economy consists of three sectors: households, firms and a central bank. Since households and firms behave as atomistic competitors, I will restrict the discussion to a representative agent of each type. The infinitely lived household consumes both gold K_t and the consumption good C_t . There are two possible states of the world: peace and war. The difference between the two states is that during the time of peace the household receives a new gold endowment K_t^s at the beginning of period, but during the time of war the endowment is zero. The probability of war is assumed to be considerably smaller than the probability of peace, thus peace reflects the normal state of the world.

Consider first the economy during the time of peace. Its random exogenous endowment of new gold, $K_t^s > 0$, is normally distributed with a positive mean and variance and measured in ounces. The household can choose what proportion of its gold endowment is consumed, i.e. turned to jewelry. The rest is deposited at the central bank for exchange of paper currency. The central bank follows the gold standard rule by being prepared to buy or sell gold in exchange for paper currency with a fixed conversion rate Q .

The non-monetary gold is not considered as a durable good, but rather as a perishable good that fully depreciates in private use. This assumption, which partially follows the model of the gold standard of Bordo, Dittmar and Gavin (2003), is chosen purely to ensure the existence of gold demand in every period. If the gold were assumed to depreciate in private use, as in Barro (1979), the household's gold demand in each period would be at least as high as the depreciated amount of gold. On the contrary, the monetary gold which is kept in the vaults of the central bank, does not depreciate.

The money supply satisfies Ricardo's (1821) set up for convertible currency where the money stock M_t is backed by the monetary gold K_t^g

$$M_t = \frac{QK_t^g}{\eta_t}. \quad (1)$$

The gold reserve ratio $\eta_t \in (0, 1]$ defines the proportion of the circulating paper money

stock that is backed by monetary gold.

The net increase in the specie stock and monetary gold between periods $t + 1$ and t equals the difference between the gold endowment and gold consumption. The gold conversion satisfies

$$K_t^s - K_t = K_{t+1}^g - K_t^g \quad (2)$$

Equation (2) can be expressed in terms of the growth rates by rewriting it as

$$K_t^s - K_t = \left(\frac{K_{t+1}^g}{K_t^g} - 1 \right) K_t^g, \quad (3)$$

and defining the rate of monetary expansion that is proportional to the increase in monetary gold as

$$x_t = \frac{K_{t+1}^g}{K_t^g}. \quad (4)$$

Finally, if K_t^g in (3) is replaced by (1), equation (3) becomes

$$K_t^s - K_t = \frac{(x_t - 1) \eta_t M_t}{Q}, \quad (5)$$

where the term on the right hand side represents the net increase in circulating money stock proportional to monetary gold between period t and $t + 1$.

The representative firm uses the labour L_t it hires from the household to produce current output via its production technology $f(L_t)$. Since the representative firm does not have access to the gold endowment, the firm faces a cash constraint in that it starts the period t without any cash or credit holdings and it has to borrow in order to be able to pay for its workers. The current wage bill must be financed with a loan or discount drawn on the central bank. The firm sells the output to the household on demand for consumption on a cash basis and after receiving its revenue, the firm pays the principal and the interest on its discount to the central bank. Carlstrom and Fuerst (1995) employ a similar set-up, but as suggested by the historical analysis, this framework is a natural one to apply to the gold standard. In Carlstrom and Fuerst's fiat standard set up at the beginning of each period the household deposits money at the financial intermediary, who then in turn forwards the sum to the firm. At the end of the period the firm repays the intermediary, who in turn forwards the interest and the original deposit back to the household. In our set up the gold does not yield any interest at the

central bank and the gold stays in the vault over the periods. By contrast to Carlstrom and Fuerst (1995) the central bank is assumed to destroy the interest yield.

The discount is defined by the value of existing monetary gold stock and the discretionary monetary injection from the central bank to the firm

$$W_t L_t \leq Q K_{t+1}^g + (d_t - 1) x_t M_t^s. \quad (6)$$

The gross rate of paper money supply can be defined as

$$M_{t+1}^s = d_t x_t M_t^s, \quad (7)$$

where d_t is a rate of money expansion from the central bank's money injection. The higher d_t , the lower is the proportion of the circulating paper money stock that is backed by gold. It is assumed that there are some ultimate bounds on the discretionary money growth d_t , i.e. $d_t \in (0, \bar{d}]$ for all $t = 0, 1, \dots$, where $\bar{x} < \bar{d} < \infty$. The upper bound of the discretionary money growth rate \bar{d} can be considered to be arbitrarily large – higher than the upper bound of the money growth rate linked to monetary gold \bar{x} .

In the eighteenth and early nineteenth century private credit markets were restricted by the usury laws which set the interest rates of different private assets at artificially low levels. The discounts here are assumed to be at the fixed gross rate $\bar{R} \geq 1$. Given that the household can only do its gold trading with the central bank at the beginning of period t , it is feasible for the central bank to have zero gold reserves during the period.

The firm hires labour supplied by the household and the production takes place during the goods exchange. The firm takes its price from the market, its wage from the contract and maximises profits. The household supplies what ever labour the firm demands. The profit function of the firm becomes

$$\Pi_t^f = P_t Y_t - \bar{R} W_t L_t. \quad (8)$$

The firm's production function is

$$Y_t = f(L_t) = A L_t^\delta \quad (9)$$

where A is the fixed stock of capital, L_t is labour demand at period t , $0 < \delta < 1$, and therefore $f(L_t)$ is a strictly concave function. In the equilibrium the real wage bill of the firm must equal the marginal demand for labour

$$\frac{\bar{R}W_t}{P_t} = f'(L_t). \quad (10)$$

Now the nominal wage rigidities⁷² are introduced into the model by assuming that wages are set in advance for one period, before the period's gold endowment is realised. Although the nominal wage is chosen before any shocks to the gold endowment are known, they are set at a level that is expected to produce the real wage which equates labour supply and labour demand and clears the goods market. To define the wage, the notional labour supply is set at one although the actual labour supply and demand may differ from this. The regulated wage for the period t is

$$W_t = \frac{\Omega f'(1)}{\bar{R}} = \frac{\Omega \delta A}{\bar{R}} \quad (11)$$

where Ω is the expected value of P_t before the gold endowment is known or the production started. If (11) is substituted back into (10) and the functional form (9) is used, the labour demand of the representative firm is given as

$$L_t = \left(\frac{P_t}{\Omega} \right)^{\frac{1}{1-\delta}}. \quad (12)$$

The production can be derived by substituting (12) into (9)

$$Y_t = AL_t^\delta = A \left(\frac{P_t}{\Omega} \right)^{\frac{\delta}{1-\delta}}. \quad (13)$$

Finally, the real wage bill of the firm becomes

$$\frac{W_t}{P_t} L_t = \frac{\delta A}{\bar{R}} \left(\frac{P_t}{\Omega} \right)^{\frac{\delta}{1-\delta}}. \quad (14)$$

At the very beginning of the period when the nominal wage is set, the nominal wage will reflect expectations of the gold flow or any possible price level changes as a result of the gold flow. Any unanticipated changes in the price level will cause a difference between the expected and actual price level. The firm determines labour demand based

⁷²This part of the model is inspired by Canzoneri and Dellas (1998).

on the real wage that is realised after the gold endowment. If the price level increases unexpectedly, the real wage bill of the firm decreases and the employment (12) increases to clear the labour market.

From the household's point of view each period is subdivided into two parts: the exchange with the central bank and the exchange with the firm. The household trades bonds and gold with the central bank and labour and goods with the firm. The household sector enters period t with predetermined money M_t and receives its gold endowment K_t^s . Now the household is in the position to do its gold trading with the central bank: it chooses how much gold to consume and how much convert to money. The gold trade with the central bank brings household's money holdings to $M_t + (x_t - 1)\eta_t M_t$. Next the household's bonds B_t mature, bringing its money holdings to $M_t + (x_t - 1)\eta_t M_t + B_t$. Finally, the household receives its labour income $W_t L_t$. The household uses some of its cash to purchase new bonds costing the household B_{t+1}/I_t in period t where $I_t \geq 1$. The rest is transferred to the goods market. The household's consumption purchases are limited by the cash-in-advance constraint

$$P_t C_t \leq M_t + (x_t - 1)\eta_t M_t + W_t L_t + B_t - \frac{B_{t+1}}{I_t}. \quad (15)$$

In this version of cash-in-advance, labour income is assumed to be available for consumption in the same period.

At the end of period t the household receives a cash dividend payment Π_t^f from the firm and carries rest of the unspent currency into period $t + 1$. Hence the budget constraint states

$$M_{t+1} \leq M_t + B_t + QK_t^s + W_t L_t + \Pi_t^f - \frac{B_{t+1}}{I_t} - P_t C_t - QK_t. \quad (16)$$

The nominal interest rate on bonds I_t is not fixed which illustrates the economic environment under the Pre-classical Gold Standard where the government paper, such as consols, were free from usury laws.

The nominal variables in the cash-in-advance constraint, budget constraint and on the firm's problem are now normalised with the money supply (7) so that $M_0^s = 1$, $m_t = M_t/M_t^s$, $w_t = W_t/M_t^s$, $q = Q/M_t^s$, $b_t = B_t/M_t^s$ and $p_t = P_t/M_t^s$. In the firm's

problem, equations (11)-(14), Ω is denoted by ω . The cash-in-advance and budget constraints become

$$p_t C_t \leq m_t + (x_t - 1) \eta_t m_t + w_t L_t + b_t - \frac{d_t x_t b_{t+1}}{I_t} \quad (17)$$

and

$$d_t x_t m_{t+1} \leq m_t + b_t + q K_t^s + w_t L_t + \pi_t^f - \frac{d_t x_t b_{t+1}}{I_t} - p_t C_t - q K_t. \quad (18)$$

Given K_t^s , the representative household's choice of C_t , m_{t+1} , L_t , K_t and b_{t+1} solves: maximise

$$E_t \sum_{t=0}^{\infty} \beta^t [u(C_t) + \gamma v(K_t)], \quad (19)$$

where $0 < \beta < 1$, γ is the utility-of-gold weight and $E_t(\cdot)$ is the expectations operator, subject to the normalised budget constraint (18) and cash-in-advance constraint (17) taking p_t , R , Π_t^f and w_t given for all $t = 0, 1, 2, \dots$. In addition, the private agent's problem must satisfy the market clearing conditions

$$C_t = f(L_t) \quad (20)$$

$$M_t = M_t^s \quad (21)$$

$$M_0 = 1 \quad (22)$$

$$K_t^s - K_t = \frac{(x_t - 1) \eta_t}{q} \quad (23)$$

$$b_t = b_{t+1} = 0 \quad (24)$$

for all $t = 0, 1, 2, \dots$. The discretionary money growth rate can be defined as inverse of the growth rate of gold backing ratio

$$d_t = \frac{\eta_t}{\eta_{t+1}}. \quad (25)$$

By writing the first term on the right hand side of (6), QK_{t+1}^g , as $\eta_{t+1} M_{t+1} = \eta_{t+1} x_t d_t M_t$ and substituting the equilibrium conditions (21)-(22) and (25), the wage constraint (6) can be written in equilibrium as

$$W_t L_t \leq (\eta_t + d_t - 1) x_t \quad (26)$$

As in Carlstrom and Fuerst (1995) there are four markets present in this economy: the goods market, labour market, credit market and money market which in this gold standard setup is synonymous with the gold market.

The outcome under the commodity standard describes the sequences of equilibrium prices and quantities that are obtained when the government manages gold convertibility and sets the discretionary money growth rate and the private agents respond to the stochastic, exogenous gold flow by maximising utility and profits. The Lagrangian for the household problem is

$$\begin{aligned} \mathcal{L} = & E_t \sum_{t=0}^{\infty} \beta^t [u(C_t) + \gamma v(K_t)] & (27) \\ & + \lambda_t \left[w_t L_t + q K_t^s + \pi_t^f - x_t m_{t+1} + m_t + b_t - \frac{d_t x_t b_{t+1}}{I_t} - p_t C_t - q K_t \right] \\ & + \mu_t \left[m_t + (x_t - 1) \eta_t m_t + w_t L_t - p_t C_t - \frac{d_t x_t b_{t+1}}{I_t} + b_t \right] \\ & + v_t [(x_t - 1) m_t - q (K_t^s - K_t)]. & (28) \end{aligned}$$

The first order conditions are

$$C_t : u'(C_t) = p_t (\lambda_t + \mu_t) \quad (29)$$

$$K_t : \gamma v'(K_t) = q (\lambda_t - v_t) \quad (30)$$

$$m_{t+1} : d_t x_t \lambda_t = \beta E_t [\lambda_{t+1} + \mu_{t+1} + v_{t+1} (x_{t+1} - 1)] \quad (31)$$

$$b_{t+1} : \frac{d_t x_t}{I_t} (\lambda_t + \mu_t) = \beta E_t (\lambda_{t+1} + \mu_{t+1}) \quad (32)$$

$$\lim_{t \rightarrow \infty} \beta^t E_{t-1} (\lambda_t + \mu_t) m_t = 0$$

where λ_t , μ_t and v_t are the Lagrangian multipliers for the period t budget, cash-in-advance and gold endowment constraints respectively. I assume that the government does not purchase any goods. In equilibrium, (21) implies that $m_t = 1$ and $b_t = b_{t+1} = 0$.

Assume that the utility function takes a constant relative risk aversion form

$$E_t \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^\alpha + \gamma K_t^\alpha}{\alpha} \right], \quad (33)$$

where α is the coefficient of relative risk aversion and $0 < \alpha < 1$. By substituting the market clearing conditions into the cash-in-advance constraint we have

$$p_t C_t = 1 - \eta_t + (2\eta_t + d_t - 1) x_t. \quad (34)$$

In equilibrium $Y_t = C_t$, thus by substituting (13) into (34) the price level becomes

$$p_t = (A)^{\delta-1} \omega^\delta [1 - \eta_t + (2\eta_t + d_t - 1) x]^{1-\delta} \quad (35)$$

and by substituting this back to (34) yields

$$C_t = A^{1-\delta} \omega^{-\delta} [1 - \eta_t + (2\eta_t + d_t - 1) x]^\delta. \quad (36)$$

Equations (35) and (36) imply that both the price level and consumption increase if either the money growth proportional to monetary gold x_t or the discretionary money growth rate d_t increase above the rate used in contract wage setting at the previous period. However, this does not apply in equilibrium. Intuitively, if at period $t - 1$ wage setters' expectation of the net money growth rate at next period is $D^e X^e$, but the actual money growth rate is $d_t x_t = D^e X^e + \Delta_t$, where $\Delta_t \in (0, \infty)$, from (35) the price level increases, which through (14) decreases real wages, through (12) increases labour demand and through (36) increases consumption. Now the wage setters' would respond by adjusting their wage expectations to $D^e X^e + \Delta_t$, then the household and government would have an incentive to set $d_{t+1} x_{t+1}$ to $d_{t+1} x_{t+1} = D^e X^e + \Delta_{t+1}$ where $\Delta_t < \Delta_{t+1} < \infty$. The process would continue until x_{t+1} would approach its upper bound \bar{x} and d_t would reach its upper bound \bar{d} . Therefore, as in Barro and Gordon (1983) the wage setters cannot be systematically surprised and in equilibrium money growth would be unefficiently high without having any effect on real economy

If the money growth rate approaches its upper bound the household converts almost its whole gold endowment to paper currency. Simultaneously, gold consumption – gold in utility yielding form – approaches zero, which reduces current period utility while the impact of gold conversion on consumption C_t is low as expectations have been adjusted. This feature of the model is reflected by the shadow marginal (dis)utility of gold conversion v .

The government's time inconsistency problem can be solved if the society is able to make the government to commit to the perfect gold standard rule. This rule implies that each note represents, fundamentally, a warehouse certificate of a gold deposit as in (1) $\eta_t = 1$. Monetary expansion is directly dependent on the change in the monetary gold stock (5) becomes

$$K_t^s - K_t = \frac{(x_t - 1) M_t}{Q}. \quad (37)$$

In the firm's problem the discount is never larger than the value of the monetary gold stock and (6) implies that the discount does not exceed the circulating money stock. Constraint can be rewritten using (1) where $d_t = 1$ and (5) as $W_t L_t = x_t M_t^s$. Finally, it should be noted that the gold standard rule is an exogenous monetary policy rule and not an outcome of optimisation problem, an optimal policy under commitment, in contrast to the *Ramsey problem* analysed by Chari and Kehoe (1990) and Ireland (1997).

The perfect gold standard rule solves the government's time inconsistency problem by setting bounds on the growth of money. If the private gold demand is so large that paper currency is converted to gold, the money stock reduces and $x_t < 1$. On the other hand if K_t approaches zero, from (5) we can see that x_t approaches $qK_t^s + 1$. The private gold demand ultimately defines the gross rate of the monetary expansion

$$x_t \in [\beta, qK_t^s + 1). \quad (38)$$

The lower bound guarantees that the net nominal interest rate is nonnegative. In equilibrium (13) implies

$$C_t = A \left(\frac{p_t}{\omega} \right)^{\frac{\delta}{1-\delta}}. \quad (39)$$

Substituting (13) into (34) and setting $\eta_t = 1$ and $d_t = 1$ gives a relation between the price level and the money growth rate

$$p_t A \left(\frac{p_t}{\omega} \right)^{\frac{\delta}{1-\delta}} = 2x_t. \quad (40)$$

Solving this for p_t gives

$$p_t = (A)^{\delta-1} \omega^\delta (2x_t)^{1-\delta} \quad (41)$$

and substituting (41) into (13)

$$C_t = A^{1-\delta} \omega^{-\delta} (2x_t)^\delta. \quad (42)$$

The important element of the gold endowment is the way how it sets bounds on the expectations of the price level. From (38) we have that if $x_t = \beta$, the household consumes its whole gold endowment and converts some paper money into gold at the central bank. Thus the price level reaches its lowest bound

$$\underline{p} = (A)^{\delta-1} \omega^\delta (2\beta)^{1-\delta}. \quad (43)$$

If x_t approaches to $(qK^s + 1)$, the household only consumes an arbitrarily small amount of gold and the price level approaches its upper bound

$$\bar{p} = A^{1-\delta} \omega^{-\delta} [2(qK^s + 1)]^{1-\delta}. \quad (44)$$

Thus under the well functioning gold standard the price level satisfies $p_t \in [\underline{p}, \bar{p}]$. We can define the bounds on private consumption by substituting the bounds on the money growth rate from (38) into (42). The consumption satisfies $C_t \in [\underline{C}, \bar{C}]$.

How are the nominal and real interest rates defined under the perfect gold standard set up? From the first order condition (32) the nominal yield on government bonds is

$$I_t^{-1} = x_t^{-1} \beta E_t \left(\frac{\lambda_{t+1} + \mu_{t+1}}{\lambda_t + \mu_t} \right) \quad (45)$$

which, by using (29), can be written as

$$I_t^{-1} = x_t^{-1} \beta E_t \left[\frac{u'(C_{t+1})}{u'(C_t)} \frac{p_t}{p_{t+1}} \right]. \quad (46)$$

If (41), (42) and the functional form of the utility function is substituted to (46), the nominal interest rate becomes

$$I_t^{-1} = x_t^{-\alpha\delta} \beta E_t \left[(x_{t+1})^{\delta\alpha-1} \right]. \quad (47)$$

As $0 < \alpha\delta < 1$ the nominal interest rate increases when the money growth rate in period t or the expected money growth rate increases. However, as the current and the expected money growth rate are bounded under the well established gold standard,

the fluctuations in the nominal interest rate are also bounded. The nominal interest rate reaches its lowest bound 1 if both the current and the expected money growth rate are expected to be β . Depending on the size of α and δ the nominal interest rate approaches its highest bound if the money growth rate is expected to be high in the future but low now or vice versa. Thus

$$I_t \in \left[1, \frac{(qK^s - 1)^\varphi}{\beta} \right) \quad (48)$$

where φ is either $1 - \alpha\delta$ or $\alpha\delta$ depending on the relative sizes of α and δ .

The ex-ante real rate of interest is defined as

$$R_t = I_t E_t \left(\frac{p_t}{p_{t+1}} \right). \quad (49)$$

Using (46) the real rate of interest can be written as

$$R_t^{-1} = x_t^{-1} \beta E_t \left[\frac{u'(C_{t+1})}{u'(C_t)} \frac{p_t}{p_{t+1}} \right] / E_t \left(\frac{p_t}{p_{t+1}} \right) \quad (50)$$

$$= R_{ft}^{-1} + \frac{\text{cov}_t \left[\frac{u'(C_{t+1})}{u'(C_t)}, \frac{p_t}{p_{t+1}} \right]}{E_t \left(\frac{p_t}{p_{t+1}} \right)}. \quad (51)$$

According to Canzoneri and Dellas (1998) the ex-ante real interest rate can be decomposed into the risk free rate and the risk premium where $R_{ft}^{-1} = x_t^{-1} \beta E_t \left[\frac{u'(C_{t+1})}{u'(C_t)} \right]$ is the risk free rate and the right hand side covariance term defines the risk premium, the expected return on bonds above the risk free rate. Under the gold standard prices move pro-cyclically. The realised return on bonds is high in bad times when the gold endowment is small and low in good times when the gold endowment is large. Positive shock on gold supply leads to a negative risk premium. Then the risk free rate becomes

$$R_{ft}^{-1} = x_t^{-1} \beta E_t \left[\left(\frac{C_{t+1}}{C_t} \right)^{\alpha-1} \right] \quad (52)$$

thus an increase in the expected gross growth rate of consumption, C_{t+1}/C_t increases the risk free interest rate. If we now substitute (42) into (52), we get that

$$R_{ft} = \frac{1}{\beta} x_t^{1+\delta(\alpha-1)} \frac{1}{E_t \left(x_{t+1}^{\delta(\alpha-1)} \right)} \quad (53)$$

thus expected future increase in money growth increases the risk free interest rate. The real interest rate under the gold standard becomes

$$R_t = \frac{1}{\beta} x_t^{1+\delta(\alpha-1)} \frac{E_t(x_{t+1}^{\delta-1})}{E_t(x_{t+1}^{\delta\alpha-1})}. \quad (54)$$

The real rate of interest increases if the money growth rate in period t increases or if the expected increase in future money growth rate increases.

The interest rate risk under the gold standard is solely dependent on the risk related to the stochastic nature of gold endowment. It is not related to government policies or labour market conditions. Interest rate targeting or money stock targeting are not feasible policies under the gold standard.

If the nominal wages are fixed in the economy money has an immediate effect on the level of output. From equation (42) the positive gold endowment shock increases the gold available for conversion. The money growth rate x_t increases. Now the household is able to increase its consumption purchases, which increases prices and decreases the real wage below the expected level. The firm's wage bill reduces, which increases labour demand and production.

The important outcome of the gold standard rule is the way how it solves the discretionary problem which rises from the fixed wage structure. Although the gold standard does not eliminate the link between money and output, it does prevent the government from exploiting it by printing paper money unexpectedly. The gold standard rule makes most monetary policy procedures, such as money targeting, dysfunctional. The role of the central bank is passive in conducting the monetary policy, it simply facilitates the convertibility and provides printing services.

Another outcome of the gold standard is that as the money growth rate x is bounded through the gold endowment, also the price level and consumption become bounded. Under the well established gold standard, market activity never disappears as the private consumption is always positive even though the growth rate in money stock would equal one. Nevertheless, the gold standard does not eliminate the variance of private consumption, or the periods of disinflation, but as $x_t \geq \beta$ (given that β is close to one) the economy does not experience serious deflationary pressure.

One could ask, however, what would happen if the endowment K_t^s would become arbitrarily large. The answer is that in that case the monetary constitution would have to adjust as gold would not fulfill the requirements for a suitable backing commodity any more. Any commodity standard must be established on a commodity that is rare, durable and easy to identify.

5 Abandonment of the Convertibility Rule

Suppose that a war or some other unexpected exogenous shock stops the gold flow suddenly. The stoppage is realised only after the wages have been set. As wars are not known to last forever the number of the stoppage periods must be finite.

During the time of war the household's demand for gold during the war, K_t^w , increases above its natural, peace time level. As $K^s = 0$, the household satisfies its gold demand by converting paper currency to gold at the central bank. To explain the increased demand for gold we can imagine a situation where the war arises the question of the central bank's solvency in form of a potential invasion of the country. The household, who has given its asset to the central bank, is concerned of the potential downside outcome, where the gold stock of the central bank would end up in the hands of enemies and therefore, the household has an incentive to consume at least some of the gold stock. The central bank who holds the asset, considers the upside outcome – the small likelihood of such an invasion – and is therefore concerned about deflationary pressure the bank runs can result.

The economy faces deflationary pressure as a result of the conversion of the paper money under the perfect gold standard. Firstly, as the stoppage is unexpected, the fall in the price level is unexpected and the price level used in wage setting is now above the actual price level. The real wage bill of the firm (14) increases which forces it to reduce employment and production. Secondly, any gold conversion reduces the reserves on which the firm can borrow. Thirdly, from the cash-in-advance constraint (34) a fall in money holdings reduces private consumption.

Obedying the gold standard rule, which forces the government to convert money to

gold on demand, would threaten the existence of the market activity. If rumours of an invasion became so strong that the whole monetary gold stock would be consumed at once, there would be no paper currency in circulation and consumption would approach zero. But even in a less severe case where the gold flow would only stop for few periods and the gold consumption would not drain the monetary gold reserves completely, the deflationary pressure can be avoided and consumption stabilised by altering the monetary constitution of the country.

What would be alternative monetary regimes to the commodity standard? Firstly, the government could abandon the commodity standard altogether and establish a fiat money system under which the money growth rate is a subject of the governmental policy. Given that the stoppage lasts for a finite time the outcome under the fiat standard as such is not desirable because in this sticky wage framework the government has an obvious temptation to increase employment and production by increasing the money growth rate. The behavior of the money stock and price level will be incorporated into the expectations and the nominal wage set in the beginning of the periods will adjust fully. Under the fiat standard the money growth rate would be defined by $M_{t+1}^s = d_t M_t^s$ where the upper bound of discretionary money growth rate d would be arbitrary large. As the realised return on bonds is inversely related to the price level, inflation would make the bonds harder to sell. Ireland (1997) has shown that even though the government would be able to commit to a sustainable money growth rate, any deviation from this would cause the economy to revert immediately to the worst possible hyper-inflation equilibrium. The fiat money system, therefore, does not necessarily offer a solution for the desirable monetary regime in this particular framework.

If the private agents only valued claims that can be converted to gold as money, the fiat regime would not be feasible and a commodity money system might emerge as a monetary regime. The commodity money, however, might not be preferable because the coins are likely to depreciate in use and coinage involves a cost, *bassage*.

Instead of abandoning the gold standard rule completely, the government, with a simple action such as closing the doors of the central bank, could prevent the money

stock decreasing by not allowing the household to convert any gold until the crisis has passed. Suspension of the convertibility rule implies, firstly, that paper notes are not convertible to gold immediately and secondly, at some future point after the crisis has passed, the gold standard will be resumed and the currency will be convertible at the old par value Q . In effect, the value of the household's paper currency is not tied by the immediate conversion to the gold as under the gold standard, but by the commitment to convert the currency in the future. If the household did not consider the promise to be credible, the circulating paper currency would lose its value immediately.

Even if the stoppage on gold flow lasted for few periods, the suspension would not necessarily cover only those periods. In fact, as illustrated by the historical example, the suspension consists of two stages: stoppage and adjustment periods. During the both stages the gold standard rule does not fully apply.

As the policy of the government and its central bank is countercyclical, its main concern is to maintain private consumption and economic activity at the same level as under the gold standard. The gold endowment under the gold standard ensured bounds on the money growth which maintained the economic activity and positive real interest rates. In the absence of the immediate gold backing rule, the government has an opportunity to issue fiat money to compensate for the loss in the gold endowment.

Under the suspension of cash payments it is not a formal conversion rule but a terminal condition which restricts the government's temptation to issue fiat money. Let $t + T$ be the final period of gold standard and the first suspension period is $t + T + 1$. To simplify the notation I write $t + T = \tau$ and $\tau + S > \tau + 1$ is the last suspension period. The gold flow resumes in period $\tau + j < \tau + S$. If the gold standard is resumed at the beginning of the period $\tau + S + 1$, the policy rule of the government states that

$$M_{\tau+S+1} = QK_{\tau+S+1}^g. \quad (55)$$

Equation (55) is effectively a terminal condition which states that the monetary gold stock must be proportional to the circulating money stock by the time of the resumption. The government is able to issue fiat money during the suspension, but the money growth rate must drop by the point of the redemption since the perfect gold standard rule

does not allow any discontinuity. Withdrawing the fiat money can cause deflation and disturb the economy as described above. On the other hand, if the policy is credible, the markets are likely to anticipate the redemption.

The household enters the first suspension period with predetermined money $M_{\tau+1}$ inherited from the final period of the gold standard. The value of existing monetary gold is still $QK_{\tau+1}^g$ and proportional to the currency in circulation. Next the nominal wage is set as in (11). After this, both the central bank and the private agents realise that there is a complete stoppage in gold endowment. The government closes the doors of the central bank and announces its policy plan (55). Then the household's bonds mature, it receives its labour income and uses some of its cash to purchase new bonds. The rest is carried to the goods market. The cash-in-advance constraint for the first period of suspension is parallel to (15) where x_t is set to one.

$$P_{\tau+i}C_{\tau+i} \leq M_{\tau+i} + W_{\tau+i}L_{\tau+i} + B_{\tau+i} - \frac{B_{\tau+i+1}}{I_{\tau+i}} \quad (56)$$

and $i = 1, \dots, j - 1$ and $j - 1$ is the last stoppage period. The household's budget constraint in the absence of gold flow, reduces to

$$\begin{aligned} P_{\tau+i}C_{\tau+i} \leq & W_{\tau+i}L_{\tau+i} + \Pi_{\tau+i}^c + \Pi_{\tau+i}^f \\ & - M_{\tau+i+1} + M_{\tau+i} + B_{\tau+i} - \frac{B_{\tau+i+1}}{I_{\tau+i}}. \end{aligned} \quad (57)$$

An important element of the suspension is the way how it does not just remove the restriction on money market, but it also removes the restriction of the credit market. The suspension abolishes the tie between discounts and monetary gold, namely (6). The central bank is now able to increase the value of the discount above the value of the monetary gold stock.

$$W_{\tau+i}L_{\tau+i} \leq QK_{\tau+i}^g + (d_{\tau+i} - 1) M_{\tau+i}^s, \quad (58)$$

where $d_{\tau+i}$ is a rate of money expansion from the central bank's money injection. Under the stoppage periods $d_{\tau+i}$ is the gross rate on money expansion and the money supply is defined as

$$M_{\tau+i+1}^s = d_{\tau+i}M_{\tau+i}^s, \quad (59)$$

where $i = 1, \dots, j - 1$. Constraint (58) can be rewritten using (1) where $\eta \in [0, 1]$ and (59) as

$$W_{\tau+i}L_{\tau+i} \leq (\eta_{\tau+i} + d_{\tau+i} - 1) M_{\tau+i}^s. \quad (60)$$

As the wage level is fixed for a period – defined as under the gold standard – the unexpected discretionary injection increases employment and consumption. If the nominal variables are scaled with (59) and the equilibrium condition

$$M_{\tau+i} = M_{\tau+i}^s \text{ for all } i \quad (61)$$

used, equation (60) becomes

$$w_{\tau+i}L_{\tau+i} = \eta_{\tau+i} + d_{\tau+i} - 1. \quad (62)$$

The cash-in-advance constraint (56) can be written as

$$p_{\tau+i}C_{\tau+i} = 1 + w_{\tau+i}L_{\tau+i} \quad (63)$$

or

$$p_{\tau+i}C_{\tau+i} = \eta_{\tau+i} + d_{\tau+i}. \quad (64)$$

The wage and production levels are defined as in (11)-(14). By using the equilibrium condition $C_{\tau+i} = Y_{\tau+i}$ and substituting (13) into (64) the price level in the first period of suspension becomes

$$p_{\tau+i} = A^{\delta-1}\omega^\delta (\eta_{\tau+i} + d_{\tau+i})^{1-\delta} \quad (65)$$

and consumption

$$C_{\tau+i} = A^{1-\delta}\omega^{-\delta} (\eta_{\tau+i} + d_{\tau+i})^\delta. \quad (66)$$

Both the price level and consumption increase as the discretionary monetary injection $d_{\tau+i}$ increases.

If the stoppage in gold flow lasts between periods $\tau + 1$ and $\tau + j - 1$, where $j \geq 1$, period $\tau + j$ is the period when the gold flow resumes and the adjustment back to the gold standard starts. I assume that the gold flow returns to the pre-suspension level.

In the beginning of the first adjustment period the household receives its gold endowment $K_{\tau+j}^s$ and makes the decision over the private gold consumption $K_{\tau+j}$. The

rest is deposited at the central bank in same manner as during the gold standard. Given that the doors of the bank stay closed for the notes-to-gold conversion, the willingness of the household to deposit gold might not seem natural⁷³. The historical evidence shows, since the rule to return to the gold standard was credible, people were willing to convert gold to paper currency during the Suspension Period.

The full resumption is not immediately achievable, because the circulating money stock exceeds the value of monetary gold and the backing is not complete. Therefore, in the adjustment periods the government can still conduct discretionary policy. The return to the gold standard to be credible, instead of stimulating the economy with the money transfer, the government must reduce the money stock so that the money stock grows more slowly than the monetary gold.

The return of the gold endowment is realised before the government decides over the discounts. By constraining the discounts the government is able to withdraw the fiat money that it issued on the previous period. In nominalised form the wage bill under the adjustment becomes

$$w_{\tau+j}L_{\tau+j} = (\eta_{\tau+j} + d_{\tau+j} - 1) x_{\tau+j}M_{\tau+j}^s. \quad (67)$$

The net paper money supply in adjustment periods is defined as

$$M_{\tau+j+1}^s = d_{\tau+j}x_{\tau+j}M_{\tau+j}^s. \quad (68)$$

The cash-in-advance constraint in adjustment period is

$$P_{\tau+j}C_{\tau+j} \leq M_{\tau+j} + (x_{\tau+j} - 1)\eta_{\tau+j}M_{\tau+j}^s + W_{\tau+j}L_{\tau+j} + B_{\tau+j} - \frac{B_{\tau+j+1}}{I_{\tau+j}}. \quad (69)$$

If we now substitute (67) into normalised (69), and use the equilibrium condition $b_{t+j} = b_{t+j+1} = 0$, we get that

$$p_{\tau+j}C_{\tau+j} = 1 - \eta_{\tau+j} + (2\eta_{\tau+j} + d_{\tau+j} - 1) x_{\tau+j}. \quad (70)$$

where $j = 2, \dots, S$. If we now substitute (13) into (69), the price level and consumption satisfy

$$p_{\tau+j} = A^{\delta-1}\omega^{\delta} [1 - \eta_{\tau+j} + (2\eta_{\tau+j} + d_{\tau+j} - 1) x_{\tau+j}]^{1-\delta} \quad (71)$$

⁷³During the suspension period the terminal condition must be included in the household's decision problem to ensure that the household takes some gold to the central bank.

and

$$C_{\tau+j} = A^{1-\delta} \omega^{-\delta} [1 - \eta_{\tau+j} + (2\eta_{\tau+j} + d_{\tau+j} - 1) x_{\tau+j}]^{\delta} \quad (72)$$

where $j = 1, \dots, S$. The price level and consumption in the adjustment period depend both on the money growth rate $x_{\tau+j+1}$ linked to the gold endowment and the discretionary money 'reduction' rate $d_{\tau+j+1}$.

Under the perfect gold standard terminal condition (55) sets the limit for the money growth rate. If (2) and (68) are substituted into (55) and the equation is solved backwards, we get the rule that limits the money growth rate under the suspension

$$\left(\prod_{i=1}^S x_{\tau+i} d_{\tau+i} - 1 \right) M_{\tau+1} = q \left[\sum_{i=1}^S (K_{\tau+i}^s - K_{\tau+i}) \right], \quad (73)$$

where the suspension lasts between periods $\tau + 1$ and $\tau + S$. The terminal condition implies that the net money growth rate under the Suspension Period must be proportional to the growth rate of monetary gold under the suspension period. The money growth rate from the gold flow is one in the stoppage periods and larger than one in the adjustment periods. The discretionary money growth rate is larger than one in stoppage periods and smaller than one during the adjustment periods. The net growth in money stock must be proportional to the growth in monetary gold in the suspension periods. Therefore

$$\prod_{i=1}^S x_{\tau+i} d_{\tau+i} = \prod_{i=1}^S x_{\tau+i} \quad (74)$$

which implies that

$$\prod_{i=1}^S d_{\tau+i} = 1, \quad (75)$$

and where $i = 1, \dots, S$.

The government's policy plan under the suspension period is to return to convertibility at some future point. It is credible if it provides the government incentives not to deviate even though the government would have an obvious time inconsistency problem. This problem exists here as under the suspension period the government would now have a temptation, given that the wages are fixed, to increase consumption by printing fiat money. The plan to return back to the gold standard limits the government's

printing because any fiat money issued must also be pulled out from circulation which is a process that is likely to cause deflation and reduce consumption.

The suspension ensures the existence of the circulating money stock and stabilises consumption. If the government's objective is to keep private consumption at the level of the gold standard, the government issues fiat money during the stoppage and pulls it out from the circulation during the adjustment periods. An opportunity to boost consumption by the fiat money issue is desirable as during a war economic activity is likely to be low in any case. This is exactly what happened during the Suspension Period. During the war years 1797-1815 the Bank of England created substantial amount of credit, but when the gold trade resumed after the Battle of Waterloo in 1815 and the government was able to abolish the war time taxes, the credit market was constrained and the circulating money stock reduced.

By contrast to the historical evidence, the model suggests that the adjustment period does not necessarily result in deflation if the net money growth rate $x_{\tau+i}d_{\tau+i}$ during the adjustment periods is above one. Any potential deflation under the adjustment, nevertheless, lasts only for a limited time. As the deflation reduces private consumption, it is important that the adjustment occurs when the gold has already started to flow into the country. The government could prevent deflation if it just closed the doors of the central bank but would not issue any fiat money. The benefit of this strategy is that it makes the adjustment period unnecessary and the length of the suspension is parallel to the length of the stoppage in gold flow.

One further point is worth of noticing. In fiat regime models such as Ireland (1997) and Carlstrom and Fuerst (1995), the government gives the monetary transfer directly to the household. Under the commodity standard set up transfers are injected via firms and not households, because the latter practice would challenge the return back to the gold standard: to reduce the circulating money stock to match the monetary gold stock in the adjustment period, the government would have to reduce the monetary price of gold Q which would encourage private gold consumption and reduce the paper money available for consumption purchases.

Finally, how does the expected future resumption effect the interest rates? The first

order conditions (32) in the stoppage and adjustment periods can be written as

$$\frac{1}{I_{\tau+i}} = (x_{\tau+i}d_{\tau+i})^{-1} \beta E_{\tau+i} \left[\frac{u'(C_{\tau+i+1})}{u'(C_{\tau+i})} \frac{p_{\tau+i}}{p_{\tau+i+1}} \right] \text{ where } i = 1, \dots, S. \quad (76)$$

In stoppage period, the money growth rate $x_{\tau+i} = 1$ and the consumption is only bound by the commitment of the government to the policy rule that there will be a return to the gold standard. If we now use the CRRA utility function and use (72) and (71), the nominal interest rates becomes

$$\frac{1}{I_{\tau+i}} = (x_{\tau+i}d_{\tau+i})^{-1} [x_{\tau+i} (2\eta_{\tau+i} + d_{\tau+i}) - \eta_{\tau+i}]^{1-\alpha\delta} \quad (77)$$

$$\cdot \beta E_{\tau+i} \left\{ [x_{\tau+i+1} (2\eta_{\tau+i+1} + d_{\tau+i+1}) - \eta_{\tau+i+1}]^{\delta\alpha-1} \right\}. \quad (78)$$

Any expected increase in either the future money growth rate $x_{\tau+i+1}$ or discretionary money growth rate $d_{\tau+i+1}$ increases the nominal interest rate. On the other hand if fiat money is expected to be withdrawn, any expected reduction in $d_{\tau+i+1}$ decreases the nominal interest rate. The lower is the $d_{\tau+i+1}$, the higher is the rate by which the issued fiat money is withdrawn from the circulation and more closer the resumption gets. Expected resumption thus decreases the nominal interest rate.

The real interest rate is defined

$$R_{\tau+i} = I_{\tau+i} E_{\tau+i} \left(\frac{p_{\tau+i}}{p_{\tau+i+1}} \right) \quad (79)$$

Using (46) and the CRRA utility function the real interest rate becomes

$$R_{\tau+i} = (x_{\tau+i}d_{\tau+i}) [x_{\tau+i} (2\eta_{\tau+i} + d_{\tau+i}) - \eta_{\tau+i}]^{\delta(\alpha-1)} \frac{E \left([x_{\tau+i+1} (2\eta_{\tau+i+1} + d_{\tau+i+1}) - \eta_{\tau+i+1}]^{\delta-1} \right)}{\left\{ \beta E_{\tau+i} \left[[x_{\tau+i+1} (2\eta_{\tau+i+1} + d_{\tau+i+1}) - \eta_{\tau+i+1}]^{\delta\alpha-1} \right] \right\}}$$

where $i = 1, \dots, S-1$. The real interest rate increases if either $x_{\tau+i+1}$ or $d_{\tau+i+1}$ increases and again, if the public expects the adjustment to last for many periods, the interest rate is higher than it would be, if the adjustment was supposed to be short. The long adjustment period suggests that the fiat money is withdrawn gradually ($d_{\tau+j+1}$ close to 1).

6 Calculations

To illustrate the implications of the suspension I analyse the behaviour of consumption, monetary gold and money. Calibration proves challenging as reliable data on gold import between 1717 and 1797 is not available. The circulation of Bank of England's depository notes grew in average 2.5 percent per year, but there were large fluctuations in the gold reserve ratio. In this simplistic example $x_t = 1.01$ when $K^s > 0$ and 0.98 when $K^s = 0$. The discount factor $\beta = 0.99$.

The prevailing monetary regime between periods 1 and 20 is the perfect gold standard. The monetary price of gold is one and the initial money stock and gold stock equal 1.42. As the money growth rate is constant (and incorporated in wage setting) consumption (and price level) are constant over time.

At period 41 there is a sudden stoppage on the gold flow. The first column of diagrams in Figure 10 illustrates fluctuations in monetary gold, the money stock and consumption when the country does not suspend the gold standard, but follows the gold convertibility rule through the stoppage periods. The money growth rate $x = 0.98$, thus the money stock and gold stock reduce 2 percent per period. Consumption falls sharply during the stoppage periods as the household converts its paper currency to gold, and remains low until the gold endowment resumes at period 30. Respectively, the monetary gold and money stock fall as the paper money is converted to gold. After the gold flow has resumed it takes 20 periods before monetary gold and the money stock are at the pre-stoppage level.

The second column illustrates development of monetary gold, the money stock and consumption when the gold standard rule is suspended. The number of stoppage periods is ten as above. During the stoppage periods the discretionary money growth rate is 1 percent per period ($d = 1.01$) and equals the net money growth rate since $x = 1$. As the household cannot convert its paper money to gold, the gold stock remains constant during the stoppage. The discretionary money stock grows 1 percent per period ($d = 1.01$). In period 30 the gold endowment resumes and the money growth rate x proportional to monetary gold is again 1 percent per period. The adjustment to

the gold standard begins as the discretionary money growth rate between periods 30 and 50 is now 0.995 implying that the net money growth rate is close to one, $x_t d_t = 1.005$. Given that wage expectations do not adjust fully, the consumption reduces slightly. However, reduction in consumption occurs after the war, not during it, thus the suspension of cash payments smooths consumption.

7 Conclusion

In this paper I have used both historical and theoretical analysis to study changes in monetary regimes and especially a transition from the gold standard to the suspension of cash payments and vice versa. The results suggest that if there is a stoppage in gold flow, the suspension of cash payments may be a preferable monetary regime to the fiat standard or to the gold standard in terms of stabilisation of consumption and production. The monetary rule enforced by the suspension – to return to the gold convertibility at the old par value in the future – represents a commitment device, which limits the issue of paper money. As the rule implies that notes will be fully convertible in the future, the suspension of cash payments ensures that paper money remains in circulation.

The suspension of cash payments is divided in two stages. During the stoppage periods, when there is no gold flow, the government prevents the household from converting money to gold and stimulates economy with fiat money transfers. The perfect gold standard does not allow any discontinuity and by the time of resumption, the circulating money stock must be proportional to monetary gold. To minimise deflationary pressure the adjustment begins when the gold flow resumes. During the adjustment periods any fiat money issued is withdrawn from circulation. If the net money growth rate under the adjustment periods is less than one, the adjustment causes some deflation, but only for limited time. If the net money growth rate during the adjustment is equal or larger than one, the stoppage of gold endowment does not caused any deflation.

The gold standard restricts the government's ability to stimulate consumption and production by printing money. Under the gold standard the money stock can only

grow if monetary gold grows in the same proportion. As the gold endowment is finite the money growth is bounded and therefore, also the price level, consumption and interest rates are bounded. Although the gold standard cannot remove the variability in consumption as such, it provides a market driven mechanism to ensure the existence of these bounds.

The conclusion about the desirability of suspension does not, at least in this particular framework, imply that the suspension would yield higher utility than the fiat money or the gold standard regime. The question of which regime maximises the welfare of household remains open and as a topic of future research.

This paper has questioned whether the gold standard as a contingent rule theory could be applied to the Pre-Classical Gold Standard of 1717-1797, and the Suspension Period of 1797-1821. I identify the gold standard and the suspension of cash payments as different monetary regimes and argue that the cash payments were suspended only because following the convertibility rule became unfeasible and the circulation of paper money fell on a level, which did not maintain consumption and production. The disadvantage of the gold standard is that it is subject to gold supply shocks as the feasibility of the standard relies on availability of gold to monetary use. This was a problem England had to face at the end of the eighteenth century.

The adjustment period during the suspension of cash payments from 1797 to 1821 was shorter and sharper than the one in the example. Figure 11 illustrates the Bank of England's public lending, discount business and notes in circulation from 1794 to 1825. The Bank gradually increased its issue from the beginning of the Suspension Period in 1797 until the end of the Napoleonic Wars in 1815. After the war the government was able to reduce its expenditure, cut income tax and tighten the credit market and money supply. By the time of the resumption of the gold standard in 1821 only the public advances remained above the pre-suspension level. The Suspension Period, nevertheless, represented an enduring social commitment to monetary stability in the form of a domestic institutional framework. Between 1797 and 1821 the Bank of England notes were always accepted at their face value. After the Battle of Waterloo the markets seem to have considered resumption very likely: the interest rate fell and gold came

gradually back to par. The suspension of cash payments was also considered credible abroad. Continental merchant bankers anticipated the victory of Britain and a return to convertibility, and built their credit in London during the war. In 1816 eight to nine percent of the British national debt was held by foreigners living abroad.⁷⁴ The national debt had grown from £225,000,000 in 1785 to over £880,000,000 in 1821, more than 250 percent of national income.

If a form of paper standard, such as the suspension of cash payments, is preferable monetary regime to the gold standard in terms of stabilisation, one can ask why the gold standard was resumed at all in 1821. Why England did not adopt a standard where, for example, the Bank Directors would have used their expertise to decide over money issue? This option appealed to a large group of contemporaries. Some private bankers, Birmingham manufacturers and even some Members of Parliament recommended that the paper standard should become permanent monetary regime. They criticised deflationary monetary policy of the Bank and suggested that at least pound should be devaluated, i.e. the gold standard resumed in lower par value.⁷⁵ The Bullionists, especially Ricardo, rejected these suggestions and the outcome of the Bullion Debates was that rules won over discretion: the convertibility rule was seen, ultimately, as ‘the invisible hand of monetary policy’⁷⁶. It was the best available solution to the institutional dilemma, which emerged from the role of the Bank of England as a private institution that was able to make profit from issuing notes and as a central bank which had wider collective objectives such as price stability. It was recognised, that institutional changes in banking system, for example, in the freedom of private banks to issue notes, were required before the Bank’s commitment to the gold convertibility rule was sustainable and it was able to operate as a true central bank.

⁷⁴Neal (1990) p. 216.

⁷⁵Fetter (1965) p. 99.

⁷⁶Flandreau (2006).

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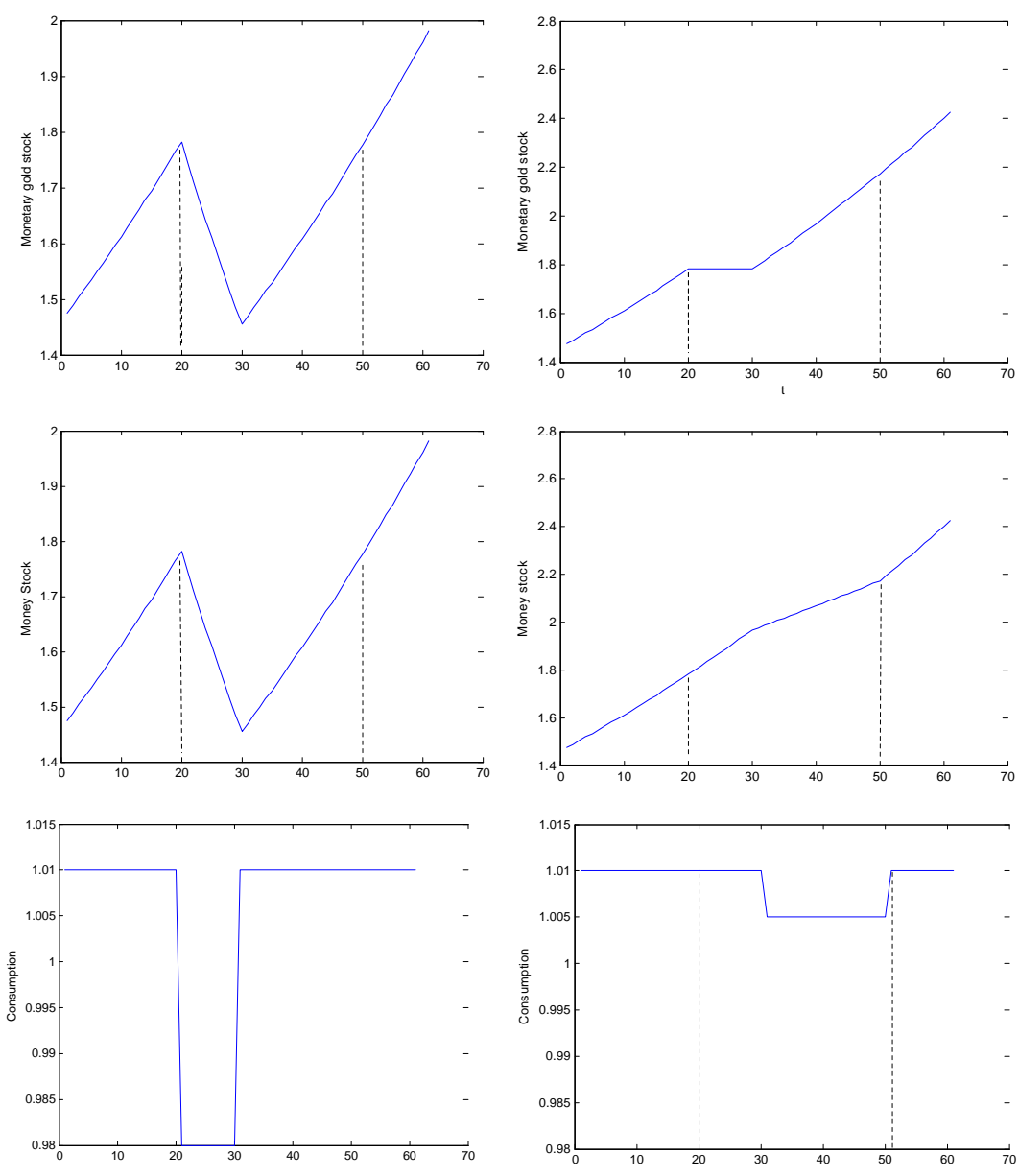


Figure 10: The monetary gold stock, money stock and consumption under the gold standard and the suspension.

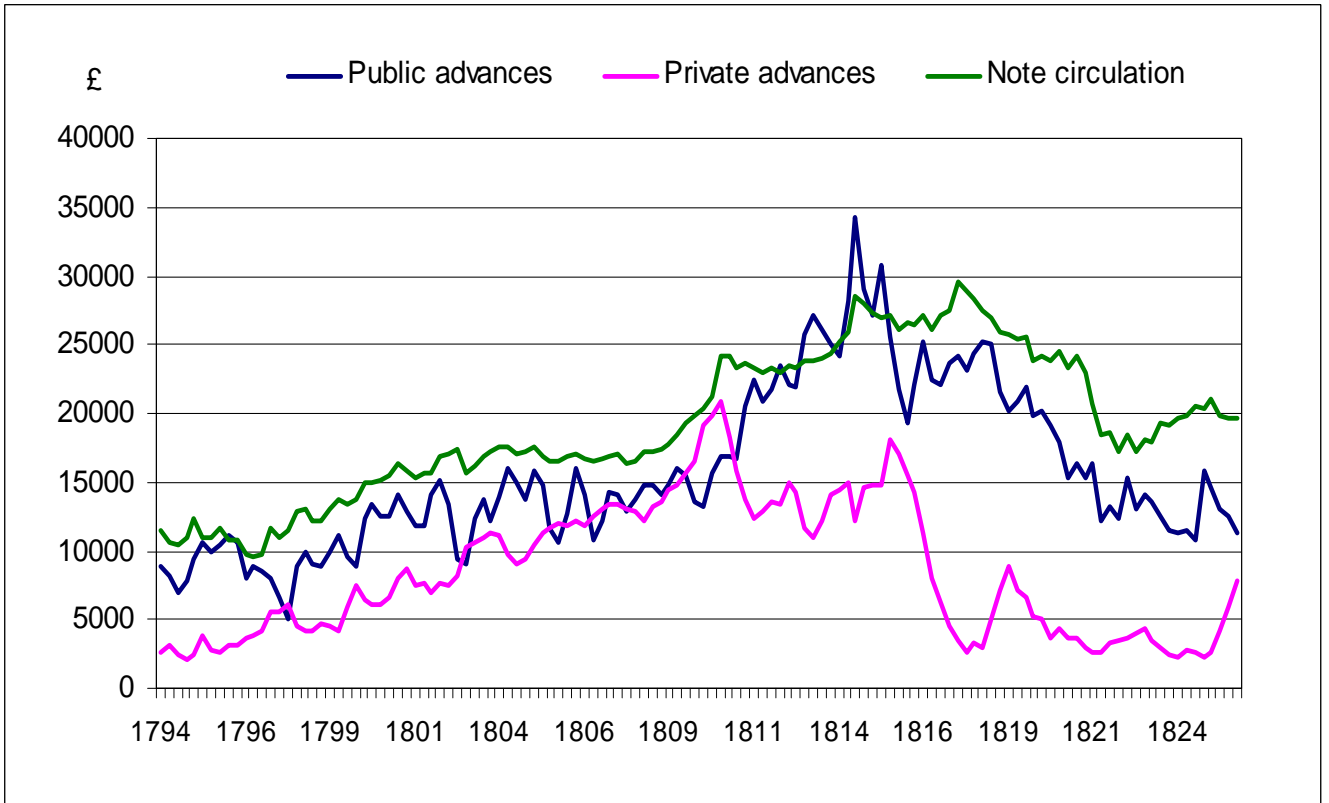


Figure 11: Public advances, private advances and the Bank of England notes in circulation 1792-1825, thousands of pounds, quarterly. Source: Gayer et al. (1953), microfilm appendix.

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