

Monetary and Fiscal Policy in England during the French Wars (1793-1821)

Pamfili Antipa¹ & Christophe Chamley²

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ABSTRACT

The French Wars (1793-1815) exerted unprecedented pressures on Britain's fiscal and monetary policy settings. Policy makers had to constantly adjust the policy mix as events unfolded. This meant implementing monetary and fiscal policy innovations, such as the suspension of the gold standard and the instauration of Britain's first income tax. These adjustments signalled the government's commitment to undertake the necessary to win the war, without jeopardizing fiscal sustainability. Drawing on new hand-collected data, we also show that the Bank of England played an essential role in two successive phases of the war. The Bank granted ample liquidity to the domestic payment system, by discounting large amounts of private bills. It also financed the decisive phase of the wars by purchasing large amounts of public debt. The successful winding down of the balance sheet and the resumption of the gold standard influenced the Bank's policies and shaped the political and financial landscape for the century to come.³

Keywords: Interactions between monetary and fiscal policies, central bank balance sheet, unconventional monetary policy, open market operations.

JEL classification: N13, H63, E58, E62.

¹ Banque de France and Paris School of Economics, pamfili.antipa@banque-france.fr

² Boston University, chamley.bu@gmail.com

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NON-TECHNICAL SUMMARY

How do you finance a world war or any costly crisis? What role should the central bank play in financing public expenditures? And once public debt has accumulated and inflation occurred, how do you exit from such a situation? We answer these questions by studying the French Wars (1793-1815). As the wars exerted unprecedented pressures on Britain's budget—only World War 1 would prove more expensive—they offer a unique case to study the interactions between fiscal and monetary policies. Their outcome also shaped what economist put forward as the proper way of implementing monetary and fiscal policies for the century to come.

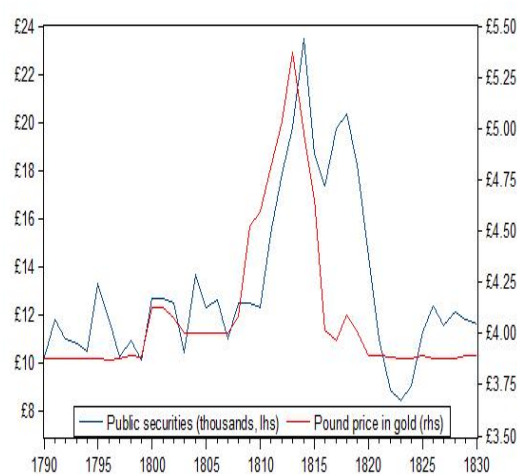
Our analysis is particularly relevant for the euro area where the euro plays a role that is analogous to gold in former times and where the European Central Bank is the principal actor of crisis management (Reis 2014). We also inform the policy choice between maintaining a fixed exchange rate and restructuring a debt overhang, as under discussion in certain euro area countries. Finally, we contribute to the analytical debate concerned with the conditions under which the variations of a central bank's balance sheet affect prices (Chamley and Polemarchakis 1984).

Over the 22 years of almost uninterrupted warfare, policy makers adjusted monetary and fiscal policies to meet increasing needs of war finance. This meant implementing monetary and fiscal policy innovations, such as the suspension of the gold standard and the instauration of Britain's first income tax—60 percent of the extra cost incurred by the war was covered by tax revenues (O'Brien 1988). These adjustments signalled the government's commitment to undertake the necessary to win the war, without jeopardizing fiscal sustainability.

Drawing on new hand-collected data, we also show that the Bank of England played an essential role in two successive phases of the war. It granted ample liquidity to the domestic payment system, by purchasing large amounts of private bills. It also financed the last and decisive phase of the wars by purchasing large amounts of public debt. While the Bank's balance sheet increased substantially during the wars, its composition may have mattered more than its growth.

The Figure below shows the Bank's holdings of public debt and the exchange rate of its notes into gold. During the suspension of the gold standard, contemporaries used this exchange rate to assess inflationary tensions. Bank notes devalued when the demand for funds intensified with the war in 1809/10 and fiscal prospects deteriorated. Prices declined when fiscal pressure subsided with the end of the war. Overall, inflationary tensions evolved with the fiscal backing of the Bank's notes. The variations in the Bank's balance sheet affected asset prices and the aggregate price level because they interacted with fiscal policy.

Inflationary Tensions and the Bank of England's Holdings of Public Debt



Sources: Mitchell 1988 and authors' computation.

The exit strategy, i.e. reversing the war stimulus came with high economic and social costs. The rate of unemployment increased from 5 to 17 percent in the post-war depression of 1816 (Feinstein 1998). These costs were, however, largely unaccounted for since public manifestations of social discontent were rendered illegal and the electoral system entailed an under-representation of the citizens most affected.

The mistakenly perceived ease with which the resumption of the gold

standard was undertaken in 1821 shaped monetary orthodoxy (Fetter 1965). It also ushered in the gold standard's second resumption after World War One, an event that prolonged and aggravated the Great Depression (Bernanke 1995, Eichengreen and Temin 2000). This is also a relevant lesson for the current policy choice between maintaining a fixed exchange rate and restructuring an outstanding debt overhang, as under discussion in certain euro area countries.

Politiques monétaires et budgétaires pendant les guerres napoléoniennes (1793-1821)

RÉSUMÉ

Le financement des Guerres Napoléoniennes (1793-1815) a imposé des contraintes sans précédent aux politiques monétaires et budgétaires anglaises. L'ensemble des politiques économiques était constamment ajusté en mettant en œuvre d'importantes innovations monétaires et budgétaires, telles que la suspension de l'étalon-or et l'instauration du premier impôt sur le revenu. Ces ajustements ont signalé que le gouvernement allait entreprendre le nécessaire pour gagner la guerre, sans mettre en péril la soutenabilité des finances publiques. En nous appuyant sur de nouvelles données, nous montrons également que la Banque d'Angleterre a joué un rôle essentiel pendant deux phases successives de la guerre. Elle a fourni de la liquidité abondante au système de paiement domestique national, en escomptant librement des effets privés. Elle a aussi financé la phase décisive de la guerre en achetant de grandes quantités de dette publique. Le succès dans la réduction de son bilan et dans la reprise de l'étalon-or ont façonné le paysage politique et financier pour le siècle à venir.

Mots-clés : Interactions entre politiques monétaires et budgétaires, bilan de banque centrale, politiques monétaires non-conventionnelles, opérations d'open market.

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“There is no neat way to distinguish monetary policy from debt management, the province of the Federal Reserve from that of the Treasury. Both agencies are engaged in debt management in the broadest sense, and both have powers to influence the whole spectrum of debt.” (James Tobin)

1 Introduction

The French Wars (1793-1815) exerted unprecedented pressures on Britain’s fiscal and monetary policy regime. As such, the wars offer a unique case study regarding the interactions between fiscal and monetary policies. Their outcome also shaped the political, monetary, and financial landscape for the century to come. We therefore ask how Britain financed and won a world war against all odds, emphasizing duly the role played by the Bank of England. As the 22 years of almost uninterrupted warfare induced public debt accumulation and inflation, we also examine the exit strategy from inflationary war finance.

Our findings are relevant for the euro area where the euro plays a role that is analogous to the specie of former times and where the European Central Bank is the principal actor of crisis management, in the absence of a supranational fiscal authority (Reis 2014). We also inform the policy choice between maintaining a fixed exchange rate and restructuring an outstanding debt overhang, as under discussion in certain member countries of the euro area. Finally, we contribute to the analytical debate that is concerned with the conditions under which the variations of a central bank’s balance sheet affect prices (Chamley and Polemarchakis 1984).

Policy makers were able to effectively adjust the monetary and fiscal policy mix as events unfolded. During the French Wars, two regime changes took place in 1797 and 1811 and consisted in implementing monetary and fiscal policy innovations. After war finance had taken its usual form—tax smoothing through debt financing—the second phase of the war (1797-1810) meant the suspension of the gold standard, a Real Bills policy of the Bank of England, and the instauration of Britain’s first and successful income tax. For the final push (1811-1815), fiscal policy went back to deficit financing.

Drawing on new hand-collected data, we also show that the Bank of England played an essential role in the last and decisive phase of the wars by purchasing large amounts of public debt. The variations in the Bank’s balance sheet affected asset prices and the aggregate price level because they interacted with fiscal policy choices. In line with

what the proponents of the Real Bills doctrine claimed, prices evolved with the fiscal backing of the Bank's notes (Sargent 1982).

The Bank's policy was set with the expectation of an exit strategy. After the war, the government would redeem some of the short-term bills held by the Bank of England by converting them into long-term bonds, backed by future tax revenues. The expansion in the Bank's balance sheet was backed by real assets. According to a Modigliani-Miller argument (Wallace 1981), the expansion of balance sheets in this context should not have a large impact on the price level. And yet, at its peak in 1813, the price level exceeded its pre-suspension level by roughly 40 percent.

The Bank's intervention took place in an environment where the convertibility of the pound into gold had been suspended. The suspension of the gold standard was accompanied by debt accumulation and inflation. Not only was the return to the pound's pre-war gold content contingent on the outcome of the war, it would come at high deflationary costs. Resuming the gold standard was an uncertain prospect, as was the reversion of the fiscal and monetary expansion that had financed the French Wars (Acworth 1925, Kindleberger 1982). This uncertainty affected the behavior of prices (Antipa 2016).

The government's exit strategy was helped by the fact that military expenditures—accounting for 2/3 of Britain's budget—collapsed from 20 to 5 percent of GDP, bringing about important primary surpluses. Sizable funding operations converting short-term bills into long-term bonds were undertaken in 1815, 1818, and 1820. Interest rate reductions for long-term debt, i.e. the widespread use of contingent debt, further rendered public finances more sustainable.

No measures were taken to alleviate the economic and social difficulties that came with the short-fall of war-related demand. The 1816-1817 after-war depression was accompanied and magnified by the large postwar demobilization, implying a more than threefold increase in the unemployment rate from 5 to 17 percent (Acworth 1925, Feinstein 1998). Although numerous, public manifestations of economic and social discontent were rendered illegal by a number of legislative actions that restrained civil rights heavily.

Moreover, the electoral system entailed an under-representation of the citizens most affected—registered voters amounted to 1.5 percent of affluent in the total population. This granted a large intersection between public creditors on the one hand, and members of parliament and registered voters on the other hand (Johnston, 2013). Since deflation increased the real value of debt to the advantage of creditors, political support for reimbursement of public debt at the pre-war gold content of the pound was strong.

The mistakenly perceived ease with which the resumption was undertaken in 1821, however, shaped British monetary orthodoxy and the global financial system for the century to follow (Fetter, 1965). It also ushered in the gold standard’s second resumption after WWI, an event that prolonged and aggravated the Great Depression (Kindleberger 1984, Bernanke 1995, Eichengreen and Temin 2000).

The remainder of this article is organized as follows. The next section briefly describes British war finance before the French Wars and lays out the logic of changes in the monetary and fiscal policy framework as events unfolded. Section three presents the sequence of regimes during the war and suspension years: here we draw on new hand-collected data regarding the public short-term debt market and the Bank’s balance sheet. Section four details the political and economic circumstances that shaped the exit strategy from inflationary war-finance. A last section puts our findings into analytical and historical perspective and concludes briefly.

2 Public Finance before the French Wars

By the beginning of the French Wars, Britain was equipped with formidable tools of fiscal and financial policy. These had been developed and honed under the pressure of the “second Hundred Years War”¹, which started in 1688 between the new political regime in Britain and the old regime in France.

2.1 Developing fiscal and financial tools

The excise, run by a new and efficient administration became the tax base and provided a stable and secure source for the new government bonds (Brewer 1988, Nye 2007). In the first half of the 18th century, the market for financial assets underwent its “financial revolution” (Dickson 1967) that was achieved when the entire public debt was refinanced at a lower interest rate (Chamley 2011).

The three wars after 1740 were financed according to “modern” principles of public finance. The war-related surge of expenditures was financed by loans that were funded by ear-marked taxes, especially the excise but also import duties, which were voted by parliament for debt service. Each war thus led to a new plateau of commodity taxes. The only tax for which the increase was canceled after a war was the land tax (Brewer 1988). In peace time, the debt-to-GDP ratio decreased, because of budget surpluses—at times

¹Buffinton (1929).

paired with a sinking fund—and because of the growth of the economy (Figure 12 and Table 7 in the appendix). The pattern of taxation and deficit fits the “tax smoothing” method of the modern literature, but it can also be explained by expediency (Barro 1979 and 1987, Chamley 1985).² With each war costs increased: during the War of American Independence (1776-1783), the rate of interest on British debt even reached the French level.

2.2 The Lull before the French Wars in 1783-1793

After the Treaty of Paris (1783), the public debt had reached 150 percent of GDP. A Sinking Fund of about £1 million per year was reinstated by Prime Minister Pitt to repay the debt. When that Sinking Fund was preserved during the war years of fiscal deficit, it was not an accounting gimmick. It provided an additional signal of the government’s commitment to long-run fiscal sustainability.³ Such a commitment would be especially important during the suspension of the convertibility of the pound when market expectations about the resumption of convertibility would depend on the prospects for long-run fiscal balance (Antipa 2016, Sargent 1982). Even in contemporary economies, separate accounts have been used to reinforce future commitments, such as the separate tax for social security in the US.

The Sinking Fund redeemed every year on average the equivalent of 42% of long-term debt created (Figure 13 in the appendix). By the end of the French Wars, the Sinking Fund had redeemed the equivalent of 26% of debt created. The Fund’s interventions in the long-term debt market may also have contributed to stabilize prices.

During the decade after the Treaty of Paris in 1783, the rate of interest decreased gradually, as one would expect in peace time. What may be more interesting was the fall of the premium of the 4% annuity over the 3%. Recall that this premium is the present value of the payments of the additional coupon of the 4% over the 3%, namely one pound, as long as the 4% is not redeemed. Following previous experience in the

²The deficit method was the same for the three wars, but the types of financial instruments were different. In the War of the Austrian Succession (1743-48), the main part of the new debt was in 4% redeemables (£15.3 million out of £23.7). The reduction of the interest from 4% to 3% was indeed the crowning of the Financial Revolution (Dickson 1967) and marked the maturity of Britain’s debt financing system. During the Seven Years War (1756-63), Britain did not issue redeemable debt, perhaps because the context was less favorable for an interest reduction than in 1748 when the stock of 4% annuities greatly exceeded the debt issued from the war. The War of American Independence was primarily financed in the 3% (Grellier 1812).

³Gladstone criticized, in 1854, the practice of “continually buying up stock at 3, 4, or 5 per cent below the rate at which you were simultaneously creating stock in order to find the money to make the purchase” (Silberling 1924).

18th century, this redemption would take place either slowly through budget surpluses (the Sinking Fund), or in one swoop as in 1749, for the entire stock of the 4% annuities (Chamley 2011). In either case, a reduction of the premium is a strong indication that the market expects interest rates to decline in the future and to the peace time level of 3%.

At the beginning of 1784, the price of the 4% was nearly $4/3$ of the 3%. A lowering of the long-term interest rate back to 3% was too far to be seen. In the Spring of 1791, the long-term rate had decreased to 3.5% but the premium was still high (Figure 1). At the beginning of the summer, the 3% was priced at 85 and the 4% at 105. That difference of 20 meant an expectation of redemption of more than 30 years in the future.⁴ That premium fell precipitously in 1791. In March 1792, the 3% was priced at 97, the premium of the 4% had shrunk to 5, with an expected interval of time to redemption of about 5 years. The market expectations and conditions were very similar to those in 1747 before the previous interest reduction for all 4% annuities (Chamley, 2011). The events in France during the summer of 1791 led the market to believe that a new period of peace was coming.

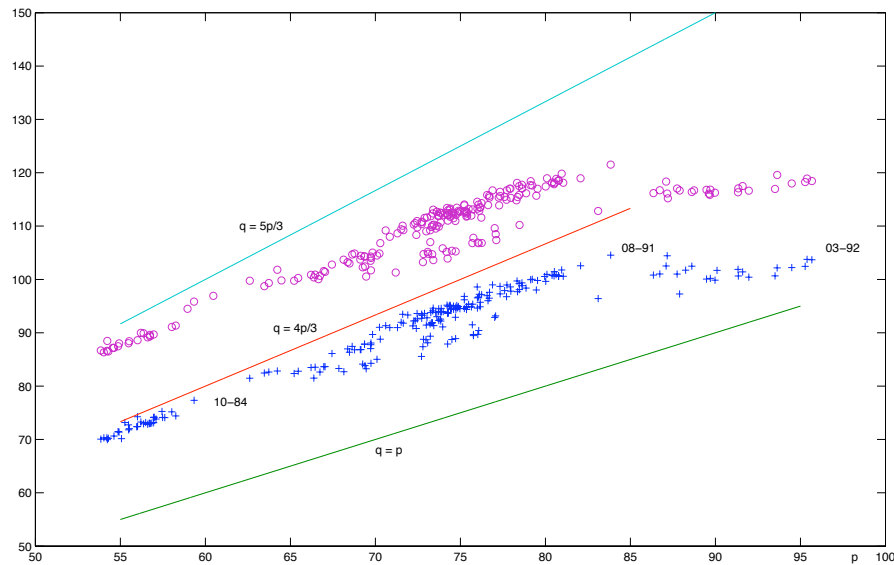


Figure 1: Prices of the consol (3%) and of the 4% annuities

Source: Gentleman's Magazine, authors' calculations.

⁴The present value of coupons of one pound for 30 years, discounted at 3%—the lower bound for the interest in this case—is 19.6.

2.3 The French Wars: Unprecedented Funding Needs

From 1793 to 1815, England mobilized in the French Wars all its resources, in collaboration with allies on the continent, to thwart the French attempt at the domination of Europe. At the onset, it was not clear that Britain would prevail and become the main world power for the century to follow. As Knight (2013, pp. xxi-xxii) writes:

“Most people (excepting very few scholars) [...] do not realize how vulnerable Britain was at this time. It was a world war in all but name [...], with ferocious fighting right to the finish between two systems of government, each using every possible resource to overcome the other. A British victory was finally achieved but only through radical efficiencies in the nation’s economic and political life.”

Policy makers made decisions under uncertainty about future events. Expectations regarding possible future events defined the mix of monetary and fiscal policies used to finance expenditures, i.e. a policy regime. Within a policy regime, decisions were affected by the realizations of random events but a given regime also implied a consistency constraint such that the regime itself did not change. Whenever the unfolding of events made a regime inappropriate for policy response, the regime had to be replaced by a new one (Daunton 2001, pp. 12-22). During the French Wars, two changes of regime took place, in 1797 and in 1811. The transition after 1815 was a phase in itself that had been anticipated before, with some uncertainty.

In the first phase, 1793-1797, fiscal and monetary policies were conducted as in the previous three wars of the 18th century: tax smoothing through debt financing and convertibility of the pound into gold at the Bank of England. The unprecedented level of interest rates on public debt led to the second phase (1797-1811) with the suspension of convertibility, the Bank’s real bills policy and, despite the war, a primary budget surplus. For the final surge in expenditures (1812-1815), fiscal policy went back to deficit financing and the Bank purchased large amounts of government liabilities. During the last phase after Waterloo, a large primary surplus and shifts in the Bank’s balance sheet led to the resumption of the gold standard at the pre-war parity in 1821. In the following, we track the sequence of these regimes.

3 Four regimes

3.1 The First Regime (1793-1797): Standard Debt Financing

When the war resumed in 1793, it was financed by standard debt financing with earmarked commodity taxes and without an increase in the land tax. However, the debt-to-GDP ratio was higher than at the beginning of the previous wars and military expenditures increased fast (Figure 2). Already in the first year of the war, while the amount of borrowing was still small compared to previous wars, the price of the 3% consol, that had been at 95 in the spring of 1792, fell to 72, lower than in any of the previous three wars. At the end of 1794, the consol was at 65. The premium of the 4% annuity over the consol had risen to 15 (Figure 1) and would only decrease with the suspension of the gold standard. The prospect of lower interest rates in the medium-term had vanished.

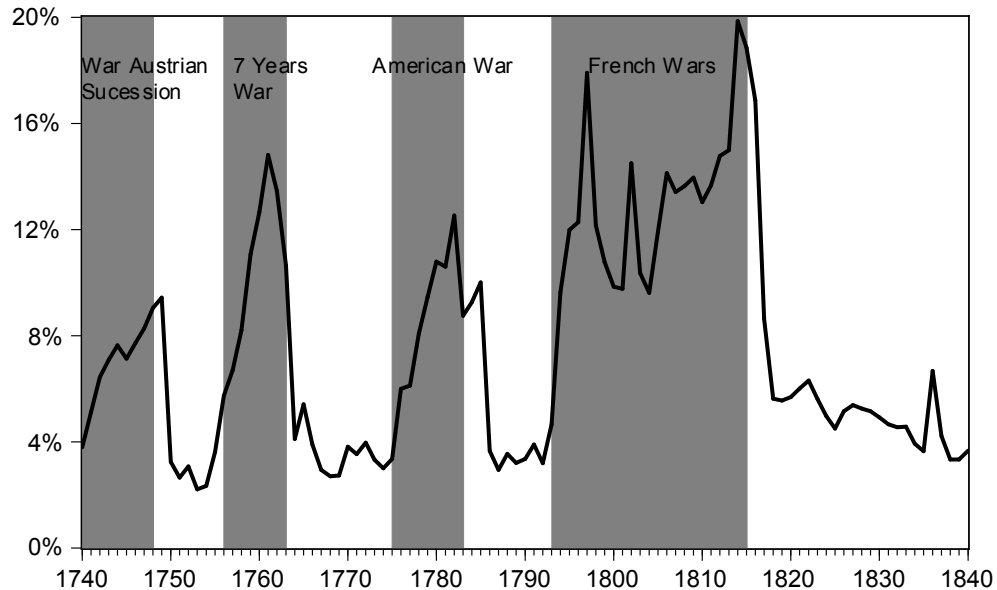


Figure 2: Military expenditures, in percent of GDP, 1740-1840

Source: Mitchel 1988.

Cooper (1982) reports “Pitt based his financial policy, and indeed, his entire conduct of the war on the assumption that the conflict would be over relatively soon.” In this view, it was coherent to finance this as the three preceding wars, i.e. by issuing debt and smoothing taxes. The main fiscal indicators for the French Wars are illustrated in Figure 3. The first of the four regimes, which for fiscal policy extends up to the introduction of the income tax in 1799, is the only period of the French Wars during

which the government was running a primary deficit.

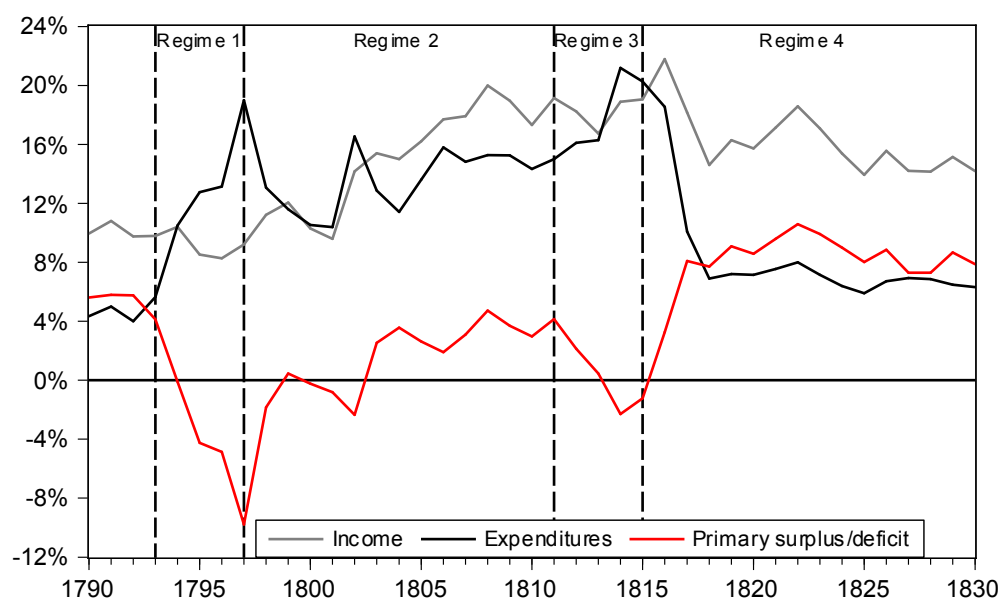


Figure 3: Fiscal Aggregates in the Four Regimes

The primary deficit is computed as the difference between income and expenditures, all in percent of GPD. Debt service is not included. Vertical dashed lines separate the four regimes. Source: Mitchel 1988.

Which Debt Instrument?

During the previous three wars since 1740, deficits had been financed by different types of financial instruments: redeemable bonds at 3 and 4 percent in 1740-48, non-redeemable bonds with a long-term maturity in 1758-63, redeemable bonds at 3, 4 and 5 percent and short-term debt in for the American War. At the beginning of the French wars, the type of new bonds was heatedly discussed. Pitt preferred the bonds with the high coupons but could not get his way. For the bonds issued in 1793, Grellier (1810, p. 371) reports:

“It was originally intended to have raised the loan on 4 or 5 percent stock; but, the embarrassed state of commercial credit having caused a scarcity of cash, the minister received offers from one set of subscribers only; and, as they preferred 3%, it was judged expedient to conclude the bargain in

that stock, on the above terms, which were between 4% and 5% under the market-price.

The minister [Pitt] admitted that the terms of the loan were much more disadvantageous than might have been expected; but that, having done every thing in his power to excite a competition among the moneyed men without effect, they were the best he could procure.”

Discussions on the types of financial instruments went on. Regarding the 1796 loan, Grellier (1810, p. 388) reports : “The terms of this loan excited considerable discussion; and it appears evident from them, that Mr. Pitt, who had formerly strongly reprobated borrowing in the 3% had now changed his opinion.”

The choices of financial instruments for war financing face at least four issues, some of which already discussed at the time. First, in deciding the coupon rate of redeemable bonds, it has to be recalled that the peace time interest rate, since the 1730s, had been around 3%. A wholesale reduction of the interest rate on these bonds was very unlikely. The attempt at reducing the interest of 4% bonds in 1736 had been a failure. The same type of operation had been a success in 1749-50 because of particular circumstances: a very high debt, both old and new, at 4% and the availability of a market for the 3% bonds (Chamley 2011). For the Seven Years war, the government did not see the conditions for another success and issued non redeemable bonds of a long maturity. The 3% would eventually be reduced to 2.5%, in 1888,⁵ after almost a century of low interest rates. For practicality, one can assume that the 3% was non redeemable.⁶

If the war deficit is financed by bonds at 3%, these are issued well below par. The rewards of the holders lie in the high coupon-price ratio and, which is important, in the capital gain after the war when interest rates decline.

Holders of bonds with a higher coupon, 4 or even 5 percent, faced the significant probability of suffering a reduction to 3 percent after the war. The spread between the prices of 4 and a 3 percent cent bonds measured the expected time span of a (discounted) coupon equal to one until such an interest reduction would take place.⁷ Because of the probability of an interest reduction after a war, capital gains on bonds at 4 and 5 percent were lower than on 3 percent bonds.

⁵Harley 1976.

⁶Bonds can be recalled through budget surpluses, but recalls affect first bonds with higher coupons and annual budget surpluses are small with respect to the stock of the debt.

⁷For an analysis of such expectations during the War of the Austrian Succession before the interest reduction of 1749-50, see Chamley (2011).

1. The first issue is therefore the impact on the amount of debt after the war and the time profile of the debt service. As an example, take a war of one year, with perfect foresight, generating a deficit of 100, during which the interest rate is 5% after which the rate returns permanently to 3%. Consider financing either by 3% or 5% bonds. In the latter case, the bonds are reduced to 3% after the war. Let B and B' be the amounts of required 3% or 5% bonds. Their prices during the war are p and p' . The one year interest during the war r .

$$p = \frac{3}{1+r} + \frac{100}{1+r} = \frac{103}{1+r}, \quad q = \frac{5}{1+r} + \frac{100}{1+r} = \frac{105}{1+r},$$

$$100 = pB = qB'.$$

Hence, $B = (105/103)B'$.

A higher coupon entails a higher service during the war and less debt thereafter. When the government is facing a flow constraint, as it actually did in the second phase of the French wars, the 3% bonds are more advantageous.

2. The price of a 4% redeemable bond, is the sum of a 3% bond and a bond that pays one pound per year until a maturity that is random and related to the end of the war. A longer war lowers the price of the 3% bond and increased the number of years during which the additional coupon of one would be paid. If the impact of the higher interest rate on discounting is not too large, the longer maturity had a positive effect on component with a random maturity. One should expect that the variance of the 4% bond price is lower than that of the 3% bond. The next table shows that the variance of the 4% price was indeed lower, but the effect is not very large.

Table 1: Descriptive Statistics of Annuity Prices, 1793-1821

	Consols (3%)	4% annuities
Mean	64.3	80.7
Standard Deviation /Mean	0.11	0.10
Maximum	83.8	101.8
Minimum	47.4	58.1
Observations	7606	6420

The arguments on the variances of the prices and the shift of interest payments to the future must have been discussed at the time since Grellier (1812) mentions them.

3. The gains from the end of the war (assuming victory) are distributed differently when the loans are in consols at 3% or redeemable annuities at 4% or 5%. In the first case, the end of the war brings a capital gain and the beneficiaries are the bond holders. For the second case, we have to consider only the difference between holding redeemable annuities and consols. The end of the war eventually terminates the difference in coupons. The beneficiary is the tax payer.
4. There are other arguments that would be in favor of high coupon bonds and these may not appear in the literature of the time. The first is that a high coupon bond generates an incentive for “good behavior”, both in terms of taxation and expenditures. Such a behavior generates a faster return to lower interest rates. By redeeming the high coupon bonds earlier, the government can reap the rewards of such a policy.
5. A second argument implies that the market seems to overreact to some news. For example, the premium of the 4% increased rapidly to a high level in the first year of the war. *A contrario*, in 1747-48, the premium was high and the rapid fall of the interest rate was not anticipated. The government made a significant profit by issuing 4% annuities in 1746-48 and lowering the interest rate in 1750.

The loans issued during the first phase of the war are presented in Table 8 in the appendix. As an example, the second loan of 1797 was raised in annuities with coupons of 3 and 4 percent and an additional annuity of 14 years, as described in Tables 2 and 8. A subscriber received for £100 a portfolio that included annuities at 3% with a total face value of £175 and a market value of £87.5 annuities at 4% with a face value of £20 and a market value of £12.8. The package was set before the issuance of the loan, with a total market value was slightly above £100, but final adjustments were made to make it sufficiently attractive for the entire period of subscription. That adjustment depended on the most recent market condition and here it took the form of an additional long-term annuity of £0.33 (6s 6d) that was priced at £4.55.

To these loans one should add the refinanced Navy, Victualing, Transport, and Exchequer bills, usually converted into bonds at 5 percent, and the loans that were raised by the Emperor of Austria, with the collaboration of the government. For example, a loan of £3 million was issued in 1794. Since the allies’ armies on the continent had to be financed by British funds, there was an argument for direct borrowing by the Emperor instead of the transfer of funds raised by British loans. These loans were to be reimbursed by taxes on the continent, but they added to the supply of bonds in the

market and Parliament provided a guarantee.⁸

Table 2: Market value of the second 1797 loan

Amount	Type	Market value
125	3 percent Consols at 50	62.5
50	3 percent Reduced at 50	25
20	4 percent Consols at 64	12.8
0.325	Long annuities at 14 years purchase	4.55
	Total	104.85

Source: Grellier (1810, p. 412.)

The Bank of England in the First Phase

The Bank of England was not a central bank in the modern sense. It had been created in 1694 to represent the interest of business and in particular of bond holders (North and Weingast 1989). During the “financial revolution” in the first half of the 18th century, the Bank certainly acted more in the interest of the bond holders than that of tax payers when it opposed or resisted the attempts of the government to reduce the interest on outstanding debt (Chamley 2011).

The pressure exerted by the the French Wars accelerated the evolution of the Bank toward its *de facto* role as a central bank (Cannan 1919). During the first phase of the war, the Bank maintained the convertibility of its notes into gold, as during previous wars. The Bank was anxious to do so and did therefore attempt to prevent loans to the Austrian Emperor and and to set some limit to its short-term funding of the government.⁹

⁸In another example, the budget presented on February 23, 1795, introduced a loan of 18 million where each subscriber of £100 received an option to subscribe in addition, for a maximum of one third of £100, to Emperor’s loans. The loans to the Emperor had therefore a cap of 6 million. Interestingly, the buyers of the British loan were entitled to a compensation if the loan to the Emperor was less than the cap, 6d by shortfall of £750,000 plus 6d if the Parliament had refused to “guarantee” the loan. (Grellier 1810, p. 382). It turned out that the loan was guaranteed but only 4.6 million were raised. The subscribers received an additional compensation of 1s. per cent. (Grellier 1810, p. 383-384).

A collateral in actions on the Bank of Vienna was attached to the loan and the Parliament guarantee meant that some revenues were earmarked in case of default by the Emperor and the British government could sue the “receivers or treasurers of Imperial revenues.” In addition, a monthly amount of £7,666:13:4 was to be paid by the Emperor for a Sinking Fund toward the repurchase of the loan at the market price.

⁹“The court of directors, on the 16th of April [1794], again directed the governors to wait on Mr. Pitt, and mention the uneasiness they felt on being left so long in advance to so large an amount on the treasury-bills. Mr. Pitt, appearing fully convinced of the propriety of the representation, said, he would order £1.2 million to be paid to the Bank on that account immediately (Grellier 1810, p. 381).

As soon as Britain went to war in 1793, the already usual practice of advancing funds for Exchequer bills without specific Parliamentary authorization or funding was officially legalized (a practice not in compliance with the Bank's Foundation Act). The possibility of applying directly to the Bank for funding was amply used by successive Chancellors of the Exchequer, whenever unforeseen expenditures arose and it was not possible to sell bills in the market at a premium.

In the winter of 1797, the tension between the Bank and the Government increased. In February, a run started on some country banks amid rumors of French invasion. On Saturday, February 25, the 3% was down to 50 1/4. The next day a crisis meeting took place with the Governors and Pitt. The Bank claimed that it had lost nearly a million in specie during the past week, leaving it with £1.3 million in cash and bullion, for a circulation of approximately £10 million.¹⁰

The suspension of convertibility was decided and announced the next day as a temporary measure. The policy had immediate effects. The 3% jumped from 50 1/2 to 52 1/2 (Figure 4). More importantly, according to Clapham (1944, Vol.1, p.272), the Bank's metallic reserve began to improve almost at once. All over Britain, bankers and merchants declared that they would support public credit by accepting the Bank's notes in their transactions. Britain's business community made sure that the transition from convertible to inconvertible paper money was relatively smooth (Coppieters 1955, p.37, Shin 2015).

The events in February 1797 can be characterized as a standard bank run that was stopped by the suspension of convertibility. "About the beginning of May the fear of issuing specie, which the stoppage of the Bank had occasioned, began to subside" (Grellier 1810, p.413). The Bank following its own interest, wanted to resume convertibility, but Pitt opposed resumption of the gold standard. The tensions of the previous year had shown that, in the credit conditions of the time, convertibility had created additional difficulties for the financing of the war. Another crisis would have entailed another suspension, and so on. From the point of view of modern macroeconomics, Pitt was right in setting a new regime with stable rules.

The regime of temporary suspension of the convertibility lasted until 1821 and the suspension was extended by a number of decrees. These extensions for limited periods or particular contingencies reinforced the commitment to the eventual resumption of the

¹⁰At that time, the Bank did not target a particular coverage ratio. Governors of the Bank declared that depending on economic and political circumstances the same amount of bullion granted the Bank more or less security in its interactions with the public (Clapham 1944).

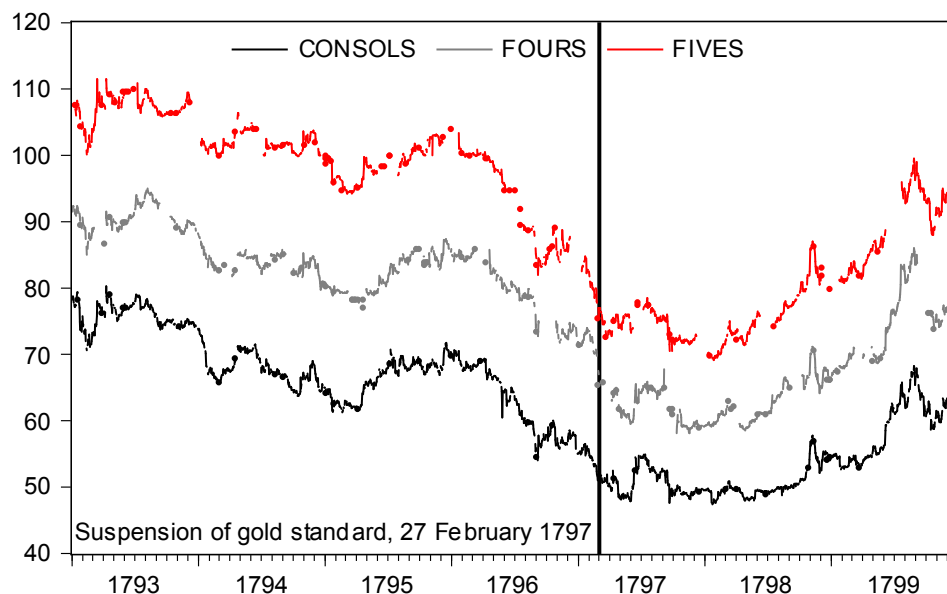


Figure 4: Prices of Annuities at 3, 4, and 5 percent in 1793-1799

The vertical line marks the date of the suspension of the convertibility. Source: Gentleman's Magazine.

convertibility. Once the fetters imposed by the gold standard were loosened, it became possible to accommodate the external drain of specie caused by Britain's expenditures on the Continent while absorbing increasing public debt issues (Bordo and White 1991).

3.2 The Second Regime (1797-1811): Suspension of Convertibility and Tax Push

Fiscal Policy

For about two years after the suspension of the convertibility of the pound, war finances continued to rely mainly on borrowing with tax smoothing (Figure 3). However, after six years of warfare against Revolutionary France, the national debt had more than doubled causing doubts regarding the stability of public finances. With a consol price of 50, the long-term interest reached at 6% its highest level since the early 18th century (Figure 5).

In these circumstances, Pitt was able to introduce Britain's first income tax (Daunton

2001, O'Brien 1988). The new tax was met with opposition but it proved very productive. In the peak years of the war (1808-1815), the tax raised about the same amount as customs, 18% of total revenues. For the rest of the French Wars, Britain abandoned the tax smoothing policy that it had followed for the previous century. The introduction of the income tax was complemented by rate hikes on a number of already existing taxes.

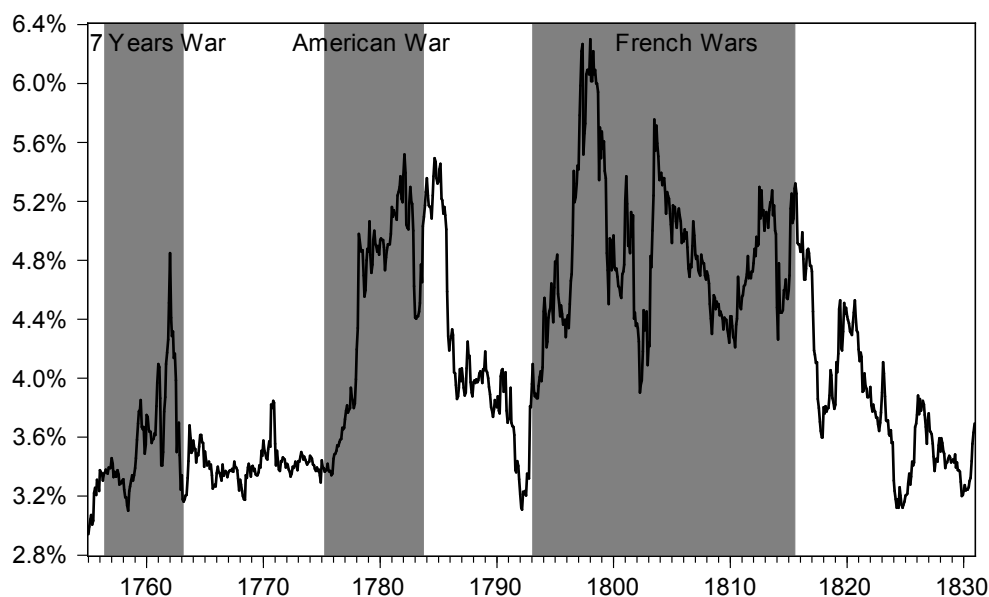


Figure 5: Prices of 3 percent consols, 1755-1830

Source: Gentleman's Magazine.

Britain had a primary surplus of 2.9% of GDP on average during the years 1803-1813. Only during two years of the final surge (1814-1815) the surplus became a deficit (Figure 3). Of course, over the whole period the primary surplus was not sufficient to service the debt that had been accumulated over the previous century, including the first part of the French Wars. Hence, the government was forced to continue to borrow in each year of the war.

The efforts in terms of taxation helped the credibility of public finances. The streamlining of the kingdom's administration further enhanced the public sentiment that everybody in the Nation was contributing to the war effort (Knight, 2013). Despite a substantial increase in the government's tasks, charges for the civil government remained broadly stable over the war years. As can be seen in Figure 5, after the suspension of convertibility and for the rest of the war, the interest rate on consols never reached the

level of the first regime again. This was due to both the fiscal restraint and to the policy of the Bank of England to which we now turn.

Monetary Policy: Real Bills

The suspension of the gold standard had created a payment system that was based on the Bank's notes, the supply of which was controlled by the Bank and the Treasury. Throughout the period, the Bank's balance sheet increased substantially but the composition of the balance sheet may have mattered even more than its growth.

The evolution of securities held by the Bank is represented in Figure 6. The Bank had loosened constraints on its discounting of securities and therefore note expansion, feeling it needed to discount freely to maintain public confidence after the suspension (Clapham 1944, p.11ff). Thus, in the second regime, the expansion in the Bank's balance sheet beyond the trend in real GDP growth operated through its increased holdings of private securities. This policy can be described as a Real Bills policy. Another noticeable feature of the second regime was the low level of public security holdings. While private securities more than doubled, the lending to the government did not expand in relation to GDP and was lower than in the first half of the 1790s (Figure 7).

In the Real Bills regime, the Bank could discount bills that financed goods in process. New notes issued by the Bank were backed by real assets and not by government securities, which are only backed by future taxes. When the demand for credit decreased—and the goods in process were sold—the notes and the discounts would be reduced *pari passu*. In theory, such a regime should not be inflationary.

Thomas Tooke (1824) and the Bank articulated the Real Bills doctrine arguing precisely that the Bank's note issue could not be inflationary since it was undertaken against sound commercial bills. Rather bad harvests, the war, and trade blockades induced higher domestic prices, while the outflow of funds used to pay for food imports and to subsidize British allies on the continent may have contributed significantly to inflation (Neal 1911, Silberling 1924).¹¹ We will discuss below the external devaluation of the pound.

There is a relation between the monetary regime in England 1797-1810 and the first phase of the assignats in France, in 1790-1792. The assignats were initially created against the real counterpart of the national domains that had been confiscated.¹² During

¹¹More recently, Lewis (1978) and Rostow (1948 and 1978) have reiterated this position, while Bordo and Schwarz (1981) emphasized the importance of monetary factors for price level determination.

¹²See the illuminating exposition by Sargent and Velde (1995) who also show that the seignorage

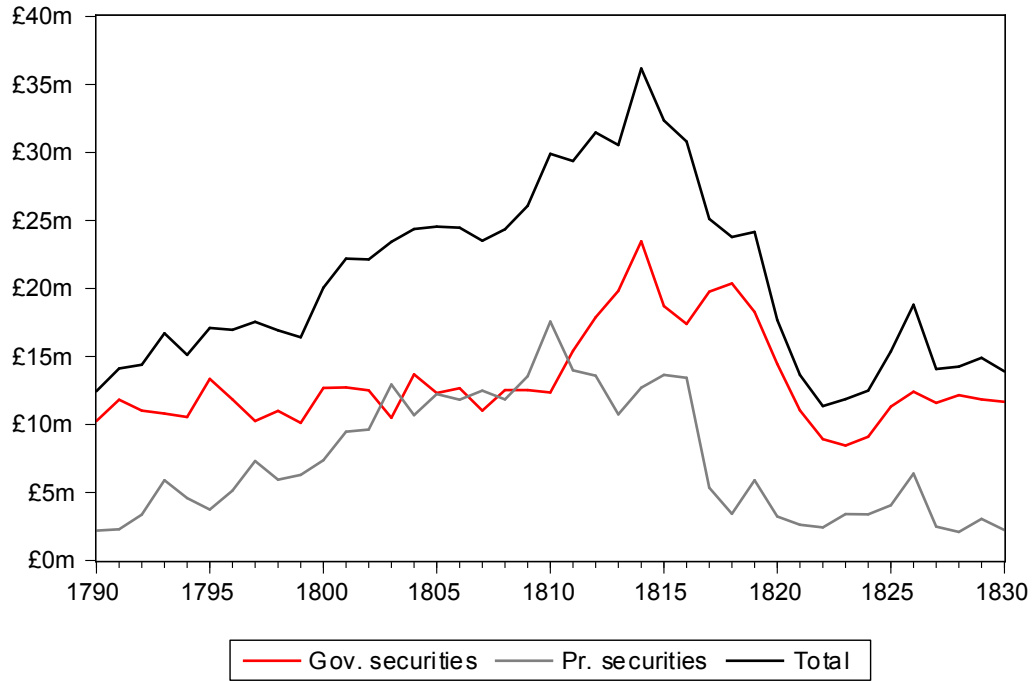


Figure 6: Public and Private Assets held by the Bank of England (1790-1825)

Nominal amounts of asset holdings were deflated by the annual growth rate of real GDP. Source: Broadberry et al. 2012, Mitchell 1988.

that phase, the assignats were issued first in large denominations, then in small notes that could be used as currency, with no significant impact on the price level. Inflation started only when the pressure of war financing and the collapse of regular tax revenues—what is a revolution for if we still have to pay taxes?—led to a quantity of assignats well in excess of their real counterpart. Inflation was first contained by price controls enforced by the Terror. It jumped to a high level after the fall of Robespierre.

The experience of the assignats remained on the mind of policy makers and economists in England. However, the policy context was very different. Taxes had not collapsed but they were increased to generate a primary surplus and the Bank's notes in this phase of the wars were not the result of direct lending to the government.

Prices only increased towards the end of the real-bills phase when fiscal prospects deteriorated (see discussion below). The evolutions in inflation led to many discussions through assignats had more than compensate for the fall of regular revenues in the continuing war.

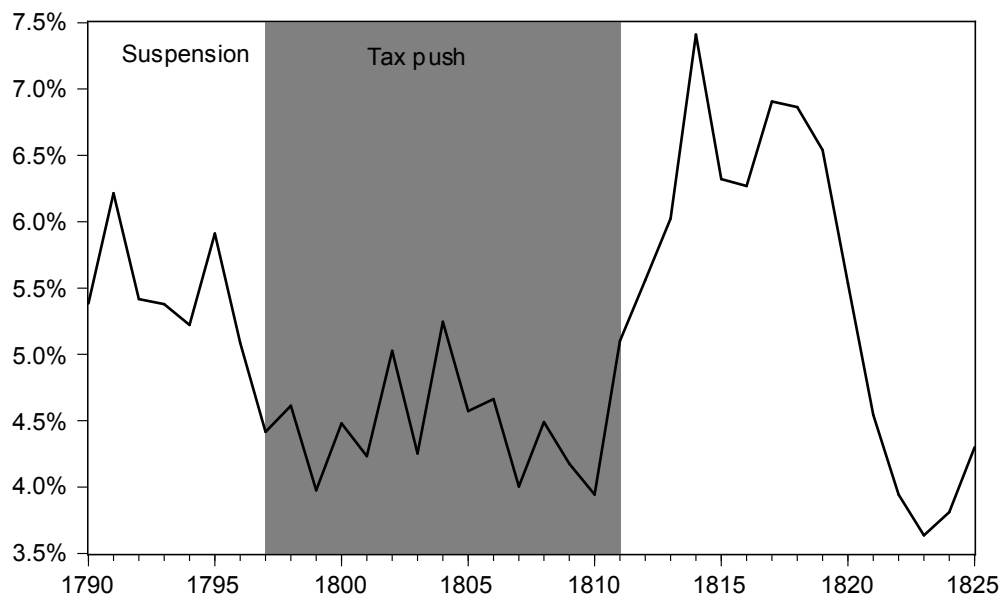


Figure 7: Public Securities Held by the Bank of England (Percent of GDP)

Source: Mitchell 1988.

by policy makers and economists, and triggered the Bullion Committee and Report in 1810/11. According to David Ricardo (1817) and advocates of the bullionist position, it was the issue of Bank notes that primarily affected prices, although the Bullion Report itself did acknowledge that other than monetary factors might have influenced prices (Fetter 1942).

3.3 The Third Regime (1812-1815): The “Surge”

The years 1809/10 proved disastrous for the British in military terms.¹³ While these events took their toll on public finances, there was little scope for more tax revenues. Although the exact limits of taxable capacity were difficult to establish, the feeling was widespread that those limits had already been over-passed (Acworth 1925).¹⁴ However, Napoleon’s defeat in Russia and Prussia’s and the coalition’s re-involvement in the war changed Britain’s situation completely and prompted a “surge”¹⁵ for this last and

¹³In July, the Fifth Coalition—the Austrian- and British-led alliance against France—was defeated at the battle of Wagram. By the end of the year, the French imposed control in most of the Iberian Peninsula.

¹⁴See also Lord Grey’s speech on the state of the Nation, 13 June 1810.

¹⁵The expression is taken from a more recent war.

decisive phase of the French Wars.

On the fiscal side, the primary budget surplus was reduced to zero. On the monetary side, the Bank which had made a substitution from private to public securities in the years 1810-1812, contributed to the surge from 1813 to June 1815 by expanding its notes and its holdings both of public and private securities (Figure 6).

The Bank was not important as a holder of long-term debt. In the first decades of the 18th century, the chartered companies, in administering their capital stock, managed nearly the whole national debt. When the French Wars commenced in 1793, the Bank held a little over 5% of outstanding funded debt. By the end of the wars, the rapid increase in debt meant that the Bank's holdings represented less than 2% of it (see table 3).

Table 3: The Composition of British Debt in 1800

Type	Amount £m	Percent
Bank of England	12	2.44
South Sea Company	24	4.89
3%	334	68.02
4%	45	9.16
5%	48	9.78
3% Imperial	7.5	1.53
Unfunded	20	4.07
Total	491	100

As in the previous years of the war, the Bank contributed in the short-term debt market to fill gaps between the expenditures and the revenues of the government. A standard practice, short-term or unfunded debt was issued in anticipation of tax incomes and took the form of Navy, Transport, Victualing and Exchequer bills, the latter accounting for the large majority of unfunded debt. At the beginning of each year, the Bank advanced funds against bills on the security of the malt and land taxes, sanctioned by Parliament. The Exchequer gradually reimbursed the Bank upon reception of tax revenues. Investors effectively purchased a share of what the government owed the Bank when acquiring Exchequer bills (Philippovich 1911, p.110).

The Bank also bought bills directly from the Treasury's intermediary, the Government Broker, whenever unforeseen expenditures arose and it was not possible to sell bills in the market at a premium. The Bank purchased these bills at face value and never resold them in the market. At some occasions, the Bank bought Exchequer bills directly in the

market to sustain their price (see Figure 14 in the appendix).¹⁶ For the Treasury this funding method implied that it sold Exchequer bills in the worst of cases at face value and at a premium otherwise.

The Bank started recording its interventions in the primary and secondary market for Exchequer bills at a weekly frequency in 1810, when the war intensified and demands for funds became more important. The hand-collected data from the Bank of England Archives depict the weekly stocks of bills issued and bills purchased in Figure 8. During the “surge” years, the Bank purchased very substantial amounts of bills. The average of £16.5 m between 1812 and 1815 compared to £4 m for the war years before 1810.¹⁷ These purchases meant an important contribution to funding the decisive war effort. Between 1812 and 1815, 30% of total public revenues originated in the issue of short-term debt.^{18 19}

Contrary to bills issued, bills purchased did not come with specific ear-marked taxes. The Bank limited the inherent risk in this system of public funding by making sure that the sum of bills issued and purchased would never exceed the total amount of bills authorized by Parliament and hence backed by future taxes.²⁰

This system of public finance effectively supported the price of Exchequer bills at a time of extreme fiscal pressures. Given the important holdings of the Bank, the broader public was willing to absorb the frequent issues of Exchequer bills at relatively low interest rates. “[...] the public would not have taken the amount of exchequer bills, which the government required to be issued at the rate of 2d. a day, if the bank had not been holders of a very large proportion of Exchequer bills in circulation.” The low rate of interest on Exchequer bills was also thought to keep up the prices of public long-term debt, the funds.²¹

The Bank’s interventions affected financing conditions through a second channel. The yields on Exchequer bills acted as a floor in the London money market (O’Brien 2006).

¹⁶Report from the Secret Committee on the Expediency of the Bank Resuming Cash Payments of 1819.

¹⁷Data before 1810 are taken from the Report from the Secret Committee on the Expediency of the Bank Resuming Cash Payments of 1819.

¹⁸Public Income and Expenditure, 1869.

¹⁹This number would rise to 40% for the after-war years (1815-1821). The abolition of war-related malt taxes along with the repeal of the income tax in 1816 entailed that the government continued to borrow short-term even after the end of the war.

²⁰Report from the Secret Committee on the Expediency of the Bank Resuming Cash Payments of 1819.

²¹Report from the Secret Committee on the Expediency of the Bank Resuming Cash Payments, 1819; testimony of Samuel Thornton and Charles Pole, respectively.

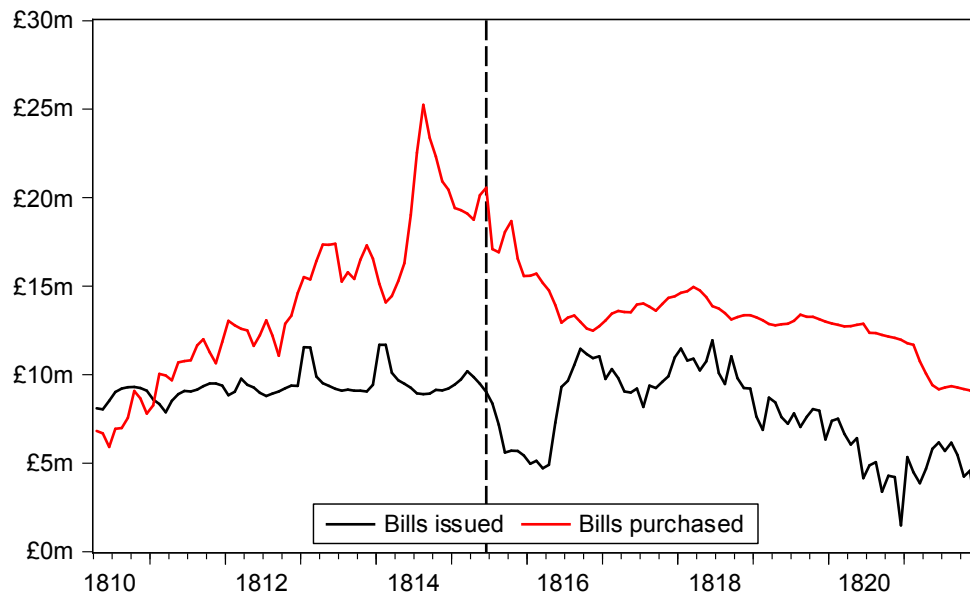


Figure 8: Exchequer Bills Issued and Purchased by the Bank of England, April 1810 to December 1815

The dashed line in Figure marks the end of the French Wars after the battle of Waterloo in June 1815. Series were seasonally adjusted using X12. Source: Bank of England Archives, authors calculations.

High prices and low yields granted favorable financing conditions for London banks and merchants. This also explains why private discounts at the Bank decreased after 1810 in Figure 6. The demand for the Bank's own discounting declined, whenever companies were able to easily discount with private banks.^{22 23}

Finally, the functional importance of the Bank's funding can hardly be overstated. Bills financed by the Bank covered charges not foreseen by the budget. They were also used to pay the dividends on long term debt and to sustain the British and Irish Sinking funds.²⁴ The former was instrumental in accomplishing the decisive war effort, the latter were essential for the credibility of Britain's public finances. The Bank's funding can therefore be understood as the ultimate backstop that kept British public finances

²²Effectively, the Bank did not compete with London banks for the business of discounting private assets—Bank rate stayed at the legal maximum of 5% between 1797 and 1822 (Clapham, 1944).

²³Report from the Secret Committee on the Expediency of the Bank Resuming Cash Payments, 1819; testimony of George Dorrien.

²⁴The Report from the Secret Committee on the Expediency of the Bank Resuming Cash Payments in 1819 contains transcripts of the request for funding that also stated the purpose of funding.

sustainable.²⁵

Refinancing Long-term

In the context of war emergencies, short-term debt accumulated. Short-term debt was used as an instrument for temporary financing. When outstanding bills accumulated, they could not be repaid by a budget surplus and had to be refinanced by long-term bonds, perpetuals in the case of Britain. Short-term debt was not necessarily backed by specific taxes and carried a higher interest charge than perpetuals—coupons were of 5.3% for the former against 3% for the latter. Perpetuals were serviced by specific ear-marked taxes, voted by the Parliament. Refinancing through perpetuals therefore meant that the short-term was also, implicitly, backed by the future taxes.

The anticipation of refinancing was essential for the perception that the Bank's government debt holdings were not seignorage and should therefore not be inflationary. At the time, long-term refinancing was called funding and, because of the exceptional accumulation of short-term debt, funding operations had to take place well before the end of the war. They became the rule when the war intensified after 1808. Operations accounted sometimes for as much as 40 percent of yearly long-term debt creation, as in 1796, 1809, and 1810.²⁶ In 1819, long-term debt creation originated solely in the conversion of short into long-term debt. For the “surge” years, funding operations accounted for 24% of long-term debt creation.²⁷

While *ex ante* parliamentary authorization and ear-marked taxes were necessary for issuing standard long-term debt, parliament only intervened to *ex post* sanction the creation of long-term debt through funding operations. If bills were converted into four or five percent denominations of bonds during war-time, they also became convertible into three percent consols when peace was concluded. Since these conversions potentially reduced the Government's interest costs, they were never opposed in Parliament.

Operations were engineered to cancel short-term debt whenever prices depreciated because of over-abundant issues. Hand-collected daily prices for Exchequer bills display clearly that beginning in 1808/1810 Exchequer bills are quasi-systematically priced at

²⁵For this system to perform efficiently, the value of the Bank's notes had to be safeguarded. Legal restrictions imposed their acceptance for any sort of debt at face value (Lord Stanhope's Act or 51 Geo. III, c. 127.)

²⁶We only consider funding operations in Exchequer bills. A total of £19 m Navy, Transport, and Victualing bills were funded in 1794, 1795, and 1796. Afterwards, funding operations only concerned Exchequer bills.

²⁷Report by the Secretary and Comptroller General of the Proceedings of the Commissioners for the Reduction of the National Debt, 1891.

a premium (Figure 9). This jump in prices coincides with an increase in the frequency and size of funding operations and the Bank's rising holdings of Exchequer bills.

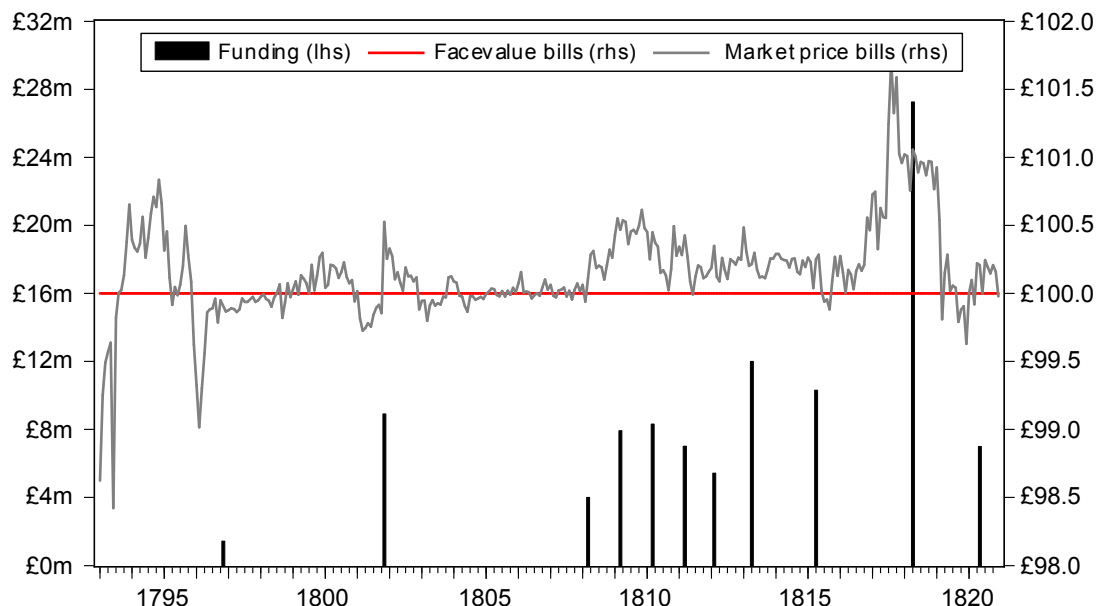


Figure 9: Price of Exchequer Bills in the London Money Market and Funding Operations, 1793-1815

Source: Gentleman's Magazine, authors' calculations.

Funding operations were similar to interest reductions of long-term bonds at 4 or 5%. Holders of convertible bills decided freely whether or not to accept the conversion of the bills into long-term bonds. The Bank stood ready to cash the bills of those holders not willing to convert. Depending on proposed conditions and current market prices, funding operations were more or less successful along two dimensions. For example, in 1815, out of the total of £18 m of fundable Exchequer bills only £10 were funded and created an outstanding debt of £12 m.

For the success of such operations, it was important to keep bill prices up. High market prices made sure that the market value of debt came close to the amount of outstanding debt the tax payer would eventually have to cover. In particular, for £1 of long-term debt created through a conversion, the public could dispose of £0.9. This ratio was of 0.7 for standard issues of long-term debt. Conversions of highly priced bills thus alleviated future tax liabilities by minimizing the stock of outstanding debt. By keeping up prices, the Bank's holdings of bills were advantageous also along this dimension.

3.4 The Fourth Regime (1815-1821): “Exit” and Resumption of the Gold Standard

Waterloo brought a definitive end to the French Wars. Government expenditures dropped immediately. During this exit phase after the war years, three issues dominated policy debates: the budget surplus, the conversion of the debt to a lower interest rate, and the resumption of the gold standard.

The income tax, which had been a war tax, was abolished in 1816, but the level of taxation remained high after Waterloo. As military expenditures collapsed from 20 to 5 percent of GDP, the primary surplus jumped to 10 percent (Figure 3). Important conversions of short into long-term and of high into low-interest rate debt were undertaken in 1818, 1819, 1822 and 1824. These operations were necessary if the debt was to be reimbursed.

Resuming the convertibility of the pound required a return to the pre-war conditions, the readjustment of the Bank’s balance sheet and a decrease in the price level. The restoration of the pre-war price level required deflation and raised issues of political economy that we will address in the next section. The Bank’s directors insisted that a resumption was possible only if the government reimbursed a substantial amount of debt to the Bank.²⁸

Table 4 shows the evolution in the Bank’s balance sheet between 1797 and 1819, when Parliament decided to resume the gold standard at the pre-war parity.²⁹ Overall, the balance sheet increased by 34.5 percent—this number abstracts from the growth of the economy over the period. The expansion of the balance sheet was solely driven by the Bank’s holdings in Exchequer bills, which were also the counterpart to its circulation of notes.

For the Bank, the exit strategy, to use a modern term, was the restoration of a balance sheet that was similar to the one before the suspension. When the gold standard was fully restored on 1 May 1821, the Bank’s balance sheet was back to its pre-suspension level (Table 5).³⁰ The Bank’s bullion reserve had rarely been higher. In order, to

²⁸Report from the Secret Committee on the Expediency of the Bank Resuming Cash Payments of 1819.

²⁹Evolutions hardly change when using 1793, the beginning of the French Wars, as a base year.

³⁰The definite resumption of specie payments (59 Geo. III, c. 76) was enacted 2 July 1819. It stipulated that the Bank was to gradually resume payments, by exchanging its notes against ever higher amounts of specie between 1 February 1820 and 1 May 1823. Discretion was left to the Bank to accelerate resumption, granted that any increase in the pound’s gold content was irreversible. The plan for resumption was credible in the eyes of contemporaries. Upon the first announcements in May 1819, Bank stock and gold prices reacted immediately, suffering sizable declines in value; the pound’s

Table 4: Bank of England Balance Sheet, 1797-1819 change in percent, scaled*

Liabilities		Assets	
Circulation	85.0	Public Securities	78.1
Deposits	-23.3	Private Securities	-19.5
Net gains	-11.9	Bullion	14.7
Total	34.5	Total	34.5

**The balance sheet items were divided by 1.31 which is the growth multiplier of real GDP between 1797 and 1819, based on Broadberry et al. 2012.*

rebuild its stock in view of resuming convertibility, the Bank had been buying gold at a loss (Clapham 1944). Private securities, coming from the Bank's discounting business, were reduced as well. Eventually, the Bank was repaid £10 million, or 55 percent of government short-term debt held on its balance sheet.³¹

Table 5: Bank of England Balance Sheet, 1797-1821 change in percent, scaled*

Liabilities		Assets	
Circulation	32.0	Public Securities	-3.7
Deposits	-43.8	Private Securities	-68.1
Net gains	-38.6	Bullion	177.2
Total	-3.8	Total	-3.8

**The balance sheet items were divided by 1.61 which is the growth multiplier of real GDP between 1797 and 1821, based on Broadberry et al. 2012.*

4 The Political Economy in the Exit Strategy

Restoring the gold standard at the pre-war parity would require deflation to bring the price level, including the price of gold, back to around the same value as before the war. Given the political and economic costs of reversing the war stimulus, the resumption was surrounded by an important degree of uncertainty (Acworth 1925, Kindleberger 2000, p.351).

The intense debates prefigured those after World War I, in which Keynes took a famous position. On one side, the Birmingham School of currency reformers, including Thomas Atwood, considered that the deflation caused by the return to the old parity was the

exchange rate on Paris appreciated (Antipa 2016).

³¹59 Geo. III, c. 76.

cause of England’s economic difficulties and of the successive crises, which shook its social and political structure at that time (Atwood 1816). Thus, they advocated paper money—or at least a reduction in the metallic content of the pound—and an important increase in the Bank’s note circulation (Checkland 1948, Fetter 1965). Contemporaries indeed considered the possibility of never resuming cash payments, as uttered by Bank proprietors when the suspension of convertibility was reiterated for the first time after hostilities had ceased in the spring of 1816 (*London Times* 13 April 1816).

David Ricardo and many contemporaries, on the other hand, posited that a reduction of the note circulation was necessary to return to the pre-war parity. Figure 10 presents the evolution of the Bank’s note circulation and prices. Between 1797 and 1810, prices did not increase nearly as much as notes in circulation and some of this growth may have been caused by real shocks. In particular, prices in the agricultural sector, which was in this early stage of the industrial revolution the main part of production, were subject to sudden spikes after poor crops, as for example in 1800-1801.³² These variations had an impact on the prices in other sectors of the economy, as manifest in the high correlation between agricultural, services and aggregate price indices, shown in Table 6. Prices increases could also have been triggered by war shortages.

The low level of prices compared to the amount of Bank notes outstanding reflects the Real Bills effect well. The Bank’s notes were the counterpart to real assets, the goods and services produced in the private sector or the taxes collected by the government. Prices only increased permanently when fiscal prospects and therefore the notes’ backing deteriorated as war-related spending increased after 1808.³³ In addition, the decrease in prices gained momentum with the end of war-related expenditures and well before note circulation declined. Price stability was achieved in line with fiscal sustainability (Rist 1938, Sargent 1982).

Table 6: Correlations between Agricultural and Other Price Indices, 1790-1830

	Agriculture	Industry	Services	GDP deflator
Agriculture	1	0.58	0.87	0.94
Industry	-	1	0.47	0.77
Services	-	-	1	0.90
GDP deflator	-	-	-	1

The post-war recession contributed to the deflation after 1815. Numerous public manifestations of economic and social discontent were rendered illegal by a number of legisla-

³²Henry Thornton, member of the Bullion Committee and driving force behind the report’s theoretical analysis, argued that the 1801-02 price spike was caused by real disturbances (Thornton 1802, pp.214ff.)

³³Hansard HC Deb 7 May 1811 vol. 19 cc927.

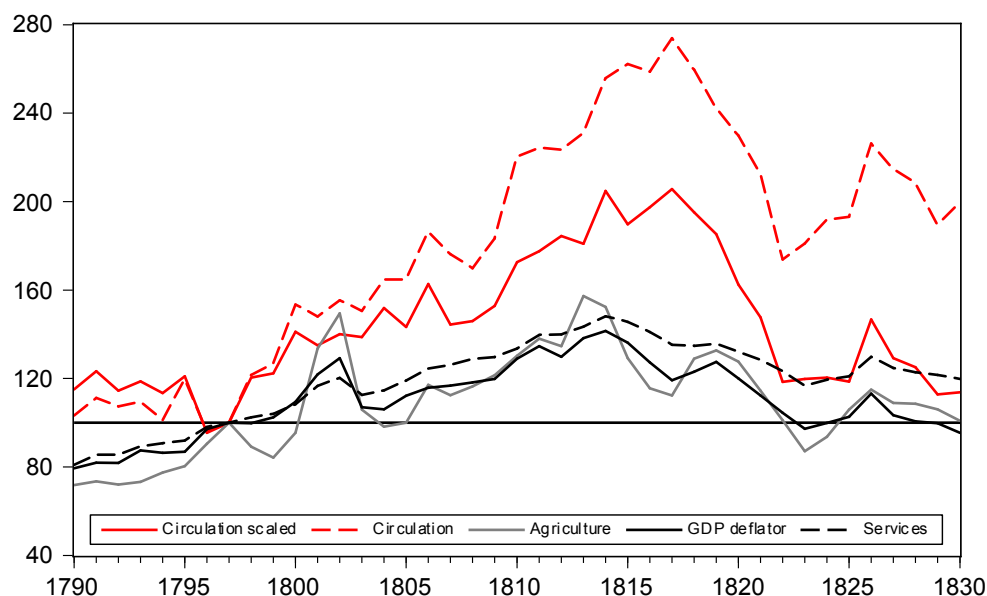


Figure 10: Price indices and the Bank's note circulation, 1797=100, 1790-1830

The Bank's note circulation was deflated by the real GDP growth rate. Source: Broadberry et al. 2012, Mitchell 1988.

tive actions. Trade unions and collective bargaining were banned from the public space. Other safeguards of individual freedom against arbitrary state action were curbed.³⁴ Following the “Peterloo Massacre”—a demonstration for universal suffrage in August 1819 that cost the life of 15 people—the British government acted to prevent any future disturbances by introducing the so-called Six Acts. The acts were aimed at censoring radical newspapers, preventing large meetings, and reducing what the government saw as the possibility of armed insurrection. Crafts (1998), characterizes the period between the French Revolution and the late 1820 as one of severe repression.

The franchise had not yet been extended and the electoral system provided no representation of the citizens of low income who were most affected. The right to vote in Parliamentary elections or to become a member of parliament was linked to property rights. Only the affluent qualified and registered voters over the period under consider-

³⁴The Combination Acts of 1799 and 1800 made trade unions and collective bargaining illegal and were commonly attributed to the fear that the French revolutionary ideas would spread among the working class. *Habeas Corpus* the principle that requires that a person under arrest be brought into court in order to safeguard prisoners against unlawful detentions was suspended several times over the period. In 1793 (34 Geo. III, c. 54), in 1798 (38 Geo. III, c. 36), 1799 (39 Geo. III, c. 15 and 39 Geo. III, c. 44), and in 1817 (57 Geo. III, c. 3).

ation amounted to 1.5% of the total population.

Denominations of public debt certificates were large enough to guarantee a large intersection between creditors of public debt on the one hand, and members of parliament and registered voters on the other hand (Johnston 2013).³⁵ Since deflation increased the real value of debt to the advantage of creditors, support for reimbursement of public debt at the old par was strong amongst registered voters and members of parliament.

There were, however, doubts in the market regarding the resumption of the convertibility. These expectations can be measured by two prices, the external exchange rate of the pound and its internal exchange rate into gold, the *agio*. The external exchange rate was based on the price for bills of exchange. The latter were payment instruments that circumvented bullion shipments by taking advantage of offsetting balances that international merchants accumulated with each other (Neal 1990, p. 5f).

These important commercial and financial networks and instruments were essential for British war finance. The Exchequer purchased bills of exchange from London merchants, drawn on their foreign correspondents. British military officials used these bills abroad to hire troops and purchase supplies. Continental merchant readily accepted the bills, as they could in turn be used to pay for British imports. Napoleon sought to undermine British war finance and the acceptance of bills of exchange by making it difficult to import British goods (Neal 1990, pp. 201ff).

The price of bills of exchange therefore reflected political and military events that, among other things, affected British export markets on the Continent. The price of bills also incorporated contemporaries' expectations, as we consider the 2.5 months usance rate on Hamburg—the only series available for the entire period of the French Wars. As shown in Figure 11, the exchange rate fluctuated around 34 schillings (Flemish banco) per pound until the end of 1808. The poor harvests in 1800/01 did, for example, not affect the exchange rate durably. Afterwards, the pound devalued progressively in line with important expenditures in the Peninsular War and the continued war-related expenditures and subsidies to Britain's allies elsewhere on the Continent (Silberling 1924).

The *agio* in Figure 11, was computed as the difference between the pound's official exchange rate into gold—the mint price—and its market exchange or spot rate. The mint

³⁵Consols and Exchequer bills were not issued for sums under £100. In 1819, yearly average salaries ranged from £39 for farm laborers to £219 for highly paid government officials (Lindert and Williamson 1983)

price carried the promise that pounds would be exchanged against gold at the pre-war parity at some unknown moment in the future, conditional on the conclusion of a definite peace treaty. Differences between the two reflected a discount factor that differentiated the value of a paper pound at time t from its expected gold content in the future. The discount factor captured how risky and, by extension, how credible the promise of resuming the gold standard at its pre-war parity was in the eyes of contemporaries (Antipa 2016).

For the years when the pound was discounted in London while not sustained by the convertibility in the Bank of England, there was a remarkable concordance between the two prices. As for the exchange rate, the *agio* increased substantially beginning in 1809, indicating the internal devaluation of the paper pound. The pound's internal devaluation was further exacerbated by the advent of unfavorable war-related news, as these made British victory seem less probable and devaluation—rather than resumption at the pre-war parity—more likely. Conversely, favorable news caused the pound's purchasing power to increase (Antipa 2016). An investor who bought pounds against gold in 1814 and resold a few years later would make a handsome profit.

5 Conclusion

The outcome of the French Wars established Britain against all odds as the unrivaled world power for the century to come. Its system of public finance enabled Britain to mobilize resources on an unprecedented scale. The system's backbone consisted in the country's effective fiscal capacity: overall, 60 percent of the extra cost incurred by the wars would be covered by tax revenues (Brewer 1988, O'Brien 1988).

As events unfolded during the 22 years of warfare, policy makers were able to effectively adjust the monetary and fiscal policy mix. Major monetary and fiscal policy innovations—the suspension of the gold standard and the instauration of Britain's first income tax—were implemented, whenever necessary in the costly pursuit of warfare. Policy regimes changed to grant their consistency given the realizations of random events. This signaled the government's commitment to undertake to necessary to win the war, without jeopardizing fiscal sustainability.

In particular, after war-finance had taken its usual form—tax smoothing through debt financing—the first regime change in 1797 meant the suspension of the gold standard, a Real Bills policy of the Bank of England, and primary surpluses thanks to the income tax. For the final and decisive surge in expenditures (1812-1815), fiscal policy went back

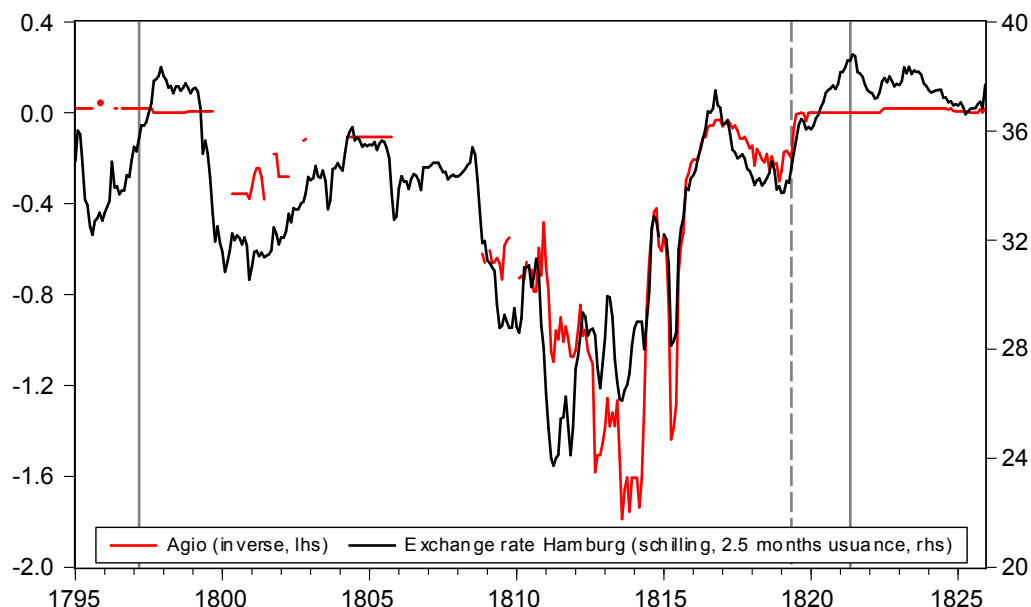


Figure 11: Market prices

The solid lines mark the suspension and resumption of the gold standard, in February 1797 and May 1821, respectively. The dashed line coincides with the announcement that the gold standard would be resumed in May 1819. Source: Boyer-Xambeu et al., 1994, authors' calculation.

to deficit financing and the Bank purchased government liabilities on a large scale.

During this second war-time regime, the Bank's balance sheet increased substantially, but its composition may have mattered more than its growth. To resume the gold standard, the Bank needed to restore a balance sheet that was similar to the one before the suspension. As the counterpart to note circulation were the Bank's holdings of public securities, the success of resuming the gold standard hinged on the Treasury's will to reimburse the Bank.

The successful return to convertibility and the pre-war price level came in 1821. The Bank did not bring down its circulation to the 1797 level to resume the gold standard. It had, however, been reimbursed the larger part of government short-term debt held on its balance sheet. In line with what proponents of the Real Bills doctrine pointed out, prices evolved with the fiscal backing of the Bank's notes.

The exit from inflationary war finance and debt accumulation also consisted in convert-

ing short-term bills into long-term bonds and then in reducing the interest rate on the latter. Exit was further helped by the collapse in military expenditures—accounting for 2/3 of Britain’s budget—that brought about important primary surpluses.

Reversing the war stimulus came, however, with high economic and social costs. The rate of unemployment increased from 5 to 17 percent in the post-war depression of 1816 (Feinstein 1998). The costs of returning to the gold standard remained largely unaccounted for since public manifestations of social discontent were rendered illegal and the electoral system of the time entailed an under-representation of the citizens most affected.

The mistakenly perceived ease with which the resumption was undertaken in 1821 shaped British monetary orthodoxy and the global financial system for the century to follow (Fetter 1965). It also ushered in the gold standard’s second resumption after WWI, an event that prolonged and aggravated the Great Depression (Kindleberger 1984, Bernanke 1995, Eichengreen and Temin 2000).

The social and economic costs that accompanied reversing the war stimulus had not changed between the first and second resumption of the gold standard. Rather, the changes in political accountability increased the costs of undoing inflationary war finance (Polanyi 1944, Eichengreen 1995). This is also a relevant lesson for the current policy choice between maintaining a fixed exchange rate and restructuring an outstanding debt overhang, as under discussion in certain member countries of the euro area.

References

- [1] Acworth, Angus W. (1925) *Financial Reconstruction in England 1815-1822*, P.S. King and Son LTD, London.
- [2] Antipa, Pamfili (2016) “How Fiscal Policy Affects the Price Level: Britain’s First Experience with Paper Money” *The Journal of Economic History* Vol. 76, No. 4.
- [3] Ashton, Thomas S. (1959) “On the Determination of the Public Debt”, *Journal of Political Economy*, 87, pp. 940-971.
- [4] Barro, Robert J. (1979). “On the Determination of the Public Debt”, *The Journal of Political Economy*, Vol. 87, No. 5, Part 1., pp. 940-971.
- [5] Barro, Robert J. (1987) “Government Spending, Interest Rates, Prices, and Budget Deficits in the United Kingdom, 1701-1918”, *Journal of Monetary Economics* 20, pp. 221-247.
- [6] Barsky, Robert B. (1987) “The Fisher Hypothesis and the Forecastability and Persistence of Inflation”, *Journal of Monetary Economics* 19, pp. 3-24.
- [7] Bernanke, Ben (1995) “The Macroeconomics of the Great Depression: A Comparative Approach”, *Journal of Money, Credit and Banking*, Vol. 27(1), pp.1-28.
- [8] Bordo, Michael D. and Eugene N. White (1991) “A Tale of Two Currencies: British and French Finance During the Napoleonic Wars”, *The Journal of Economic History* 51(2), pp. 303-316.
- [9] Boyer-Xambeu, Marie-Thérèse, Lucien Gillard and Ghislain Deleplace (1994) “Régimes monétaires, points d’or et serpent bimétallique de 1770 à 1870”, *Revue Économique* 45(5), pp. 1139-1174.
- [10] Brewer, John (1988) *The Sinews of Power*, Century Hutchinson, London.
- [11] Broadberry, S., B. Campbell, A. Klein, M. Overton, and B. Leeuwen (2012) “British Economic Growth, 1270-1870: An Output-based Approach”, mimeo.
- [12] Buffinton, Arthur H. (1920) “The Second Hundred Years’ War, 1689-1815”. New York: Henry Holt and Company, 1929.
- [13] Calomiris, Charles, W. and Stephen H. Haber (2014) *Fragile by Design*, Princeton University Press.
- [14] Cannan, Edwin (1919) *The Paper Pound of 1797-1821*, The Bullion Report 8th June 1810, New York, Kelley Reprints, 1969.

- [15] Chamley, Christophe (1985) "Efficient Taxation in a Stylized Model of Intertemporal General Equilibrium", *International Economic Review*, vol. 26, No2, 451-68.
- [16] Chamley, Christophe (2011) "Interest Reductions in the Politico-Financial Nexus of Eighteenth-Century England", *The Journal of Economic History*, 71(3), pp. 555-589.
- [17] Chamley, Christophe and Herakles M. Polemarchakis (1984) "General Equilibrium Assets and the Neutrality of Money", *Review of Economics Studies*, 51, pp. 129-138.
- [18] Clapham, John (1944) *The Bank of England*, Cambridge University Press, Cambridge.
- [19] Cooper, Richard (1982) "William Pitt, Taxation, and the Needs of War", *Journal of British Studies*, Vol. 22, No. 1 (Autumn, 1982), pp. 94-103.
- [20] Coppieters, Emmanuel (1955) *English Bank Note Circulation, 1694-1954*, The Hague.
- [21] Crafts, Nicolas (1997) "Some Dimensions of the "Quality of Life" during the British Industrial Revolution", *Economic History Review*, Vol. 50 (4), pp. 617-39.
- [22] Crouzet, François (1964) "Wars, Blockade, and Economic Change in Europe, 1792-1815", *The Journal of Economic History*, 24(4), pp. 567-588.
- [23] Daunton, Martin (2001) *Trusting Leviathan: the Politics of Taxation in Britain*, Cambridge University Press.
- [24] Dickson, Peter, G. (1967) *The Financial Revolution in England*, Macmillan, London.
- [25] Duffy, Ian P.H. (1981) "The Discount Policy of the Bank of England during the Suspension of Cash Payments, 1797-1821", *The Economic History Review*, 35(1), pp.67-82.
- [26] Eichengreen, Barry (1995) *Golden Fetters*, Oxford University Press, New York.
- [27] Eichengreen, Barry and Peter Temin (2000) "The Gold Standard and the Great Depression", *Contemporary European History* Vol. 9, pp. 183-207.
- [28] Ekelund, Robert, B and Mark Thornton (1992) "The Union Blockade and Demoralization of the South: Relative Prices in the Confederacy", *Social Science Quarterly*, 73(4), pp. 890-902.

- [29] Esteban, Javier Cuenca (2003) “The British balance of payments, 1772-1820: India transfers and war finance,” *The Economic History Review*, **54**, 1, 58-86.
- [30] Feinstein, Charles H. (1972) *National Income, Expenditure and Output of the United Kingdom, 1855-1965*, Cambridge University Press, Cambridge.
- [31] Feinstein, Charles H. (1998) “Pessimism Perpetuated: Real Wages and the Standard of Living in Britain during and after the Industrial Revolution”, *The Journal of Economic History*, Vol. 58(3), pp. 625-658.
- [32] Ferguson, Neal, Andreas Schaab, and Moritz Schularick (2014) “Central Bank Balance Sheets: Expansion and Reduction since 1900”, mimeo (ECB Forum on central banking, Sintra, May 2014).
- [33] Fetter, Frank W. (1942). “The Bullion Report Reexamined”, *The Quarterly Journal of Economics*, Vol. 56(4), pp.655-665.
- [34] Fetter, Frank W. (1959) “The Politics of the Bullion Report”, *Economica*, 102, 99-120.
- [35] Fetter, Frank W. (1965) *Development of British Monetary Orthodoxy 1797-1875*, Harvard University Press.
- [36] Frankel, Jeffrey, A. (1982) “The 1807-1809 Embargo against Great Britain”, *The Journal of Economic History*, 42(2), pp. 291-308.
- [37] *The Gentleman’s Magazine*, various issues since 1737.
- [38] Grellier, J. J. (1812). *The Terms of All the Loans Which Have Been Raised for the Public Service*, 3rd ed., London.
- [39] Grellier, J. J. (1810). *A History of the National Debt*, London.
- [40] Harley, Charles K. (1976). “Goschen’s Conversion of the National Debt and the Yield on Consols”, *Economic History Review* 29, no. 1, p. 101-06.
- [41] Hodrick, Robert and Edward Prescott (1997) “Postwar U.S. Business Cycles: An Empirical Investigation”, *Journal of Money, Credit and Banking*, 29, pp. 1-16.
- [42] Johnston, Neil (2013) “The History of Parliamentary Franchise”, *Commons Library Research Paper* 13/14.
- [43] Kindleberger, Charles P. (1984) *A Financial History of Western Europe*, Routledge, London.

- [44] Kindleberger, Charles P. (2000) “British Financial Reconstruction, 1815-1822 and 1918-1925”, in *Comparative Political Economy*, The MIT Press, Cambridge, Massachusetts.
- [45] Lucas, Robert (1980) “Two Illustrations of the Quantity Theory of Money”, *American Economic Review* 70, pp. 1005-14.
- [46] Mankiw, N. Gregory (1987) “The Optimal Collection of Seigniorage-Theory and Evidence”, *Journal of Monetary Economics*, 20, pp. 327-41.
- [47] Michie, Ranald C. (2001) *The London Stock Exchange: A History*, Oxford University Press.
- [48] Mitchell, Brian R. (1988) *British Historical Statistics* Cambridge University Press, Cambridge.
- [49] Neal, Larry (1991) “A Tale of Two Revolutions, International Capital Flows, 1789-1819”, *Bulletin of Economic Research*, 43(1), pp. 307-37.
- [50] Neal, Larry (1998) “The Financial Crisis of 1825 and the Restructuring of the British Financial System”, *Federal Reserve Bank of Saint Louis Review*.
- [51] North, Douglas C. and Barry R. Weingast (1989) “Constitutions and Commitment: the Evolution of Institutions Governing Public Choice in Seventeenth Century England”, *The Journal of Economic History*, 49(4), pp. 803-832.
- [52] Nye, John V.C. (2007) *War, Wine, and Taxes: The Political Economy of Anglo-French Trade 1689-1900*, Princeton NJ: Princeton University Press.
- [53] O’Brien, Patrick K. (1988) “The Political Economy of British Taxation, 1660-1815”, *The Economic History Review*, 41(1), pp. 1-32.
- [54] O’Brien, Patrick K. (2006) “Mercantilist Institutions for the Pursuit of Power with Profit. The Management of Britain’s National Debt, 1756-1815”, *London School of Economics and Political Science Working Paper* No. 96/06.
- [55] Polanyi, Karl (1944) *The Great Transformation*, Farrar and Rinehart, New York.
- [56] Reis, Ricardo (2013) “The Mystique Surrounding the Central Bank’s Balance Sheet, Applied to the European Crisis”, *American Economic Review: Papers and Proceedings*, 103(3).
- [57] Rist, Charles (1938) *History of Monetary and Credit Theory* Augustus M. Kelley Publishers, New York.

- [58] Sargent, Thomas, J. (1982) “The Ends of Four Big Inflations” NBER Chapters, in: *Inflation: Causes and Effects*, pages 41-98 National Bureau of Economic Research, Inc.
- [59] Sargent, Thomas, J. and François R. Velde (1995) “Macroeconomic Features of the French Revolution”, *Journal of Political Economy*, 103, 3, 474-518.
- [60] Sargent, Thomas, J. and Paolo Surico (2011) “Two Illustrations of the Quantity Theory of Money: Breakdowns and Revivals”, *American Economic Review* Vol. 101(1), pp. 109-128.
- [61] Sargent, Thomas, J. and Neil Wallace (1982) “The Real-Bills Doctrine versus the Quantity Theory: A Reconsideration”, *Journal of Political Economy*, 90, no 6, pp. 1212-1236.
- [62] Shin, Hiroki (2015) “Paper Money, the Nation, and the Suspension of Cash Payments in 1797”, *The Historical Journal*, 58, no 2, pp. 415-442.
- [63] Silberling, Norman J. (1924) “Financial and Monetary Policy of Great Britain During the Napoleonic Wars”, *The Quarterly Journal of Economics*, Vol. 38, No3, 397-439.
- [64] Stasavage, David (2007) “Partisan Politics and Public Debt: The Importance of the “Whig Supremacy” for Britain’s Financial Revolution”, *European Review of Economic History*, 11, pp. 123-153.
- [65] Sussman, Nathan and Yishay Yafeh (2006), “Institutional Reforms, Financial Development and Sovereign Debt: Britain 1690-1790”, *Journal of Economic History*, 66(4), pp. 906-935.
- [66] Thornton, Henry (1802) *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*, Rinehart and Company, Inc., New York.
- [67] Tooke, Thomas (1824) *Thoughts and Details on the High and Low Prices of the Last Thirty Years*, 2nd edition, John Murray, London.
- [68] Wallace, Neal (1981) “A Modigliani-Miller Theorem of Open-Market Operations”, *The American Economic Review*, 71, 267-274.
- [69] Williamson, Jeffrey G. (1984) “Why Was British Growth So Slow During the Industrial Revolution?”, *The Journal of Economic History*, 44(3), pp. 687-712.

6 Appendix

Figures and Tables

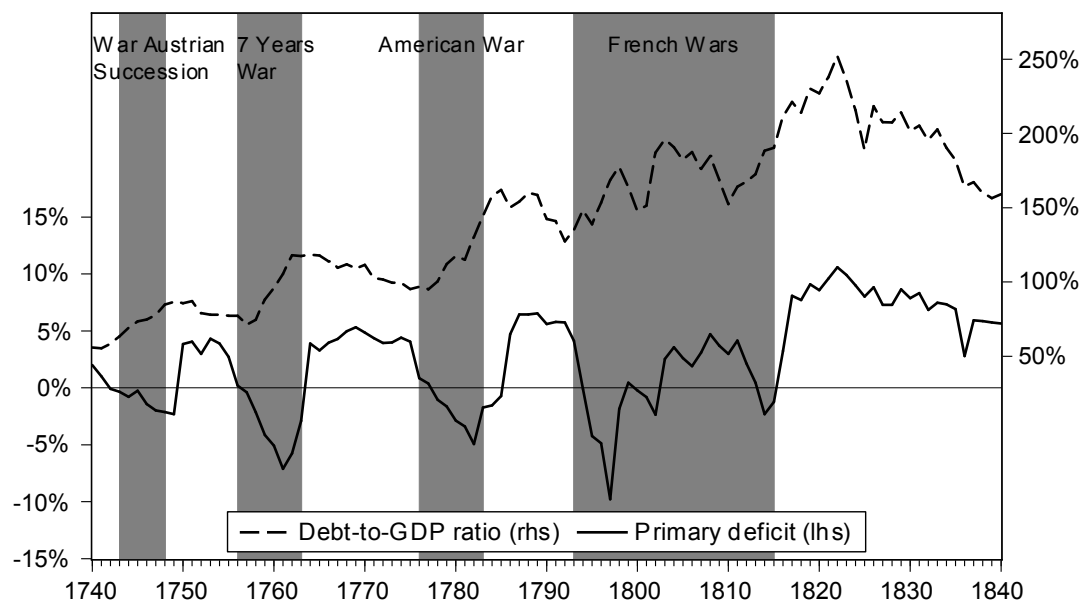


Figure 12: Evolutions in the debt-to-GDP ratio and the primary deficit/surplus, 1740 to 1840

Sources: Mitchel 1988, Broadberry et al. 2012.

Table 7: Primary Deficit and Real GDP Growth, 1740-1840

	Primary deficit	Real GDP growth
Mean	2.57	1.46
Maximum	10.59	10.86
Minimum	-9.78	-5.36
Standard Deviation	4.31	3.24
Observations	101	101

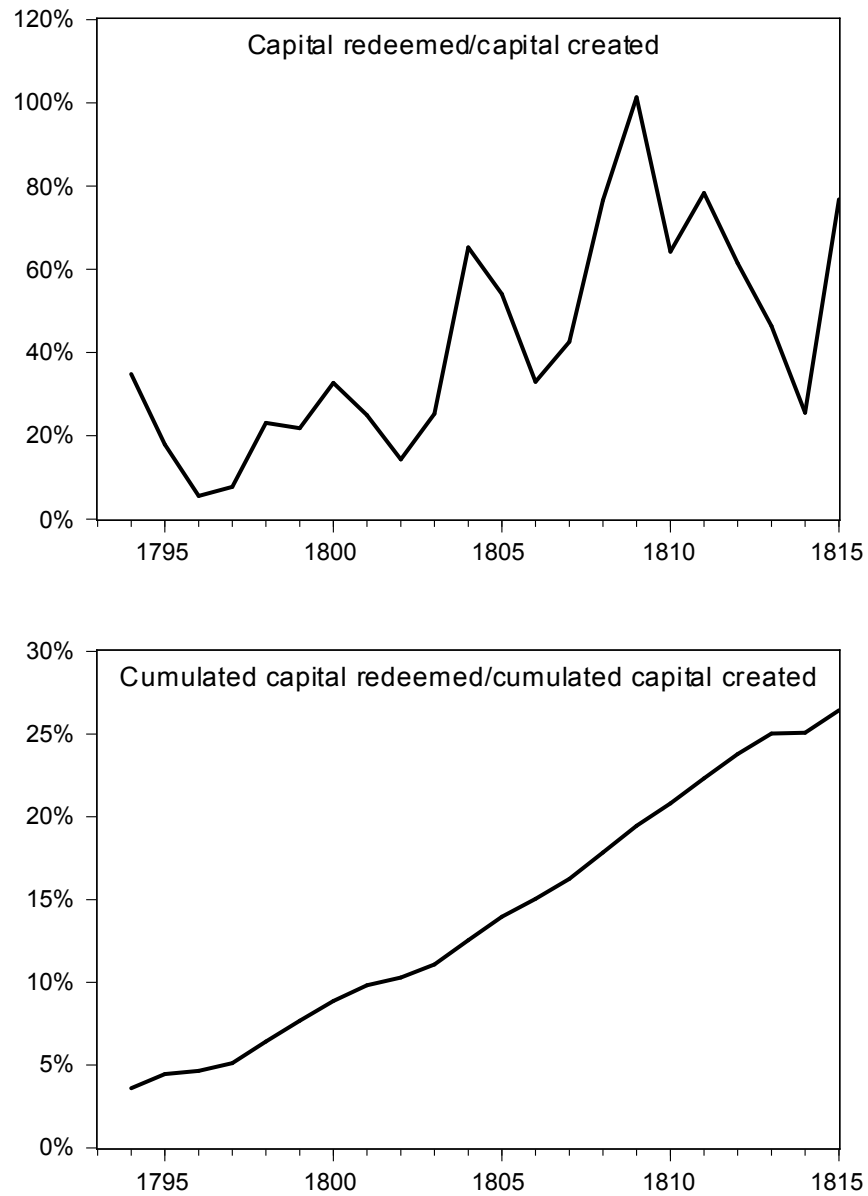


Figure 13: The Sinking Fund, 1793-1815

Source: Report by the Secretary and Comptroller General of the Proceedings of the Commissioners for the Reduction of the National Debt, 1891.

The Bills described as issued, are those passing directly to the Bank from the Exchequer, under special Contracts or Agreements with the Treasury; as the annual Malt Bills, and the Bills under the Acts of 44 Geo. 3. cap. 46., 46 Geo. 3. cap. 41. &c.

The Bills purchased, are those which are bought by the Bank in the public Market, or of the Government Broker. The Bank seldom, if ever, buy Securities, of any Description, at a Premium; and therefore they have not, of late years, made any considerable Purchases of Exchequer Bills in the Market, as those Bills have generally been kept at a Premium, to prevent the Embarrassment which might ensue from their being paid into the Exchequer for Revenue; but the Bank take the Bills they hold of the Government Broker, and they in no Instance credit any Premium, or deduct any Discount, upon the Bills so taken; but they never resell in the Market any Bills which they purchase from the Government Broker.

When it has been absolutely necessary to raise Money upon Exchequer Bills, for carrying on the Public Service, and when they cannot be sold in the Market at a Premium, the Chancellor of the Exchequer has generally applied to the Bank to purchase Bills, from

Figure 14: The Bank's Proceedings in the Market for Exchequer Bills

Source: Second Report from the Secret Committee on the Expediency of the Bank Resuming Cash Payments, 1819

Table 8: Loans Issued by Public Subscriptions, 1793-1798

Date	Amount £m	Instruments	Yield*	Price**	for £100
1793	4.5	3%	3.44	87.09	139 in 3%
1794	11	3%, 4%, 66.25 year ann.	4.26	70.50	£100 in 3%, £25 in 4%, £0.57 in 66.25 year ann.
1795	18	3%, 4%, 65.25 year ann.	4.82	62.29	£100 in 3%, £33.3 in 4%, £0.43 in 66.25 year ann.
1796	18	3%, 3% red., 64.25 year ann.	4.39	68.32	£120 in 3%, £25 in 3% red., £0.33 in 64.25 year ann.
	7.5	3%, 3% red., 63.75 year ann.	4.38	68.47	£120 in 3%, £25 in 3% red., £0.28 in 63.75 year ann.
1797	18	3%, 3% red., 64.25 year ann.	5.30	56.59	£125 in 3% or £112.5 in 5%
	14.5	3%, 3% red., 4%, 64.25 year ann.	5.93	50.63	£125 in 3%, £50 in 3% red., £20 in 4%, £0.33 in 62.75 year ann.
1798	17	3%, 3% red.	6.00	50.00	£125 in 3%, £50 in 3% red.

* Yield equals the coupon of the 3% consols divided by their market price.

* Average price of consols for the month before terms of loan are fixed

Source: Parliamentary Papers (BPP, 1898), Grellier (1810, 1812), authors' calculations.