8 British and French finance during the Napoleonic Wars

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The Napoleonic Wars offer an experiment unique in the history of wartime finance. While Britain was forced off the gold standard and endured a sustained inflation, France remained on a bimetallic standard for the war's duration. For wars of comparable length and intensity in the nineteenth and twentieth centuries, Napoleonic war finance stands out. As Friedman (1990) pointed out, the French experience is a puzzle. Under the *ancien régime* and the revolutionary governments, France's credit was far inferior to Great Britain's; yet, in the years of bitter struggle after 1796, it was the British who used inflationary finance, not the French.

This apparent paradox may be explained by drawing upon the new literatures on tax smoothing, time consistency, and credibility in macroeconomics. Before the Revolution, French fiscal policy strongly resembled the British practice where large temporary increases in wartime expenditures were paid for by increased borrowing, leaving taxes relatively unchanged.[1] This was a relatively efficient strategy for war finance, but its success hinged critically on the credibility of the government to repay its accumulated and enlarged debt after the war. If the government was perceived by the public to be pursuing a time inconsistent policy, that is, a policy likely to produce default once the debt is acquired, this avenue of war finance would have been closed.[2] The French monarchy was not as credible a borrower as the British parliament and consequently was forced to borrow at higher interest rates for the same program of war finance.

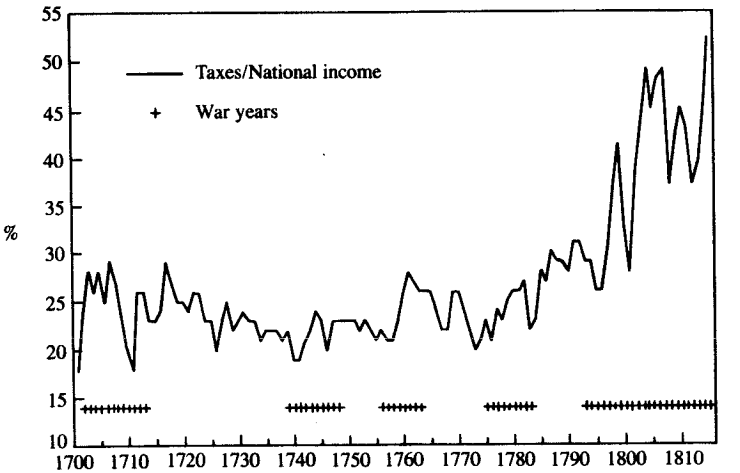
Nevertheless, the French were much better creditors than traditionally perceived by historians, and it was only the failure of the *ancien régime* to return to a policy of peacetime balanced budgets after the American War for Independence that brought on the fiscal crisis that led to the Revolution (White, 1989). The revolutionaries frequently and publicly announced their commitment to honor the national debt. In the process of economic reform, they issued paper money, the *assignats*, to cover current deficits and retire the short-term debt. The public willingly held the *assignats* because they regarded the government's promise to redeem the paper money and reorga-

nize the nation's finances as credible. However, the continued decline in tax revenues and increases in expenditures forced the government to issue more money. The resulting hyperinflation ruined what remained of France's financial reputation.

This left the French government with no opportunities to borrow or use inflationary finance. The only means of finance remaining was taxation in France or its conquered territories. In 1797, the government admitted that it could not service the debt and decreed a reduction in the value of the outstanding debt by two-thirds. After this hurdle, the government began the slow and painful process of re-establishing its credibility by deed and by creating institutions signaling its good intentions. In 1800, the new government under Napoleon resumed interest payments on the debt in specie and established the Banque de France and a Sinking Fund. By bringing the budget into balance, paying interest, and retiring the long-term debt, Napoleon was able to bring yields on the government debt down and engage in some very limited borrowing.

Across the channel, at the same time as France was returning to specie convertibility, the Bank of England was forced to suspend convertibility in February 1797. The suspension, initially supposed to end in June 1797, lasted until 1821. Thus, Britain gave the appearance of traveling down the same dangerous road that France had almost a decade before. However, although it was freed from the gold standard constraint, Britain financed most of its expenditures by taxation and borrowing, with a limited use of inconvertible paper. Although there was a modest wartime inflation, Britain managed to ensure that its promise of resumption remained credible. The British government's commitment was credible because, unlike France, its tax system did not collapse and indeed taxes were raised substantially. Moreover, operation of the Sinking Fund of 1786 throughout the war served as a further signal of the government's intention of ultimate redemption. Belief that ultimate budget balance would be restored meant that money creation, like borrowing, was a temporary measure. Hence the British public did not, as in the French case from 1794 to 1796, sharply reduce their holdings of real cash balances and erode the inflation tax base. Britain was thus able to follow a flexible program of war finance.

A tarnished reputation did not allow Napoleon to follow a similar policy. Lacking strong credibility, he was forced to keep the franc convertible. Borrowing was limited and the French were pressed to cover the extra wartime expenditures by raising domestic taxes and imposing heavy levies on the rest of the Empire. The apparent puzzle of French war finance is resolved with a twist: it was the nation's weakness as a borrower, not its strength, that kept it on a specie standard.



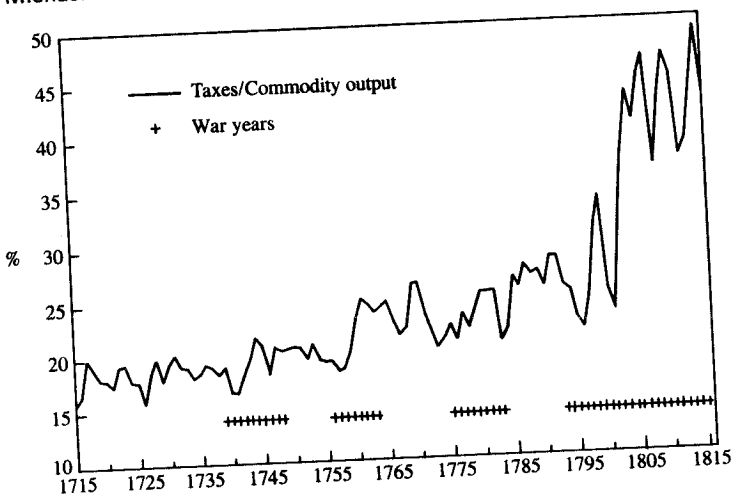
Sources: Gayer, Rostow and Schwartz (1953); Mitchell and Deane (1982); Mathias and O'Brien (1976)

8.1 Great Britain, tax receipts as a percentage of commodity output

Avant la révolution: British and French fiscal policy before 1789

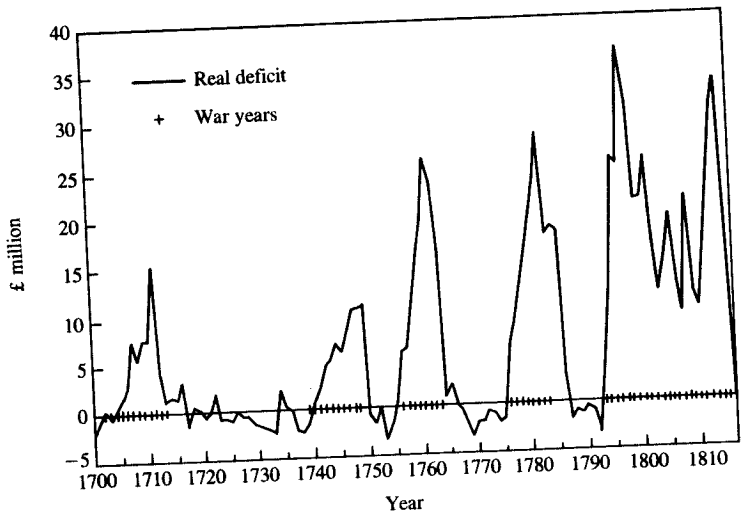
Although the eighteenth century French monarchy has traditionally been regarded as an unworthy debtor, French fiscal policy resembled the British practice of keeping the level of aggregate taxation relatively smooth while borrowing to finance wars. Although neither nation started the century auspiciously, the British gradually built a reputation as a superior creditor.

Britain's movement towards tax smoothing – financing of wartime expenditures by borrowing and then servicing and amortizing the debt by taxation in peacetime – began after the Glorious Revolution of 1688. This political victory for parliamentary government led to improvements in tax collection and administration and the development of more modern capital markets (Dickson, 1967; Brewer, 1989). By the War of the Spanish Succession (1702–13), Britain's new fiscal program was in place. Taxes as a percentage of national income in figure 8.1 and as a percentage of commodity output in figure 8.2 did not rise substantially in wartime periods until the very end of the eighteenth century. Holding taxes relatively stable, the boom in wartime spending produced very large deficits, as seen in figure 8.3. These deficits accounted for a very substantial fraction of national income, as indicated in figure 8.4.



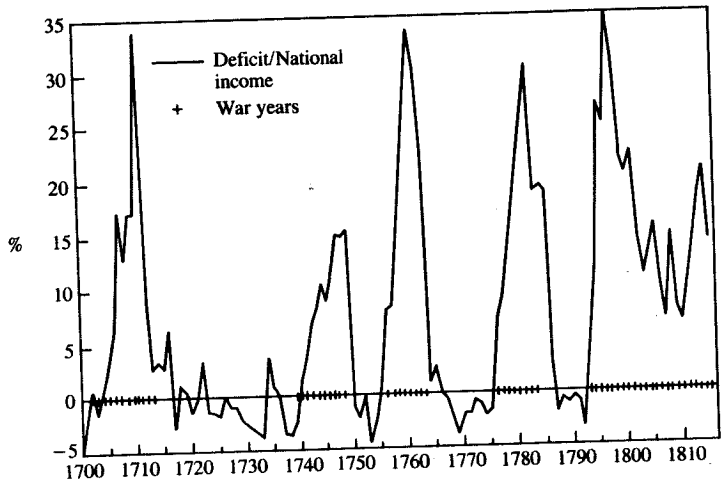
Sources: as figure 8.1

8.2 Great Britain, taxes as a percentage of commodity output



Sources: as figure 8.1

8.3 Great Britain, real deficit (surplus)



Sources: as figure 8.1

8.4 Great Britain, deficit as a percentage of national income

British wartime expenditures were primarily financed by the issue of "unfunded debt," a variety of short-term obligations that included Army, Navy, and Ordnance bills and increasingly Exchequer bills. The "funded debt" or long-term securities were mostly used during and after the war to retire the more costly unfunded debt. The funded debt was secured by specially earmarked indirect taxes. Before 1713, the funded debt consisted of irredeemable annuities issued at high interest rates (up to 14 percent). Afterwards, the government attempted to reduce both the principal and servicing costs of this outstanding debt by establishing a Sinking Fund (to be supplied by budget surpluses) in 1717 and carrying out a number of conversions of the annuities and other irredeemable debt into redeemable perpetuities.

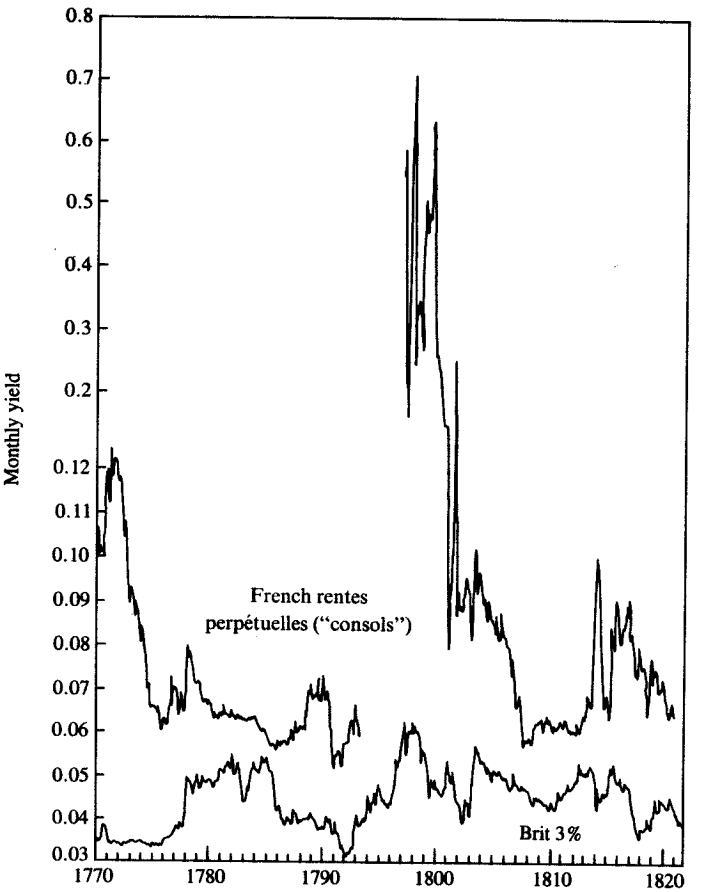
The most famous conversion plan was the South Sea promotion, which allowed annuitants to convert their annuities into South Sea or government stock. Although the operation of this plan produced the South Sea Bubble with considerable losses for the public, it did convert virtually all of the irredeemable debt and reduce the interest bill (Neal, 1990b). While the collapse of the Bubble temporarily discredited the government, it did ensure that public finance would be divorced from narrow political and private interests, improving over the longer term the credibility of government's fiscal and debt-management policies. The capstone on this develop-

ment was the final conversion of most of the redeemable debt from 5 percent to 3 percent consols between 1749 and 1757 (Brewer, 1989, p. 124).

Reduction of the debt and of its servicing costs during periods of peace then allowed the government to resume borrowing in ever larger amounts in the succeeding wars, as may be seen in figure 8.3. The shares of wartime expenditure financed by borrowing increased from 51 percent in the Nine Years War (1689–97) to 81 percent in the American War for Independence (O'Brien, 1988, table 3). However, the rise in debt during the Seven Years War (1756–63) and especially the American War, from £130 milion to £243 million, increased fears of national bankruptcy and crippling levels of peacetime taxation to service the debt. As a consequence in 1786, Pitt, the Chancellor of the Exchequer, re-established the Sinking Fund, which during the seven succeeding years of peace used budget surpluses to reduce the debt. The Sinking Fund was viewed by contemporaries as a way of showing the public that taxes would eventually be reduced and hence could be viewed as an investment in sovereign credibility and future borrowing power.

The monthly yield on the 3 percent consols (Brit 3%) from 1770 to 1821 is depicted in figure 8.5.[3] During the American Revolution and the Napoleonic Wars, the interest rate rose sharply.[4] This pattern is consistent with recent developments in the theory of fiscal policy (Barro, 1989). To marshal scarce resources for the war effort, real interest rates should rise in wartime to reduce both present consumption and leisure in favor of saving and labor effort. The nominal interest rate displayed here should be a good proxy for the real interest rate, since up to 1797, Britain adhered to a specie standard, under which the price level was remarkably stable.[5]

France's national finances at the beginning of the century were not greatly inferior to Britain's. John Law's unsuccessful attempt to reorganize the government's finances ended in 1721 with another massive write-down of the debt (Murphy, 1986). The annual interest payments on the *rentes perpétuelles*, or consols were, for example, cut in half (Riley, 1986). Although the collapse of Law's schemes had allowed the government to write down the debt, the French were unable to follow the British and improve their fiscal management, leaving the state's finances relatively precarious. In 1759, in the midst of the Seven Years War, the Crown was forced to suspend repayment of the capital on a variety of short-term debts (Marion, 1914). The continuing financial crisis after the war eventually led to the partial bankruptcy of 1770 when reimbursement of the capital of maturing securities was again suspended and the interest payments on securities were reduced. After this last crisis, the Crown made a new commitment to fiscal stability. Finance ministers successfully balanced the budget or ran surpluses up to the American war, as shown in the budgets



Sources: Neal (1990a); *Gazette de France*; *Ancien Moniteur*; Courtois (1877)

8.5 Yields of British and French securities, 1770–1820

depicted in figure 8.6. Taxes, as in the British case, were a relatively constant but lower share of output, as seen in figure 8.7.

The first French interest rate in figure 8.5 is the monthly yield on the stock of the Compagnie des Indes, the French East India Company. The series begins in 1770 when the Crown took over the Compagnie des Indes and converted its stock into 5 percent consols. After soaring to well above 10 percent in the wake of the monarchy's partial bankruptcy, the French yields

Table 8.2 *Revenue and expenditure, Great Britain, 1793–1816, million pounds*

	1793	1794	1795	1796	1797	1798	1799	1800	1801
I. Revenue									
(1) Net revenue	18.52	19.33	19.05	19.39	21.48	27.24	32.51	33.10	32.75
(2) Indirect taxes	13.57	14.20	14.79	14.53	16.22	18.58	21.37	20.00	23.39
(2a) Customs duties	3.65	4.35	3.42	3.65	3.94	4.74	7.06	6.78	8.78
(2b) Excise and stamp duties	10.01	9.85	11.37	10.88	12.28	13.84	14.31	13.22	14.61
(3) Direct taxes	2.95	3.03	2.95	3.02	3.36	4.59	8.12	9.60	10.44
(3a) Land and assessed taxes	2.95	3.03	2.95	3.02	3.36	4.59	6.45	5.09	4.64
(3b) Income and property taxes	0.00	0.00	0.00	0.00	0.00	0.00	1.67	4.51	5.80
(4) Other revenue (Post Office, Misc.)	2.00	2.10	1.32	1.84	1.90	4.06	3.02	3.51	2.95
II. Expenditure									
(5) Total net public expenditure	21.82	26.80	38.31	38.25	46.93	49.51	49.76	54.22	58.48
(6) Debt charges	9.15	9.80	10.47	11.60	13.59	16.20	17.09	17.20	19.05
(7) Civil government expenditure	2.34	2.07	2.25	2.52	3.91	4.60	4.79	5.31	5.85
(8) Military expenditure	10.33	14.93	25.59	24.13	29.43	28.71	27.88	31.71	33.58
(9) Deficit	−3.3	−7.47	−19.26	−18.86	−25.45	−22.27	−17.25	−21.12	−25.73
III. Composition of loans									
(10) Total loans	12.44	22.96	32.53	35.58	53.08	37.02	43.57	46.49	59.74
(11) Funded loans	3.92	12.91	18.79	28.58	42.84	22.77	16.35	20.50	36.15
(12) Unfunded loans	8.52	10.05	13.74	6.99	10.24	14.26	27.22	25.99	23.59
(13) Expenditure for loan reduction	8.76	15.91	12.73	14.28	24.64	14.74	29.38	25.52	32.73
(14) Net borrowing	3.68	7.05	19.80	21.30	28.44	22.28	14.19	20.97	27.01

Sources and Notes (by row):

(1)–(4) Gayer, Rostow and Schwartz (1953, Appendix IX, Table 223).

(5)–(8) Gayer, Rostow and Schwartz (1953, Table 226). Row (5) = (6) + (7) + (8). Debt charges are interest on the public debt; civil government includes both civil government and civil list; military expenditure is the sum of Army, Navy and Ordnance.

of reputation. Only taxation at home and abroad were available to the French.

British fiscal strategy, 1793–1815

The war against France was initially financed in the traditional eighteenth century manner; according to O'Brien (1967), 90 percent of wartime expenditures between 1793 and 1798 were covered by borrowing. The massive scale of expenditures led to a virtual doubling of the national debt by 1798. Table 8.2 shows the movements in expenditures and receipts for Great Britain from 1793 to 1816. The Napoleonic Wars required far greater expenditures and thus large deficits for a longer period of time than previous wars, as seen in table 8.2 and in figures 8.3 and 8.4. This increased pressure on government finance resulted in two new developments that

1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816
35.17	37.81	45.07	50.13	54.93	58.74	51.31	62.72	68.39	66.55	66.09	72.57	73.75	78.45	65.51
26.40	30.39	34.43	37.40	39.19	39.74	40.64	40.59	43.72	42.18	40.48	42.67	44.85	44.24	40.50
7.73	8.19	9.47	10.15	10.81	10.55	10.28	11.90	12.42	10.94	11.58	11.87	12.61	11.95	10.08
18.67	22.20	24.96	27.25	28.38	29.19	30.36	28.69	31.30	31.24	28.90	30.80	32.24	32.29	30.42
8.65	6.18	9.71	10.85	12.55	17.19	19.02	20.85	21.23	20.60	20.57	22.18	22.56	24.12	19.15
5.32	5.80	6.02	6.26	6.39	7.03	7.62	8.44	7.74	7.39	7.50	7.91	8.04	9.50	7.35
3.33	0.38	3.69	4.59	6.16	10.16	11.40	12.41	13.49	13.21	13.07	14.27	14.52	14.62	11.80
3.47	3.85	3.94	4.93	6.27	5.38	5.51	5.10	7.35	7.64	9.11	11.84	10.61	14.43	10.23
48.46	47.24	57.36	67.38	66.63	66.89	71.11	74.53	78.21	82.29	91.67	106.15	107.37	99.52	64.81
19.63	19.92	19.84	21.49	22.41	23.02	22.34	23.39	23.68	23.86	25.58	26.43	29.11	31.39	32.19
6.26	5.67	7.74	8.82	6.08	6.85	6.66	6.93	8.97	6.81	8.47	9.19	9.19	14.72	6.90
22.57	21.65	29.78	37.07	38.14	37.02	42.11	44.21	45.56	51.62	57.62	70.53	69.07	53.41	25.72
−13.29	−9.43	−12.29	−17.25	−11.7	−8.15	−19.8	−11.81	−9.82	−15.74	−25.58	−33.58	−33.62	−21.07	0.7
42.50	30.86	32.86	53.01	51.01	49.98	59.34	58.73	59.32	64.97	80.70	105.30	88.89	95.49	55.84
26.05	11.95	14.15	25.34	20.11	15.52	14.22	22.64	21.60	23.75	34.92	51.14	36.62	50.66	9.25
16.45	18.91	18.71	27.67	30.90	34.45	45.11	36.09	37.72	41.22	45.78	54.16	52.27	44.83	46.59
28.32	22.43	19.13	35.23	39.61	39.43	48.98	47.12	50.31	49.27	56.25	67.93	56.42	73.99	57.54
14.18	8.43	13.73	17.78	11.40	10.55	10.36	11.61	9.01	15.70	24.45	37.37	32.47	21.50	−1.70

(10)–(14) Gayer, Rostow and Schwartz (1953, Table 229). Expenditure for loan reduction is also referred to as capital charge. Row (14) = (10) − (13).

deviated from the previous century's experience: the suspension of specie payments in 1797 and the introduction of an income tax in 1799.

Britain fought the wars of the eighteenth century on the gold standard, but the circumstances of the late 1790s forced a suspension of payments in February 1797. Pressure on the Bank of England's gold reserves began with a financial crisis at the outbreak of war in 1793. Faced with both an external drain, caused by capital flight and foreign remittances, and an internal drain, the Bank of England reduced its private loans; but this only exacerbated the internal drain. The crisis was finally alleviated by the government's issue of Exchequer bills to merchants in the City. Pressure on the Bank's reserves from external gold outflows continued so that by December 1795, the Bank reacted to its gold reserve ratio falling below 20 percent by discouraging accommodation of government securities. The government then turned to the money market (O'Brien, 1967, chapter 5). The sale of government securities, which otherwise would have been absorbed by the Bank, competed with private securities, forcing up interest rates to unprece-

Table 8.3 *The Bank of England's contribution to government finance, 1793–1815, million pounds*

	1793	1794	1795	1796	1797	1798	1799	1800	1801
(1) Bank of England notes	11.38	10.51	12.44	9.99	10.39	12.64	13.17	15.95	15.38
(2) Government securities held by the Bank	9.97	9.41	13.21	11.91	10.24	11.09	10.48	13.78	13.94
(3) Private securities held by the Bank	5.74	4.08	3.69	5.17	7.31	5.98	6.50	8.00	10.38
(4) Seigniorage	0.15	−0.59	0.47	−0.81	0.52	1.07	0.56	0.89	0.28
(5) Seigniorage as a percentage of the deficit	4.54	−7.89	2.44	−4.29	2.04	4.80	3.25	4.21	1.09
(6) Seigniorage as a percentage of total war revenue	1.9	−4.43	1.89	−2.28	1.56	4.15	1.59	2.35	0.72

1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815
16.14	15.65	17.12	17.13	19.38	18.31	17.65	19.06	22.91	23.32	23.22	24.02	26.58	27.25
13.86	11.38	14.84	14.15	14.49	13.43	14.55	15.03	15.76	19.54	21.65	25.31	29.31	25.85
10.68	14.04	11.57	14.07	13.54	15.24	13.76	16.25	22.42	17.56	16.45	13.71	15.86	18.86
0.47	−0.12	0.52	−0.28	−0.05	−0.05	0.21	0.87	1.69	0.38	−0.05	0.35	1.30	0.00
3.54	−1.27	4.23	−1.62	−0.42	−0.61	1.06	7.37	17.20	2.41	−0.19	1.04	3.87	0.00
1.55	−0.42	1.28	−0.57	−0.11	−0.09	0.38	1.56	2.95	0.63	−0.07	0.45	1.45	0.00

Sources and Notes (by row):
(1) Mitchell and Deane (1962, p. 442) circulation.
(2) Mitchell and Deane (1962, p. 442) government securities.
(3) Mitchell and Deane (1962, p. 442) total securities − government securities.
(4) Gayer, Rostow, and Schwartz (1953, Appendix 3, Table 121 and Appendix 4, Table 138).
(5) Row (4) divided by the deficit in row (9), table 8.1.
(6) Row (4) divided by column (13), table 4.12, O'Brien (1967).
Total war revenue comprises total war loans (total taxes collected less the 1788–92 average) + total loans.

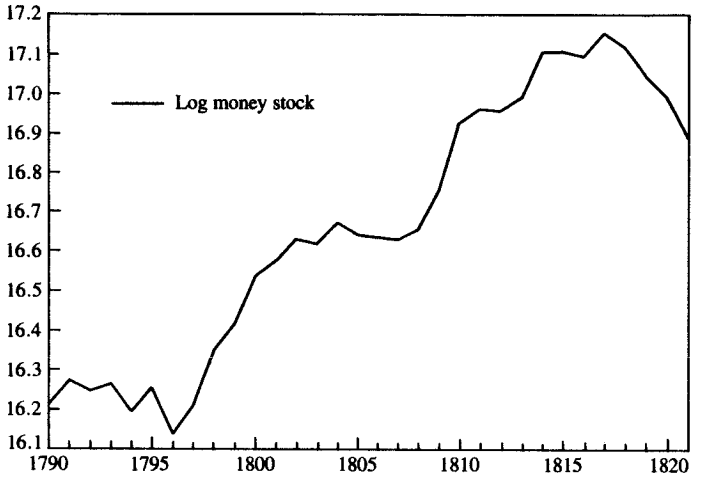
dented levels, as seen in figure 8.5. The 3 percent consol rate reached an eighteenth and nineteenth century peak of 6.3 percent in April 1797. Private borrowers then turned to the Bank, which responded by rationing credit in December 1795.[10] The credit stringency was in part alleviated, as it had been in 1793, by direct government lending to the City. According to O'Brien (1967), the response by the Bank to its dwindling gold reserves hindered the government's war finance. To prevent the perceived collapse of the Bank in the face of both a massive external drain and a run on the country banks, occasioned by fears of a French invasion, the government finally allowed it to suspend specie payments on February 26, 1797.

After the Bank suspended specie payments, the government was again able to sell much of its short-term debt to the Bank of England. Thus, until hostilities ceased, the share of unfunded loans in total loans increased dramatically from a low of 19 percent in 1797 to a peak of 76 percent in 1808 (see table 8.2).[11] The government's ability to float debt is also measured by the expansion in the Bank's holdings of public securities, seen in table 8.3. Accommodation of both government and private borrowing is generally viewed by historians – including Fetter (1965), Schumpeter (1938), Silbering (1923), and Viner (1937) – as the way in which the Bank contributed to war finance.

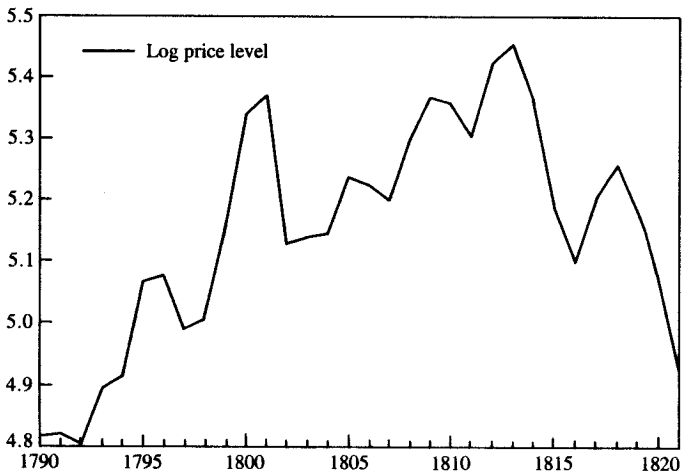
Both the Bank's note issue in figure 8.8 and the price level in figure 8.9

rose considerably during the period. Although there is considerable controversy as to whether the Bank caused the inflation by its note issue,[12] the unavailability of other than fragmentary data on London and country bank liabilities makes the case hard to test. Nevertheless, the fact that private borrowers could discount commercial and government paper freely at the 5 percent usury ceiling when the shadow nominal interest rate was surely higher, reflecting inflation rates up to 10 percent per annum, suggests that the indirect mechanism originally pointed out by Thornton (1802) was important.

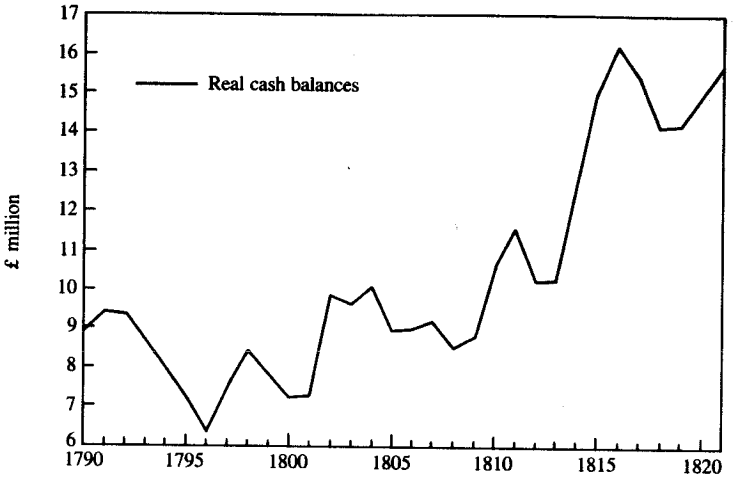
While money creation by the Bank seems to have been responsible for inflation, and although real cash balances – the inflation tax base – maintained a rising trend in this period (see figure 8.10) in contrast to the French experience from 1794 to 1796 (White, 1990), it was not a principal pillar of war finance. One measure of the contribution of the Bank to war finance is seigniorage revenue (measured as the increase in bank notes divided by the average price level) expressed as a percentage either of the deficit or of war revenue. As seen in table 8.3, seigniorage was relatively unimportant in magnitude. However, these are downward biased measures of the contribution of inflationary finance because they omit the private banking system, whose liabilities, according to Presnell (1963) were at least as large as those of the Bank. Money creation did not make a large



Source: Gayer, Rostow and Schwartz (1953)
8.8 Great Britain, log of the money stock



Source: as figure 8.8
8.9 Great Britain, log of the price level



Source: as figure 8.8
8.10 Great Britain, real cash balances

contribution to war finance, but it did give the government critical flexibility in short-finance and debt management.

For this reason, the government viewed the Bank of England as an essential component of its war finance program. This can be seen in its opposition to a number of requests by the Bank (June 1797, October 1797, February 1803) to resume specie payments (O'Brien, 1967, chapter 5), its support of the Bank in the face of the withering criticism of the Bullion Report of 1810, its encouragement of the Bank to accommodate private demands for credit and its granting of *de facto* legal tender status to the Bank's notes in 1811 (Fetter, 1949).

Despite the government's opposition to resumption during wartime conditions, there also exists considerable evidence that the government wished to confirm its commitment to a return to the gold standard once hostilities ceased. The government's failure directly to confront the 1810 Bullion Report's criticism of the Bank for allowing the exchange rate to depreciate by over 10 percent (see Laidler, 1987) can be understood in this light. The government felt unable to argue that continued suspension was justified by wartime fiscal needs because it was concerned that this position would weaken both internal and external confidence in the paper pound. Instead, the government took the much misaligned positions of both disputing the facts of depreciation and presenting a list of non-monetary causes (O'Brien, 1967, chapter 6).

The second departure from the eighteenth century pattern of government finance was the institution of an income tax in 1799. Concern over the size of the national debt, the inability to raise further revenue from indirect taxes and the threat of defeat by the French revolutionaries were all arguments that Pitt used to overcome opposition to direct taxation by the propertied classes. The income and property taxes were immensely successful. In table 8.2, they rise from zero to approximately 20 percent of total tax revenue by the end of the war. Moreover, unlike the preceding wars, and especially the American war where net borrowing could rival and exceed tax revenues (see table 8.4), total taxes covered a far greater share of government expenditure than borrowing, which at its Napoleonic war peak covered approximately 30 percent. By contrast, in the same year that the British parliament levied an income tax, the French Directory attempted to impose a new forced loan. Property owners, large and small, had relatively little say in the government and remained outside the governing structure. They were not convinced that this was an appropriate means of raising funds, or that they would benefit. There was thus a high level of avoidance and the yield on the tax remained low.

The British experience during the Napoleonic wars suggests that the government followed policies consistent with the modern theory of tax smoothing. The theory of tax smoothing implies that an optimizing government will set tax rates over time so as to minimize deadweight losses (Barro, 1989). In a policy of tax smoothing, if future government expenditures are known with certainty, then the current tax rate will be set to reflect those expenditures and will remain constant over time. In an uncertain world, taxes will follow a martingale as the government attempts to forecast expenditures rationally and set the current tax rate consistent with its forecast of the future so that only unpredictable events will produce changing tax rates. Thus, in the event of a war of unprecedented severity and duration, such as the Napoleonic War, tax rates will increase significantly during the war to reflect the new, higher present value of government expenditures. However, the wartime rise in taxes will not fully match the rise in expenditures since they would be expected to decline after the war (Kochin, Benjamin and Meader, 1985).

The theory of tax smoothing implies that average tax rates should follow a martingale process. In table 8.5, we test for a martingale for Britain in 1700–1815, using two measures of the average tax rate: the ratio of tax revenue to commodity output and the ratio of tax revenue to national income. In both cases, the Dickey–Fuller test (see Nelson and Plosser, 1982) for the coefficient on the lagged average tax rate shows that the null hypothesis that the coefficient is equal to one cannot be rejected at the 1 percent level. This evidence supports the hypothesis that the British govern-

Table 8.4 *Revenue and expenditure, Great Britain, 1776–85, million pounds*

	1776	1777	1778	1779	1780	1781	1782	1783	1784	1785
I. Revenue										
(1) Net revenue	10.57	11.10	11.44	11.85	12.52	13.28	13.76	12.68	13.21	15.53
(2) Indirect taxes	8.06	7.66	7.72	8.14	8.85	9.13	9.32	8.43	9.17	10.68
(2a) Customs duties	2.68	2.41	2.35	2.52	2.77	3.02	2.90	2.95	3.03	4.54
(2b) Excise and stamp duties	5.38	5.25	5.37	5.62	6.08	6.11	6.42	5.48	6.14	6.14
(3) Direct taxes	2.04	2.45	2.64	2.58	2.65	2.77	2.86	2.76	2.66	2.97
(Land and assessed taxes)	1.87	2.30	2.50	2.45	2.52	2.63	2.72	2.59	2.46	2.67
(4) Other revenue (Post Office, misc.)	0.17	0.15	0.14	0.13	0.13	0.14	0.14	0.17	0.20	0.30
II. Expenditure										
(5) Total net public expenditure	14.04	15.26	17.94	19.71	22.60	25.81	29.23	23.51	24.24	25.83
(6) Debt charges	4.63	4.71	5.03	5.52	5.99	6.92	7.36	8.05	8.68	9.23
(7) Civil government expenditure	1.27	1.77	1.42	1.16	1.25	1.35	1.26	1.38	1.32	1.45
(8) Military expenditure	7.54	8.78	10.98	12.46	14.87	17.06	20.13	13.67	13.76	14.79
(9) Estimated deficit	−3.47	−4.16	−6.50	−7.86	−10.08	−12.53	−15.47	−10.83	−11.03	−10.30

Sources and Notes (by row):
(1)–(4) Mitchell and Deane (1962, p. 388).
(5)–(8) Mitchell and Deane (1962, pp. 390–391).
(9) = (5) − (1).

Table 8.5 *Tax smoothing in Great Britain, 1700–1815*

$T/Y = B_0 + B_1 * (T/Y)_{t-1} + e_t$

variable	Period	Coefficients of independent variables B_0	B_1	$\bar{R}^2$	*SEE*	*D–W*
Taxes/ Commodity output	1715–1815	0.876 (0.918)	0.978 (25.94)[a]	0.87	2.81	1.84
Taxes/ National income	1700–1815	1.69 (1.46)	0.947 (22.39)[a]	0.81	3.16	1.85
$\Delta T/Y = B_0 + B_1 \Delta (T/Y)_{t-1} + e_t$						
Taxes/ Commodity output	1715–1815	0.312 (1.09)	0.049 (0.47)	0.002	2.82	1.92
Taxes/ National income	1700–1815	0.29 (0.98)	0.017 (0.177)	−0.008	3.20	1.19

Notes:
t-values in parentheses.
[a] *t*-value not significantly different from 1 at the 5 percent level of significance.

ment was engaged in tax smoothing.[13] However, as the data on commodity output and national income are based on interpolations between benchmarks, these results should be regarded only as suggestive. Similar regressions were tried for France, using the ratio of tax revenues to commodity output for the period 1728–96. The results were comparable to those for Britain, however the even more fragmentary nature of the French data does not allow any but tentative conclusions to be drawn.

The ability to tax smooth is based on the government's credibility to ensure a flow of revenue after the war to service the debt. The British invested in credibility by their performance of debt service after the major wars. In addition, establishment of the Sinking Fund and its continued operation during the Napoleonic Wars strengthened this investment. This stands in striking contrast to the French monarchy which created a Sinking Fund in 1785 – attempting to enhance its reputation – only quickly to be forced to abandon it.

The British experience is also consistent with recent theoretical development on rules versus discretion (Bordo and Kydland, 1992). The experience of the suspension period can be viewed as being consistent with following a contingent gold standard rule. Under this rule, the government maintains the standard – keeps the price of its currency in terms of gold fixed – except in the event of a major war. In wartime, it may suspend specie payments and

issue paper money to finance its expenditures, and it can sell debt issues in terms of the nominal value of its currency on the understanding that the debt will eventually be paid off in gold. The rule is contingent in the sense that the public understands that the suspension will last only for the duration of the wartime emergency plus some period of adjustment; it assumes that afterwards the government will follow the deflationary policies necessary to resume payments.

After hostilities ceased in 1815, several attempts were made to pick a date for resumption – 1816 and 1818 – but as each occasion approached, the Bank requested a postponement on the ground that the exchanges were unfavorable. Finally parliament agreed on July 2, 1819 (Peel's Act) on resumption in stages from February 1, 1820 to full redemption on demand on May 1, 1823 and it was agreed that the government would retire its outstanding securities held by the Bank and that the Bank would reduce its note issue to achieve the aim. Resumption was achieved on May 7, 1821. The tenor of the debate in parliament and the press, the lack of effective opposition to resumption, and the fact that resumption was achieved, despite the delays, before the final date suggests that observing the rule was paramount (Feaveryear, 1963, pp. 224–225; Fetter, 1965, pp. 73–76; Laidler, 1987).

The experience of the suspension may also be understood within the context of recent theories of optimal seigniorage and revenue smoothing. During the years of the paper pound, the government can be viewed as having two fiscal instruments: taxation and seigniorage (the inflation tax). According to the theory the government would at each moment of time set each tax rate so as to minimize the deadweight losses (excess burdens) of the instrument (Diamond and Mirlees, 1971). Over time an optimizing government would smooth revenue from both tax instruments and both instruments would evolve in a similar martingale pattern (Mankiw, 1987; Poterba and Rotemberg, 1990; Trehan and Walsh, 1990).

A simple test of the revenue smoothing hypothesis is to regress the rate of inflation on the average tax rate. If revenue smoothing occurs, a positive and significant coefficient is expected (Mankiw, 1987). We replicated Mankiw's regressions for the period 1797–1815, in both levels with a Cochrane–Orcutt adjustment for serial correlation, and first differences (see table 8.6). As can be observed, none of our results were consistent with the hypothesis – in every case the coefficient on the tax rate was of the wrong sign.[14] As Goff and Toma (1993) argue, seigniorage smoothing would not be expected to prevail under a specie standard where the inflation rate does not exhibit persistence.[15] Our results suggest that though specie payments were suspended the commitment to resume prevented the government from acting as it would under the pure fiat regime postulated by the theory. This

Table 8.6 *Revenue smoothing in Great Britain, 1797–1815*

Regression equations (*t*–values)

(1) $\Delta \log P_t = -1.81 - 0.0008\ (T/Y) + 0.001$ (time)
$(-0.12)\ (1.27)\qquad (0.14)$
$R^2 = 0.016\ SEE = 0.119\ D\text{–}W = 1.60\ \rho = 0.33$

(2) $\Delta \log p_t = -7.77 - 0.007\ (T/CO) + 0.004$ (time)
$(-0.40)\ (-1.27)\qquad (0.42)$
$R^2 = 0.004\ SEE = 0.120\ D\text{–}W = 1.56\ \rho = 0.35$

(3) $\Delta^2 \log p_t = 0.007 - 0.01\ \Delta\ (T/Y)$
$(0.207)\ (-1.87)$
$R^2 = 0.121\ SEE = 0.137\ D\text{–}W = 1.77$

(4) $\Delta^2 \log p_t = 0.01 - 0.01\ \Delta\ (T/CO)$
$(0.31)\ (-2.03)^*$
$R^2 = 0.148\ SEE = 0.135\ D\text{–}W = 1.74$

Notes:
(T/Y) represents tax revenues divided by national income.
(T/CO) represents tax revenues divided by commodity output.
* signifies statistically significant at the 5 percent level.

suggests that though the British authorities may have used the inflation tax as a source of wartime finance, they did not follow an optimal policy of seigniorage smoothing.

The consulate and empire, 1799–1812

Although Great Britain, in spite of suspension, was able to finance a considerable portion of its war effort by borrowing, France relied almost entirely on taxation while it attempted to rebuild its reputation as a debtor. It had lost its credibility during the Revolution and was unable to follow a tax smoothing policy. Consequently, even at the height of the wars, the Empire covered most of its expenditures by taxation. Napoleon has traditionally been regarded by historians as a simple, obstinate hard-money man. In public, he adamantly professed to oppose any new borrowing. The collapse of the *ancien régime*'s finances from excessive borrowing and the Revolution's finances from excessive use of paper money may have irrationally colored his and his contemporaries' views of public finance. However, his pronouncements were necessary, to a certain degree, to restore confidence and many of his actions and statements should be judged in this light.

Napoleon's coup of November 1799 began sweeping changes in government finance that built on the tough measures taken by the Directory. The system of taxation was reorganized, new taxes were imposed, payment on the debt in specie was resumed and institutions – the Banque de France and a Sinking Fund – were established, which served as additional guarantees of the government's commitment to fiscal prudence. Nevertheless, even at its apogee, Napoleon's system of finance did not engender greater confidence, and it appears to have restrained any return to large-scale borrowing. The Imperial budget remained secretive and the public had no equivalent to the British parliament to monitor the Emperor's plans. In the absence of such an institution it was impossible for the government to make a completely convincing commitment to its announced fiscal program.

Immediately after his coup, Napoloen began to alter the tax system. The centralized agency for the collection of direct taxes established during the Revolution was abolished in the same month as the coup and replaced by separate offices in each *département* who reported to the minister. The practice of electing local tax officials was eliminated. The new government also returned to the *ancien régime*'s policy of requiring interest-bearing security deposits of its tax collectors. The monarchy's method of short-term borrowing was re-established with the tax collectors issuing *rescriptions* to make their monthly payments to the government in advance of the taxes they collected.[16] The bonds acted as a guarantee for the *rescriptions*, providing proper incentives for effective tax collection.

Although collection of direct taxes improved with these measures and a new *cadastre*, the government did not rely on direct taxes to cover its expenditures. Indirect taxes had been the largest component of royal revenues; in table 8.1, the budget for 1788 shows that they accounted for 43 percent of total revenue. These taxes were extremely unpopular, and under the Revolution, they had virtually disappeared by 1790. Only during the Empire were indirect taxes gradually reintroduced. The communes re-established the *octrois*; in 1802 the government demanded a portion of this revenue, which increased over time. New taxes, similar to those of the *ancien régime* were imposed on tobacco, alcohol, salt, and the prices of government monopolies, such as the post, were increased (Marion, 1925, vol. 4, pp. 297–304).

The result of this new policy regime was that France was taxed at a significantly higher level than before the Revolution. Even though the borders of France were expanded somewhat, this cannot fully account for the dramatic rise in tax revenue seen in table 8.1. French taxes as a percentage of commodity output in figure 8.6 were distinctly higher under the Empire, allowing the government to cover most of its expenditures without borrowing. The slow restoration of France's reputation began when the Consulate ordered the payment of *rentes* fully in specie in 1800,

leading the yield on the *tiers consolidé* in figure 8.5 to drop below 10 percent for the first time.[17] To amortize the debt, the Consulate created a Sinking Fund in November 1799, which received the security bonds of the tax collectors. Half of these funds were then invested in the stock of the Banque de France, established in January 1800, and half placed on deposit. The Sinking Fund then used the dividends received from the bank plus revenue from the remaining *biens nationaux* slowly to retire the debt. In 1800 and 1801 alone it retired 3.6 million francs of 5 percent *rentes*. The general solvency of Napoleon's regime is reflected in the return, on March 28, 1803, to the bimetallic standard. The *franc germinal* was established, fixing the bimetallic ratio at 15.5:1. Throughout the Napoleonic wars the government adhered to this new standard.

The fiscal discipline of the Empire produced a continued decline in the yield of the *tiers*, which dropped below 7 percent during the middle years of the Empire. The growth of the public debt under the Empire was modest. On the eve of Napoleon's coup in November 1799, the *rentes perpétuelles* amounted to 46.3 million francs. When the Empire collapsed in April 1814, this had risen to only 63.3 million (Fachan, 1904; Vührer, 1886). Although Napoleon never had any major issue of new long-term debt, the Sinking Fund was authorized to issue bonds paying 6 or 7 percent. These bonds helped to consolidate some of the older debts and the small accumulating deficits, but they were not a major vehicle for war finance. Between 1806 and 1812, 224 million francs of these bonds were issued. Another source of borrowing was the Banque de France, established in 1800. In the first five years of operation, approximately one-third of the bank's discounts were advances to the government. This short-term borrowing was quite cheap, as the government could borrow from the bank at rates lower than the open market. Borrowing from the Banque de France was important for smoothing the flow of tax payments; but it was, in the overall picture of government finance, a relatively minor contribution to war finance. Even at the peak of 80 million francs in 1805, it was less than 10 percent of expenditures. This followed the pattern of British finance where the unfunded debt was bought by the Bank of England. The critical difference is that in Britain it was rolled over into long-term debt.[18]

While the Emperor's borrowing from the Banque was generally restrained, the government on one occasion did press the bank too far. By December 1805, the bank had made 97 million francs of discounts, 80 million of which were on obligations of the tax farmers (Courtois fils, 1881, pp. 116–117). The redemption in specie of this large increase in the Banque de France's notes from these loans led to a sudden drop in reserves and temporary and partial suspension of payments. This was also what happened in Britain and led to the suspension. But, unlike the British case, the government could not fully or permanently suspend payment, given its

history, and the hope that the public would maintain its real balances. In the next few years, Imperial borrowing from the bank was more restrained. Only in 1811 did government borrowing from the bank begin rapidly to rise again.

France's borrowing during the wars from all sources was limited. Although the Empire may have been able to issue new *rentes*, the general opinion was that credibility was weak. This view was shared by ministers like Barbé-Marbois and diehard emigres like Ivernois.[19] Furthermore, it was feared that any large issue of debt would rapidly drive up yields. Mollien complained at times that even small sales of bonds of the Sinking Fund could not be carried out without quickly driving up the interest rate (Marion, 1925, vol. 4, pp. 347–351). Rightly or wrongly, the government interpreted these signs and popular opinion that the market would not be favorable to new large loans.

The fiscal discipline imposed on the Empire because of France's lack of credibility was, however, partially eased by taxation of its conquered territories and its allies. Before 1805, these revenues appear to have been relatively small. The largest subsidies were 4 million francs per month from Spain and 30 million per year from Italy. The transfers to France were thus limited and most of the taxation of conquered nations was to support French armies abroad. In 1805, Austria supplied 75 million and in 1809 164 million francs. Between 1806 and 1812, Prussia provided somewhere between 470 and 514 million francs. These enormous revenues meant that French armies abroad were not a drain on the French Treasury. While it may appear that France was able to pay for its wars cheaply by taxing the conquered countries, it should be noted that after 1814 France had to repay these countries with reparations. Although the reparations were not anticipated, *ex ante*, they were probably more expensive than a policy of raising all tax revenue in France or borrowing voluntarily from conquered nations.

French finances appeared victorious in early 1811. Britain was encumbered by a growing debt, the Bank of England's notes had depreciated, and the pound sterling stood at a substantial discount. France maintained the value of the franc, the Bank of France redeemed its notes at par, and the budget of the previous year was balanced. The *rentes* stood at above 80, implying a yield of just over 6 percent. What destroyed the Empire was the enormous expense and failure of the Russian campaign. There was a budget deficit of 46 million in 1811, and of 37.5 million in 1812. The *rentes* tumbled in 1813. The situation was sufficiently grave that the Empire attempted to cover the deficit with an old expedient – it offered the *biens communaux* for sale and imposed new taxes. The collapse of the Empire produced a huge deficit for 1814, leaving the restored monarchy with enormous arrears (Marion, 1925, vol. 4, pp. 372–380).

Napoleon's Hundred Days brought a crushing burden in the form of the

Treaty of November 20, 1815 – estimated at 1,290 million francs. The victorious allies imposed an indemnity of 700 million francs payable in five years, the cost of the army of occupation for five years, and reparations for individuals and towns that reached 320.8 million francs. Thus, in addition to ordinary expenditures, the French Treasury's budget for 1816 included 140 million francs for the indemnity and 130 million for maintaining foreign troops. To cover this, tax farmers' security bonds were increased, the *liste civile* was cut, salaries of employees were reduced, and a surcharge on direct taxes was levied.

The restored monarchy remained very weak and was rescued only by a series of new loans issued and managed by Hope and Baring in 1817. The end result was that the *rentes* which required annual payments of 63.3 million in 1814 now had an annual cost of 202.4 million francs in 1830. Ironically, these interest payments were not much different from the total cost of payments in the last years of the *ancien régime*.

Conclusion

While the Napoleonic wars after 1797 offered the curious spectacle of faithful Albion abandoning the gold standard and borrowing substantially while perfidious France maintained convertibility of the franc and borrowed very little, these war finance regimes were the consequence of each nation's credibility as a debtor. Given its long record of fiscal probity, coupled with its open budgetary process in parliament, Great Britain could continue to borrow a substantial fraction of its war expenditures at what were relatively low interest rates. British tax rates did not vary much over most of the eighteenth century as peacetime surpluses offset wartime deficits to pay off the accumulated war debts. Indeed, taxes would not have been greatly increased during the Napoleonic wars except that their duration imposed a debt burden much higher than the eighteenth century norm, requiring a rise in the tax rate to sustain the nation's credibility as a borrower. In addition, because of its longstanding record of maintaining specie convertibility, Britain had access to the inflation tax, although in practice it was not a major source of wartime finance.

France, on the other hand, had squandered her reputation in the last decade of the *ancien régime* and the Revolution. Her dependence on taxation did not reflect any superior fiscal virtues but rather the opposite. Borrowing would have been exceedingly costly and the public very skeptical of the Empire's fidelity. Moreover, the recent experience of *assignat* hyperinflation ruled out the inflation tax as a source of revenue. Inherited credibility resolves this paradoxical pairing of fiscal regimes.

Notes

For helpful comments and suggestions we thank Levis Kochin, Hugh Rockoff, Mark Rush, Forrest Capie, Stanley Engerman and Angela Redish. Howard Bodenhorn provided valuable research assistance.

1 See Barro (1987); Barro (1989).
2 See Kydland and Prescott (1977); Lucas and Stokey (1983).
3 These dates were chosen because the available French data begins in 1770.
4 For a similar pattern in earlier wars in the eighteenth century, see Barro (1987); Benjamin and Kochin (1984).
5 Barsky (1987) found that the inflation rate for Great Britain over the period 1729–1913 showed no evidence of persistence based on autocorrelations. Absence of inflation persistence also characterized the 1797–1815 period, as seen in n. 13 below. Such evidence is not consistent with an *ex post* Fisher effect (positive correlation between the nominal interest rate and inflation). For the period of the suspension, Black and Gilmore (1990) found that nominal interest rates only partially incorporated expectations of inflation and with a long distributed lag – evidence suggesting that nominal rate movements largely reflected movements in the real rate.
6 White (1989, p. 553).
7 Another factor that may have driven down French interest rates was a switch in Dutch investment from Great Britain to France during the Fourth Anglo–Dutch war. White (1989).
8 Braesch (1936, vol. 2, pp. 55–186).
9 A higher marginal productivity of capital is associated with a less developed economy. France has traditionally been regarded as lagging far behind Britain but more recent research by O'Brien and Caglar (1978) and others suggests that the differences were not great.
10 Williamson (1984) following Ashton (1959) provides evidence that government borrowing during the French war crowded out private investment. Heim and Mirowski (1987) dispute this conclusion. Evidence in favor of Williamson's position is presented by Black and Gilmore (1990). Also see Mokyr (1987) and Williamson (1990).
11 These figures do not account for the retirement of debt or conversions between funded and unfunded debt. Accounting for these factors, as O'Brien (1967, table 4) does, reduces the share of unfunded loans somewhat but does not change the pattern significantly.
12 Silberling (1923), Morgan (1939), and O'Grada (1989) argued that the Bank's note issue did not cause inflation based on evidence that price changes temporally preceded both note issue and the Bank's total advances. In agreement with this position, Gayer, Rostow and Schwartz (1953) view the Bank as passively accommodating private demands for credit. The counter view is taken by Viner (1937) and Schumpeter (1938). One difficulty with treating the fact that price changes preceded monetary changes as evidence for causality is that the bulk of the prices included in the indexes used in the tests were commodity prices whose

movements in an efficient market would predict future changes in monetary policy.

13 However, it should be recognized that the power of these tests is relatively weak. There is considerable controversy about their use (see McCallum, 1989). It has recently been suggested that these tests may sometimes pick up segmented trends in lieu of the unit roots (Rappoport and Reichlin, 1989).

14 We also ran the regression using the nominal interest rate as dependent variable as did Mankiw (1987). In every case the coefficient on the tax rate was insignificant and of the wrong sign.

15 Indeed the inflation rate over the period 1797–1815 does not display any evidence of persistence, as can be seen in the following autocorrelations:

Autocorrelations of inflation 1797–1815

Lags	Autocorrelations								
1–9	0.24	−0.54	−0.38	0.15	0.15	−0.16	0.02	0.15	−0.07
10–18	−0.25	0.04	0.35	0.13	−0.19	−0.17	−0.02	0.04	0.02

Notes:
Standard error of correlation = 0.23.
$Q(18) = 16.4$ is well below the critical value of 26.0 at the 10 percent level of significance.

Alternatively based on the insignificant coefficient of the following first order autoregression, the inflation rate in 1797–1815 did not follow the martingale postulated by the theory of seigniorage smoothing:

$$\log P_t = 0.003 + 0.209 \log P_{t-1} \quad R^2 = 0.037 \quad D\text{–}W = 1.65$$
$$(t\text{-values})\ (0.109)\ (0.804) \quad SEE = 0.107$$

However, these results should be viewed as suggestive owing to the limited number of observations.

16 See Marion (1925, vol. 4, pp. 169–212) and Godechot (1968, pp. 643ff.).

17 The interest rate for France before the introduction of the *tiers consolidé* is the yield on the *inscriptions sur le grand livre de la dette publique*, which was a 5 percent perpetual.

18 Even the British rolled over their debt with varying degrees of difficulty, depending on the progress of the war. Two major conversions occurred during interludes of peace in 1803 and 1814.

19 Marion (1925, vol. 4, pp. 337–338).

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