

Rockoff, Hugh

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War and Inflation in the United States from the Revolution to the First Iraq War

Hugh Rockoff

Department of Economics

Rutgers University, 75 Hamilton Street

New Brunswick NJ 08901

Rockoff@econ.rutgers.edu

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Abstract

The institutional arrangements governing the creation of money in the United States have changed dramatically since the Revolution. Yet beneath the surface the story of wartime money creation has remained much the same. During wars against minor powers, the government was able to fund the war by borrowing and levying taxes. In major wars, however, there came a point when further increases in taxes could not be undertaken for administrative or political reasons, and further increases in borrowing could not be undertaken except at higher interest rates; rates that exceeded what was considered fair based on prewar norms. At those moments governments turned to the printing press. The result was substantial inflation.

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1. Money creation as a means of war finance

When the United States went to war against major powers it resorted to the printing press to help finance the war. In every case the result was a substantial inflation. In wars against second tier powers, however, the United States, for the most part, avoided the printing press and inflation.¹ At one level, the explanation is simple. A war against a major power requires more resources than a war against a second tier power, and forces the government to dig deeper into its bag of tricks to finance the war. There is, however, a bit more to say about how, why, and with what consequences governments have turned to the printing press.

A major war means that there will be a large, although temporary, need for additional revenues. Borrowing is the obvious first choice. But if borrowing proceeds too far, at some point nominal interest rates will rise. For several reasons to be discussed below, war governments were loath to allow nominal interest rates to rise above prewar norms. Tax increases that were sufficient to finance future interest and principal payments helped to make borrowing credible and help maintain interest rates. But taxes were difficult to increase quickly, and if raised too far too fast had the potential to arouse opposition and undermine support for the war. Faced with the prospect of breaching prewar interest rate norms, and unable or unwilling to raise taxes sufficiently to finance

¹ The one partial exception is the Vietnam War. The war, as discussed below, did contribute to the excessive monetary growth that characterized the late 1960s and early 1970s. But there were other factors besides the war.

the war, governments turned to the printing press. Although a simple story, it does, as I will show, fit the facts.

There were several reasons why war governments were unwilling to see prewar interest rate norms breached. (1) The analogy with personal or business finance undoubtedly was influential. If I can afford a mortgage at the same rate as other homebuyers, I am making a sound investment; if I can only get a mortgage at a subprime rate I have a clear sign from the market that I am overextended. Surely, the argument goes, what is true for an individual, or a family, or a business must be true for the government. If the interest rate my government must pay rises it must be overextended; it must have done something wrong. (2) Although many citizens may be unaware of the amounts being borrowed, some will be disturbed by rising indebtedness and the prospect of higher taxes in the future, a fear likely to be amplified by rising interest rates. (3) Rising nominal rates may be interpreted as a sign of economic weakness, undermining public confidence in the war effort, discouraging allies, and encouraging enemies.

(4) The most important reason, however, as will be clear as we examine the statements of government officials below, was simply the ancient prejudice against usury. Typically, the common man or woman, and the politicians who represent them, favored the borrower over the lender; the victim over the shylock. Higher interest rates on government debt meant that the taxpayer was being victimized by the shylocks. If borrowing by the government raised rates in general, then even people borrowing for private purposes were victimized. Printing money and using it to support the price of government bonds appeared to be only fair. True, printing money might cause inflation.

But inflation hurt lenders and helped borrowers; hurt the shylocks and helped their victims. Higher rates in wartime were considered especially loathsome. War was a time when the nation was pulling together for a common purpose. Lenders should not be allowed to profit from the special circumstances in wartime. In this respect the decision to suppress interest rate increases is similar to the decision to impose an excess profits tax. Of course, the tax increases revenues, but increased profits, always suspect in some quarters, are especially detestable in wartime.

Economists, with a few exceptions, have found printing money an unacceptable means of war finance. But the appropriate balance between borrowing and taxation has been more controversial. Space does not permit a detailed review of the history of thought about wartime finance, but it will be useful to mention the views of a few leading economists to establish the range of the controversy. Adam Smith argued that relying mainly on borrowing was a mistake: It hid the cost of the war from the public.

The ordinary expense of the greater part of modern governments in time of peace being equal or nearly equal to their ordinary revenue, when war comes they are both unwilling and unable to increase their revenue in proportion to the increase of their expense. They are unwilling for fear of offending the people, who, by so great and so sudden an increase of taxes, would soon be disgusted with the war; and they are unable from not well knowing what taxes would be sufficient to produce the revenue wanted. The facility of borrowing delivers them from the embarrassment which this fear and inability would otherwise occasion. By means of borrowing they are enabled, with a very moderate increase of taxes, to raise, from year to year, money sufficient for carrying on the war, and by the practice of perpetually funding they are enabled, with the smallest possible increase of taxes, to raise annually the largest possible sum of money (Smith et al. 1976 [1776], 1080).²

² By perpetually funding Smith meant issuing consols. Since the bonds would never mature, taxes only had to be raised sufficiently to pay the interest on the bonds.

Smith then went on to explain how long-term-bond finance encourages war by hiding the true costs of war.

In great empires the people who live in the capital, and in the provinces remote from the scene of action, feel, many of them, scarce any inconveniency from the war; but enjoy, at their ease, the amusement of reading in the newspapers the exploits of their own fleets and armies. To them this amusement compensates the small difference between the taxes which they pay on account of the war, and those which they had been accustomed to pay in time of peace. They are commonly dissatisfied with the return of peace, which puts an end to their amusement, and to a thousand visionary hopes of conquest and national glory from a longer continuance of the war. (Smith 1976 [1776], 1080),

Smith was thinking about colonial wars. When it came to the Napoleonic wars, it would be a different story. In that case, the British government did turn in the end to the printing press to help finance the war.

John Stuart Mill argued that wartime borrowing was justified as long as interest rates did not rise (Mill, 1936 [1848], 873-6). Mill did not elaborate, but I would conjecture that he was guided by the analogy between private and public finance. The analogy remains influential.

The modern view of optimal war finance owes a great deal to Robert Barro (1987, 1989). Barro argued that if the war government relied entirely on taxes there the sharp spike in taxes that would result would discourage economic activity. By borrowing, the war government smoothes taxes over time, minimizing disincentive effects. Smoothing interest rates, the factor that I am stressing to explain the resort to the printing press, is the opposite side of the coin.

Theorists of war finance generally rejected money finance out of hand. But it will be useful to recall some of the problems created by inflation that lead economists to reject money finance. Inflation, most economists believe, reduces the efficiency of the

price mechanism as a means of allocating resources, and imposes hardships on vulnerable groups including the elderly who have accumulated savings in the form of nominal incomes, and workers who enjoy rents based, for example, on long service. Memory of the costs of inflation may erode as time from the last bout lengthens. And war parties that represent debtors may be more tolerant of inflation, but it is hard to imagine any war government welcoming inflation.

The classic statement of the costs of high inflation comes from John Maynard Keynes.

Lenin has declared that the best way to destroy the Capitalist System is to debauch the currency. By a continuing process of inflation, governments can confiscate, secretly and unobserved, an important part of the wealth of their citizens. By this method they not only confiscate, but they confiscate arbitrarily; and, while the process impoverishes many, it actually enriches some. The sight of this arbitrary rearrangement of riches strikes not only at security, but at confidence in the equity of the existing distribution the system brings windfalls, beyond their deserts and even beyond their expectations or desires, become 'profiteers,' who are the object of the hatred of the bourgeoisie, whom the inflationism has impoverished, not less than of the proletariat. As the inflation proceeds and the real value of the currency fluctuates wildly from month to month, all permanent relations between debtors and creditors, which form the ultimate foundation of capitalism, become so utterly disordered as to be almost meaningless; and the process of wealth-getting degenerates into a gamble and a lottery. (Keynes 1920 [1919], 298).

Keynes had the hyperinflations that followed World War I in mind when he wrote these passages. Long continued secular inflation to which markets can adjust is a different matter, and likely to create fewer costs. As we will see, the bouts of inflation during America's major wars were of the short and intense variety.

The money finance, however, also comes with benefits when compared with other means of finance that costs in the minds of policy makers may offset some of the

costs of inflation and make money creation an attractive alternative to other means of finance in major wars: low administrative costs, the ability to hide the costs of war, and a surprising degree of equity. Each is worth some attention.

(1) Low setup and administrative costs. Major wars require sudden and substantial increases in spending. The printing press can be accessed quickly and the administrative costs of collecting resources from printing money are low when compared with conventional taxation. A tax on windows requires that administrators go from house to house and count the windows, that tax bills be written and sent to householders, that money is collected, that suits are launched against householders who refuse to pay, and so on. On the other hand, when money is printed it can simply be handed to the soldier who will do the fighting. Smugglers may evade a tariff, and householders may cover the windows in their homes, but the inflation tax is hard to evade. Anyone who uses cash will see its value fall. Borrowing, it is true, can also be accessed quickly, provided the capital market is broad and deep. If the banking system is well developed, funds can be borrowed quickly from banks.

(2) Hiding the cost of war. When taxes are raised to finance wars it is all too obvious to the public that the war is costly. It is after all, the government itself that, typically, delivers the bad news. The public may, however, not attribute the inflation resulting from money creation to the government because the chain of reasoning linking inflation to the government and the war it waging is relatively long. It will be the shopkeeper who is forced to deliver the bad news. So the inflation that an economist might trace to money creation might be attributed by the public to a variety of other factors: shortages of particular commodities or a rising tide of greed and profiteering.

Keynes makes this point in the passage quoted above when he claims that through inflation “governments can confiscate, *secretly and unobserved* [my italics], an important part of the wealth of their citizens. Keynes enlarged on this thought in a subsequent passage.

There is no subtler, no surer means of overturning the existing basis of society than to debauch the currency. The process engages all the hidden forces of economic law on the side of destruction, and does it in a manner which not one man in a million is able to diagnose.(Keynes 1920 [1919], 298).

Keynes’ estimate of one in a million was a bit of an exaggeration; but his point, that the victims of inflation may not be able to trace the inflation back to government finance, is well taken.

The means of creating new money will affect how easily the inflation is tied by the public to war finance. In the Revolution and the nineteenth century wars, as I will show below, the public saw new forms of currency in its pocket: Continental dollars during the Revolution, Treasury notes during the War of 1812, and greenbacks in the Civil War. The argument that the government was printing the new money and that it was the new money that was causing the inflation was far from watertight. Perhaps the government was printing money simply to replace the gold and silver held by hoarders. Or perhaps it was printing money to make sure that people had enough given that prices had risen. But the connections were clearer than when subsequent forms of monetary expansion were used. Under the National Banking Act (1863), the government sold bonds to private banks that in turn issued private bank notes. This method also provided additional revenues for the government from monetary expansion, and depressed yields on government bonds. But from a public relations point of view it had the advantage that

the note was issued by a private bank and not by the U.S. Treasury. Once the Federal Reserve was established, money could be created without alerting the public by introducing a new form of currency.

(3) Equity? In some circumstances financing through money creation may be viewed at least in some quarters as a comparatively equitable means of finance. A war party that represents debtors, for example may, at least up to a point, welcome inflation.

Inflation is essentially a tax on cash balances. The real value of cash goes down by the amount of resources acquired by the government. A tax on cash may not seem fair compared with a well administered progressive tax on income or wealth. But compared with, say, a tax on food or fuel, a tax on cash may well be broader based and more equitable. During the Revolution Benjamin Franklin, perhaps in an over-zealous effort to defend American financial practices, recognized that inflation was a tax, and argued that since people held cash in proportion to their wealth, it was a comparatively fair form of taxation. At least in our day, of course, cash is a declining proportion of wealth, and the inflation tax is regressive.³

Up to this point I have been describing war finance as if decisions about the use to be made of each means of finance were made seriatim. In fact, it was an ongoing balancing act. Decisions about how much use to make of a particular form of finance were made both on the basis of previous decisions and on the basis of expectations

³ More formally, money creation can be regarded as part tax and part borrowing by the government at zero interest. Start with a quantity equation (1) $M = kPy$ where M is the stock of money, k is the proportion of income held as money, P is the price level, and y is real income. Differentiating both sides and rearranging terms produces (2) $\Delta M/P = (M/P)(\Delta P/P) + (M/P)(\Delta k/k + \Delta y/y)$. The term on the left hand side is the government's revenues from inflation. The first term on the right is the inflation tax: the product of the rate of inflation (the tax rate) and the real stock of money (the tax base). The second term on the left is the amount of money the economy will absorb before inflation sets in because more is demanded for transactions or precautionary purposes.

about the alternatives that would be available. The basic principle is that the government will push each means of finance until the marginal cost in political support from raising one more dollar through a given means of finance equals the marginal cost in political support of raising another dollar from any alternative.⁴ Of course, this is only the beginning of a long story. There are different forms of borrowing, different forms of money creation, and different forms of taxation each of which have different political consequences. Nevertheless, as I will try to show below, a simplification of this model which says simply that government's are afraid to let nominal interest rates increase, and when they see that prospect they turn to the printing press, goes a long way toward explaining the American experience.

So far I have assumed the traditional framework in which money creation is one of three means of financing government expenditures: taxes, borrowing from the public, and printing money. This description can be made a tautology by defining "finance" appropriately, but this tautology should not blind us to the many other ways governments have for getting hold of the resources they need to fight wars. Soldiers can be paid in cash to join; but they can also be given land grants, which were an important means of enlisting soldiers before the Civil War. And, of course, conscription has been used in most of America's major wars. If conscripts are paid less than a competitive wage, the difference between a competitive wage and what they are paid is an implicit tax. Still another possibility is to rely on "the kindness of strangers" as was done in the

⁴ The discussion here abstracts from the decision about the amount of resources to devote to the war effort. In reality, however, that decision will also be part of the balancing act. The war government may decide that cutting the amount of resources devoted to the war is less costly than increasing one of the means of finance.

Revolution and the First Gulf War. And it may be possible to reduce current spending on civilian activities, for example by deferring maintenance on existing infrastructure. A secondary purpose of the paper is to draw attention to the role of these non-standard means of getting resources have played in “financing” America’s wars.

In what follows I will argue that money creation was mainly the result of the fear that nominal interest rates would rise if borrowing from the public was increased – the distinction between real and nominal interest rates does not seem to have been a part of public decision making until recently – and that a simple version of the quantity theory of money goes a long way toward explaining the resulting inflation. Inflation, in a simple version of the quantity theory (with velocity constant) occurs at the same rate as the rate of growth of money per unit of output. Inflation, in other words, is simply “too much money chasing too few goods.” It should be kept in mind, however, that the increases in the stock of money in some of these wars was extraordinary, and dominated other factors affecting the rate of inflation. In peacetime when money growth is only one of many factors, the effect of money on prices is not likely to show up in as clear a fashion as in these wartime experiences.

2. From the Revolution to the Civil War

The Revolution

The American revolutionaries were taking on the richest and most powerful nation on earth. The Americans, moreover, lacked a financial system that could provide large amounts of capital in short order. There was no market for government securities

and no commercial banks. Some funds were raised by domestic borrowing. Robert Morris famously lent substantial sums to the Revolutionary government, as did his assistant Haym Solomon. Toward the end of the war, the government took to paying soldiers and suppliers with warrants, obligations to pay after the war was over; a practice that sometimes was more commandeering than borrowing. Foreign loans (and subsidies) from Britain's continental rivals – the Netherlands, Spain, and most importantly France -- were also a major source of finance, providing desperately needed hard currency, in the form of loans and subsidies. The French also provided aid directly in the form of military support. But all these together could not cover the costs of the war. And the foreign monies were not forthcoming in substantial amounts until the Revolutionaries could show themselves to be a substantial threat to Britain on the battlefield.

Raising sufficient revenues through taxation was also a daunting task. The Continental Congress did not have the authority to tax: It had to request revenues from the states. Taxation, moreover, was not popular to begin with – “no taxation without representation” – and many citizens, including many of the richest, were Tories who would be unlikely to cooperate willingly with the authorities. The Continental Congress therefore took to the printing press. Ease of access, low administrative costs, and the difficulty of evading the inflation tax carried the day. Overall, Farley Grubb (2011a, 272) estimated that 77% of the expenditures of the Continental Congress were financed by issuing continental dollars. By year: 100% in 1775 and 99% in 1776, when no alternatives were feasible, then 59% in 1777, 75% in 1778, and 77% in 1779.

Initially, the continental dollar, like many colonial currency issues (often to finance wars), as Grubb has emphasized, was both a zero coupon bond and currency.⁵ The first issue, which was authorized within a week of Bunker Hill, bore no explicit interest but was set to be redeemed between 1779 and 1782. If the notes had been regarded simply as investments, continental notes for \$100 dollars at face value would have traded, at a safe prewar rate of say six percent, for between \$65 and \$78 in specie (Grubb 2011b, 14). This prewar norm was also the rate used for coupons on government loans during the war. But some of the notes were issued in small denominations of one to eight dollars. The point clearly was that they would also circulate as money.⁶ The point is sometimes made that the distinction between bond financed deficits and money financed deficits disappears in wartime. Here the distinction disappeared because the same instrument was part bond and part money; in later wars the distinction would disappear because money was created to fix the price of bonds.

Table 1 gives an idea of the amount of money created during the Revolution by the Continental Congress and the corresponding increase in prices. It shows cumulative issues of the continental dollar and two measures of the price level. The amount of continental dollars has been converted to a specie (gold and silver coin) basis using an estimate of the specie price of continental dollars based on commodity prices in Philadelphia. This price declined dramatically during the war, giving rise to the old

⁵ See Calomiris (1988) for a related but somewhat different interpretation of the Continental dollar.

⁶ Hence, the Constitution uses the now mysterious term “bill of credit, rather than paper money or cash.”

expression “not worth a continental,” once a common description of something that was of little value.⁷

While the amount of Continental dollars outstanding shown in Table 1 is probably about right, the monetary situation as a whole was extremely complex. The Continental currency, as noted above, was not a simple fiat money. Rather it consisted of bonds with complex redemption schedules. Professor Farley Grubb (2011b) has worked out the implications of these redemption policies for the prices of the notes and concluded that during the early years of the war the notes were priced as bonds reflecting the present value of their promised future redemption. But in later years, when Congress changed the redemption rules, the value of the notes fell below their present value as bonds. In 1779 Congress stopped issuing Continental dollars. Instead it turned to other instruments: quartermaster notes, loan office certificates, warrants, tax adjustment notes, and so on. This flood of paper probably contributed to the inflation, but the amounts issued and the extent to which this paper served the purposes of money, have yet to be determined.

To add to the complexity most of the states issued their own paper monies. Ratchford (1941, p.34) estimates that the states issued an amount on the same order as the Continental dollar. There were also substantial amounts of counterfeits in circulation, including counterfeits produced by the British. The British were good at counterfeits – they had access to better facilities for printing notes than did the Americans – and printing notes undermined the American economy even as it

⁷ Alternatively, one could think of the depreciation of the Continental Dollar in specie as an increase in the Continental Dollar price level.

minimized British expenditures of hard currency. Another issue concerns the treatment of specie. It is estimated that on the eve of the Revolution between 4 and 9 million dollars' worth of specie circulated in the colonies. Much of this was probably hoarded during the war as people tried to spend their fast depreciating paper money. But it is possible that people regarded hoarded specie as part of their liquid assets, and that these hoards continued to influence spending decisions.

Figure 1 shows the percentage increases in most of the paper currencies that circulated in the United States and the percentage increases in prices when expressed in the corresponding currency. The rates of inflation on an annual or even monthly basis implied by these numbers were extremely high. The Continental dollar depreciated at a rate of about 5 percent per month. The Virginia dollar depreciated 10.7 percent per month. In the last few months of the Virginia inflation it appears to have come close to Phillip Cagan's definition of hyperinflation, fifty percent or more per month, which Cagan (1956) used while studying twentieth century hyperinflations.⁸

Figure 1 shows that the depreciation of the Continental dollar was similar to the increase in the amount of Continental dollars outstanding; but the depreciation of the state currencies outran the amounts issued. I do not have a ready explanation for this difference or the differences in the experiences of the individual states. Perhaps the somewhat better performance of the national currency can be explained by differences in the redemption policies, or simply by the greater credibility of the national government. Credibility of future redemption might also explain some of the differences among the states. Virginia, for example, had very large claims to western land that

⁸ Cagan, however, added that the fifty percent rate had to persist for a year.

might have provided a basis for redemption of the paper money, while Maryland had none. All this, of course, has to be considered highly speculative.

While paper money was the main means of finance, the revolutionary government found other ways of acquiring the resources in the aggregate may have been equally important. The government made a start on building a navy, but the more important weapons for attacking British shipping were the New England privateers. It has been estimated that there were on the order of 10,000 people employed in building and manning privateers. After the land war moved south privateering was New England's main contribution to the war effort. The central government did not offer cash or securities to the privateers. Instead, it promised them a share of the spoils of war: The letter of marque authorized American ships to capture British ships and offered them $\frac{1}{2}$ the profits derived from selling the goods they took. It was an attractive offer given the high domestic prices of imported goods.

The states and the Continental Congress followed a similar strategy for recruiting soldiers for the army. Volunteers were offered land grants, to be filled with western lands that would be opened for settlement after the war. The British had restricted Western settlement in the late colonial period, but these restrictions would be removed once the war was won. Land grants were a colonial tradition and men volunteering for the Revolution would have thought that there was a good chance that they would be rewarded in this fashion. The earliest explicit offer of land came in 1776, but ironically it was an offer of 50 acres to British soldiers who deserted (Gates 1968, 251). To make sure that the offer reached the Hessians, it was printed in German on the backs of tobacco wrappers (Hibbard 1965 [1924], 118).

Both the Continental Congress and the states made land grants. The grants made by the Continental Congress went to veterans of the Continental Army; the grants made by the states went to veterans of their militias and as supplemental grants to their citizens who served in the Continental Army. The southern states were especially generous. Virginia, the most populous state, and the one with the most western land claims, increased its bounties during the course of the war as it became harder to enlist men. Toward the end of the war, ordinary soldiers and sailors were promised 300 acres and a slave to work the land. North Carolina made the largest grants. Under a law of 1780 the North Carolina scale started with 640 acres for privates and 1,000 acres for noncommissioned officers.

The rewards to officers, in many cases, were far more generous than the rewards for enlisted men. The Continental Congress gave brigadier generals 850 acres and major generals 1,100 acres. North Carolina added 12,000 acres for both brigadier and major generals. It rewarded Major General Nathaniel Greene, the hero of the Revolution in the South, with a “little dukedom,” as one Tennessee legislator put it, of 25,000 acres (Gates 1968, 252-53). Virginia added an additional 10,000 acres for brigadier generals and 15,000 for major generals. Virginia granted Major General Charles Lee, 16,875 acres, Brigadier General Daniel Morgan, 23,328 acres, and Major General Horatio Gates, 31,000 acres (Bockstruck 1996, 196, 308, 376).⁹ Washington undoubtedly could have had an enormous amount of land. He refused, however, to accept any land for his service during the Revolution, even though his personal economy depended on the extensive lands awarded to him for his service in the French

⁹ The island of Manhattan is 13,000 acres.

and Indian War (Flexner 1984, 53-54, 194). The Northern states made smaller distinctions among ranks. Whereas Virginia gave privates 300 acres and major generals 15,000, a ratio of 50 to one; New York gave privates 500 acres and major generals 5,500, a ratio of 11 to one (Gates 1968, 252). The states with large claims on western lands were, of course, in a position to reward their veterans generously. The expectation that those claims might have to be surrendered to the central government simply added another incentive to reward their own citizens generously since it was likely that those claims would be honored by any national government. Although the veterans of the Revolution were promised a great deal of land, its monetary value is difficult to estimate, and may not have been very great. Some preliminary efforts to distribute federal land were made in the mid-1780s, but it was not until 1796 that a military track in Ohio was made available where small holders could exercise their warrants (Gates 1968, 259).

War of 1812

Albert Gallatin, a much admired Secretary of the Treasury, who would serve during the first part of the War of 1812, maintained that wars should be financed mainly by borrowing with taxes raised only enough to cover the interest on the additional debt, the traditional J.S. Mill view. Gallatin's main concern seems to have been that America's trade would be disrupted in a war with Britain, and her economy could not easily absorb the further effects of high taxation (Dewey 1931, 128-29). Perhaps a connection could be made here with Barro's concern with the disincentive effects of high tax rates.

War was declared in June 1812. Immediately following the declaration Congress authorized an issue of \$5 million in treasury notes (more below) and a doubling of tariff rates. But with America's foreign trade disrupted, higher tariff rates would not translate into sufficient revenues to fund payments on the debt. This was recognized from the start, but getting higher internal taxes through Congress was hard. In February 1813 Congress authorized a loan of \$16 million, an amount exceeding previous authorizations and intended to finance the war. But this issue could not be sold at par, the usual prewar condition, and lower bids had to be accepted. The disappointment fostered by the need to increase yields on this loan put more pressure on Congress to increase tax revenues, and to issue interest bearing notes that could circulate as money. At a special session of Congress in the summer of 1813, a range of new taxes were levied: a direct tax (property tax), and taxes on carriages, refined sugar, stamp and auction taxes, and a variety of taxes on alcohol. In September of 1814 efforts to raise revenues along these lines were strengthened. Altogether, however, the taxes raised during the war were insufficient to maintain the credibility of the debt.

Sometimes it is claimed that the War of 1812 was financed entirely by "debt," thus making for a complete reversal from the Revolutionary War, which was financed, as we have seen, mostly by printing money. The Bureau of the Public Debt's website, for example, tells visitors that "The War of 1812 was financed mainly through the use of borrowed funds. Total public debt increased from \$45.2 million on January 1, 1812, to \$119.2 million as of September 30, 1815." (<http://www.publicdebt.treas.gov/>). But much

of the debt was in small denominations intended to circulate from hand to hand as money, or to serve as interest bearing bank reserves.¹⁰

As far as I am aware no one has published estimates of the stock of money during the War of 1812. The fragmentary estimates of some of the components of the stock of money to be found in the literature were assembled by Milton Friedman and Anna Schwartz (1970, Table 14). They wisely refrained from combining those estimates. Any attempt to do so faces a number of problems. For one thing, the nature of the money supply changed dramatically during the war. The Treasury Notes were one example. Were they money? Bonds? Or are they best regarded as a mixture of the two? And in August 1814 when the British captured Washington, banks outside New England suspended specie payments and state bank notes went to heavy discounts in terms of specie.¹¹ I have decided, however, not to follow the wise precedent set by Friedman and Schwartz, and instead put together my own estimates of the stock of money. At best these estimates are useful for painting a broad brush picture and are subject to a wide margin of error.

Initially, veterans of the War of 1812 who served in the regular army in addition to cash received bounties of 160 acres; an amount that was raised to 320 acres toward the end of the war (Hickey 1989, 164, 243-44). About 29,000 of the 60,000 regulars took them up. There were, however, several problems with the grants from the point of view of the veterans. First, the grants were located in a few restricted western areas, in

¹⁰ The interest rate on these notes was set, typically, at 7.3 percent. This works out to be 2 cents per day on \$100, facilitating circulation from hand to hand.

¹¹ Presciently, Adam Smith warned in the *Wealth of Nations* about the dangers of depending on bank notes because of the risk of an enemy capturing the nation's capital.

part because it was hoped that the veterans would be a buffer against Native Americans. This was also true of the Revolutionary warrants, but many of the Revolutionary grants were in highly productive farmland, such as those in South Central Ohio. One area in Michigan reserved for veterans of the War of 1812 was replaced when it was found to be too swampy, although some of the other areas reserved for the veterans of 1812 did contain good farmland. Veterans who had served in state militias were not entitled to grants. State governments rewarded many veterans who had served in militias during the Revolution. However, this was no longer possible because the states had ceded their western lands to the federal government.

The Mexican War

The Mexican War (1846-48) was easily financed by borrowing; there was no need to raise taxes to assure bond holders of future interest and debt repayment, or to resort to the printing press to keep nominal interest rates down. The federal budget had been in surplus before the war, so bond buyers were not going to worry about the ability of the government to meet future interest and principal commitments. All of the debt issued during the war was issued at par or at a premium. In comparing the financing of the Mexican War with the War of 1812, Dewey (1931, 255) concluded that “the ease of the treasury was due not so much to a wiser intelligence as to the great increase in the wealth of the country and to the advance in government credit.” Again, focusing on finance should not obscure the role of land grants, which were also important in filling the ranks.

The Civil War

During the Civil War the United States created two new forms of money, the greenback and the national bank note. Although there were a variety of motives for creating them, both were created with an eye to monetizing part of the interest bearing debt and hence keeping nominal interest rates within “normal” bounds.

(1) The Greenbacks. The famous greenbacks were first issued as part of a major funding bill passed in February 1862. The war had begun in April 1861 with expectations on both sides that it would soon be over. The First Battle of Bull Run was fought in July, and by February 1862 it was clear that a long and bloody war lay ahead. The funding bill called for the issue of \$500,000 in 5-20s: six percent bonds with interest payable in gold, callable after 5 years maturing at 20. The equivalent today, as a share of GDP, would be \$1.49 billion.¹² The law also provided for \$150,000 in notes: the famous greenbacks.¹³ They were legal tenders: they could be used to pay taxes or settle private debts denominated in dollars.¹⁴ A key provision of the legal tender act was that the notes were convertible into the 5-20s, so that the act created the currency with which the 5-20s could be purchased.

Secretary of the Treasury Salmon Chase does not seem to have been very enthusiastic about the greenbacks. Indeed, in 1869 as a member of the Supreme Court he would rule that the legal tender clause was unconstitutional. The idea for the

¹² Using the calculator at www.measuringworth.com.

¹³ They were known greenbacks, of course, for their color which became traditional for American currency, and perhaps also because they were “backed” by green ink rather than by gold.

¹⁴ Except for tariffs, which had to be paid in specie. Allowing tariffs to be paid in greenbacks would in effect have lowered the tariff rate, something anathema to the Republicans.

greenbacks had originated in the Congress. In the Senate, John Sherman argued that if the greenbacks were not issued, money for the war effort could not be had, except at ruinous interest rates, because gold and silver had ceased to circulate. In the House, Thaddeus Stevens was equally enthusiastic. As a result of issuing the greenbacks, Stevens argued, the \$500 million in 5-20s would be subscribed before the government could use the funds. In other words, it was clearly understood that the greenbacks were a vehicle for monetizing the debt and preventing an increase in nominal rates.

There would be two further authorizations of greenbacks in July 1862 and July 1863; \$450 million in all, with about \$430 million issued.

The \$500 million in 5-20s authorized in February 1862, did not sell well initially because Chase insisted on selling them at par even though the legislation authorizing them had authorized sale at market price. Sales, however, did pick up for a number of reasons, including the depreciation of the greenback, which made the 5-20s, which promised interest in gold, more attractive..The 5-20s could be exchanged at par for greenbacks, so essentially the government was printing money to buy bonds; economically the same as the Federal Reserve open market operations undertaken during World War II to be discussed below. Eventually, the right to convert greenbacks into interest bearing gold bonds was terminated, so the greenbacks became a pure fiat money.

The reputation of the greenbacks was mixed. The greenbacks were popular in Congress. And in parts of the country “Lincoln Green” was seen as a superior form of money. This was especially true in the West where some currency issued by state banks had been backed by southern bonds and so had lost most of its value. On the

other hand, it was widely recognized that the greenback was a source of inflation. This was more obvious than it would be in subsequent wars because there was an active market for gold dollars and one could see the increase in the greenback price of gold from day to day.

(2) The National Banking System. Chase's preferred method for dealing with the currency was a national banking system. He had mentioned this idea as early as his report to Congress in December 1861. The basic idea was a nationalized version of the "free banking law" that had been adopted before the war in several states, including Chase's home state of Ohio. The key provision, for our purposes, was that paper money would be issued by private banks, but it would be backed by government bonds. Under the state level free banking laws, states chose different lists of eligible bonds, including of course bonds of the state in which the bank was located. Under Chase's National Banking Act, the federal government would charter banks, and their notes would be backed by federal bonds. Chase offered a number of reasons for supporting a National Banking system. For one thing it would provide a more uniform and safer currency than the myriad of state banking systems that had existed before the war. At the same time, since these notes would be issued by private banks and redeemable in gold or silver (after resumption of specie payments) there would be less danger of inflationary issues than if the power to issue paper money were permanently left in the hands of Congress. Clearly, however, monetizing part of the federal debt and thus keeping nominal interest rates low was an important gain expected from the National Banking Act.

The consequence of the increase in the stock of money during the war was inflation. This can be seen in Table 3 which shows the issues of the greenbacks,

estimates of the total stock of money, two measures of the price level, and the interest rate on long-term federal government bonds during the war years. Evidently, the stock of money rose rapidly in the North during the Civil War.¹⁵ The cost of living rose by a factor of 1.9 and the GDP deflator by a factor of 1.7.

Inflation was disruptive and undermined support for the war. For one thing, creditors suffered unexpected losses, thus harming an important constituent of the Republican party.¹⁶ Wages did not keep pace with the inflation, although there is a debate about whether this was a purely monetary phenomenon, or whether it was also the result of real disturbances such as the cutoff of supplies of cotton. One of the groups badly hurt by wartime inflation was the soldiers. Wages of soldiers remained at \$13 per month from the start of the war until May 1864 when they were increased to \$16 per month, an increase that was too small to catch up with the current price level, let alone make up for past losses. The problem of rigid wages for soldiers combined with rapid inflation would also prove to be a problem in World War I.

Emphasis on money creation should not distract attention from the efforts the Lincoln government made to fund and market its debt. The Republicans were serious about taxes. In addition to raising the tariff rate, the Republicans imposed a series of excise taxes. The taxes they imposed on alcohol and tobacco are still with us. Perhaps even more remarkable, they imposed progressive taxes on corporate and personal incomes and inheritances. To help market the debt, Chase turned to the investment banker Jay Cooke. Cooke assembled a team that fanned out across the North and sold

¹⁵ The inflation was more severe in the South which relied more heavily on the printing press.

¹⁶ But western farmers, another important constituent of the party, one imagines, were debtors.

bonds to doctors and lawyers and other middle class investors. Constructing new means of borrowing and taxation took time. But by the end of the war, reliance on new issues of greenbacks had ended. Although the inflation was substantial, it was nothing like the inflation in the South during the Civil War, which relied almost entirely on the printing press.

Nonfinancial methods of acquiring resources were also used during the Civil War. Conscription was the main form in this class. As in the Revolution, conscripts could hire substitutes. Thus the amount paid to substitutes could be regarded as a tax on the conscripts. It simply went straight from taxpayer to soldier, bypassing the government bureaucracy. Land grants were not an important part of war economics. The Homestead Act, however, which was passed during the war, allowed veterans to count their war service toward the five years of residence required under the Act to obtain title to the land.

The consequences of relying or not relying on the printing press in the 19th century can be seen in Figure 2, which shows the percentage increase in prices and the percentage increase in money per unit of output in five 19th-century wars. The price series used for Figure 2 is a consumer price index. But the GDP deflator when available produces a similar picture. Money per unit of output is the percentage change in the stock of money divided by real GDP. To be sure, real GDP estimates from the antebellum and Civil War years are best described as conjectures. The estimates of the stock of money for the War of 1812 and the Civil War are my own. The estimates are useful for broad brush comparisons but no more because a good deal of data is missing

and because of the added complication of different kinds of money circulating at varying prices rather than at face value.

Overall, the results are consistent with the notion that inflation was generated in major wars by resorting to the printing press. There were large increases in money per unit of output in the Civil War and substantial inflation. In the War of 1812 the increases in money per unit of output and inflation were somewhat less. In the Mexican War there was no resort to the printing press and no inflation.

The most surprising result is for the Spanish-American and Philippine-American wars. Money per unit of output did increase noticeably, but prices increased to a much smaller extent. One possible explanation is that the Spanish-American and Philippine-American Wars occurred during a period of economic slack similar to what we are experiencing today. To be more precise, the Spanish-American War began five years after the great panic of 1893 -- just as this paper is being written in 2013, five years after the panic of 2008. And as we are acutely aware, there is still considerable slack in the economy. Real GDP recovered rapidly after the panic of 1893. By 1895 real GDP was higher than before the crash. But getting back to full employment was a long drawn out affair. Figure 3 shows unemployment beginning three years before the crisis of 1893 and three years before the crisis of 2008.

After the panic of 1893, unemployment, as shown in Figure 3, did not get back to the pre-panic level until 1901. There is a larger drop in the unemployment rate between 1898 and 1899 than in earlier post-1893 years that may be associated with spending on the Spanish-American War. There was also the unusually large increase in the money supply shown in Figure 2. The reason appears to be an increase in the stock of

monetary gold: Favorable harvests in the United States combined with poor harvests in Europe produced an export surplus and a substantial inflow of gold. Thus, in the 1890s the gold standard produced by chance the kind of monetary stimulus that the Federal Reserve is now attempting to produce deliberately. If the increase in the stock of money did not produce an increase in commodity prices, what did it do? It may account for the drop in the unemployment rate. It may also have fed into the stock market, which enjoyed a bull market – until the stock market panic of 1901. Clearly, unemployment after the 2008 panic has followed a path that is eerily similar to the path followed by unemployment after the panic of 1893. Hopefully we will do better than we did in the 1890s, but if we continue to follow the earlier path we will not get back to the pre-panic level of unemployment until 2016.

3. The World Wars

The establishment of the Federal Reserve in 1913 substantially changed the mechanics of wartime money creation. In the Revolution, the War of 1812, and the Civil War the phrase “printing money” was literally true; after 1913 it became a metaphor. The Continental dollar, the Treasury notes from the War of 1812, and the Greenbacks from the Civil War were all freshly off the press. They included some bond like features, but there was no mistaking the fact that they were intended to circulate from hand to hand as money. Reliance on new types of money made the chain of reasoning connecting the inflation to the monetary policies of the war governments fairly straightforward. Many people undoubtedly blamed rising prices simply on the rising greed of the shopkeepers, or the disruptions of war. But it was not hard to see that specie had disappeared, that

the government was printing the new stuff that replaced the specie, and perhaps that the government was more than replacing the specie.

With the Federal Reserve in place, however, the process became more roundabout. The money supply consisted mainly of Federal Reserve notes and bank deposits, although gold, subsidiary coins, and some additional historical paper remnants continued to circulate. The amount of Federal Reserve notes and deposits increased, but there was no new currency to signal the change in monetary policy. The basic stories of monetary policy in World War I and World War II were similar. But there were important differences in the administrative details.

World War I

America declared war on April 6, 1917. Eighteen days later Congress authorized borrowing of \$5 billion. This would be 1.44 trillion as a share of today's (2014) GDP, about the same effort that the United States made after the First Battle of Bull Run when an understanding of the magnitude of the Civil War was realized.¹⁷ Evidently, Congress well understood the size of the task that lay ahead. This was the total authorization; it was assumed that the Secretary of the Treasury would space out the actual bond sales as the war progressed. One of the stipulations was that the coupon not exceed 3.5%. Clearly, Congress saw a low rate of interest, reflecting prewar norms, as important. As can be seen in the last column of Table 4 this coupon would have meant selling the bonds below par if typical prewar rates prevailed.

¹⁷ Using the calculator at www.measuringworth.com.

A number of measures were taken to increase the market for the bonds. In October 1917, after considerable wrangling, taxes were raised. Many of the new or increased taxes were excises. Alcohol, tobacco, jewelry, cameras, cosmetics, chewing gum, and many others came in for new or increased taxes. Income taxes, now possible because of the sixteenth amendment, were raised. The highest rate was 67% on incomes over \$2,000,000, about \$187,000,000 today (2014), using GDP per capita as the inflator.¹⁸ There was also a graduated tax on inheritances and an excess profits tax. Although the actual policy followed with respect to taxes was similar to that followed in the Civil War, and consistent with the classical idea of war finance that borrowing was OK as long as interest rates did not increase, I should note that the ideas of economists were beginning to change. Some economists were advocating more reliance on taxation. The primary argument emphasized equity. If you rely on bond finance, then young men are taxed twice, once when they are conscripted into the army, and once again when they come home and pay higher taxes to pay interest and principal on the bonds. Better to tax the stay-at-home fat cats, than sell them bonds.

The Treasury also made efforts to encourage people to buy bonds through a national campaign based on patriotism. For one thing, giant rallies were held in which celebrities, including Hollywood stars, urged people to support the war effort by buying the bonds.¹⁹ Even the name of the bonds reflected the Treasury's new emphasis on salesmanship. These were "Liberty bonds" not the prosaic 5-20s of the Civil War.

¹⁸Using the calculator at www.mesuringworth.com.

¹⁹ Kang and Rockoff (2006) discusses the efforts to market the bonds in some detail.

But the Treasury also relied on the Federal Reserve to monetize part of the debt. For short-term financing, which was needed before higher taxes could be realized or between sales of bonds on the open market, the Treasury sold short-term certificates of deposit directly to the Federal Reserve. Reliance on the Federal Reserve, however, went much further. The Federal Reserve set a discount rate on loans secured by government bonds that was below the yield on the government bonds. Thus, banks were encouraged to loan money to the public with which the public could buy Liberty bonds. Although the institutional details were different, the effect was similar to the issue of greenbacks with the right of conversion into 5-20s. The effect of these operations can be seen in the first column of data in Table 4 which shows the amount of high-powered money (currency plus bank deposits at the Federal Reserve) during the era of World War I.

The amount of high-powered money created by the Federal Reserve, however, does not tell the whole story. Since banks only keep a fraction of the reserves they obtain, there is a multiple expansion of deposits and loans. During the war years, one can assume that many, perhaps most, of these loans went for the purchase of government bonds, or freed up other funds that could be used to purchase government debt. The second column of data in Table 4 shows the increase in the total money supply. The percentage increase in the money supply from 1916 to 1920 was about the same as the percentage increase in high-powered money. But the amount of the increase was much larger for money. Since many government bonds ended up on the balance sheets of individuals rather than financial institutions, it is hard to know exactly how much of the purchases of the war debt were financed by money creation. Friedman

and Schwartz (1963, 221) argued that virtually all of the increase in the money supply directly or indirectly went to finance the war effort.

The decision by the Federal Reserve to support the market for Liberty Bonds seems to have been taken for granted by both the Treasury and the Federal Reserve during the war.²⁰ Continuation of the policy afterwards, however, became a contentious issue. The Treasury, under Secretary Carter Glass, wanted a continuation of the low discount rate that prevailed during the war to ease Treasury refunding, that is, to prevent an increase in the yields on government bonds. For a time the Federal Reserve acquiesced. The Federal Reserve did not want an open confrontation that might have led to a transfer of power to the Treasury, and the Federal Reserve was concerned that a sudden decline in government bond prices might weaken the banks because they held large amounts of bonds on their own account as well as loans secured by bonds. Benjamin Strong, the President of the New York Federal Reserve, appears to have been the leading advocate of a higher discount rate to stem the inflation that continued after the war (as shown by the price indexes in Table 4). Rates were finally raised in January 1920 to the then very high rate of 6 percent. Inflation, gold exports, and the possibility that the United States might be driven off the gold standard tipped the balance. Even Carter Glass was persuaded that an increase was needed.

World War II

The Federal Reserve supported the bond market immediately after Pearl Harbor. A few months later, Mariner Eccles, the chair of the Federal Reserve Board, explained that the

²⁰ This paragraph is based mainly on Friedman and Schwartz (1963, 221-231).

Federal Reserve had bought about \$100 million of government bonds after Pearl Harbor because the market had been “very weak, very jittery” (Rockoff 2012, 170).²¹ The question from the start was not whether the Federal Reserve would support the bond market, but rather at what price. In April 1942 the Federal Reserve announced that it would keep the interest rate on Treasury bills (generally 90 days) fixed at 3/8 of one percent. Although there was no explicit set of rates for longer maturities, a rigid pattern emerged. The Federal Reserve, in other words, promised to set a floor under the price of government securities and buy whatever amount of bonds was necessary to prevent the price from falling below that level. The yields were low compared with yields in the nineteenth and early twentieth centuries, or in the postwar period. But they reflected what had happened in the Great Depression. A low level of economic activity and the rush to government securities for safety meant that for a decade rates on government bonds had remained at very low levels. The Federal Reserve simply promised to preserve that structure of rates during the war. From a long historical view the rates in the 1930s were abnormally low, but from the perspective of 1941, they were the “new normal.”

Deliberate purchasing of debt by the Federal Reserve was a departure from what was done in World War I. In World War I, as I discussed above, the Federal Reserve monetized bond issues mainly by lending money to banks on paper collateralized with government bonds. It bought relatively small amounts for its own account. In World War II, however, the Federal Reserve went into the market and bought government bonds.

²¹ Eccles was appointed by Roosevelt and generally supported the Keynesian (perhaps more accurately proto-Keynesian) view that the main function of monetary policy in most circumstances was to keep interest rates low.

Both methods were effective. In both cases the expansion of bank reserves allowed banks to purchase government securities or to make loans to customers who in turn bought bonds, either directly with the funds lent to them, or indirectly by using other funds freed up by the loan.

I don't have a clear answer for why the Federal Reserve's policy changed. Friedman and Schwartz (1963, 561-2) suggest that it was "dissatisfaction with World War I experience" that explains the change, but they don't elaborate. Another possibility is that the change reflected changes in Federal Reserve operating procedures that were already in place. When the Federal Reserve was founded in 1913 it was natural to emulate the Bank of England, which generally relied on discount policy. This was all the more necessary because the U.S. government did not have a large debt and much of the debt that it did have was used by banks to back national bank notes. So a purchase of securities might produce perverse offsetting effects on the amount of cash in circulation. The large increases in debt during World War I and the Great Depression made reliance on open market operations easy for the Federal Reserve.

Friedman and Schwartz (1963, 563) claimed that "the support program converted all securities into the equivalent of money."²² Here we can see the strong family resemblance between the financing of the Revolution with debt that was intended to circulate as cash, and with the financing of the Civil War with greenbacks that could be converted into government bonds on demand.

²² Although they did not modify their estimates of the stock of money to include government debt during the period when bond prices were fixed by the Federal Reserve.

4. The Postwar Era

After World War II the United States fought smaller colonial wars. For the most part, it was able to avoid funding those wars with the printing press. In both the Korean War and the Vietnam War, however, the administrative branch of the government put strong pressure on the Federal Reserve to expand the money supply and support government bond prices.

Korean War

The World War II bond support program remained in place after the war. Although it may have contributed to the postwar surge in prices, debate over it remained muted until the outbreak of the Korean War in June 1950. The Federal Reserve believed that maintaining a floor under bond prices had converted it into an engine of inflation during World War II, and it did not want to repeat the process in the Korean War. Prices had increased by more than 50 percent, and inflation in turn had led to the introduction of an annoying system of price and wage controls and rationing. The Treasury was insistent, however, that full support for securities markets be continued. The Federal Reserve made a tentative move toward independence in August 1950 when it announced that it would permit some increase in the yields on government securities. The Treasury reacted quickly by announcing that it would maintain current yields in its next refunding operation.

The conflict came to a head in March 1951. Conferences were held between the two agencies and with various members of the government. The result was the famous Treasury-Federal Reserve Accord which relieved the Federal Reserve of the obligation -

- or so the agreement was interpreted by the Federal Reserve -- to peg the price of government securities. Even President Truman was involved. In his *Memoirs* Truman (1956, volume 2, 44-45) discusses both his involvement and his opposition to the Federal Reserve's interpretation of the Accord. Truman, as he clearly lays out, did not want to see higher interest rates because of the impact higher rates would have on public opinion.

It did not seem appropriate to me that we should enter into a period of deficit financing on a rising money-rate pattern. I also felt strongly that in the moment of impending crisis we should not take deliberate steps that could possibly disturb public confidence in the nation's financing. ...For that reason I invited members of the Federal Reserve Board to visit with me. At this conference, I asked them to give the Treasury their full support for its financing program, just as they had done during World War II. ...

I was given assurance at this meeting that the Federal Reserve Board would support the Treasury's plans for the financing of the action in Korea. This assurance was given entirely voluntarily. At no time during the conference did I attempt to dictate to the Board or tell them what specific steps they ought to take. I explained to them the problems that faced me as Chief Executive, and when they left I firmly believed that I had their agreement to cooperate in our financing program. I was taken by surprise when subsequently they failed to support the program.

Although the Accord freed the Federal Reserve from the obligation to peg the price of government bonds, the Federal Reserve did not move to the opposite extreme and abandon the bond market to its own devices. The Federal Reserve continued to buy some bonds and exercise a moderating influence on interest rates. It was not until March 1953 that pegging was explicitly rejected.

Why did the Federal Reserve refuse to maintain peg bond prices as it had done in World War II? One factor was that inflation and price controls were still fresh in

everyone's mind. In that respect the situation is reminiscent of the period after the Revolution. The memory of inflation during the Revolution, and of the problems generated by state currency issues under the Articles, led to the adoption in the Constitution of an explicit ban on state issues of paper money, and perhaps (the question is controversial) a ban on federal issues.²³

Friedman and Schwartz (1963, 626-27), however, see the Accord as a response to the growing worldwide abandonment of Keynesian cheap money policies because in country after country the anticipated postwar problem, a return to the depressed conditions of the 1930s, was replaced by the problem of persistent inflation. In other words, Friedman and Schwartz saw the Accord as the product of an intellectual change. This seems somewhat early to me, after all Friedman and Schwartz had not yet attacked the Keynesian orthodoxy! But it may be that attitudes were already beginning to change.

Another part of the story may be the size of the financial problem facing the government. Although China entered the war in October 1950 it remained a limited war. Substantial tax increases were put in place in the revenue act of September 1950, as a result of an overwhelming vote in the Congress: 328 to 7 in the House. These included increases in income taxes and corporate taxes, as well as sin and luxury taxes. All in all the enthusiasm of the Congress for taxes was most reminiscent of the tax bill passed shortly after the start of the Spanish-American War (Rockoff 2012, 247). It was, as Bank, Stark, and Thorndike (2008, 115-16) pointed out, a "rally round the flag" vote.

²³ The Constitution grants the federal government the right to coin money (presumably gold and silver) and to issue notes (interest bearing securities). It is silent on federal bills of credit (paper money).

Fortunately, these tax increases turned out to be enough. Federal spending increased from \$40 billion in 1950 to \$74 billion in 1953 that is from about 13 percent of GDP to 19 percent of GDP. But federal revenues about kept pace, increasing from 13 percent of GDP in 1950 to 18 percent in 1953. In World War II, by way of contrast, Federal spending increased from 9 percent of GDP in 1940 to 44 percent in 1945. Revenues also increased, from 6 percent of GDP to 20 percent, but that still left a large gap, equaling almost a quarter of GDP to be filled by borrowing or printing money. Had it been necessary to increase spending to anything approaching same extent during the Korean War, the government might well have been forced to issue more debt and Truman would have found it necessary to increase pressure on the Federal Reserve to prevent “a rising money-rate pattern.” As it was, the Federal Reserve permitted an increase of the long rate from 2.62 percent in 1950 to 3.20 percent in 1953. Hardly a staggering increase, but sufficient to show that it had achieved a modicum of independence.

Vietnam War

There were considerable increases in money and inflation during the era of the Vietnam War, as shown in Figure 4. War finance was a contributing factor, but not the whole story.

Events moved swiftly after Lyndon Johnson became president. He moved ambitiously to create his Great Society with bold initiatives to help the poor and middle class. In January 1964 Johnson declared his War on Poverty, but in August 1964 came the Gulf of Tonkin Resolution authorizing the use of force against North Vietnam. Like

Harry Truman, Johnson was determined to prevent a communist takeover of a divided country in South East Asia. The Kennedy-Johnson tax cut had been put in place in February 1964, a triumph for the “New Economics” of his Keynesian advisors. But now with rising government expenditures and rising prices on the horizon, his economic advisors began to talk about tax increases. For a time Johnson resisted, afraid that tax increases would undermine support for both his Great Society programs and his war in Vietnam. Eventually, however, Johnson came around to the idea that a tax increase was necessary. He proposed a “surtax,” an additional 10 percent on personal and corporate incomes, that was enacted in June 1968.²⁴

Meanwhile, the Federal Reserve was also becoming concerned about the first stirrings of the inflation that would bedevil the economy for the next decade and a half. The result was a clash between President Johnson, who wanted the Federal Reserve to maintain interest rates despite the growing deficit and rising rate of inflation, and William McChesney Martin, the chair of the Federal Reserve. Martin, although not an extreme inflation hawk is still remembered for his description of the job: to take away the punch bowl just when the party is getting interesting. But one dramatic episode brought the conflict into sharp focus. Early in December 1965 the Federal Reserve announced an increase in the discount rate (the rate at which the Federal Reserve lends to member banks) from 4 to 4.5 percent. Martin knew that Johnson was opposed to any increase in rates, but felt that the time to act had arrived. Johnson publicly condemned the move (*New York Times*, December 6, 1965, 1). “I regret, as do most Americans, any action

²⁴ Bank, Stark, and Thorndike (2008, 135-8) describe the details of the tax. 10 percent was an exaggeration because it applied for only part of the tax year.

that raises the cost of credit, particularly for homes, schools, hospitals and factories.” In the Senate a number prominent Democrats denounced the move and called for hearings. In the House, the legendary Congressman Wright Patman of Texas, the chair of the House Banking Committee, called on the President to demand Martin’s resignation “to prevent the country from being thrown into economic crisis.” Martin was summoned to Johnson’s Texas ranch and there for two hours they discussed the Federal Reserve’s decision (*New York Times*, December 7, 1965, 1). The press conference that followed was suffused with sweetness and light, but according to Martin’s later memory, it was not all sweetness and light while the doors were closed (Meltzer 2009, volume 2, book 1, 458.) The parallels between this episode and the meeting between Truman and officials from the Federal Reserve described in the previous section are striking. In both cases the Federal Reserve was subjected to intense pressure from a populist president who was vehemently opposed to any increase in nominal rates.

As was true after the Korean War Accord, the Federal Reserve, although it had successfully asserted its independence, did not follow a sharply restrictive monetary policy. Open market operations continued to be expansionary and high-powered money and the money supply continued to grow. The policy stance of the Federal Reserve demonstrated Martin’s concern that policy reflect a consensus on the Federal Reserve Board, and then as now there were inflation doves as well as hawks, and Martin’s

understanding that the Federal Reserve was independent within (not from) the government.²⁵

The inflation continued through the 1970s. And it obviously cannot all be blamed on the war. Federal spending was rising for domestic reasons as well as because of the War. And there was an important change in monetary policy. Before World War II peacetime monetary policy was aimed mainly at maintaining the gold standard. After World War II price stability remained a major determinant until the 1960s. As Keynesian economics became the dominant paradigm, mainstream economists and policy makers came to believe that the Federal Reserve could reduce unemployment through monetary expansion with an acceptable impact on inflation. As time went by it became clear that the gains in employment from monetary expansion were temporary, and trying to suppress unemployment through monetary policy produced unacceptably high rates of inflation.

The relationship between money per unit of output and inflation (consumer price index) in America's twentieth century wars is shown in Figure 4. As expected the World Wars witnessed the largest increases in the stock of money relative to real output and the largest increases in prices. Perhaps the most surprising aspect of the figure is that the increases of money per unit of output and prices were similar in World War I and World War II, even though World War II lasted much longer and produced far more casualties. Part of the explanation is that the attack on Pearl Harbor created deep and

²⁵ Meltzer (2009, volume 2, book 1, 441-79 is a detailed account of Federal Reserve policy in the mid-1960s.

long lasting support for the war making it possible for the Roosevelt administration to increase taxes without worrying about adverse political effects.

By way of summary we can look at Figure 5 which shows the consumer price index from 1774 to 1950. During that long period inflation was almost completely a wartime phenomenon. Until World War I, wars were followed by deflations that returned the price level to the prewar level. The price level in 1900 was about the same as it had been in 1774. This was the result of adherence to the gold standard and to the determination of governments to return to prewar prices of foreign currencies after the war was over. Wartime inflation, however, was not fully reversed between World War I and World War II, and after World War II we entered a new world of fiat money in which some measure of inflation became the norm. It is not too much of an exaggeration to say that after World War II what had once been the unique finances of wartime – high levels of government spending financed in part by borrowing from the public and in part by money creation – became the peacetime norm.

5. Conclusions

The operating assumption here has been the classical, perhaps old-fashioned idea that inflation is caused by “too much money chasing too few goods.” The evidence shown here, of course, doesn’t prove that proposition; at best it strengthens it a bit by adding a few consistent but contestable observations to a large body of other observations with which monetary historians are familiar. In the wars there were various non-monetary factors at work, such as the disruption of foreign trade and large increases in government spending, which could also explain wartime inflation, and these factors

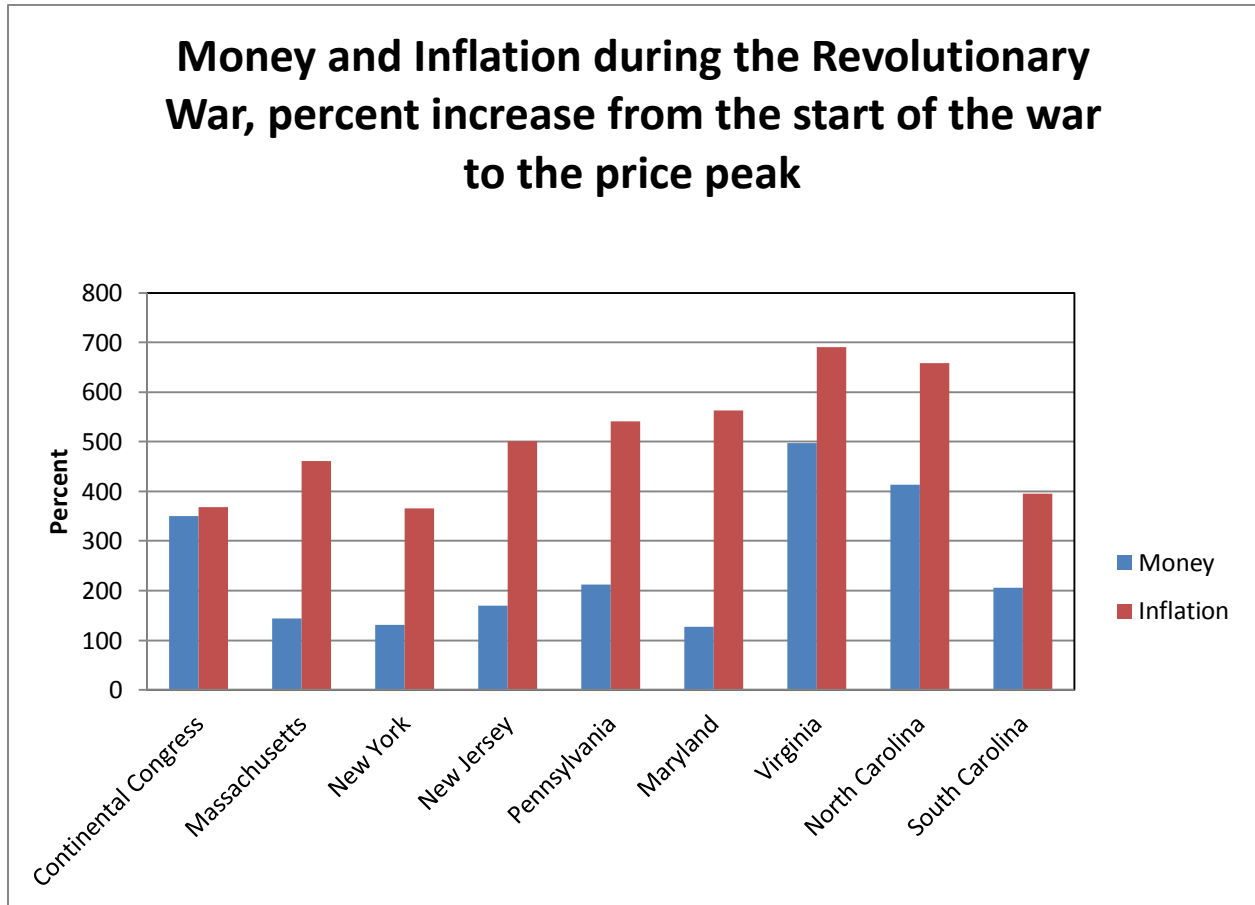
undoubtedly did have some impact. Many years ago Milton Friedman (1952) pointed out that the inflation and increase in money per unit of output during World War I and its aftermath was about the same as in the Civil War and World War II, even though the dislocations measured by duration, casualties, government spending, and so on were far greater in World War II and the Civil War than in World War I. That set of comparisons obviously strengthens the case for assigning a primary role to money. Here we have added some examples from the pre-Civil War and post-WWII periods, but while they are consistent with money being the major determinant of the rate of inflation, they do not add decisive evidence. Inflation and money growth were less, for example, during the War of 1812 than in the North during the Civil War, but that would be expected both on monetary and non-monetary grounds.

America's wars with major powers have been financed to a significant extent by the printing press, and have produced significant inflations. Its wars against second tier powers were not financed in this way, and did not produce inflation. Only the Vietnam War is a partial exception. Although the political economy of each war was unique, there were some common features. The natural reaction when faced with a major war was for governments to borrow the sums needed. But large scale borrowing raised the prospect of substantial increases in interest rates. For a variety of reasons war governments were loath to see interest rates rise above prewar norms. For one thing, higher rates would be a signal to the public and to friends and foes abroad that the government's decision to wage war was undermining the economy. Increasing taxes at least to a level that promised to be sufficient to pay interest and principal on war debt was an obvious necessity for keeping interest rates in check. But raising taxes was often difficult for

administrative reasons (new taxes could not be levied and collected quickly), because higher taxes were ideologically objectionable to the war party, and because higher taxes would, at some point, undermine support for the war. Given those constraints turning to the printing press was an obvious choice even though it also came with a cost: inflation that also threatened to undermine support for the war provided the public worked out the connection between the inflation and the financial policy of the government. This is a simple story, and often needs elaboration and modification to match particular experiences, but it does a good job of explaining the major features of the American experience from the Revolution to the present day.

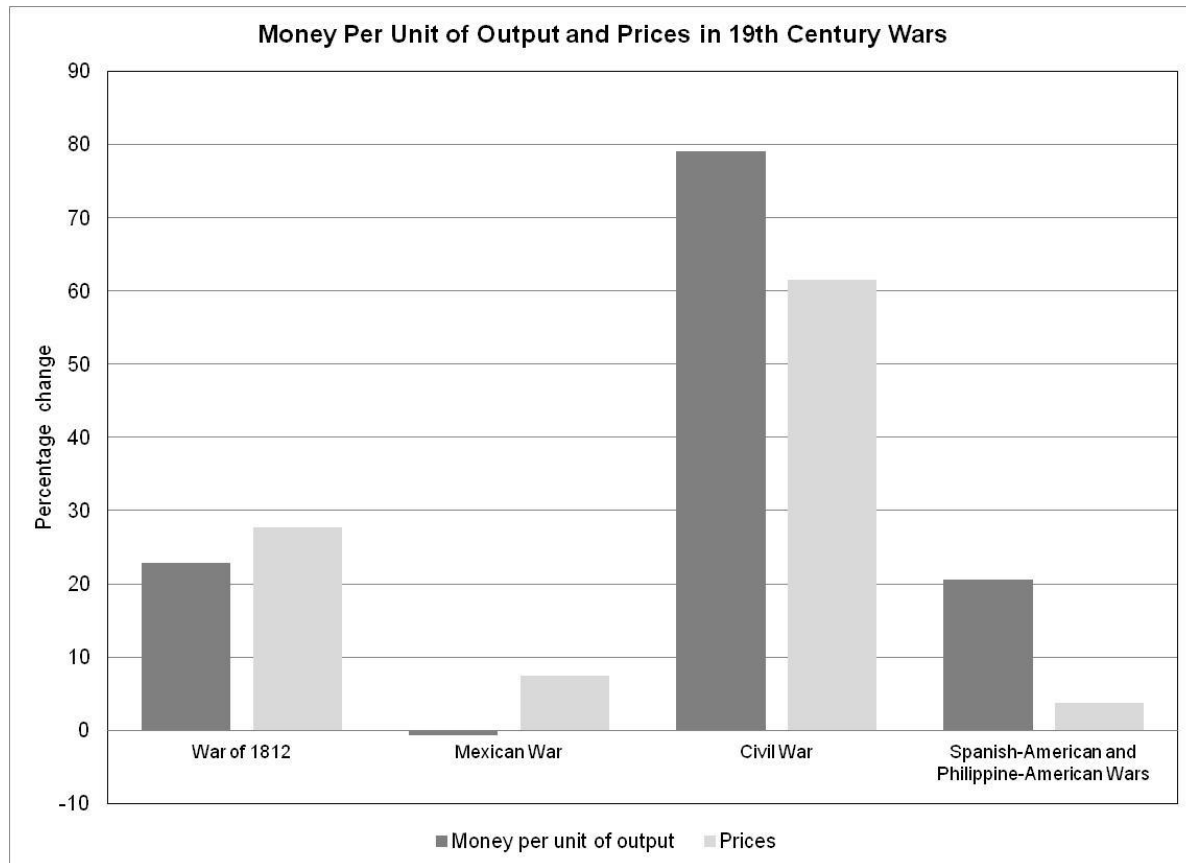
Appendix: The Means of Finance for America's Wars				
	Revolution	War of 1812	Mexican War	Civil War (North)
Start	April 1775	June 1812	April 1846	April 1861
End	September 1783	February 1815	February 1848	April 1865
Means of acquiring resources	(1) Printing Money (2) Borrowing from the public (3) Borrowing from foreign countries (4) Land Grants (5) Conscription (6) Letters of Marque	(1) Borrowing from the public (2) Printing Money (3) Taxes (4) Land grants (5) Letters of Marque	(1) Borrowing from the public (2) Land grants	(1) Borrowing from the Public (2) Taxes (3) Printing Money (4) Conscription
	Spanish American and Philippine American War	World War I	World War II	Korean War
Start	April 1898	April 1917	December 1941	June 1950
End	July 1902	November 1918	September 1945	July 1953
Means of acquiring resources	(1) Taxes (2) Borrowing from the Public (3) Printing Money	(1) Borrowing from the Public (2) Printing Money (3) Taxes (4) Conscription	(1) Taxes (2) Borrowing from the Public (3) Printing Money (4) Conscription	(1) Taxes (2) Conscription
	Vietnam War	First Iraq War		
Start	August 1964	January 1991		
End	January 1973	February 1991		
Means of acquiring resources	(1) Borrowing from the public (2) Taxes (3) Printing Money (4) Conscription	(1) Contributions of foreign governments		
Sources: Dewey (1930, <i>passim</i>), Rockoff (2012, <i>passim</i>) and other financial histories. I have tried to order the means of acquiring resources from most to least important, but in some cases, particularly when comes to nonmonetary forms of finance such as land grants, the ordering is just an informed (hopefully) judgment.				

Figure 1



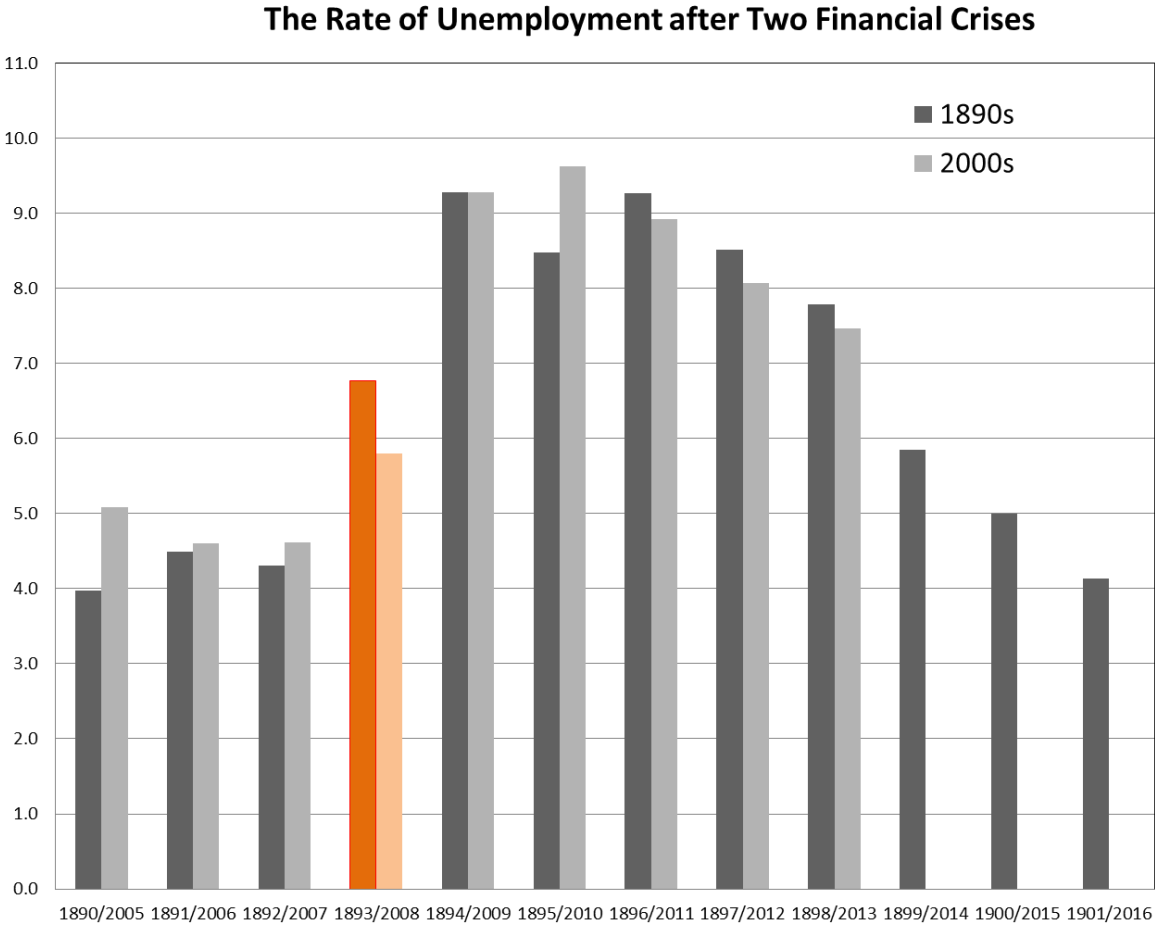
Notes and Sources. Massachusetts includes New Hampshire and Rhode Island. New York includes Connecticut, and Pennsylvania includes Delaware. I assumed that the state paper monies were initially issued at par. Assuming that the state issues were initially issued at a 33.3% discount does not alter the overall picture very much. The amount of paper money issued by the Continental Congress is from Grubb (2011b, table 2, p. 15). The amounts issued by the states are from Ratchford (1941, p. 34). Prices are from McCusker (2001, Tables C-1 and C-2, pp. 76-79).

Figure 2



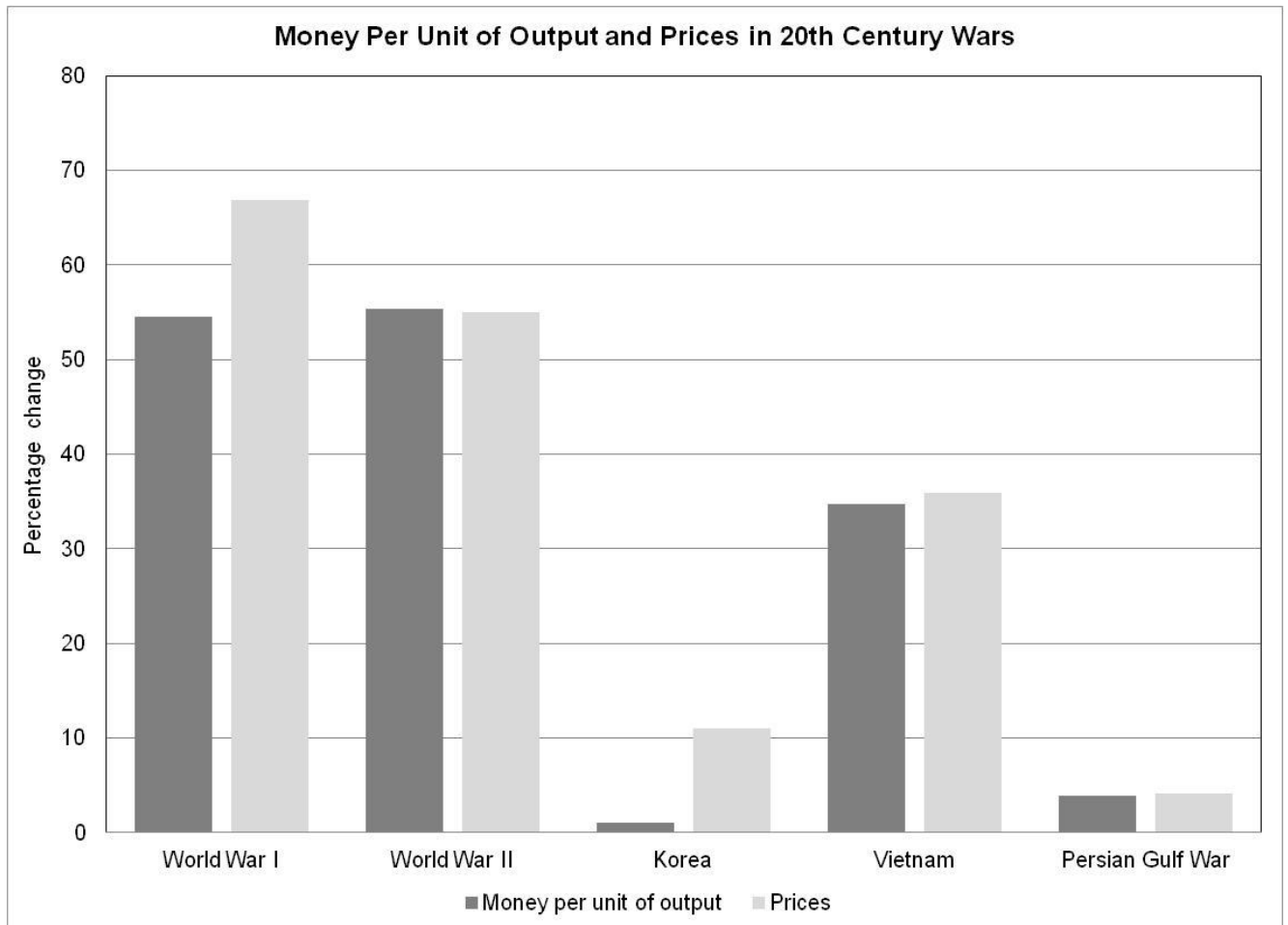
Notes and Sources. The war periods were defined as the start of the war to the price peak: War of 1812, 1812-1814; Mexican War, 1846-1847; Civil War (North), 1861-1865; Spanish-American and Philippine-American Wars, 1898-1902. The sources for money, prices (consumer price index) and output (real GDP) are given in Tables 1-3. Percentage changes were calculated by taking the difference in natural logarithms and multiplying by 100.

Figure 3



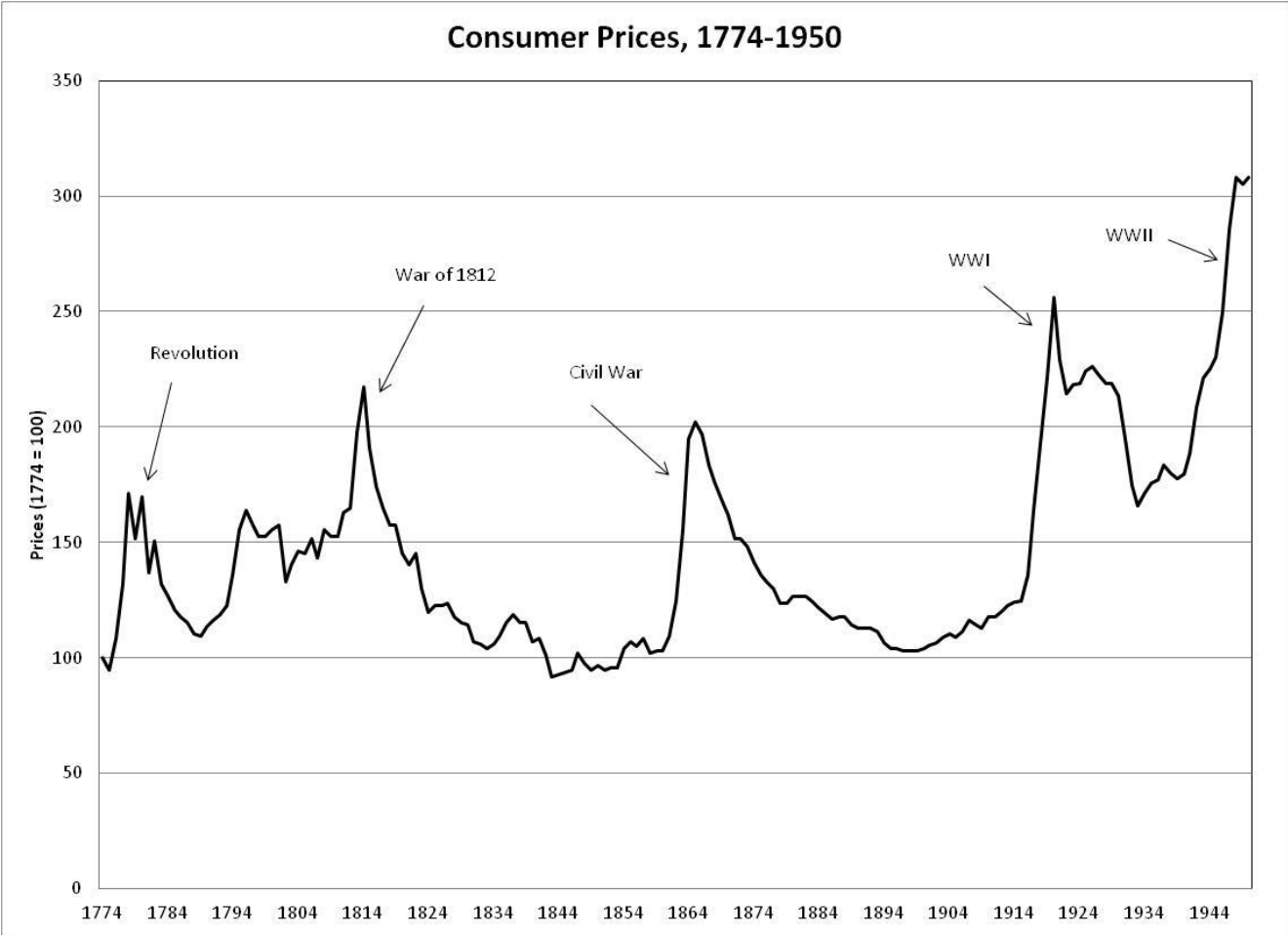
Sources: *Historical Statistics of the United States, Millennial Edition*; U.S. Bureau of Labor Statistics.

Figure 4



Notes and Sources. The war periods were defined as the start of the war to the price peak: World War I, 1914-1920; World War II, 1939-1948; Korean War, 1950-1954; Vietnam War, 1964-1973; Persian Gulf War, 1990-1991. The sources for money, prices (consumer price index) and output (real GDP) are given in Tables 4-5. Percentage changes were calculated by taking the difference in natural logarithms and multiplying by 100.

Figure 5



Source: www.measuringworth.com

Table 1. Money and Prices during the Revolutionary War

Year	Continental dollars in circulation at face value (Millions)	Specie and an estimate of the specie value of the continental dollars (Millions)	The consumer price index in specie prices	Wholesale prices.
1775	6.0	12.5	100	100
1776	24.9	22.9	114	115
1777	37.9	16.1	139	164
1778	101.4	18.3	180	187
1779	200.0	17.7	160	301
1780	200.0	11.5	179	300
1781	200.0	6.5	145	288

Sources: Specie: Friedman and Schwartz (1970 table 13). I assumed that the estimate for 1775 remained in the economy and influenced spending decisions even though it may at times have been hoarded and therefore counted it as part of the money supply. Continental dollars: Grubb (2011b, table 2, p. 15). I used the price of continental dollars that Grubb derived from a Philadelphia price index and applied it to all the outstanding issues. In fact, at times different issues circulated at different discounts because of differences in redemption features. An estimate of the total money stock would include state issues of notes and counterfeits. Consumer price index: www.measuringworth.com. Wholesale Prices: Historical Statistics (2006, series Cc113)

Table 2. Money, Prices, and Interest Rates in the War of 1812					
	Government Currency Issues (Millions)	Total Stock of Money (Millions)	Cost of living (specie .prices)	GDP deflator (specie .prices)	Long-term Interest rate, government bonds
1811	0	56.42	100	100	7.18
1812	2.84	73.51	101	99	7.39
1813	4.91	86.85	122	115	7.61
1814	10.65	100.49	134	123	9.22
1815	14.13	130.01	117	104	8.81

Notes: Only scattered and sometimes contradictory figures are available for privately issued bank notes and deposits. So there is a wide margin of error around the estimates in the second data column. The total stock of money includes private bank notes and deposits, specie, and the government issues.

Sources: Money: Friedman and Schwartz (1970, table 13) Cost of living, GDP deflator, and long-term interest rate; www.measuringworth.com.

Table 3. Money, Prices, and Interest Rates in the Civil War

	Amount of Greenback dollars outstanding (Millions)	Total Stock of Money (Millions)	Cost of living	GDP deflator	Long-term Interest rate, government bonds
1860	0	554	100	100	5.57
1861	0	558	106	104	6.45
1862	149	729	121	116	4.92
1863	411	973	151	143	4.37
1864	471	1,397	189	175	4.83
1865	456	1,445	196	178	5.54
1866	428	1,315	191	169	5.52

Notes: The monetary totals are for June. The total stock of money includes greenbacks, specie, interest bearing federal currency, bank notes and bank deposits.

Sources: Money, *Historical Statistics* (2006, series Cj28). Cost of living, GDP deflator, and long-term interest rate; www.measuringworth.com.

Table 4. Money, Prices, and Interest Rates in World War I						
	High-powered Money (Billions)	Total Stock of Money, M2 (Billions)	Cost of living	GDP deflator	NNP deflator	Long-term Interest rate, government bonds
1913	3.417	15.73	100	100	100	4.74
1914	3.532	16.39	101	101	101	4.70
1915	3.669	17.59	101	104	105	4.78
1916	4.178	20.85	111	117	118	4.69
1917	5.096	24.37	134	145	146	5.05
1918	6.190	26.73	157	169	168	5.52
1919	6.770	31.01	180	173	170	5.49
1920	7.368	34.08	209	197	194	6.12
1921	6.679	32.85	186	168	166	5.97

Notes: High-powered money (monetary base) is currency in 1913 and currency plus bank deposits at the Federal Reserve from 1914 on. The total stock of money includes greenbacks, specie, national bank notes, federal reserve notes, and bank deposits held by the public in commercial banks.

Sources: High-powered money, Money, and NNP deflator, Friedman and Schwartz (1982, Table 4.8). Consumer price index, GDP deflator, and long-term interest rate; www.measuringworth.com.

Table 5. Money, Prices, and Interest Rates in World War II						
	High-powered Money (Billions)	Total Stock of Money, M2 (Billions)	Cost of living	GDP deflator	NNP Deflator	Long-term Interest rate, government bonds
1939	17.501	49.27	100	100	100	3.01
1940	21.358	55.20	101	101	101	2.84
1941	23.341	62.51	106	108	109	2.77
1942	25.427	71.16	117	117	123	2.83
1943	30.181	89.91	125	123	140	2.73
1944	35.788	106.82	127	126	150	2.72
1945	41.851	126.63	130	129	157	2.62
1946	44.241	138.73	141	144	158	2.53
1947	45.026	146.00	161	160	171	2.61
1948	46.166	148.11	173	169	182	2.82
1949	45.396	147.46	172	169	180	2.66
1950	43.642	150.81	173	170	183	2.62
<p>Notes: High-powered money (monetary base) is currency plus bank deposits at the Federal Reserve. Money includes currency held by the public and bank deposits held by the public in commercial banks. The NNP deflator includes adjustments that Friedman and Schwartz made for price controls.</p> <p>Sources: High-powered money, Money, and NNP deflator, Friedman and Schwartz (1982, Table 4.8). Consumer price index, GDP deflator, and long-term interest rate; www.measuringworth.com.</p>						

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