Institutional Failure, Monetary Scarcity, and the Depreciation of the Continental

CHARLES W. CALOMIRIS

Money without credit is no money.
Boston Gazette, Feb. 2, 1778

All these iniquities are founded on the false idea, that money is but a sign.
Count Destutt Tracy

The efforts of some American colonials, who complained of monetary scarcity and advocated increased government involvement in supplying paper money, were valid attempts to improve economic welfare and facilitate transactions. The potential for improvement depended crucially on the fiscal and monetary policies of colonial governments. This approach to monetary scarcity is useful for explaining variation in the real supply of money across colonies and over time. The role of fiscal and monetary policies in determining the changing value of the continental, and the consequences for real currency supply during and after the Revolution, are examined in detail.

Whether the colonies suffered a scarcity of money has been a topic of debate among economic historians. Throughout eighteenth-century America there were a wide variety of circulating media—foreign coins and bills, a trivial number of domestic coins, and private, colonial, state and continental notes.[1] Specie import cost was inflated before the Revolutionary War by mercantilistic prohibitions and duties intended to encourage the flow of specie from the colonies to Britain. These included direct prohibitions on specie exports from Britain, duties that biased the terms of trade in favor of the home country, prohibitions on competing trade and manufacturing within the colonies, and restrictions on colonial trade with foreign powers. Colonial bills were restricted in supply by prohibitions and limitations originating in

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The quotation is given in a letter from John Adams to John Taylor. See Charles Francis Adams, ed., *The Works of John Adams* (Boston, 1850), vol. 10, p. 376.

[1] Colonial notes took two forms: obligations backed by colonial land banks and notes of colonial treasuries without land backing. Both were receivable in payment of tax obligations at colonial treasuries.

Britain, as well as by local government prohibitions of private paper issues and local limits on emissions of legal-tender currency. Parliament enacted its prohibitions at the behest of British and colonial creditors who saw in paper money a means to reduce the value of hard-currency debt. Some colonials complained that government regulations and government unwillingness to supply sufficient paper bills caused unnecessary monetary scarcity.

The testimony of contemporaries, who often seem to have regarded the medium of exchange as outside the influence of, that is exogenous to, commerce, and available data on the real stock of paper currency indicate wide fluctuations in long-run paper real balances. Contemporaries often perceived a causal influence for these fluctuations on the extent of trade. In 1718, New York's Governor Hunter stated: "I do affirm that since the circulation of these bills, the trade of this place has increased at least above a half of what it was."[2] The currency stock valued in real terms at roughly 8 million Spanish milled dollars was viewed as a severe shortage in 1775, and the trebling of real balances from 1775 to 1776 due to state and continental note issues confirms the earlier potential for growth in real money balances.

In this article I address the question whether the notion of monetary scarcity is consistent with contemporary complaints, economic theory, and observed fluctuations in real money balances. I focus on the issuance and depreciation of continental bills and the dramatic fluctuations in real money balances which they produced.

Most economists believe the supply of real money in the long run is an endogenous variable, determined independently of the nominal money supply, and they have expressed skepticism concerning reports of changing real scarcity and abundance. In part this skepticism follows from interpreting "scarcity" as a disequilibrium phenomenon. If specie imports determine marginal changes in the long-run supply of money and if prices eventually adjust to equilibrium levels, the long-run real supply of money is independent of short-run disequilibrium changes in real balances due to shocks in the nominal supply of money or the level of prices.

A different interpretation of long-run scarcity, however, is consistent with both observed long-run swings in real balances and equilibrium analysis, and the ideas of some contemporary proponents of colonial monetary policy. This interpretation defines equilibrium monetary scarcity to be consistent with Milton Friedman's view of optimal money-supply policy.[3] If government policy can costlessly increase the long-run level of consumer surplus enjoyed by moneyholders, then the

[2] Gilbert C. Fite and Jim E. Reese, *An Economic History of the United States* (2nd edn., New York, 1973), p. 95.

[3] See Milton Friedman, *The Optimum Quantity of Money and Other Essays* (Chicago, 1969).

failure to implement that optimal policy makes money unnecessarily scarce. I argue that complaints of monetary scarcity and calls for government actions to increase the supply of paper money were often reasonable exhortations for institutional reform, rather than merely attempts to extinguish specie debt with depreciated paper, or evidence of unsophisticated economic analysis.

Benjamin Franklin's and Adam Smith's views on paper money are the starting point for a model of equilibrium scarcity. This framework is applied first to general patterns in the movements of nominal and real balances in various colonies, and then to the specific case of the depreciation of the continental. The explanation of scarcity focuses on the potential for improving social welfare by displacing specie money and avoiding transacting costs by supplying paper money. The need for appropriate fiscal, as well as monetary, reforms to accomplish this end is a central feature of the model. Historically, the failure to implement accompanying changes in fiscal policy to provide real "tax backing" to nominal currency made the difference between monetary emissions that increased the real paper-money supply and those that merely caused changes in the price level.

In the case of the continental, depreciation resulted from the failure of the Confederation to provide a credible commitment to back its currency debt. The demand for money would have supported a large real expansion of properly backed government currency relative to the level achieved by actual emissions. The relatively high exchange value of Morris notes and warrants, the notes of the Bank of North America, and state-issued notes in the 1780s are evidence that the continental's demise primarily reflected a crisis of confidence in tax policy. Depreciation and monetary scarcity were a consequence of the perverse allocation of the power to tax before and under the Articles of Confederation. The principal institutional flaws that led to depreciation were the lack of coordination of finances among the states and the failure of the Articles of Confederation to provide the necessary link between expenditure-induced nominal currency issues, on the one hand, and the credible backing of currency through future taxation, on the other hand.

The importance of tax backing for determining the value of colonial money recently has been stressed by Bruce D. Smith and Elmus Wicker as applications of the rational expectations models of Robert Barro, Thomas Sargent and Neil Wallace.[4] The approach presented here draws

[4] See Bruce D. Smith, "Some Colonial Evidence on Two Theories of Money: Maryland and the Carolinas," *Journal of Political Economy*, 93 (Dec. 1985), pp. 1178–1211, "American Colonial Monetary Regimes: The Failure of the Quantity Theory of Money and Some Evidence in Favor of an Alternate View," *Canadian Journal of Economics*, 18 (Aug. 1985), pp. 531–65, "Money and Inflation in the American Colonies: Further Evidence on the Failure of the Quantity Theory" (unpublished manuscript, University of Western Ontario, 1987); Elmus Wicker, "Colonial Mone-

on this work but differs in two important respects. First, to develop a framework that explains the effects of continental note emissions, the specific form of tax backing for these notes is described. Second, a real demand for money as a medium of exchange is assumed. The inclusion of a real demand for money entails a possible consumer surplus from money holdings, which implies the potential for monetary scarcity in the sense of Friedman.[5]

I. EQUILIBRIUM MONETARY SCARCITY: BEN FRANKLIN AND ADAM SMITH

The desire to alleviate monetary scarcity was the principal motivation for Benjamin Franklin's advocacy of monetary emissions in Pennsylvania. Franklin was among the most articulate advocates of expanding the government's role in money creation. In 1729, at the age of twenty-three, he wrote "A Modest Inquiry into the Nature and Necessity of a Paper Currency," a polemic supporting the creation of land banks in Pennsylvania. Franklin argued that the expansion of properly backed paper currency could have a lasting real effect on the aggregate stock of money and the extent of trade.[6]

Franklin focused on the favorable developmental consequences for a capital-poor, land-rich economy of being able to substitute paper for exportable specie. Franklin expounded on the virtues of multiple deposit expansion in Europe and the great saving enjoyed through fractional reserve banking and consequent reductions in specie holdings. The mortgage-backed currency issued by land banks, he reasoned, would be even more efficient because it would not direct any real resources to production of the exchange medium. In addition to the

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tary Standards Contrasted: Evidence from the Seven Years' War," this JOURNAL, 45 (Dec. 1985), pp. 869–84; Thomas Sargent and Neil Wallace, "Some Unpleasant Monetarist Arithmetic," *Federal Reserve Bank of Minneapolis Quarterly Review* (Fall 1981), pp. 1–17; Neil Wallace, "A Modigliani-Miller Theorem for Open-Market Operations," *American Economic Review*, 71 (June 1981), pp. 267–74; Robert J. Barro, "Are Government Bonds Net Wealth?" *Journal of Political Economy*, 82 (Nov. 1974), pp. 1095–1117.

[5] Consumer surplus refers to the utility gain from consumption over and above the cost of consuming. Consumers pay a price in foregone interest earnings equal to the marginal gain from holding a unit of money, but they receive utility from infra-marginal money holdings in excess of this cost.

[6] See Jared Sparks, ed., *The Works of Benjamin Franklin* (Boston, 1840), vol. 2. Franklin argues that abundant money leads to lower interest rates, greater production, immigration, and specialization by enhancing the rapid settlement of debts and by insuring that traders will always be able to purchase the bundle of goods they desire. Furthermore, in a currency-scarce economy, merchants who deal in foreign goods often are forced to pay wages and debts in kind from inventories, and thereby promote the consumption of foreign goods to the detriment of local commerce. In this context, land-backed paper money has a developmental "bootstrapping" role in moving the economy beyond a critical initial threshold which allows exchange and specialization to thrive, given that settlers are land-rich, lack tradeable wealth, and face limits on borrowing abroad.

wealth-creating advantages of paper money, Franklin argued that paper provides a preferable medium of exchange because it is lighter and does not lose value by wear.[7]

Franklin addressed opponents of land banks who claimed that an increase in money always led to inflation. He maintained that credible land-backed money would not be inflationary, in part because its creation corresponded to the earmarking of a set of real assets which backed it.[8] The importance of backing in determining the value of money was extended by analogy to the government's use of its assets (future taxes) as a means of redeeming and giving value to its debts, including currency. Noteworthy American proponents of this view included Franklin, Robert Morris, Gouverneur Morris, Alexander Hamilton, James Madison, and John Adams.

Adam Smith, in *The Wealth of Nations*, describes the two components of tax-backed money's value which determine its price in the market—namely, future taxes and interim liquidity benefits:

> A prince who should enact that a certain proportion of taxes should be paid in a paper money of a certain kind, might thereby give a certain value to this paper money, even though the time of its final discharge and redemption should depend altogether on the will of the prince. If the bank which issues this paper were careful to keep the quantity of it always somewhat below what could easily be employed in this manner, the demand for it might be such as to make it even bear a premium, or sell for somewhat more in the market than the quantity of gold and silver for which it was issued.[9]

Adam Smith argued that the demand for money-like debt depended not only on the backing of money, but on the sufficiency of the supply of competing liquid claims in the economy as a whole. He allowed money demand, as well as land or tax backing, to influence the value of money-like claims through the liquidity premium money enjoys.[10] These two determinants of the value of money are incorporated into a formal model, presented in the Appendix, which forms the basis for analyzing colonial and revolutionary monetary experience.

[7] Hanson points out that the costliness of importing small-denomination coins made small-denomination paper currency especially desirable to colonial moneyholders, and that colonial governments elected to print a large proportion of relatively small denomination bills. See John R. Hanson III, "Money in the Colonial American Economy: An Extension," *Economic Inquiry*, 17 (Apr. 1979), pp. 281–86, and "Small Notes in the American Colonies," *Explorations in Economic History*, 17 (Oct. 1980), pp. 411–20.

[8] See Sparks, *Franklin*, vol. 2, pp. 273–74.

[9] Adam Smith, *The Wealth of Nations*, Edwin Canaan, ed. (New York, 1937), p. 311.

[10] Evidence that other contemporaries interpreted events in these terms abounds. While specific examples are too many to enumerate, a prominent illustrative one is a letter of Gouverneur Morris of March 5, 1782, which summarizes his tax-based interpretation of the depreciation of the continental. See John Catanzariti and E. James Ferguson, eds., *The Papers of Robert Morris* (Pittsburgh, 1984), vol. 4, pp. 353–58. I am indebted to Elizabeth Nuxoll, associate editor of *The Papers of Robert Morris*, for bringing this example to my attention. Additional evidence of the prevalence of the tax-based view of government money is provided in the appendix to Smith, "Further Evidence."

The essential features of the formal model are intuitive. A promise to redeem paper money for specie (or specie tax obligations) at a future date fixes the expected future real value of the paper currency. This is true even if the public is uncertain whether or to what extent the government will fulfill its promise to redeem the currency. While not all colonial currency issues promised specific dates of redemption, this was often the case.[11] The relevance of this assumption for the continental is discussed below. The real future backing of paper currency implies that an increase in nominal paper money can lead to an increase in real paper money.

By increasing real paper money the government allows individuals to conserve specie holdings and increases social wealth.[12] By providing current securities to be redeemed by future taxes, the paper emission might increase wealth by more than the amount of specie displacement if individuals value future tax obligations using a high discount rate.[13] Furthermore, if paper money is a superior transacting medium—because it is lighter and of smaller denomination than specie—then its availability increases economic welfare by even more than these pecuniary benefits by allowing individuals to economize on transacting costs. As long as the level of real balances is below the level of the optimal money supply, there is an opportunity for the government to alleviate notional scarcity by increasing the supply of paper money. Increases in the nominal supply of money which are not backed with anticipated future taxes, however, will not increase the real supply of paper money or the level of social welfare.

II. COLONIAL MONETARY REGIMES AND MONETARY SCARCITY

The tax-based framework describes an obvious connection between fiscal policy and the value of paper money, noted most recently by

[11] In "Colonial Monetary Standards," Wicker points out that currency issues during the Seven Years' War typically had promised terminal dates of redemption.

[12] In "Further Evidence," Bruce D. Smith claims there was a positive correlation between specie flows and paper money issues, rather than the negative association which specie displacement by paper would imply. He argues this is evidence against competition in demand between specie and paper monies. Smith's argument relies implicitly on the assumption that changes in the supply of bills were uncorrelated with changes in the level of demand for money. If money supply were procyclical, however, increases in real paper money would not necessarily be associated with outflows of specie. Lester's discussion of the factors influencing the timing of currency issues in Pennsylvania, New York, New Jersey, and Delaware argues for an important connection between changes in the supply and demand for paper money. He shows that paper currency was issued to stimulate the economy; thus currency issues were procyclical. Lester also argues that noninflationary currency issues led to specie resource savings, increased prosperity, and an environment conducive to financial contracting (for example, p. 133). See Richard Lester, *Monetary Experiments: Early American and Recent Scandinavian* (Princeton, 1939).

[13] Either finite time horizons or imperfect capital markets can account for the non-equivalence of debt and taxes. See R. Glenn Hubbard and Kenneth L. Judd, "Liquidity Constraints, Fiscal Policy, and Consumption," *Brookings Papers on Economic Activity*, 1 (1986), pp. 1–60.

Bruce D. Smith and Elmus Wicker. Smith points out that differences in the fiscal policy regimes of the colonies correspond to differences in co-movements of nominal emissions and real balances. In some instances, changes in nominal notes are not associated with changes in real balances, while in others the association is strong.[14] He shows, for example, that the strong fiscal backing of the Middle Colonies maintained the value of their bills despite increases in nominal supply, unlike the fiscally profligate governments of Rhode Island and (before 1750) Massachusetts, whose bills routinely depreciated with new nominal issues.

A clear change in the pattern of co-movement between real and nominal issues in Massachusetts that coincided with a fiscal policy reform provides additional evidence of a connection between tax backing and currency valuation. After 1749, fiscal reform made credible the specie backing of Massachusetts currency. While the real value of Rhode Island currency remained relatively insensitive to changes in nominal supply, the real value of Massachusetts currency rose and became highly correlated with nominal issues. The post-1750 pattern of association between nominal and real balances in Massachusetts mirrors the association apparent in the Middle Colonies.

These patterns are reflected in Table 1. In regimes of poor tax backing, Rhode Island and Massachusetts before 1750, changes in nominal money are associated with changes in price rather than real balances. In regimes of strong tax backing, New York and Pennsylvania, for example, increases in nominal money supply are associated with a one-for-one rise in real paper balances.[15]

In summary, money was unnecessarily scarce in the colonies. In some, taxation was the binding constraint on real paper money expansion, but in others although the tax base would have supported a larger supply of real balances, nominal money was kept low. In all cases, the real supply of paper money could have been increased by a combination of increased taxation and nominal emissions.

[14] Smith and Wicker were not the first to notice these differing patterns. Other useful comparative studies of colonial monetary institutions and experience include: Leslie Brock, *The Currency of the American Colonies, 1700–1764: A Study of Colonial Finance and Imperial Relations* (New York, 1975); Joseph Ernst, *Money and Politics in America, 1755–1775* (Chapel Hill, 1973); Lester, *Monetary Experiments*; John McCusker, *Money and Exchange in Europe and America, 1600–1775* (Chapel Hill, 1978); Theodore Thayer, "The Land Bank System in the American Colonies," this JOURNAL, 13 (Spring 1953), pp. 145–59; Roger Weiss, "The Issue of Paper Money in the American Colonies, 1720–1774," this JOURNAL, 30 (Dec. 1970), pp. 770–84; and Robert Craig West, "Money in the Colonial American Economy," *Economic Inquiry*, 16 (Jan. 1978), pp. 1–15.

[15] Colonies with reliable tax backing which maintained a relatively stable value of their currencies may have further reduced transacting costs by encouraging the use of credit. In her detailed study of colonial wealth in 1774 Alice Hanson Jones finds that in the Middle Colonies—New York, Pennsylvania, New Jersey, and Delaware—financial assets of each wealth and occupational class are much greater a percentage of total assets or net worth than they are in New England or the South. See Alice Hanson Jones, *Wealth of a Nation to Be: The American Colonies on the Eve of the Revolution* (New York, 1980).

TABLE 1
NOMINAL AND DEFLATED NOTES PER THOUSAND PERSONS

	Massachusetts		Rhode Island		Pennsylvania		New York	
	Nominal	Deflated	Nominal	Deflated	Nominal	Deflated	Nominal	Deflated
1720	2,087	953	3,400	1,333			1,200	737
1725			2,540	755	945	678		
1730	2,938	870	5,800	1,476	1,330	875		
1735	2,556	711	11,900	2,845	1,000	602		
1740	2,159	412	18,300	3,003	935	565	1,255	755
1745	4,824	748	22,000	2,934	780	446		
1750	12,257	8,925	14,900	1,241	707	414	2,000	1,115
1755	250	188	19,500	1,034	702	416	1,850	1,027
1760	2,229	1,727	31,500	1,221	2,660	2,533	3,500	2,096
1765	1,536	1,153	14,200	481	1,440	1,274		

	New Jersey		Maryland		South Carolina	
	Nominal	Deflated	Nominal	Deflated	Nominal	Deflated
1720						
1725						
1730					3,550	551
1735			545	388		
1740	1,207	751	676	296		
1745			646	323		
1750	460	265	439	247	2,142[b]	295[b]
1755	41[a]	24[a]	409	252	2,801	400
1760			592	405	9,182	1,312
1765					4,327	610

[a] Figures are for 1754.
[b] Figures are for 1749.
Note: Sterling exchange rates are used as deflators.
Sources: Derived from Bruce D. Smith, "Some Evidence on Two Theories of Money: Maryland and the Carolinas," *Journal of Political Economy*, 93 (Dec. 1985), pp. 1128–1211; and Bruce D. Smith, "American Colonial Monetary Regimes: The Failure of the Quantity Theory of Money and Some Evidence in Favor of an Alternate View," *Canadian Journal of Economics*, 18 (Aug. 1985), pp. 531–65.

III. CURRENCY SUPPLY, TAX CONSTRAINTS, AND REVOLUTIONARY FINANCE

Pelatiah Webster's estimate of total specie and bills in America at the beginning of 1775 is $10 million (specie equivalent).[16] From May 1775 to November 1776 the states, acting individually, defied British prohibi-

[16] Webster rejected Hamilton's estimate of $30 million outstanding, "on a more critical examination of the subject." Ronald Michener supports this estimate as being, "more consistent with the probate evidence and our knowledge of the amount of colonial currency in circulation at that time." See Pelatiah Webster, *Political Essays on the Nature and Operation of Money, Public Finances, . . and Other Subjects* (Philadelphia, 1791), p. 142; and Ronald Michener, "Fixed Exchange Rates and the Quantity Theory in Colonial America," *Carnegie-Rochester Conference Series on Public Policy*, 27 (Autumn 1987), p. 279. Hamilton's estimate is given in his letter to Robert Morris dated April 30, 1781. See Catanzariti and Ferguson, eds., *The Papers of Robert Morris*, vol. 1, p. 35.

tions on currency issues and provided for their rebellious needs by emitting a large quantity of bills. The nominal emissions of the states for 1775 and 1776 totaled approximately $18 million.[17]

The greatest source of increase in liquidity during the early war years, however, was the bills first authorized by the Continental Congress in May 1775. By the end of 1776, Congress had issued $25 million in continentals for which it received $21 million in specie value.[18]

The first continentals were issued to pay for outfitting the army. When Congress issued its first paper bills, it had no intention of fighting a protracted war with Great Britain or of financing large expenditures by money creation. Forming an army was a threat, a bargaining chip to use in obtaining concessions from Great Britain, a demonstration of the colonies' unity and resolve. Similar threats had proven successful in the past in securing the repeal of the Stamp Act and the Townshend Act.

Initially, other means of financing the emergency expenditures were not feasible. There was little time to set up institutions for adequate taxation. Moreover, Congress lacked the power to tax and was disinclined to do so—taxation without adequate representation was a sensitive issue in 1775. And there was insufficient time to place domestic and foreign loans initially.[19]

The value of the continental rested on the reliability of future real taxation per unit of nominal issue. The bills all promised redemption according to the stipulation of Congress, which had promised to redeem them on specific dates, beginning in 1779. Though Congress had no power to tax, the delegates to the convention pledged joint and several liability on behalf of the individual colonies, and specific colony quotas were established on the basis of population. Congress suggested that each colony create a sinking fund to demonstrate good faith. The prevailing belief that these issues would be limited nominally, along with the belief that unused government procurements and future taxes would sink them, allowed the bills to trade at par with specie until mid-1776.

The profound increase in real balances which state and congressional emissions entailed indicates that the two-and-one-half million colonial

[17] Nominal emissions are taken from Edward F. Robinson, "Continental Treasury Administration, 1775–1781: A Study in the Financial History of the American Revolution" (Ph.D. dissertation, University of Wisconsin, 1969), pp. 327–28. Data are adapted from figures reported in Ralph V. Harlow, "Aspects of Revolutionary Finance, 1775–1783," *American Historical Review*, 35 (Oct., 1929), pp. 46–68. I am indebted to Ronald Michener for bringing these data to my attention.

[18] Table 2 summarizes data and sources for nominal currency issues and their real value.

[19] For more detailed accounts of the financing of the Revolution than that offered here see Albert Bolles, *Financial History of the United States, 1774–1789* (New York, 1883); Charles Bullock, "The Finances of the United States from 1775 to 1789," *Bulletin of the University of Wisconsin: Economic, Political Science, and History Series*, 1 (June 1895); Davis Dewey, *Financial History of the United States* (New York, 1903); E. James Ferguson, *The Power of the Purse: A History of American Public Finance, 1776–1790* (Chapel Hill, 1961); and William Graham Sumner, *The Financier and the Finances of the American Revolution* (New York, 1892).

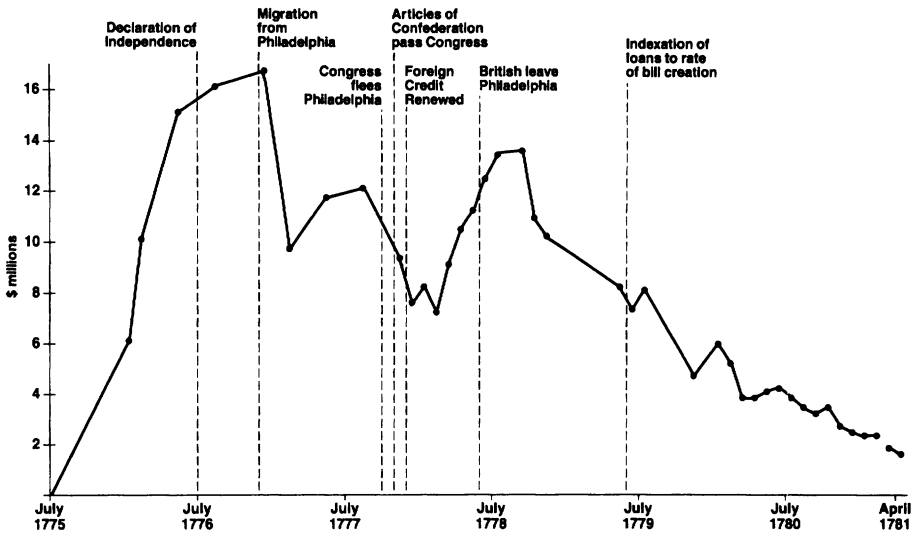

FIGURE 1

TOTAL SILVER VALUE OF CONGRESSIONAL BILLS OF CREDIT

Sources: See Table 2.

inhabitants were willing to hold much more than the meager real supply of paper currency in circulation before the war. Though it is customary for money demand to rise during wartime—presumably because of a desire to increase the proportion of mobile, concealable wealth—the rise in real balances seems too large to attribute to a change in money demand. Later, during the time of greatest national crisis, when one would expect money demand to have risen to its height, real paper-money balances fell dramatically, as Figure 1 demonstrates.[20]

The bills began to depreciate relative to specie in mid-1776. Table 2 summarizes data on currency issue and the rate of depreciation from 1775 to 1781, after which the bills ceased to circulate. The depreciation of the currency and the decline in real money balances coincided with decaying confidence in the ultimate redemption of the bills. A variety of factors contributed to the changing valuation of money from November 1776 to May 1781—battle successes and failures, the French alliance, government indexation policies (discussed further below)—all precipitated appreciation or depreciation through their impact on anticipations of future redemption.

Congress repeatedly expressed a desire to maintain the currency at par to establish a favorable reputation for future financing and to minimize the cost per dollar issued of current financing. The early

[20] From 1777 to 1780 state bills were relatively small, and states maintained parity between federal and state bills. Thus the inclusion of state bills in Figure 1 would increase real values for 1775/76 significantly, but contribute proportionately less to real supply for 1777/79.

TABLE 2
NOTE ISSUES, EXCHANGE RATE, AND SPECIE VALUES

Date of Issue	Amount Issued (000)	Exchange Rate Paper/Specie	Specie Value of New Issues (000)
1775	$6,000	At par	$6,000
1776			
February	4,000	At par	4,000
May	5,000	1.25	4,000
July and August	5,000	1.25	4,000
November and December	5,000	1.50	3,330
1777			
February	5,000	3.10	1,600
May	5,000	3.00	1,660
August	1,000	3.00	330
November	1,000	4.00	250
December	1,000	5.00	200
1778			
January	3,000	5.00	600
February	2,000	6.00	330
March	2,000	5.00	400
April	6,500	5.00	1,300
May	5,000	5.00	1,000
June	5,000	5.00	1,000
July	5,000	5.00	1,000
September	15,000	6.00	2,500
November	10,000	8.00	1,250
December	10,000	10.00	1,000
1779			
February	10,000	17.00	580
April	5,000	20.00	250
May	10,000	20.00	500
January and May[a]	40,000	20.00	2,000
June	10,000	24.00	410
July	15,000	24.00	620
September	15,000	38.00	390
October	5,000	41.00	120
November	20,050	50.00	400

(*continued*)

slippage in the value of bills caused congressional concern. In late 1776 and early 1777 Congress responded to the continuing depreciation of its bills by asking the states:

(1) To accept congressional bills as payment for state taxes at par with state bills, and to force private parties to exchange congressional bills at prevailing specie prices. The states complied with this request in piecemeal fashion, though the regulations of private commerce were mostly ineffectual. The main effect of these laws was to link the value of state bills to the depreciating continentals.

(2) To cease issuing new state bills, and instead to meet local fiscal needs with taxation. On the whole the states acceded to this request until the acceleration of state bill issues in 1780.

TABLE 2—continued
NOTE ISSUES, EXCHANGE RATE, AND SPECIE VALUES

Date of Issue	Amount Issued (000)	Exchange Rate Paper/Specie	Specie Value of New Issues (000)
1780			
January	0	40.00	0
February	0	45.25	0
March	0	61.50	0
April	0	61.21	0
May	0	59.67	0
June	0	56.30	0
July	0	61.38	0
August	0	70.00	0
September	0	72.33	0
October	0	70.00	0
November	0	86.87	0
December	0	99.54	0
1781			
January	0	103.33	0
February	0	102.50	0
March	0	125.00	0
April	0	146.67	0
Total	$241,500		

[a] Bullock conjectures that only $40 million in new issues were made under this authorization.
Sources: All data for 1775 through 1779 are taken from Charles Bullock, "The Finances of the United States from 1775 to 1789," *Bulletin of the University of Wisconsin: Economic, Political Science, and History Series*, 1 (June 1895), p. 135. Specie exchange rates for 1780 and 1781 are from Anne Bezanson, *Prices and Inflation during the American Revolution* (Philadelphia, 1951), p. 65.

(3) To begin sinking tax quotas in order to inspire confidence in the sagging currency. This request was not met to any significant degree.[21]

For the next three years Congress struggled simultaneously to finance war needs and support its currency. It continued appeals to the states for quota sinking funds and reiterated its promise of full redemption. It experimented with alternative means of finance including lotteries, piracy, domestic loans, and foreign loans; but these sources were insufficient to support the war effort. Most of the funds borrowed from abroad were needed to maintain hard-currency interest payments on loans. Roughly 40 percent of the total cost of the war—some $38 million (specie equivalent)—was financed by continental issues. Receipts from domestic national loans financed roughly 10 percent of the cost of the war, while state debt issues and seizures of property accounted for respective shares of 18 and 17 percent. Foreign loans raised less than 8 percent of the total, and taxes accounted for only 6 percent.[22]

[21] See Bolles, *Financial History*, pp. 147–49.
[22] These statistics are derived from Bullock, "Finances," pp. 177ff.

Three important events coincided with an acceleration of depreciation from late 1778 through 1779: 1) 170 percent nominal money growth during 1778; 2) in mid-1779, the indexation of domestic loans and public servants' wages (made retroactive to 1778 for loans) to the rate of bill creation, which extended the indexation rule established for soldiers' pay in December 1776; and 3) defeats in the South. These events led people to revise forecasts of future expenditure upward and the probability of redemption of bills downward.

In late 1779 Congress launched a campaign to convince people that it would redeem its obligations in full, but words were insufficient to stop speculation against the bills. By the end of 1779 Congress had ceased issuing bills; rather it relied on specific supply requisitions from the states and the seizure of property by troops on an ad hoc basis in exchange for certificates of indebtedness. Still the bills continued to depreciate.

In March 1780 Congress made a last ditch effort to halt depreciation by reducing the promised specie backing of bills to one-fortieth of par, which was roughly the market value of the bills at the beginning of 1780. Congress also proposed that the states declare a special tax for which bills would be receivable relative to specie at forty for one. At the same time, Congress proposed to issue one-twentieth of the outstanding stock of old bills in paper of a new tenor—indicating an intention effectively to double the existing nominal bill supply. The states (except Massachusetts) refused to accept the old currency in payment for taxes at the rate of forty for one; instead they indexed the bill/specie exchange rate for tax payment to the prevailing market rate. Thus the states accepted bills on the same terms as private parties, rather than providing the notes with any backing. Without the tax backing of the states, the continental continued to depreciate, even though its nominal supply remained unchanged. In fact, it depreciated exactly in proportion to the announced effective increase in nominal currency, despite congressional assurances. As Gouverneur Morris writes:

> The moment when former promises are demonstrated to be fallacious, is not the moment to make new promises. The strict connections between the new paper and the old injured it, because the depreciation of the old from forty to eighty, necessaryly [sic] brought down the new to two for one.[23]

By mid-1781 continentals had ceased to circulate and were held from that time on solely as a speculative store of value. Specie imports and new state bill issues became the media of exchange. Congressional power and credit were at an all-time low. Individual states were financing and organizing their activities in an uncoordinated fashion. Specific supply requisitions and seizures of property led to inefficient allocations, high transport costs, public resentment, and the misuse of

[23] Catanzariti and Ferguson, eds., *The Papers of Robert Morris*, vol. 4, p. 354.

authority by government officials. A dramatic improvement came when Robert Morris resuscitated the credit of the government by pledging his own assets as backing for government obligations (called Morris notes and warrants). He contracted with private merchants to supply troops on the basis of competitive bidding. Morris also took out loans on the government's behalf from the newly organized, privately held, Bank of North America.

Morris's personal backing was not a long-term solution to the government's credibility problem; it was the temporary substitution of credible private credit for defunct public credit. All attempts to provide the government with its own source of revenue (and hence cred were met with opposition by the states. Attempts to pass modest import duties were defeated by Rhode Island's opposition in 1781, and by New York's veto in 1783. Though Morris had solved the crisis of financing the war, his administration was unable to achieve a long-term solution to the problem of federal credibility. Indeed, the fate of the continental would not be decided until after the Constitution had granted the federal government a means to secure its own revenue.

Applying the Tax-Based Model to the Continental

The central assumptions of Adam Smith's analysis of paper money's value are applicable to the Revolutionary currency. Bills were initially issued with an explicit commitment to remove them four years in the future, and new emissions announced in 1780 had a six-year promised maturity. They were to be collected by the states in payment of taxes, then sent to Congress for cancellation and crediting to the states' accounts. No authority backed the currency contemporaneously. State tax collectors traded in the currency and accepted it at the market rate, but the states—and Congress itself—did not make a market in the currency or accept it for taxes at a pre-set rate of exchange. Rather they adopted indexation schedules for wages, taxes, and loan principals. The only backing was potential redemption.

The value of the promise to redeem continentals depended crucially on the ability and willingness of Congress to tax. Under the Articles of Confederation, however, only states had taxation authority, while both Congress and states could issue money and other debt. The redemption of continentals required the completion of the following chain of events: the war had to be won, Congress had to want to redeem its currency, the states had to be willing to transfer resources to Congress or to vest it with the power to tax, and the public had to be sufficiently wealthy and willing to be taxed.[24] Any threat to a link in this chain of events reduced the probability of redemption.

[24] The aggregate wealth to support the taxation needed to back the bills clearly existed. See the discussion in Bolles, *Financial History*, p. 85.

The depreciation of the currency was not uniform, nor did it correspond closely to changes in nominal supply during much of the period. While increases in nominal supply (and expected nominal supply in early 1780) often did have an inflationary effect on the value of currency, nominal issues initially led to a boom in the real supply of money rather than an offsetting increase in the price level. Moreover, much depreciation occurred in 1781, even after Congress had ceased issuing paper money once and for all.

These facts indicate that the time path of real balances was dominated by changing redemption expectations. Early issues of continentals were accepted at par because expected backing relative to currency issued was sufficient. As expected tax collections fell and the nominal money supply rose, nominal money came to exceed the level of expected backing. At this point money growth and changes in expectations of future tax collections together determined the value of money; changes in nominal money were reflected proportionately in price level changes, while changes in expected tax collections affected prices and real balances.

The realization that the British would wage war, their early successes, and their impending invasion of Philadelphia hurt the currency and reduced real balances (see Figure 1), just as the British withdrawal from Philadelphia, the French alliance, and the small nominal emissions of 1777 helped to stabilize its value in early 1778. Though Congress seems to have wanted to redeem its bills through 1778, the indexation of loan principals and wages by Congress to the rate of bill creation in 1779 did not bode well for congressional commitment to the currency; neither did the Forty-for-One Act of 1780.

Throughout, the failure of the states to support the currency or to vest Congress with the power to tax was a primary cause of depreciation. Clearly, the states were capable of better supporting the common currency, but they chose not to. An indication of this is the relative values of state and continental notes. Like many of the other states, Pennsylvania ceased issuing its own bills from 1777 until 1780, and maintained parity in tax collection between state and continental currency during the period. After the Forty-for-One Act this changed; not only did Pennsylvania cease to maintain parity between the two types of bills, it increased its own issues greatly, despite the pleas of Congress for restraint. Table 3 shows that while the continental depreciated to a level of several hundred to one (bills-to-specie), state bills during the 1780s traded at near par with specie for much of the period.

To contemporaries it was clear that the difference between the state and continental bills was the expected value of each for extinguishing taxes. One merchant wrote: "the state money has got into very general

TABLE 3
RATIOS OF PENNSYLVANIA STATE CURRENCY TO SPECIE, 1780–1789

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1780											3.00	
1781	1.33		1.73	1.99	4.09	4.38	5.00			2.25		2.50
1782	3.00	3.00						4.00				
1783	3.00	1.25	1.25			1.25	1.33					
1784												
1785									2.50	3.00	1.75	1.12
1786		1.11			1.05	1.08	1.11		1.12			1.12
1787			1.10		1.75	1.16	1.22	1.30	1.38	1.58		
1788		1.43				1.56						
1789		1.33	1.43	1.33	1.28						1.	

Source: Anne Bezanson, *Prices and Inflation during the American Revolution* (Philadelphia, 1951), p. 345.

circulation, especially since it became receivable in taxes."[25] Anne Bezanson points out that the interval from 1777 to 1780, during which real currency supply was lowest, corresponds to a hiatus in merchant activity in Philadelphia, which on the basis of merchant accounts she attributes in part to the increased scarcity of a transacting medium.[26]

The Political Economy of Revolutionary Finance

Much still remains to be explained: why Congress issued so much currency rather than other debt, why the states did not choose to support the continental, why Congress chose to index the principal of its other debt in favor of supporting its currency, and why Congress, once given taxation power under the Constitution, chose to repudiate its commitment to currencyholders but not to other debtholders.[27] Continentals were eventually redeemed for one-hundredth of their face value; at the same time, Congress redeemed its other debt and debts incurred by the states in full.

Congress was constrained to issue cash rather than to finance with other debt or taxes because it lacked power and could not compel the states to sink existing congressional debt. That a lack of access to future tax receipts can imply quantity constraints to sovereign borrowers in bond markets was as common a theme in the eighteenth century as it is today.[28]

[25] Anne Bezanson, *Prices and Inflation during the American Revolution* (Philadelphia, 1951), p. 48.

[26] Ibid. It is important to keep in mind that specie substitution for paper was precluded by the state of war. Only in 1780 did specie inflows begin to play a role.

[27] Winning lottery tickets were repudiated as well.

[28] For example, the fiscal crisis which led Louis XVI to convene the *estates general* was precipitated by credit rationing in foreign markets which had its root cause in the large existing debt relative to available future tax flows. If the present value of the existing tax stream is less than outstanding debt, either monetization of the debt or an increase in net taxes must result.

The fiscal reluctance of the states was the result of both strategic behavior and the practical difficulty of establishing a fair distribution of the tax burden among the states. The Articles of Confederation called for quotas on the basis of wealth, not population. No one, however, had estimated the wealth of the colonies, so population was used for the recommended congressional tax quotas. Those in poorer states felt this an unfair burden and found support in the Articles of Confederation.

From a strategic perspective, it made little sense for any state to sink its quota before the others, even if that state was willing to act cooperatively. The states had assumed joint and several liability for congressional debt, which meant that the payment of taxes by any one state did not relieve that state of potential obligations, if other states refused to pay. One might expect the result to be few tax payments, even if all states would have benefited from jointly supporting the currency. William Sumner describes the combined effect of the debate over fair quotas and the strategic play among the states:

> It was impossible to know how much each state ought to pay, and there was no adequate publication of the facts as to what each state had paid. Being in the dark as to facts, each state maintained that it had paid more than its share.[29]

In allocating the funds at its disposal, the national authorities, empowered by the Articles of Confederation and the Constitution, chose to give preferential treatment to individuals who held debt in forms other than continentals. The policy of indexing debt principal to the rate of bill creation, begun in 1779, foreshadowed the different redemption policies followed by Congress under Hamilton's plan. The policy may be viewed as a preference for using the "inflation tax" in lieu of direct taxation. In fact, policymakers described their actions in precisely these terms. Morris writes that " . . .the depreciation of the paper money, which wiped away not less than twelve millions annually, was in effect a tax to that amount.[30]

Some viewed the inflation tax as the most equitable means of spreading the burden of taxation. As Franklin wrote:

> The general effect of the depreciation among the inhabitants of the States has been this, that it has operated as a gradual tax upon them, and every man has paid his share of the tax according to the time he retained any of the money in his hands, and to the depreciation within that time. Thus it has proved a tax on money, a kind of property very difficult to be taxed in any other mode; and it has fallen more equally than many other taxes, as those people paid most, who, being richest, had most money passing through their hands.[31]

[29] Sumner, *Financier*, vol. 1, p. 273.
[30] Ibid., vol. 2, p. 76.
[31] Sparks, *Franklin*, vol. 2, p. 424.

Equity may only be part of the motivation for taxing money balances. It may benefit the government to default on money before it does so on bonds. For example, if international bond markets are more competitive than domestic currency markets, governments may choose to favor bondholders over currencyholders. A pattern of preferential treatment to bondholders can be seen in many episodes of government financial stringency, for example, the priority given to specie redemption of bonds over the resumption of specie payments for greenbacks after the American Civil War.[32] Indeed, part of the reason opponents of government paper money failed to prohibit it explicitly in the Constitution was the desire to employ it during periods of unpredictable high expenditure (for example during wartime).[33] The use of currency as a war-financing expedient helps to insulate the government's reputation in bond markets by removing the need to default on some portion of government debt.

The Legacy of Hyperinflation

The financial legacy of the American Revolution was distrust of government money which, when combined with the struggle over private bank chartering privileges, contributed to the prolonged inadequacy of financial institutions in the United States.[34] Critics of government monetary control cited the revolutionary experience as proof that governments could not be trusted to repay their monetary obligations. Such bitter opposition to government bill issues led to the prohibition of state bill issues by the Constitution. Federal powers regarding paper money creation were left deliberately vague by the framers as a compromise between those who advocated absolute prohibition and those who saw the advantage of occasional issues.

While a small amount of government currency was issued during the War of 1812, only the financial exigencies produced by the Civil War led the government once again to create a substantial supply of paper money. The somewhat credible commitment to resume specie backing of greenbacks limited their depreciation, and the achievement of resumption in 1879 set the stage for a permanent government role in supplying paper money.[35] Thus the displacement of the post-Revolution

[32] For a review of government policy during and after the Civil War, see Paul Studenski and Herman Krooss, *Financial History of the United States* (New York, 1963); and Charles Calomiris, "Price and Exchange Rate Determination during the Greenback Suspension" (unpublished manuscript, Northwestern University, 1987).

[33] See J. Willard Hurst, *A Legal History of Money in the United States* (Lincoln, Nebraska, 1973), p. 16, for a discussion of the constitutional debate over federal monetary powers.

[34] Ironically, overvalued foreign coins, which were made receivable for payment of U.S. taxes, provided a token, resource-saving alternative to full-specie-value coins. These coins were an intermediate step in terms of savings between specie and paper currency. A thorough discussion of the use of token foreign coins can be found in David Martin, "The Changing Role of Foreign Money in the United States, 1782–1857," this JOURNAL, 37 (Dec. 1977), pp. 1009–27.

[35] See Calomiris, "Greenback Suspension," for an analysis of resumption expectations and their effect on the value of greenbacks.

view of government-created paper money as a financing instrument of last resort coincided with a change in the government's revealed commitment to currencyholders, and this was linked to changes in the power and inclination to back government debt of all kinds with taxes.

Appendix

It is useful to construct a formal model of money valuation to analyze the determinants of equilibrium monetary scarcity. Money is defined as a government liability; its value depends on its future backing by real assets through its usefulness as a means of extinguishing real tax obligations which otherwise would be paid in specie, and the interim flow of liquidity services it provides.[36] From this approach follow three important implications: 1) total expected real taxation potentially constrains the supply of real money and thus may cause monetary scarcity; 2) the means for relieving monetary scarcity may be either a real increase in taxes (and transfers) or an increase in nominal bill issues, depending on which constraint binds real balances at the margin; and 3) sometimes changes in real balances through time indicate changing perceptions of future fiscal policy (that is, if tax constraints are binding on real balances). These points form the basis for interpreting cross-sectional variation among colonies in the correlation between nominal and real balances and for the discussion of changes in the real money supply during the American Revolution.

The first version of the model excludes specie balances for simplicity. This assumption later is relaxed. I adopt a standard, representative-agent, flexible-price model of the economy with markets for (nondurable) goods, paper money, and interest-bearing debt. The real rate of interest (r) is given in equilibrium by exogenous intertemporal time preference, and (the logarithm of) real income (y) is determined by exogenous aggregate labor supply. (The logarithm of) real money ($m - p$) demand is assumed to depend negatively on the nominal rate of interest ($r + n$) and positively on (the logarithm of) real income:

$$(m - p)_t = ky - j(r + n_t),$$

where k and j are positive constants, t indexes time, and n is the (known) rate of inflation. The negative coefficient on the nominal interest rate reflects the interest cost from holding wealth in noninterest-bearing money.

Initially, at time zero ($t = 0$), the government issues (through a lump-sum transfer) a fixed nominal supply of noninterest-bearing bills, which fixes m at a constant level until the last period ($t = x$). The government (credibly) sets (the logarithm of) lump-sum taxes collected in the last period equal to T units in terms of specie. It promises to accept its bills in payment of taxes in lieu of specie at the prevailing market exchange rate in the last period, or at par (one unit of paper instead of one unit of specie), whichever implies a lower value for the bills.[37] This assumption captures the upper bound of promised specie parity which placed an upper bound on the value of paper bills.

[36] The motivation for government intervention in the creation of paper money must rest on a comparative advantage which the government enjoys in supplying liquidity relative to private citizens. Typically, the government's claim on the future through taxation is viewed as the source of that advantage. If one defines liquid assets as those whose backing is a matter of common information, then dependable taxation would provide superior backing for liquid assets than most other forms of backing.

[37] For continental notes the upper bound on their value was set by the promise to redeem the currency at par for Spanish milled dollars. Clearly, this represented the maximum future value for the currency.

The role of taxation in the model is to provide an endpoint condition with which to determine the time path of the price level. The money demand function alone does not provide enough information to solve for price over time, because price depends on its own rate of change (n). Typically, solutions to this problem rely on expectations of future government policy—or in colloquial terms, the "backing" of currency.

In this framework, government taxation policy fixes the marginal value of money in the last period to be equal to its value in extinguishing tax obligations. This implies two possible results. If m is less than T, nominal bills will trade at par at $t = x$ ($p_x = 0$) and some specie, as well as all bills in circulation, will be paid in to the government as taxes. If m is greater than T, the price level (the inverse of the specie value of bills) will be greater than unity at $t = x$ ($p_x = m - T$) and no specie will be paid in as taxes. Thus given a knowledge of T and m, one can determine p_x.

If there were no demand function for paper money—that is, if bills were only valued as a store of wealth—then the time path of the price level would be consistent with a constant rate of growth in the value of bills (deflation) equal to r from $t = 0$ to $t = x$. Prices of specie (and other commodities) would fall at the rate r to pay the market rate of interest to moneyholders, who in the absence of a demand for liquidity view money purely as a store of value. Given the assumption of a real demand for bills as a transacting medium during the holding period between $t = 0$ and $t = x$, however, the equilibrium time path of price depends crucially on the parameters of money demand. To derive the time path of price, solve recursively for p using p_x and the money demand function:

$$m - ky + jr = p_{x-1} - j\,(p_x - p_{x-1}),$$

or

$$(m - b) = (1 + j)p_{x-1} - jp_x,$$

where $b = ky - jr$, the zero-inflation level of money demand.

First, consider the case where $p_x = (m - T)$, and therefore, $(m - T)$ is greater than zero. Substituting for p_x above gives:

$$(m - b) + j\,(m - T) = (1 + j)p_{x-1},$$

and

$$(m - T) - (m - b) = (1 + j)\,(p_x - p_{x-1}),$$

which reduces to

$$(b - T) = (1 + j)n_{x-1}.$$

Intuitively, this equation implies that if the real value of money balances at the end period (that is, T) is greater than the zero-inflation equilibrium level of real balances (b), there must be deflation in equilibrium to make marginal money holdings worthwhile. Similarly, if available real balances at time $t = x$ are less than the zero-inflation equilibrium level, inflation at $t = x - 1$ is required to charge money-holders the equilibrium "price" for holding money. That is, the scarcity of real balances at $t = x$ determines the equilibrium rate of inflation (deflation) at $t = x - 1$.

In the second case, where m is less than T and $p_x = 0$, the money-demand function implies:

$$(m - b) = (1 + j)p_{x-1},$$

and whether there is inflation in equilibrium ($p_{x-1} < 0$) again depends on whether the level of real balances at the end period (now given by m) is less than the zero-inflation equilibrium level of money demand.

Which of the two government policy variables, m or T, acts as the binding constraint on real balances depends on their relative magnitudes. If m is greater than T, then raising m has no effect on real balances at the end period, and therefore, no effect on real balances for earlier periods. An increase in T, however, will increase real balances by reducing p. Alternatively, if m is less than T, an increase in T will have no effect on real balances, since the value of bills has already reached the upper bound of par. However, in this case an increase in m will increase real balances.[38]

Only one or the other constraint (m or T) can bind in equilibrium, but both m and T may be set at suboptimal levels. The optimal m and T—in the sense of Friedman—would maximize the present value of the stream of liquidity services moneyholders receive between $t = 0$ and $t = x$. This would imply a deflationary equilibrium. In a deflationary equilibrium, the rate of deflation declines over time because m is constant and p falls over time. Setting $(b - T)$ equal to $-r(1 + j)$ maximizes the rate of deflation at $t = x - 1$ by setting it equal to r, and thus maximizes the flow of liquidity services between $t = 0$ and $t = x$.[39]

The availability of coins or other substitutes for government-supplied paper does not fundamentally alter the results of the model. In the case of perfect substitution between paper and specie money, for example, the price of paper in terms of specie is given, as before, by taxation at the end period. The real supply of paper money displaces specie one for one, and allows it to be exported for other goods and services. This is the resource savings emphasized by Franklin.

A novel feature of this case is that total real money balances (paper and specie) are bounded from below by the zero-inflation level of money demand. Government liquidity rent (or seignorage) is limited due to the availability of an elastically supplied (perfect) substitute (specie currency) which maintains its real value in specie terms. The welfare-maximizing deflationary equilibrium—in which specie is fully displaced, and in which money earns the highest possible pecuniary return—is the same as in the case of no substitutability between paper and specie.

In the case of perfect substitutability between paper and coin, increases in paper supply cause a one-for-one displacement of specie on the margin. A more complicated and realistic model of the demand for paper money would include: a wealth effect in the money-demand function, limited substitutability between paper and coin monies due to

[38] In "Fixed Exchange Rates and the Quantity Theory in Colonial America," Michener argues that fixed exchange rates rather than tax backing explain colonial price movements in many cases. Michener does not provide a convincing explanation for how fixed parities were maintained, and the evidence he presents against the tax-backing approach seems inadequate. He focuses on evidence of government deficits, tax collection fraud, and failures to retire currency issues by the alleged strong-backing colonies as evidence that their backing was in fact poor. The tax-backing model presented here requires only that individuals expect to be able to redeem currency for future taxes. Continuing reissues of currency or temporary deficits do not in themselves imply poor backing or depreciation, so long as parities in tax collection remain in force and the present value of future taxes is viewed as adequate. Moreover, one can extend this model to the case where potential rather than actual taxes back money. If credible taxation parity is maintained beyond the redempton date of bills, individuals may decide not to pay in paper currency for taxes in order to retain paper as a medium of exchange. In this case it may be that the present value of money balances exceeds the present value of future tax receipts (but not the present value of potential taxes which the government would be willing and able to levy if currency-holders came to doubt its commitment). In other words, the government could issue currency with minimal actual tax backing so long as it could levy taxes when needed to support the currency.

[39] Note that the optimality of increasing the real supply of paper money by increasing taxes depends critically on the assumptions of non-distortionary (lump-sum) taxation and government transfers. These assumptions allow one to abstract from the potentially negative effects of distortions created by tax incentives and the loss of economic resources due to wasteful government expenditures.

differences in denomination, weight, and resilience to wear, and an endogenous level of monetary transactions depending (positively) on the availability of low-cost paper money. Each of these elements would reduce the displacement of specie as a consequence of increases in paper money supply since the equilibrium demands for both monies would rise with an increase in paper supply.