

## The Relationship Between Money and Prices: Some Historical Evidence Reconsidered

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### **Abstract**

This article describes a debate about the validity of the quantity theory of money and offers further evidence against it. The evidence is primarily from the North American colonies of Virginia, New York, and Pennsylvania and regards the issue of measuring the money supply. Studies have shown that changes in colonial money and inflation are inconsistent with the quantity theory. Some have argued that those studies measure money wrong: specie belongs in the measure because the colonies were on a fixed exchange rate system with Britain; changes in colonial paper money were offset by specie flows. When specie is counted, the quantity theory stands. This study responds with evidence that the critics are wrong: the colonies had no such fixed exchange rate regime, and movements in the stock of colonial paper currency cannot have been offset by specie flows.

*The views expressed herein are those of the author and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.*

[James] Madison entertained an intelligent view of the causes affecting the value of paper money. "It depends on the credit of the State issuing it, and on the time of its redemption; and is no otherwise affected by the quantity than as the quantity may be supposed to endanger or postpone the redemption."

—Albert Bolles, 1884

Central to most thinking about monetary theory and monetary policy is a version of the *quantity theory of money*. According to Lucas (1980, p. 1005), "two central implications of the quantity theory of money . . . [are] that a given change in the rate of change in the quantity of money induces (i) an equal change in the rate of price inflation; and (ii) an equal change in nominal rates of interest." Lucas goes on to state (p. 1005) that these propositions "possess a combination of theoretical coherence and empirical verification shared by no other propositions in monetary economics."

While Lucas does not state what this empirical verification consists of, it seems safe to assume that it includes the findings of Friedman and Schwartz (1963, p. 676) that, since the Civil War, "changes in the behavior of the money stock have been closely associated with changes in economic activity, money income, and prices . . . . The interrelation between monetary and economic change has been highly stable." It also likely includes the claim of Friedman (1960, p. 2) that, since World War II, "no country succeeded in stemming inflation without adopting measures directed at restraining the growth of the stock of money," as well as the conclusion of Schwartz (1973, p. 264) that, at least since the time of Alexander the Great, "long-run price changes consistently parallel the monetary changes, with one exception for England in the sixteenth century."

These conclusions and Lucas' propositions have been so firmly held by economists that they are often built into (rather than derived from) economic models. They also influence everyday thinking about the role of the Federal Reserve System, in that the central bank is charged (under this view) with preventing secular inflation, increases in interest rates, and so on.

However, despite Lucas' assertions about theoretical coherence and empirical verification, the quantity theory propositions described above have come under sharp theoretical and empirical scrutiny. On theoretical grounds, the asserted effects of monetary changes on prices and inflation have been challenged by Wallace (1981) and by Sargent and me (1986, 1987). In particular, we have produced economic models in which the consequences of monetary changes, even for nominal magnitudes, depend crucially on how such changes are accomplished. Loosely speaking, our work directs economic observers to examine the consolidated balance sheet of a nation's treasury and central bank. Monetary changes that affect total liabilities on this consolidated balance sheet (without compensating changes in assets) will have the effects Lucas predicts. However, monetary changes that do not result in changes in this consolidated balance sheet can actually be irrelevant for prices and interest rates. To illustrate this point, Sargent and I (1987) provide an example of a once-and-for-all change in the money stock that produces no changes in prices or interest rates.

These Wallace/Sargent-Smith results have some quite dramatic implications for the conduct of monetary policy. One is that open market operations accomplished with fiscal policy held constant (that occur with the consolidated balance sheet of the treasury and the central bank unaltered) have no effect on prices. Another implication is that government attempts to manage foreign exchange rates can be effective only if accompanied by fiscal actions that have redistributive consequences. (See Sargent and Smith 1986.)

Of course, if these theoretical results lack empirical verification, as Lucas implicitly suggests, then the results are rightly not of great interest to economic policymakers or monetary economists. However, at least on the surface, there appears to exist quite strong empirical support for them. For instance, Sargent (1982), Bomberger and Makinen (1983), Makinen (1984), Smith (1984; 1985a,b), Wicker (1985), White (1986), and Imrohroglu (1987) provide evidence of a number of episodes in which very large monetary changes occur (in some cases, over quite long periods) and in which price levels and currency values are extremely stable. In most of these cases, it is fairly apparent that the monetary changes were accomplished without significant effects on the consolidated balance sheet of the relevant treasury and central bank. These episodes thus provide a wide range of empirical support for the Wallace/Sargent-Smith view and against the Lucas version of the quantity theory.

That more such evidence will appear seems likely as well, since Redish (1985) suggests the existence of similar evidence for periods in early Canadian history, for instance.<sup>1</sup> Given the cumulation of this kind of evidence and its important implications for monetary economics, it seems appropriate to briefly review the findings of some of this literature, as well as some reactions to these findings.

Sargent (1982) has examined the experiences of four European economies as they emerged from hyperinflations after World War I. One of his findings is that each of these economies experienced extremely rapid growth in its money supply for some time after the price level had been stabilized. Post-hyperinflation Germany, for instance, saw its money supply increase by a factor of nearly four in the year following price stabilization. Sargent argues that these monetary changes were accomplished without altering the net balance sheet positions of the relevant treasury and central bank. Thus, these episodes support the propositions derived by Wallace, Sargent, and me. Subsequently, Bomberger and Makinen (1983) and Makinen (1984) have accumulated similar evidence based on the experiences of other countries emerging from hyperinflations.

The evidence presented by Sargent (1982) is not universally regarded as being inconsistent with the quantity theory, however. Under one interpretation, the hyperinflations essentially destroyed the monetary systems of these economies, which were then simply remonetizing after the stabilizations. Another interpretation is that the reforms that accompanied price stabilization required some adjustment in the expectations of agents: Changes in expectations over time increased the demand for money, preventing increases in the money supply from producing inflation.<sup>2</sup> Thus, further presentation of evidence is called for.

I have presented an array of evidence consistent with Sargent's (Smith 1984 and 1985a,b). Moreover, much of this evidence is not readily explained by appealing to

changes in monetary systems or expectations. In particular, many researchers have observed that, in the British North American colonies, there were several episodes in which the money supply apparently changed dramatically over long periods. These changes were quite often not accompanied by any price level movements. For instance, in 1760–70, the colony of New York reduced its per capita currency supply 86 percent, but available evidence indicates that the price level fell only 3 percent over the same period. This kind of experience was repeated in different colonies and different time periods. In addition, these monetary changes were accomplished with only minor changes in the (consolidated) government balance sheet. Hence, these observations are consistent with the Wallace/Sargent-Smith propositions and inconsistent with the quantity theory. Moreover, since no regime changes (or monetary reforms) had occurred, the counterarguments that are available against Sargent's interpretation of events are not available in the colonial context.<sup>3</sup>

Limitations in the kind of data that are available for the colonial period have, however, led to some questioning of this interpretation of events. Specifically, the only data that are available on colonial money supplies are measures of the amount of paper money issued by each colony.<sup>4</sup> I have related this money supply measure to movements in colonial prices and exchange rates, finding that in many cases large money supply movements produced no changes in price levels or currency values. Still, in addition to their own paper currencies, the colonies had stocks of specie (coins) that circulated within them. Since no data on colonial specie stocks exist, any money supply measures necessarily omit this component of the money stock. In fact, I have discussed this omission (in Smith 1984 and 1985a,b) and presented some arguments about why the inability to measure the quantity of specie is unlikely to be of concern in interpreting the colonial evidence. These arguments center on indications that the specie stock was generally a fairly small component of the colonial money supply.

Subsequent work by Bordo (1986), Bordo and Marcotte (1987), and Michener (1987) has called into question whether unobserved movements in the specie stock invalidate my interpretation of the colonial evidence. Together, these authors argue that specie was actually a large component of the colonial money supply. Moreover, they believe that movements in the stock of specie systematically counteracted movements in the stock of paper money, so that the movements in the money supply observed by me and others were completely illusory. Thus, for instance, in 1760–70, when the stock of paper money fell 86 percent in New York, the total stock of money was actually unchanged, according to Bordo, Marcotte, and Michener. In particular, in their view, as the paper currency stock declined, there were massive inflows of specie which exactly offset the effects of that contraction. Moreover, they believe this was true in each episode I have examined.

Bordo, Marcotte, and Michener do not provide evidence to support this position. Thus, they must provide a further argument in order to make their position plausible. A second part of their criticism of my work, then, is that I (and earlier historians of colonial monetary affairs) fundamentally misunderstand the monetary regime under which the colonies operated. Specifically, I have presented the colo-

nies as operating under a flexible exchange rate system, in which colonial currencies circulated at market-determined rates against other currencies (sterling, for example). Bordo, Marcotte, and Michener view the colonies as operating under a fixed exchange rate system, in which colonial currencies bore a fixed value in terms of specie. Under this view, the colonies were small open economies operating under fixed exchange rates. According to standard quantity theory reasoning, then, the colonial money supplies were completely determined by the necessity of maintaining this fixed rate. When the colonies were attempting to change their money supplies by printing or withdrawing paper currency, their efforts were to no avail, and the paper currency measures I have used do not reflect actual changes in the total money supply.<sup>5</sup>

The purpose of this paper is to review where the colonial evidence stands in light of the Bordo/Bordo-Marcotte/Michener critique. Thus, the paper asks these three questions and answers them in the following way:

- *How important was specie as a component of the colonial money supply?* It is not possible to know how much specie there was in the colonies. Many historians believe that there was very little and that what specie there was did not function as a medium of exchange. However, even if we take an agnostic position on this issue, historical evidence suggests that there was not enough specie to invalidate my earlier conclusions.
- *Were there specie flows that invalidate the evidence I have presented?* In some of the most dramatic episodes I have discussed (Smith 1985a,b), all evidence suggests that the stock of specie and the stock of paper money moved together. Thus, offsetting specie flows are not a possibility. In other cases, it is possible to place bounds on the specie stock that indicate that offsetting specie flows were not feasible.
- *Is it plausible to think of the colonies as operating under a fixed exchange rate regime?* The literature reviewed above does not suggest a plausible mechanism by which a fixed exchange rate system could have been maintained in the colonies.

The paper begins with a brief review of colonial monetary arrangements. Then I review the quantity theory and the Wallace/Sargent-Smith propositions, discuss why the nature of the colonial exchange rate regime is at issue, and offer some comments on why the colonies present particularly interesting evidence regarding these different approaches to monetary theory and policy. Next I present evidence on specie flows for three colonies discussed by Michener. And finally I examine the colonial exchange rate regime and argue that there is no reason to view the colonies as operating under fixed exchange rates.

### **Money in the Colonies**

The term *money* applied to the colonies has been taken by various historians to include a large number of different objects. However, in the discussions of Smith (1984; 1985a,b), Wicker (1985), Bordo (1986), Bordo and Marcotte (1987), and Michener (1987), the term can be taken to mean paper currency issued by the colonies themselves and specie.<sup>6</sup>

Each colony had its own unit of account; in the period under consideration, it was called a *pound* of the currency of the colony in question. Before the colonies printed (or minted) their own currencies, these pounds were simply abstract accounting units—almost no money existed denominated in them. Once paper money was issued, it was denominated in the unit of account of the colony issuing it, and in fact, this paper money would be the only money denominated in this unit of account. Finally, for the colonies discussed here, it is reasonable to view each colony as being able to operate an independent monetary policy.

To study the empirical relevance of the Wallace/Sargent-Smith propositions, the colonies are ideal. This is because, according to the way colonial monetary systems were intended to operate, all changes in the colonial money supply were supposed to be accompanied by changes that preserved the colony's (consolidated) balance sheet position.

More specifically, in the colonies discussed here, there were only two methods for increasing the stock of paper currency. One was to print currency in order to finance government deficits, that is, to directly purchase goods and services. At the same time the currency was issued, the government would levy specific future taxes. These taxes could be paid either in paper currency or in specie accepted at a defined rate in lieu of paper currency. Such taxes provided a mechanism for retiring the currency issued. More important, though, is the fact that, if levied in sufficient amounts, these taxes provided a source of future revenues which would roughly maintain the colony's (consolidated) balance sheet position.<sup>7</sup>

The other method of introducing currency in the colonies was to print it and issue it in the form of loans to private citizens. When loans were repaid, the currency was to be retired. Moreover, these loans constituted an asset acquired by colonial governments, again preserving their net balance sheet positions. (Methods used by the colonies to insure the security of these loans are discussed in Smith 1985a,b and 1987.) Thus, all monetary issues were intended to be *backed* by actions preserving the net balance sheet positions of the colonial governments. In the colonies to be discussed below, existing evidence suggests that the governments were in fact quite scrupulous in attempting to offset monetary increases with either current asset acquisitions or future tax revenues (Smith 1985a).

In addition to paper currency, gold and silver coins circulated in the colonies. These were mostly of Spanish and Portuguese origin, entering the British colonies through trade with Spanish and Portuguese colonies. These coins were not denominated in the unit of account of any colony. Moreover, the scope for them to circulate was limited by the fact that much specie was in relatively large denominations, inhibiting its use in ordinary transactions. (See Hanson 1979, 1980 and McCusker and Menard 1985, p. 339.)

How important was specie as a component of the colonial money supply? Here opinions differ greatly. Ferguson (1961, p. 4), in his justly celebrated study *The Power of the Purse*, says that "what coin existed in the colonies came mainly from trade with the Spanish and French West Indies. Its circulation was largely confined to merchants, and its stay was likely to be of short duration—it was a commodity for export rather than a medium of exchange." In expressing this view, Ferguson could easily have been

paraphrasing many colonial authors. For instance, Benjamin Franklin referred to "silver . . . , which is now become a merchandise, rising and falling like other commodities as there is a greater or less demand for it or as it is more or less plenty" (quoted in Bullock 1900, pp. 54–55). Brock (1975, p. 166) quotes a committee of the South Carolina assembly to the same effect: "gold and silver had 'for the most part been dealt for as a merchandize, and not as a currency in payments, or a medium of trade.'" Moreover, with respect to the amount of specie available, Brock (1975, p. 532) says that "in ordinary times, the supply of specie was at best meagre and uncertain, and was not infrequently wanting altogether."

Taking the opposite position is Michener (1987), who says that "colonial [paper] currency passed in domestic transactions at a customary fixed rate with pieces of eight" (p. 258) and who believes that "over two thirds of the money supply must have been specie in New York and Pennsylvania in 1774" (p. 275).<sup>8</sup> This estimate is not consistent with other existing estimates, however. In the historical literature, the estimate that most closely approximates Michener's is that of Weiss (1970, p. 779), who estimates specie to have constituted between 52 and 60 percent of the money supply in New York and Pennsylvania at this time. Estimates that appear to receive more support in the historical literature are Letwin's (1981) that specie could have been no more than 40 percent of the money supply of Pennsylvania at this time and McCusker and Menard's (1985) that about 25 percent of the colonial money supply was specie.<sup>9</sup> Not only is Michener's estimate of the specie stock inconsistent with other estimates, but Michener makes no attempt to reconcile his estimate with historical assertions that there was only a "minor amount of coin" in Pennsylvania in 1770–75, for instance (Bezanson 1951, p. 10).

The fact of the matter is that historians do not now know, and quite likely will not ever know, how much specie was in the colonies, either in absolute amount or relative to paper currency. The bulk of historical evidence suggests, however, that it was much less than half of the colonial money supply. Moreover, we know that many colonies were especially poor in specie. It is perhaps best to consider the case of each colony separately, as I have done elsewhere (in Smith 1987). Fortunately, however, for this study it is not necessary to take a stand on how much specie was available in the colonies as a whole, since the arguments presented below will not depend on this.

It remains, then, to discuss the exchange rate regime in the colonies. This discussion is best deferred, however, until after a description of the quantity theory and the Wallace/Sargent-Smith propositions. Then I can discuss more clearly why the nature of the colonial exchange rate regime is at issue.

## Two Views About Money and Prices

### *The Quantity Theory*

In its most basic form, the quantity theory simply asserts that money times velocity equals nominal income. This statement can, in fact, be taken as a definition of (income) velocity and as such has no empirical content. In order to give the quantity theory empirical content, it is necessary to provide further economic structure. For my purpose here, it is convenient to adopt Friedman's (1956) assertion

that velocity (or money demand) is a stable function of real income, nominal interest rates, and possibly expected inflation. Under suitable side hypotheses about the response of real income and real interest rates to long-run monetary changes, Friedman's assertions allow Lucas' propositions (above) to be deduced.<sup>10</sup> Thus, for the purpose of this paper, Friedman's specification can be taken as a definition of the quantity theory.

What does the quantity theory predict will happen as a result of a long-run change in the money supply (or the money growth rate), then? Under the hypothesis of long-run neutrality of money, real income and real interest rates will be unaffected. Other predicted changes depend on the exchange rate regime.

Consider a small open economy, that is, one whose actions have negligible effects on world prices. If this economy has a flexible exchange rate with other currencies, its actions will not affect world prices. Hence, its exchange rate will depreciate in proportion to the increase in the money supply, and its domestic price level will rise proportionally.

But consider a small open economy with a fixed exchange rate. Under the quantity theory, the fixed exchange rate and world prices determine domestic prices and inflation. Since real income and interest rates are not affected by monetary changes, the hypothesis of stable money demand (or velocity) implies that the domestic money supply must be unaltered. Thus, a change in one component of the money supply requires offsetting changes in other components, or in foreign holdings of domestic currency. In a setting like the colonies, offsetting specie flows would be a possibility.

Now consider the colonies. Existing historical evidence suggests that in the colonies long-run variations in per capita real income and nominal interest rates were relatively minor (Smith 1987). Then, if the colonies had flexible exchange rates with other currencies, large monetary changes should have produced proportional changes in price levels under the quantity theory. If the colonies had fixed exchange rates, however, large monetary changes should have produced large offsetting specie flows.<sup>11</sup> Notice that under the quantity theory, long-run changes in the stock of paper currency issued must create either proportional long-run movements in prices and exchange rates or offsetting specie flows. If neither results, then the quantity theory fails to explain these historical episodes (independently of the exchange rate regime).

#### *A Different View*

Wallace (1981) and Sargent and I (1986, 1987) present models which have implications sharply at variance with the quantity theory. In these models, it is possible for long-run changes in the money supply to have no effect on the price level or exchange rates, even under a flexible exchange rate regime. Our reasoning parallels that underlying the Modigliani-Miller theorem for corporate finance. In particular, Modigliani and Miller (1958) present circumstances under which the following result holds: a corporation cannot affect its market value purely by rearranging its liabilities (say, between debt and equity).

Wallace, Sargent, and I present models in which the same reasoning applies to the government. More specifically, in our analyses, pure reorganizations of the government balance sheet (the consolidated balance sheet of the

treasury and the central bank) do not affect the market value of government liabilities, including currency, and hence do not affect the price level. But as this reasoning makes clear, only monetary changes that represent pure rearrangements of the (consolidated) government balance sheet will leave price levels (and other measures of currency values, such as exchange rates) unaffected.

That last caveat is important. In general, when central banks engage in open market operations, they exchange non-interest-bearing liabilities, like currency, for interest-bearing liabilities, like bonds. In the absence of any other actions by the government, such an exchange will alter retained earnings on the government's portfolio and hence will not be a pure rearrangement of the government balance sheet. Thus, an important part of the Wallace/Sargent-Smith analysis is that monetary changes accomplished through open market operations be accompanied by government rebates of excess earnings on the government portfolio. These rebates can take the form of tax reductions.<sup>12</sup>

In practice, open market operations are rarely accompanied by such rebates, so the Wallace/Sargent-Smith results will not apply. Clearly, randomly selected episodes will not shed light on whether these models are empirically relevant. However, the colonies are ideal for studying these models because colonial governments routinely rebated, through tax reductions, the excess earnings generated by their portfolio changes (Smith 1987).

Finally, in contrast to the situation under the quantity theory, the Wallace/Sargent-Smith results can be stated without reference to the prevailing exchange rate regime (Sargent and Smith 1986). Thus, our analyses predict that colonial monetary changes will produce no effects on price levels, exchange rates, or specie flows, independently of the colonial exchange rate regime.

#### **The Evidence: Currency vs. Specie Flows . . .**

I now review three colonial episodes in which large changes in the amount of paper money in circulation occurred.<sup>13</sup> These changes were apparently accomplished without significant effects on the balance sheets of the relevant colonial governments. Thus, the Wallace/Sargent-Smith propositions suggest that no significant changes should have been observed in prices or exchange rates. Since this is what occurred, colonial evidence supports this view. For the events described to be consistent with the quantity theory, however, movements in the stock of paper currency must have been offset by changes in other components of the money supply (specie). Moreover, this would have to be the case independently of the prevailing exchange rate regime. Available evidence about movements in the stock of specie for these colonies during 1755–70 is now reviewed. As will be seen, the specie flows required for the colonial evidence to be consistent with the quantity theory do not seem to have occurred. (A systematic review of the evidence concerning specie flows during other periods and in other colonies appears in Smith 1987.)

#### *Virginia*

Virginia first introduced paper currency in 1754. During 1755–60, the per capita stock of paper currency in this colony rose 749 percent.<sup>14</sup> While no price index is available for colonial Virginia, McCusker's (1978, p. 211) sterling exchange rate series shows a currency depreciation of

only 9 percent during this period.<sup>15</sup> If the stock of paper currency provides a reasonable estimate of movements in the total money supply, this is a sharp empirical refutation of the quantity theory.<sup>16</sup>

In 1760–70, the per capita paper currency stock of Virginia contracted 98 percent. This massive monetary reduction was accompanied by only a 16 percent appreciation of Virginia currency against sterling, which again refutes quantity theory predictions.

Virginia is the one location where Michener (1987, p. 280)<sup>17</sup> claims to present evidence of offsetting specie flows. If correct, this would suggest that the data just discussed misrepresent Virginia's monetary situation. Michener's evidence consists of "the report of Andrew Burnaby, an English traveller who visited Virginia in the fall of 1759 . . . Burnaby noted that: 'The use of paper currency in this colony has intirely banished from it gold and silver.'"

Does this change the picture of Virginia's monetary situation? Clearly not. Even assuming that Burnaby's report can be taken at face value, we have to ask whether it represents evidence of specie flows that offset the changes known to have occurred in the paper currency supply. The historical literature provides us with an estimate of how much specie there was in Virginia by the beginning of 1756: "less than . . . £20,000" (Ernst 1973, p. 48; Ernst 1987). In 1757 alone, Virginia issued £180,000 in paper currency. Thus, even if Burnaby was right, only a small fraction of the change in the paper currency stock could have been offset by specie flows. To summarize, it is possible that a focus on movements in the stock of paper money overestimates monetary movements in Virginia (which I admit in Smith 1985a). However, specie flows cannot change the basic picture of a very large increase in the colony's money supply.

Michener (1987) is silent on the topic of specie inflows during 1760–70, which he must believe were large. Again, the evidence suggests otherwise, since existing literature indicates an acute shortage of money in Virginia throughout the latter part of the decade (Evans 1962).

#### *New York*

During 1755–60, the per capita paper currency stock of New York rose 90 percent. At the same time, the price level in New York rose 20 percent and the exchange rate against sterling fell only 7 percent. During 1760–70, these events were reversed. The per capita paper currency stock was reduced 86 percent while the price level fell only 3 percent and the sterling exchange rate remained virtually unchanged. Again, these events are consistent with the quantity theory only if there were offsetting changes in the stock of specie. (See the accompanying table for all figures cited in this and the next section.)

It appears, however, that to the contrary there were massive inflows of specie while the paper currency supply was increasing and massive outflows of specie while the paper currency supply was decreasing. To see this, consider the following. During 1755–60, New York increased its paper currency stock about £231,000. During the same period, New York received parliamentary grants from England with a value in colonial currency of £195,000 (not all of which was specie; see Brock 1975, p. 348). But this only scratches the surface of specie inflows during 1755–60. Brock (1975, p. 348) tells us that "valuable as the parliamentary grants were in providing specie and ex-

change, they were in New York's case small in comparison to the sums of specie brought into the [colony] . . . as a result of the fact that large numbers of his Majesty's forces were located in the colony" at this time. Thus, as summarized by Brock (1975, p. 350), "there were sizeable importations of specie into New York, both from England and from the other colonies." Finally, also according to Brock (1975, p. 351), there were significant inflows of specie from the West Indies. So we know that there were not offsetting specie outflows during this period; in fact, in all likelihood, a focus on paper currency movements substantially understates the extent of the monetary expansion that occurred in New York during these years.

It is also known that New York had massive specie outflows during 1762–70. By early December 1763, the merchant John Watts wrote, "we have nothing remaining but Paper Currency" (Brock 1975, p. 353). This situation continued, with Ernst (1973, p. 259) describing "the critical shortage of coin" in New York throughout 1768. Since we know that there was a great deal of specie in New York in the early 1760s, specie outflows must have been large, indeed, during this period of massive contraction in the paper currency stock.

Thus, in the colony of New York, we know that there were no offsetting changes in the specie stock and that, in fact, it is quite likely that specie flows magnified changes in the money supply.

#### *Pennsylvania*

Of all the colonies I have considered (in Smith 1984 and 1985a,b), Pennsylvania is the best candidate for specie flows that offset movements in the paper currency supply. This is not surprising, in some sense, since Pennsylvania was probably the most specie-rich of the colonies. It is interesting, then, to consider this colony, for it permits an illustration of what heroic assumptions are required to generate offsetting specie flows even in the most specie-rich of the colonies and in one which had an increase in its paper currency stock that was not unusual (by the standards of other colonies at this time). It will be seen, however, that even if these heroic assumptions are accepted, offsetting specie flows are not a possibility for the 1760–70 period.

In 1755–60, the per capita paper currency supply of Pennsylvania increased 277 percent. Nevertheless, during this time, the price level (in Philadelphia) rose only 17 percent and Pennsylvania currency appreciated against sterling.

As was true in the other colonies considered, the years 1760–70 saw a major monetary contraction in Pennsylvania. In this decade, the per capita paper currency stock was reduced 68 percent. This reduction was accompanied by a price level decline (in Philadelphia) of only 3 percent and an appreciation of Pennsylvania currency against sterling also of only 3 percent.

The situation with respect to potential changes in the stock of specie in Pennsylvania can only be guessed at. An obvious problem is that we have no clear idea of how much specie was available prior to the monetary expansion of 1755–60. This is easy to see in that Brock (1975, p. 386) says that "by 1753 complaints of the scarcity of currency [which Brock takes to include specie] were being received by the assembly" and in the same sentence says that "the receiver of the quit rents reported . . . in February of

that year that ‘full four fifths’ of the money received by him was gold and silver.”

Without saying why, Brock takes four-fifths as a working figure, and Michener (1987, p. 282) apparently follows Brock in this. It is interesting to consider the consequences of doing so.

Since Pennsylvania had £82,500 of paper currency in circulation in 1753, if specie were 80 percent of the money supply, then the specie stock would have been £330,000. In 1753–60, Pennsylvania increased its paper currency in circulation £403,700. Interpolating population figures suggests a 25 percent increase in the population during those years. Michener (1987, p. 282) takes the population increase to represent the increase in the demand for money. That assumption implies that, over this period, with an unchanged price level, Pennsylvania could have accommodated (under the quantity theory) a money supply of roughly £515,500. This implies a net specie outflow of about £300,000. Thus, offsetting specie flows are a logical possibility if one accepts Brock’s estimate that 80 percent of the money supply was specie in 1753. (For future reference, this would have left Pennsylvania with about £30,000 in specie in 1760.) An even larger gross outflow of specie would have been required to accomplish this, however, since we know that Pennsylvania experienced an “influx of specie . . . in the early years of the [French and Indian] war” (Brock 1975, p. 387).<sup>18</sup> Even Michener (1987, p. 283) presents evidence of specie flows into Pennsylvania from other colonies during these years. He also argues (p. 283) that during 1758–60, “Pennsylvania’s earnings of foreign exchange [were] exceptionally high.” Thus, while offsetting specie flows are a possibility (under Brock’s estimate), they require enormous gross outflows of specie.

Moreover, as seen above, Brock’s estimate that 80 percent of Pennsylvania’s money supply was specie in 1753 is very large, even relative to Michener’s two-thirds estimate.<sup>19</sup> Replacing Brock’s 80 percent with Michener’s 67 percent leaves Pennsylvania with a specie stock of roughly £165,000 in 1753. By my calculations, under this scenario, even if Pennsylvania was devoid of specie by 1760, its per capita money supply would have increased over 57 percent during 1755–60. This is more than triple the percentage increase in the price level. Finally, these calculations could be repeated with more conventional estimates of the specie component of the money supply. Recall that Letwin’s (1981) upper bound on this figure is 40 percent. Replacing Brock’s 80 percent with 40 percent gives Pennsylvania a specie stock of about £55,000 in 1753. Thus, offsetting specie flows are a logical possibility only if one accepts an immense figure for the specie component of the money supply.

Suppose one takes an agnostic stand on this issue and admits that there are possible scenarios under which changes in the Pennsylvania currency stock (from 1755 to 1760) were offset by specie flows. What was the situation from 1760 to 1770? During this period of immense reductions in the per capita paper currency stock, it is probable that there were net outflows of specie. Even Michener (1987, p. 284) indicates that Pennsylvania exported specie during the early 1760s and that “by July 1762, local supplies of specie were greatly reduced.” (Recall that even under Brock’s estimate, Pennsylvania would have had only about

£30,000 of specie in 1760 if offsetting specie outflows had occurred. How were these specie shipments accomplished if there had been offsetting specie flows during 1755–60?) Moreover, according to Ernst (1973, p. 102), outflows of specie continued from 1763 to 1766: “By the beginning of 1766 the amount of paper in circulation ran close to £290,000 out of the total of £330,000 outstanding at the end of the war. Coin supplies apparently diminished far more rapidly.” And while Michener (1987, p. 285) claims that “Pennsylvania imported substantial amounts of specie” in 1766 and 1767, Ernst (1973, p. 207) says that “by late 1767 and through the next year numerous newspaper articles appeared citing the great scarcity of money.” Thus, specie imports could not have been too substantial. Michener (1987, p. 285) also says that “merchant letters suggest that the specie inflow was halted or reversed in 1768.” Therefore, it is clear that there were not significant inflows of specie during this decade and that quite likely there were net outflows.<sup>20</sup>

What does the Pennsylvania evidence indicate, then? If there were offsetting specie outflows during 1755–60, there must have been almost no specie in Pennsylvania by 1760. Since specie flows could therefore not have been very important during 1760–70, movements in the stock of paper currency must present a reasonably accurate picture of the monetary situation in Pennsylvania during this decade: A 68 percent reduction in the money supply occurred in the face of almost constant prices and currency values. Yet if there were not offsetting specie flows during 1755–60, the quantity theory cannot explain the relative price stability of this period. Thus, either way, the colonial data provide sharp evidence contradicting the quantity theory.

### ... And Fixed vs. Flexible Exchange Rates

To summarize, the evidence as it currently exists indicates that movements in the money supply (as measured by the stock of paper currency) cannot generally have been offset by specie flows. (I review further evidence on this point in Smith 1987.) Why, then, do Bordo (1986), Bordo and Marcotte (1987), and Michener (1987) believe that offsetting specie flows should have (or did) occur?<sup>21</sup> This belief is apparently dictated by their view that the colonies operated under a fixed exchange rate regime. As seen above, this view (in conjunction with the quantity theory) would direct them to expect such specie flows. Of course, that these flows did not occur indicates that the quantity theory is inconsistent with colonial evidence. However, it is also possible to ask whether it is reasonable to think of the colonies as operating under a fixed exchange rate regime.

In studying the colonial exchange rate regime, it is important to distinguish between what historians call the *par of exchange* and the *commercial exchange rate*. Recall from above that, even before many colonies issued paper currency, they had local units of account called *pounds*. This unit of account was defined by setting a value, in colonial pounds, for a Spanish piece of eight. This legislated value defined the *par of exchange*.

The *par of exchange* was not an exchange rate, however. Colonial governments neither intended nor expected that this legislated rate would obtain in private transactions, nor did the governments attempt to enforce or maintain the *par of exchange* as an exchange rate.

The exchange rate that prevailed in individual transactions is referred to as the *commercial rate of exchange*. This rate is logically distinct from the par of exchange; as McCusker (1978, p. 21) says, “par was only a benchmark; the commercial rate of exchange fluctuated around par.” What determined the commercial rate of exchange? Again quoting McCusker (1978, p. 22): “The final and most important influence on the commercial rate of exchange was the state of the market for bills of exchange. Here, of course, the laws of supply and demand were at work.” Did the commercial rate actually differ from the par of exchange? According to Governor Lewis Morris of New Jersey (quoted in McCusker 1978, p. 116), “the collonies on the continent very much differ in [the] proportion [that] their currency beares to stirling, and each collony dayly alters.”<sup>22</sup> This is clearly the description of a flexible exchange rate regime.

Bordo (1986), Bordo and Marcotte (1987), and Michener (1987) do not accept this characterization, however. I will now attempt to sketch my understanding of their views and my evaluation of them. This is easiest for the Bordo/Bordo-Marcotte position. Bordo and Marcotte (1987, pp. 312–13) state that “South Carolina . . . fixed the exchange rate between its currency and the British pound sterling at 7:1.” At this point it is clear, however, that they have simply confused the par of exchange with the commercial rate of exchange.

To emphasize that colonial governments did not enforce the par of exchange as an exchange rate, I need only point to the expressed attitude of colonial courts and legislatures toward what Bordo and Marcotte view as a fixed rate. For instance, Ernst (1973, p. 54) tells us that in 1755 the Virginia House of Burgesses amended an act in order “to allow courts of record to settle all executions for sterling debts in local currency . . . at a ‘just’ rate of exchange. A just rate was taken to be the actual rate [that is, not the par of exchange] at the time of court judgment.” Or as Gipson (1961, p. 263) says, “Local courts should have the authority to ascertain the difference in exchange between sterling and current money.” That there was such a difference is clearly indicated by the fact that “a significant margin could exist between the rate set by the provincial court and the commercial rate at the time a debtor finally settled [an] account” (Sosin 1964, p. 178). Notice that the legislature directed the courts not to enforce the par of exchange in settlements. Similar court attitudes in New York, Pennsylvania, and North Carolina are discussed in Smith 1987. Finally, to examine whether legislatures ever intended the par of exchange to be an exchange rate, we can return to the Virginia House of Burgesses: “No laws, they declared, could guard against the fluctuating rate of exchange” (Sosin 1964, p. 180).

Michener’s position is more difficult to describe, since he in effect takes two positions. Michener (1987, p. 238) begins by saying that Nettels (1934) “discussed the rating of foreign coins, the arrangement I believe effectively fixed the par of exchange.” This is correct by definition; but as we have seen, the par of exchange and the commercial rate of exchange were not the same thing. Michener (1987, p. 258) goes on to argue that “exchange rates in many colonies fluctuated within specie points about a fixed par of exchange.” However, Michener later abandons the position

that this par of exchange was the one fixed by colonial governments.

Unlike Bordo and Marcotte, Michener recognizes that interpreting the colonies as operating under fixed exchange rates raises several problems. At least one becomes obvious upon reviewing a standard textbook definition of a fixed exchange rate system (Parkin 1984, p. 590):

A fixed exchange rate regime is one in which the [central bank] declares a central or par value at which it will act to maintain the value of its currency. It also usually involves declaring what is known as an *intervention band*. That is, in declaring a fixed exchange rate, the central bank announces that if the exchange rate rises above the par value by more than a certain percentage amount, then it will intervene in the foreign exchange market to prevent the rate from moving any further away from the par value. Likewise, if the rate falls below the par value by a certain percentage amount, the central bank declares that it will intervene to prevent the rate from falling any further.

In order to maintain a fixed exchange rate, the central bank stands ready to use its stock of foreign exchange reserves to raise or lower the quantity of money outstanding so as to maintain its price relative to the price of some other money.

Interpreting the colonies as operating under fixed exchange rates is difficult because they had no central bank, or other entity, that stood ready to maintain any fixed rate in this manner.

Michener recognizes this difficulty but attempts to avoid it, by saying (1987, p. 263) that “how this [fixed exchange rate] was enforced is an interesting question but somewhat beyond the scope of this paper.” Michener (1987, p. 263) does hazard some guesses, however: “The modern institutional arrangement is to have a government institution . . . which holds reserves of foreign exchange and stands ready to exchange domestic currency for foreign exchange at the par of exchange it wishes to defend. The simple answer may be that colonial Treasurers’ offices performed this function in colonial times.” Michener then describes some claims by one colonial treasurer to this effect.

We know that this depiction is inaccurate, however. According to Nettels (1934, p. 262), “Acts of issue [of money] generally promised that the holders of the colony’s bills [paper money] might at any time exchange them for any stock in the colonial treasury. But since the treasuries ordinarily did not have any stock of either specie or goods of approved value, this promise probably had no effect in maintaining the specie value of the bills.” Thus, another device is called for.

Seemingly anticipating this argument, Michener (1987, p. 264) offers a second possibility regarding how a fixed rate of exchange could have been maintained. In particular, he says that “the leading merchants of the colony defended the fixed par.” To be more specific, he asserts that “the principal merchants of a colony would actually confer, decide on what ought to be current money [that is, the exchange rate], and then attempt to persuade others to follow their lead.”

This somewhat surprising assertion would seem to require more of a supporting argument than Michener provides.<sup>23</sup> He does not attempt to describe which merchants fixed the rate of exchange or show that merchants as a group had coincident interests with regard to currency val-

ues.<sup>24</sup> He also does not provide a convincing argument that logically it would have been feasible for merchants to maintain a fixed exchange rate in the manner he describes.

On the latter point, Michener (1987, p. 265) does make some attempt at a defense. He believes that the institutional arrangement he describes “effectively made currency and specie perfect substitutes at the customary valuation.” If these objects were perfect substitutes, the exchange rate between them would have been indeterminate (Kareken and Wallace 1981), with merchants free to choose any value they preferred.

To summarize Michener’s (1987, p. 258) position, then: In the colonies, “pieces of eight and bills of credit [paper money] were used interchangeably as a medium of exchange. Colonial currency passed in domestic transactions at a customary fixed rate with pieces of eight, a rate generally recognized by both the courts and the government, who gave the custom legal sanction.” And, again, this customary rate was set by merchants.

This description of events contains at least three historical inaccuracies. We have seen above that no legal sanction was given to any fixed rates in the colonies; we know that the notion that specie and paper currency were perfect substitutes, or circulated interchangeably, is false;<sup>25</sup> and we know that, as a general statement about the colonies, the notion that merchants fixed rates is unsupported. For instance, McCusker (1978, p. 156) indicates that in 1768 the New York “Chamber of Commerce appointed a committee to establish the value in New York currency of the major coins in circulation.” This would hardly have been necessary if the merchants making up the Chamber of Commerce had either been setting an exchange rate or following the lead of other merchants.<sup>26</sup>

## Conclusions

Despite recent arguments, there is no reason to alter the standard historical perception of the British North American colonies as operating under a flexible exchange rate system. There is also no reason to think that specie flows occurred in ways that would make colonial history consistent with the predictions of the quantity theory of money. Moreover, colonial data provide far more evidence against the quantity theory than that cited above. (See, for example, Smith 1987.) Instead, since in the colonies considerable monetary changes were accomplished without significant alterations in net government balance sheet positions, these data support the propositions derived by Wallace (1981) and Sargent and me (1986, 1987). In light of the similar evidence cumulating from other places and periods (Sargent 1982, Bomberger and Makinen 1983, Makinen 1984, White 1986, and Imrohroglu 1987), it is necessary to seriously consider the possibility that the effects of monetary changes depend as much on how they are accomplished as on how large they are.

\*I acknowledge very helpful conversations with John McCusker. My epigraph is from Albert Bolles’ 1884 book, *The Financial History of the United States, From 1774 to 1789*, vol. I, 4th ed., p. 147, fn. I, New York: D. Appleton and Co. (reprinted in 1969, New York: Augustus M. Kelley).

<sup>1</sup>Notice that all of this evidence is historical in nature. This is because the Wallace/Sargent-Smith models predict different economic behavior from that which Lucas predicts only when monetary changes occur that are not accompanied by changes in the consolidated balance sheet of the treasury and the central bank. This rules out the use of postwar time series data to discriminate between the competing hypotheses.

This is not to say that there is no modern evidence on this issue, however. Miller (1983) presents evidence that, since the mid-1960s, changes in the net liability position of the U.S. Treasury—Federal Reserve System, rather than changes in the money supply alone, have been the relevant variable from the point of view of price level changes.

Also, there is much more historical evidence against Lucas’ propositions than I have cited above. See, for example, the discussion of the historical French experience in Riley and McCusker 1983.

<sup>2</sup>The latter argument is acknowledged by Sargent (1982, n. 20).

<sup>3</sup>See also Wicker 1985 for a similar interpretation of these events. Calomiris (1988) discusses the lack of support for the quantity theory in these historical episodes and presents an explanation for its failure in terms of monetary/fiscal interactions. These interactions are not the ones emphasized by me (Smith 1984 and 1985a,b) or by Wallace (1981) and Sargent and me (1987), however. Finally, White (1986) suggests strong parallels between parts of French and Spanish history and the American colonial experience.

<sup>4</sup>Colonial monetary institutions and some components of the colonial money supply are discussed in the next section.

<sup>5</sup>Surprisingly, given that this is their description of events, Bordo and Marcotte (1987) and Michener (1987) make no attempt to discuss why colonial governments continually attempted to manipulate their money supplies. Nor do they explain why the quantity of paper money emitted was such a contentious subject in many colonies.

<sup>6</sup>For a discussion of other candidates for inclusion in the money supply, see Smith 1987. There I also discuss why the absence of data on these candidates is not of great concern for the purpose of this paper.

<sup>7</sup>Wicker (1985) pursues a related line of reasoning. This method of creating currency converts all decisions about government finance into decisions purely about the timing of taxation. Hence, the arguments raised initially by Barro (1974) are relevant.

<sup>8</sup>Bordo (1986) and Bordo and Marcotte (1987) apparently accept Michener’s views on this.

<sup>9</sup>There are, admittedly, problems encountered by McCusker and Menard (1985) in arriving at this estimate, which are discussed by Michener (1987, pp. 278–79). There are, however, problems in constructing any such estimate. Consider, for instance, Michener’s estimate, arrived at by using Jones’ (1980) studies of colonial probate records for 1774. There are at least three serious problems with using these records for the purposes to which Michener puts them. First, by definition, probate records represent the financial holdings of older (and wealthier) individuals than the population as a whole. Second, Jones examines probate records only for the year 1774, while it is known that “values reported by probate inventories, particularly financial assets and liabilities, fluctuated violently in response to the changing fortunes of the export sector” (McCusker and Menard 1985, p. 264). Third, “while designed to generate an unbiased wealth estimate for probated decedents, the [Jones] sample is small . . . and the standard error large; one wonders if the numbers are sufficient to support the elaborate weighting and adjustment needed to generate figures for the living population” (McCusker and Menard 1985, p. 265). The last problem is highlighted by Michener’s (1987, p. 275) admission that only 38 percent of sampled probate inventories report any holdings of cash, which illustrates the potential for substantial standard errors. For further elaboration on these points, see McCusker and Menard 1985, pp. 264–65. [By the way, Weiss (1970) also uses Jones’ probate studies to arrive at his figures.]

Michener (1987, p. 280) also cites Bullock (1900, pp. 176–77) and Brock (1975, p. 447) as providing evidence that specie was plentiful in the colonies. My reading of Bullock’s work is that he actually asserts the contrary. A reading of pp. 446–47 in Brock 1975 indicates that the specie stock of South Carolina expanded in concert with a major expansion in the paper currency stock. This cannot provide support for Michener’s position.

<sup>10</sup>More elegant derivations of quantity theory propositions like that of Lucas (1982) could also have been examined.

<sup>11</sup>Since colonial currencies did not circulate outside the colonies and since the colonies had no banks—and, hence, no bank-created money—the only candidate for compensating changes in the money supply is specie.

<sup>12</sup>An example of some confusion caused by a failure to understand that the Wallace/Sargent-Smith analysis requires essentially only that these rebates occur is the discussion in Michener 1987, pp. 245–53. Michener criticizes me (Smith 1984 and 1985a,b) for applying the analysis just outlined to the colonies. His criticism takes the form of arguing that the colonies did not always retire currency as scheduled; hence, the analysis does not apply to the colonies. Such a criticism is clearly misplaced. An examination of Sargent and Smith 1987 will indicate that the timing of government transactions plays no role in our argument. The important element is, rather, the manipulation of taxes and other payments to the government in such a way as to hold earnings on the government portfolio constant.

<sup>13</sup>The quick sketch of events below is fleshed out in Smith 1985a, 1987.

<sup>14</sup>All figures on monetary changes in Virginia are derived from Brock’s measures of this colony’s paper currency stock (Brock 1975, Table XXVIII) and U.S. Bureau of the Census (1975) data on population.

<sup>15</sup>Bordo and Marcotte (1987) and Michener (1987) correctly point out that McCusker’s (1978) exchange rate series does not present true spot exchange rates. McCusker actually presents the price of sterling bills of exchange, which were claims to future payment of specie. It is unclear to me from reading these authors’ works whether they intend this point to be a criticism of the use of McCusker’s series for the purposes in the text. It should be noted, however, that the kind of data McCusker presents is routinely used as if it provided spot exchange rates. See, for example, Bezanson, Gray, and Hussey 1935, p. 7. Michener (1987, p. 275) also employs McCusker’s series in this way.

<sup>16</sup>Since Virginia had only introduced paper currency in 1754, this was a new regime. Hence, appeals to monetizations and changes in expectations might be appropriate here. However, such appeals would have little basis in the two colonies discussed below.

<sup>17</sup>Bordo (1986) and Bordo and Marcotte (1987) do not claim to provide any direct evidence of specie flows, apparently being content to accept Michener’s arguments.

<sup>18</sup>Brock's reference appears to be to the years 1756 and 1757.

<sup>19</sup>Since economic conditions are unlikely to have been much different in 1774 than in 1753 (at least with respect to per capita real income and nominal interest rates), under the quantity theory the level of real balances per capita should have been roughly the same in these two years. If one believes specie was about two-thirds of the money supply in 1774, then it must also have been about two-thirds of the money supply in 1753 in order to conform to such a prediction.

<sup>20</sup>This conclusion is in complete accordance with the conclusions of all other historical studies of this period. For instance, Walton and Shepherd (1979, pp. 104–5), studying the period 1768–72, say of the colonies in general: "Only if balance-of-payments surpluses consistently had been earned would the colonies have accumulated an adequate supply of circulating coin. We are justified in assuming that balance-of-payments surpluses did not occur, since no such supply did accumulate."

<sup>21</sup>Michener (1987, p. 280) asserts that there is evidence in 18th century literature that specie flows of the appropriate type did actually occur. He cites Smith 1789, p. 307, and Hume [1749] 1955, p. 188. I read this literature as simply asserting the absence of significant amounts of specie in the colonies. This cannot support Michener's position, which of course requires the colonies to have had an ample stock of specie.

<sup>22</sup>Incidentally, McCusker's (1978) description of the colonial monetary system is completely standard. The reader interested in confirming this can consult Ernst 1973, p. 15: "The rate of exchange [in the colonies was] a price determined by the play of market forces." Ernst (p. 15) goes on to present examples where specie commanded a premium relative to paper currency "despite the laws rating paper and coin as equal" (that is, despite the fixed par of exchange). The reader can also consult Ferguson's (1953, p. 158) classic piece: When "sterling bills [of exchange] became scarce and expensive . . . specie and bills of exchange rose in value relative to paper money." See also Hammond 1957, p. 10: "The bills of credit of the colonial governments [might] . . . either . . . be kept equal to specie in value, or not." Other references include Lester 1938, p. 325; Weiss 1970, p. 775; and Bullock 1900, p. 78. Soltow's (1958) piece is also extremely valuable. It describes the meeting of an organized foreign exchange market in Williamsburg. In this market, "when the supply of cash was . . . scarce . . . the exchange rate declined. If . . . there was more money than [sterling] Bills [of exchange] . . . , the price of sterling rose" (Soltow 1958, p. 475).

<sup>23</sup>A modern version of this method for maintaining a fixed exchange rate would be the following. Canadian merchants would confer, decide what the exchange rate ought to be, and attempt to persuade others to follow their lead. In doing so, they would fix the U.S./Canadian exchange rate. (Incidentally, there are a number of historical reports of failed attempts by groups of merchants to manipulate exchange rates. See Smith 1987, fn. 35.)

<sup>24</sup>We know, in fact, that they did not. See, for example, Ernst 1982.

<sup>25</sup>For instance, Ernst (1965, p. 45) presents evidence that "exchange rates between specie and sterling often deviated from the figures cited for paper and sterling." Thus, these were not used interchangeably. Also of interest is McCusker's (1976, p. 97) statement that "a paper bill of credit, with a distinct, explicit value in colonial currency, was naturally to be preferred over any given coin, the value of which in colonial currency was uncertain or, at least, debatable." In short, to colonists, specie and paper money were not perfect substitutes. For further details on this point, see McCusker 1976. Finally, since specie and paper currency were not perfect substitutes, Michener needs to show that it was feasible for merchants to maintain an exchange rate. He does not attempt to do so.

<sup>26</sup>The New York Chamber of Commerce was quite explicit that its action was necessary because paper currency and specie were not circulating at the par of exchange. This fact is also apparent in the report of the above-mentioned committee. On these points, see Stephens 1971, pp. 52, 56, 316–17.

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Currency, Prices, and Exchange Rates  
in Two British North American Colonies

Colony	Year	Notes Issued			Prices		Exchange Rates	
		Colonial £	£ Per 1,000 People	% Change	Index*	% Change	Colonial £ Per 100 £ Sterling	% Change
New York	1755	179,076	1,848	+90	66	+20	180.13	-7
	1756	230,773	—		66		182.65	
	1757	219,281	—		65		178.40	
	1758	307,198	—		70		172.60	
	1759	481,186	—		79		168.39	
	1760	410,387	3,503	-86	79	-3	167.20	-1
	1761	366,158	—		77		181.41	
	1762	330,807	—		87		189.76	
	1763	287,163	—		79		186.73	
	1764	243,885	—		74		184.85	
	1765	166,502	—	501	72	-3	182.80	-1
	1766	131,502	—		73		177.18	
	1767	109,799	—		77		178.96	
	1768	87,348	—		74		179.87	
	1769	82,858	—		77		172.47	
1770	81,591	501	77	165.90				
Pennsylvania	1750	84,500	707	+277	113.0	+17	170.60	-6
	1751	84,000	—		112.8		169.86	
	1752	83,500	—		111.9		166.85	
	1753	82,500	—		109.9		167.49	
	1754	81,500	—		109.1		168.35	
	1755	96,000	702	2,646.7	107.3	-3	168.79	-3
	1756	147,510	—		109.6		172.57	
	1757	262,466	—		107.1		166.07	
	1758	329,774	—		109.6		159.00	
	1759	433,562	—		125.0		153.52	
	1760	486,199	2,646.7	-68	125.7	-3	158.61	-3
	1761	438,104	—		121.2		172.71	
	1762	349,053	—		133.4		176.26	
	1763	286,312	—		136.4		173.00	
	1764	328,058	—		119.4		172.86	
1765	302,400	—	851.7	118.4	-3	169.90	-3	
1766	278,736	—		124.7		162.96		
1767	263,860	—		123.7		166.02		
1768	234,450	—		119.7		166.62		
1769	230,496	—		115.9		157.56		
1770	204,468	851.7	121.6	153.92				

\*For New York, 1910-14 = 100; for Pennsylvania, the monthly average of 1741-45 = 100.

Sources: Notes: Brock 1975, Tables XVI (NY) and XIX (PA, 1756-70); Lester 1938, p. 353 (PA, 1750-55)  
 Population: U.S. Bureau of the Census 1975, series Z1-19 (NY; PA, 1760-70); Weiss 1970, p. 779 (PA, 1750-55)  
 Prices: Warren, Pearson, and Stoker 1932, pp. 215-16 (NY); Bezanson, Gray, and Hussey 1935, p. 433 (PA)  
 Exchange Rates: McCusker 1978, pp. 164-65 (NY), pp. 185-86 (PA)