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This paper contains preliminary findings from research work still in progress and should not be quoted without prior approval of the author.

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Abstract

Recent developments in monetary economics stress the nature of monetary injections, emphasizing that these have implications for the relationship between money and prices. In constrast, traditional approaches posit stable money demand functions that are independent of how money is injected. The former approach implies that certain proportionality relations between money and prices need not obtain. This permits the two approaches to be empirically distinguished, but only if an appropriate "experiment" is conducted. The colonial period is one such experiment. Colonial evidence suggests that the nature of injections is crucial to the effect on prices of changes in the money supply.

One of the most profound recent developments in monetary theory has been a rethinking of how the value of money is determined. In particular, Sargent (1981) and Wallace (1981) have stressed the importance of how money is introduced in determining its value. This contrasts strongly with the view that the value of money is determined by its quantity (or time path) in conjunction with a demand function for money that is quite stable over time, and reasonably invariant with respect to the nature of monetary injections (contractions). The Sargent-Wallace view suggests that one can expect to find in history large monetary expansions (contractions) that were not accompanied by eroding (increasing) currency values if these expansions were produced in an appropriate way. Thus, one expects to find historical instances which permit the quantity theory of money to be contrasted with that of Sargent and Wallace.

In fact, several such instances have been examined which provide indirect support for the Sargent-Wallace approach. Sargent (1981) discusses how four hyperinflations were ended by changing the nature of backing for currency despite continued high rates of growth in the money supply. McCusker and Riley (1983) document sustained per capita growth in the money supply of France (1650-1788), while price levels fell. Also, Smith (1983) presents evidence from some of the British colonies in North America (1720-1770) that both very rapid growth and contraction of money stocks occurred without resulting in price level changes or exchange rate movements. This is attributed to the nature of backing for money, and cross-sectional evidence from several of the colonies is produced to show that (a) better backing of currencies resulted in more stable currency values, and (b) that when backing was relatively amply provided, relative rates of growth in the money stock across

colonies were not strongly related to relative rates of inflation or currency depreciation.

This paper is an attempt both to expand the body of evidence against the quantity theory, and for the first time to present some direct evidence on the Sargent-Wallace approach. In particular, Smith (1983) examined primarily Massachusetts, Rhode Island, New York, Pennsylvania, New Jersey, and Virginia. This paper examines price levels and exchange rates in the Carolinas, and shows that these are poorly accounted for by changes in the money supplies of those colonies. It then turns to an examination of the monetary system of Maryland, which is particularly well suited to provide direct evidence for or against the Sargent-Wallace approach to determining the value of money. The experience of the colony turns out to be generally supportive of the Sargent-Wallace view.

The reason for focusing on Maryland derives from the nearly unique method adopted by that colony for backing its currency. Each of the colonies (at least ostensibly) backed its currency in some manner. Typically currencies were backed either with future tax receipts, or with mortgages (usually on land or metal plate). A time path for the value of this backing is generally impossible to obtain from existing data. However, Maryland backed the largest component of its note issues with the proceeds of a sinking fund invested in Bank of England stock. At preannounced dates (which were met in practice) some portion of the outstanding stock of these notes was to be converted into sterling (or more precisely, sterling bills of exchange, described below) at a specified rate. Thus a large component of Maryland paper money was a claim to future delivery of sterling. As the Sargent-Wallace view suggests that the value of money can be determined in essentially the same way

as the value of privately issued claims, as Maryland notes were a claim against the sinking fund, and as there is fairly complete data on the market value of this sinking fund, this provides a particularly appropriate setting in which to gather some empirical evidence on the Sargent-Wallace view.

The results of the paper are as follows. The quantity of money in circulation does not well account for the time path of prices or exchange rates. In South Carolina, for instance, the per capita stock of paper money more than tripled from 1755 to 1760. The price level increased 7% over this same period, while exchange rates between South Carolina currency and sterling held constant. From 1760 to 1770, on the other hand, the per capita paper money stock declined by 63%. The price level rose 1%, and exchange rates depreciated 2%. Similarly, from 1760 to 1768, the per capita stock of paper money in North Carolina was halved, while the exchange rate between North Carolina currency and sterling appreciated only 5%. (There are no existing price indices for North Carolina at this time.) It will be argued that these facts are irreconcilable with the quantity theory.

With regard to the evidence provided on the Sargent-Wallace approach, this finds much more support in the data. Regression results indicate that the quantity of money in circulation in Maryland had no effect on exchange rates. However, both the value of the sinking fund and variables relating to Maryland's track record for redeeming notes on schedule affect the exchange rate strongly, and with signs corroborating the Sargent-Wallace viewpoint. Thus the overall picture arising from the evidence presented here is that the value of money in the colonial period appears to have been determined in much the same way as is the value of privately issued liabilities.

The format of the paper is as follows. Section I provides a brief description of the important features of colonial monetary arrangements. Sections II and III discuss the alternate theories of money which are under consideration here. Section IV discusses the experiences of the Carolinas with regard to currency values, and shows that these are inconsistent with the quantity theory. Section V examines the relation between currency values and the value of backing for currency in Maryland. Section VI concludes.

I. Colonial Monetary Arrangements

The term money applied to the colonies has been used in different ways by different authors. At its broadest the term money includes specie, various kinds of paper money, monetized commodities (i.e., commodities which were legal tender as well as circulating warehouse receipts for commodities), bills of exchange (circulating, privately issued liabilities), and book credit extended by merchants. Of these, contemporary usage included in the term money only specie, paper money, and commodity monies. In this section we provide an overview of these various assets as a prelude to examining how the two theories discussed above fit the data.

Local units of account in each colony[1/] were £ colonial currency. There were flexible exchange rates between the currency of each colony and sterling. Colonial currency itself took two forms. One was specie. The specie circulating in North America at this time was primarily coined in Spanish and Portuguese colonies, and was denominated in the units of account of those colonies. The amount in circulation was outside of colonial control, being determined by trade flows and the specie holdings of immigrants.

The currency denominated in the local unit of account was paper currency, which was issued in amounts determined by the legislature of each

colony (subject to approval of colonial governors, proprietors, and the crown). This paper took two forms, bills of credit issued by colonial institutions known as loan offices or land banks, and bills of credit issued directly by colonial treasuries. Notes issued by treasuries were used to cover shortfalls of tax receipts, and these notes were introduced into the economy by direct payment for goods or services provided to the government. There is one exception to this statement, which is that Maryland injected some notes via lump-sum transfers.

Notes issued by loan offices were introduced in a more complex way. In the colonies and period under consideration there were no private banks. Rather, most colonies operated land banks, which issued notes that were lent to private individuals and secured by mortgages on land or on plate. The interest rates charged on these loans appear generally to have been below market rates. In addition, a number of rules governed operation of these loan offices which were meant to provide secure backing for the notes. These included provisions that the amount lent by the loan office was not to exceed half the value of the property mortgaged.[2/]

The notes issued in these two ways were (as has been pointed out) the only types of currency actually denominated in the local unit of account. For much of the period under consideration they were legal tender. In addition, colonial governments were obligated to accept these notes at face value in payment of taxes and in repayment of loans issued by colonial land banks. In addition, in the colonies at hand they were issued specifically to provide a medium of exchange in light of the shortcomings of commodity monies, and the problems attendant on the use of specie as a medium of exchange.[3/]

It should also be noted that despite the fact that many authors refer to these notes as fiat money, all colonial note issues were (at least ostensibly) backed in some manner. In the case of notes issued by loan offices, as the principal of a loan was repaid provisions were made for its retirement at specified dates. In the event of default, mortgaged property was to be seized and auctioned off, with the proceeds used to retire notes. In the case of notes issued by colonial treasuries, these notes were backed by future tax receipts. In particular, at the time such a note issue was authorized, future taxes were earmarked to be used to retire the notes. This system was meant to mitigate against the accumulation of any long-term government debt, although as we will see, different governments backed their notes with greater or lesser degrees of scrupulousness.

In addition to specie and paper currency, each of the colonies examined in this paper had a commodity money system. In Maryland tobacco was a legal tender. Until 1747, people trading in tobacco used the actual commodity in transactions. After 1747 Maryland introduced a system of colonial warehouses and the use of tobacco notes, which were simply negotiable warehouse receipts for tobacco stored. In North Carolina several commodities were legal tender, and the government of the colony established rates at which each was to be accepted in payments due the government. Unlike most other colonies, which discontinued their commodity money systems when sufficient paper money had been issued, this arrangement persisted in North Carolina throughout much of the period in question.

In addition to these types of money, some historians include book credit and bills of exchange as part of the colonial "medium of transactions." Book credit was simply credit extended by merchants to customers, and

bills of exchange were circulating, privately issued liabilities. In this sense they may appear similar to modern bank liabilities. However this similarity does not extend very far. Bills of exchange were not convertible into currency on demand, but rather carried a maturity date. Moreover, there were often many copies of a single bill in existence. If the holder of one of these copies presented it for (illegitimate) repayment, the legitimate holder of the bill would need to, and often did have to[4/] contest payment in court. Finally, bills of exchange appear to have been used only in relatively large denominations. Hence these appear to have been much more like privately issued assets for which secondary markets exist than like bank deposits.

Given this overview of colonial monetary arrangements, we may now turn to a description of the two alternate theories of money which will be used to try to explain colonial experience.

II. A Version of the Quantity Theory

According to Lucas (1980, p. 1005), one of the "two central implications of the quantity theory" is "that a given change in the rate of change in the quantity of money induces an equal change in the rate of price inflation. . . ." According to Schwartz (1973, p. 264), at least since Alexander the Great, "long-run price changes consistently parallel . . . monetary changes, . . ." which is argued to be a verification of quantity theoretic views.

How are we to check, then, whether these views are consistent with colonial monetary arrangements, in which each colony had its own paper currency exchanging at market determined rates with sterling? The approach adopted here is one applied to Latin America by Vogel (1974), which is to match price level movements (or in some cases here exchange rate movements)

with changes in the quantity of money issued by each of the colonies, i.e., with changes in the stock of paper money outstanding in each colony. In fact, because data on specie, quantities of commodity monies, circulating bills of exchange, etc. are not available, there is really no choice other than to attempt to do this. Moreover, this approach coincides quite well with quantity theoretic implications when applied to New England before 1750 (Smith (1983)). However, because matching paper currency movements with price level (or exchange rate) movements omits many things which a quantity theorist might in principle wish to consider, we argue below that our approach does no great violence to the quantity theory.

What is omitted by focusing on movements in the stock of paper currency? First, as indicated in the previous section, liabilities of private agents such as book credit or bills of exchange are not considered. However, as argued above, bills of exchange appear to have had many of the attributes of modern privately issued liabilities for which secondary markets exist. Such liabilities are not included in modern money supply measures. Similarly, book credit was simply credit extended by merchants to customers. Such credit extensions are also not included in modern attempts to empirically implement the quantity theory. Hence omission of these items would not appear to do any violence to the quantity theory.

With respect to commodity monies, two facts should be noted. One is that in the Carolinas, and in Maryland before 1747, commodity notes were not in use. Thus exchanges using commodity monies were simply trades of commodities. The government of North Carolina, for instance, fixed legal rates at which selected commodities would be accepted in lieu of specie. Since the legal rates established on commodities cannot generally have corresponded to

market clearing prices, it seems unlikely that such rates obtained in private transactions. More probably they obtained only in transactions with the government when it was advantageous to make payments with certain commodities. Thus it seems an open question as to whether these are to be regarded as monetary transactions.

Second, even once the system of commodity notes was introduced,[5] commodity monies did not enjoy the same general acceptability nor circulate so widely as paper currency. According to McCusker (1976, p. 97), "the major characteristic distinguishing colonial bills of credit from commodity notes was their widespread acceptability." In fact, it appears that in Virginia (which has been more extensively studied than the other colonies), tobacco notes virtually did not circulate at all, except to transfer title to tobacco. These statements apply even more strongly to commodity money systems without commodity notes. Hence omission of commodity monies does not seem a particularly important problem. Finally, McCusker (1976, p. 95) likens commodity notes to "modern warehouse certificates [which] have a negotiable character." These are not included in modern attempts to implement the quantity theory. Hence their omission does not seem out of line with standard practice.

Lastly, the approach taken here omits the quantity of specie in circulation from the measured money supply. While it is unfortunate to be forced to omit this, we will still argue that its omission does not bias our results in any important way. First, as has been noted previously, specie circulating in the colonies was primarily of Spanish and Portuguese origin, and was not denominated in the unit of account of any colony. Second, money issued by foreign governments circulating within the borders of another coun-

try is not included in modern attempts to implement the quantity theory. Hence this omission is not out of line with standard practice.

Third, in the regions under consideration here, specie omission is not particularly detrimental. In North Carolina "it appears certain that there was never any substantial amount of coin in the colony throughout the period."[6] In Maryland, specie circulated at a market determined exchange rate with notes within the colony. Hence it would be inappropriate to look at a sum of notes and specie. And finally, even in South Carolina,

> . . . 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. Not only did a gold or silver coin bear no indication of its value in colonial currency, but its value depended on its weight and condition, factors not easily measured by individual colonists.[7]

Thus, even in South Carolina, it is not unreasonable to proceed as if there were flexible exchange rates between specie and paper currency.

Lest one be unpersuaded by these arguments, however, we should note the following. In asking whether the quantity theory can confront colonial monetary phenomena, our approach will be to match paper currency movements with movements in prices and exchange rates. It will be seen that for these colonies, as for most of the colonies examined in Smith (1983), these movements match very poorly (even over long periods). It might be suspected that this is due to either one of two factors: (1) paper currency was not a large

component of the "money supply" (appropriately defined), or (2) changes in the stock of paper currency were offset by specie flows.

In fact, neither of these views is tenable. With regard to the first point, conservative contemporary estimates placed the components of the money supply (which according to contemporary usage meant specie and paper currency) late in the colonial period at about 1/4 specie and 3/4 paper currency.[8/] As we have seen, this seems conservative for at least some of the colonies at hand. Thus paper currency circulation was not so small that even large increases (or reductions) in it did not have significant impacts on the money supply.

With regard to the second point, this view also does not bear close examination. First, there is no evidence in favor of it. Second, during much of the period at hand, there are reasons to think either that the reverse happened, or at least that specie flows large enough to offset paper currency movements could not have occurred. In North Carolina, for instance, it has been noted that there was never any significant amount of specie in the colony. In Maryland this view is also not tenable. During the period we examine there were two instances of large increases in the quantity of paper currency; one as this currency was injected into the economy over a period of years, and one during the French and Indian War. With respect to the first period, Gould (1915) asserts (without apparent contradiction elsewhere in the literature) that specie stocks rose along with the stock of paper currency. Hence it would appear that movements in the stock of paper currency do not give an overly inaccurate picture of movements in the overall stock of money. With respect to the French and Indian War period (this is true in all of the colonies considered), there is also every reason to think that movements in the

stock of specie and of paper currency were generally positively rather than negatively correlated. The reason for this is as follows. During the war, each of these colonies made large military expenditures. These were generally financed by printing money. Hence note issues rose dramatically (as will be seen) during this period. At the same time British expenditures in the colonies were large, and in addition, the British government provided sterling grants to each of the colonies. Both of these must have had the effect of increasing specie stocks. Thus paper currency and specie stocks both grew during the war.

After the war paper currency stocks contracted very rapidly. The reason for this is that notes were backed by future tax receipts. At the time of note issue, future taxes were levied. As notes came in in receipt of these taxes they were destroyed. The resultant contraction in paper currency stocks was most likely accompanied by a contraction in specie circulation. The reason is that, as is well known, at the end of the war there was strong sentiment in England that the colonies should help pay for the war. The taxes that were imposed almost certainly led to drains of specie at the same time as paper currency was being retired. Hence in this instance as well it is probable that movements in the stock of paper money were paralled by similar specie movements. Thus again our approach should provide a reasonably accurate picture of movements in the overall stock of money.[9/]

III. The Sargent-Wallace View

In contrast to the quantity theory, the Sargent-Wallace approach is to attempt to determine the goods value of money (inverse price level) in much the same way that the value of privately issued liabilities is determined. In particular, just as the value of privately issued liabilities depends on the

issuer's balance sheet, the same is true for government liabilities. Thus issues of money which are accompanied by increases in the (expected) discounted present value of the government's revenues need not be inflationary.

As this approach likens money to privately issued liabilities, it seems appropriate to first attempt to apply it to monetary systems which are not fiat in nature, i.e., in which money is backed. However if paper money is convertible on demand into commodities, then one is perhaps not surprised that its value is not directly linked to its quantity. Thus it seems that the colonial monetary arrangements under consideration, where money was (supposed to be) backed by future income streams, but where money was not convertible on demand into any commodity, are particularly appropriate for study of this view.

What should we expect to observe in the colonial period under this alternate theory, then? We should expect to observe that when money is carefully backed, its value (price levels, exchange rates) should not depend strongly on its quantity. When money is not carefully backed, it should depreciate in value. In fact, when incremental note issues which are essentially unbacked occur, the quantity theory becomes a special case of the Sargent-Wallace approach.

In order to see this, it is useful to consider an analogy. Suppose that a firm doubles the number of its shares outstanding. What happens to its price per share? The answer is that more information is required. In a stock split we expect a halving in the price of the stock. This is analogous to the quantity theory, and corresponds to the case where a firm increases its liabilities without a corresponding increase in its future (expected) stream of net revenues. On the other hand, if the quantity of a firm's shares out-

standing increases, and there is a corresponding increase in its income stream, the change in stock price depends on the relative magnitudes of these increases. Thus whether or not quantity theoretic propositions apply depends on the nature of backing for government liabilities. If these are poorly backed or unbacked, we expect these propositions to hold. If issues of money are carefully backed by increases in government assets or claims to future income streams, we expect these propositions to fail.

Our approach, then, is to apply Sargent's claim (1981, p. 5) that governments were "like a firm whose prospective receipts were its future tax collections. The value of the government's debt was, to a first approximation, equal to the present value of current and future government surpluses." There are two methods by which this claim will be applied to the data. These are as follows. First we will examine the monetary experiences of North and South Carolina. Both of these colonies had periods in which they issued (nearly) unbacked notes. In these periods the quantity theory applies fairly well to the data. Each colony also had a "currency reform" in which paper currency became much more carefully backed. These reforms served to end currency depreciation. Moreover, inflation and currency depreciation after these reforms were not rekindled by extremely rapid rates of monetary growth. In fact, in these "post-reform" periods, large increases and reductions in the money supplies of both colonies occurred. These had virtually no impact on currency values.

There are two conclusions to be drawn from this evidence. One is that the quantity theory does not hold generally. The second is that these episodes provide evidence that the nature of backing is a determinant of currency values.

This evidence on the Sargent-Wallace hypothesis is of an indirect nature, however. In particular, it shows only that the way in which money is backed affects the response of currency values to other economic variables. Therefore, some time is spent examining exchange rate determination in Maryland. As indicated previously, Maryland backed a large component of its note circulation with investments in Bank of England stock. At specified dates (1748 and 1764), notes were to be redeemed with this sinking fund. Thus, unlike the notes of other colonies, Maryland notes were backed by a fund whose market value can be followed over time. This presents an opportunity to see how the value of backing for notes affected their purchasing power. As will be seen, the value of backing for notes (and the government's track record on meeting scheduled redemptions) had large and significant effects on Maryland currency values. The quantity of notes circulating did not. Thus the Maryland experience provides direct evidence in favor of the Sargent-Wallace view.

IV. The Evidence: North and South Carolina

A. South Carolina

South Carolina was one of the earliest colonies to experiment with paper money, and the first to create a loan office. It was also the first colony (along with North Carolina) to experience large depreciations of its paper currency, and finally, it was the first colony to solve this problem. Initially, South Carolina had issued (in 1703) £4,000 of notes to finance expenditures. Following the general paradigm laid out in section I, at the same time these notes were issued future tax levies were introduced to retire the notes. The same is true for subsequent note issues (which can be followed in Table 1). However, in fact these tax proceeds were generally diverted to other uses, so that very little retirement of notes was actually affected.

In 1712 South Carolina created a loan office, with a resultant large increase in circulating notes. Thus by 1712 South Carolina had created a system of monetary arrangements which were to persist until 1731. Very early on the note issues of the colony were made a legal tender, and they were always acceptable in payment of taxes. For a brief period the colony experimented with notes that were redeemable on demand for rice, but this arrangement was short-lived. For our purposes, however, there is only one important feature of South Carolina's note issues; before 1731 these were poorly backed in the sense that as they were issued, the government did not succeed in (significantly) raising its flow of future net tax receipts.[10/]

Unfortunately, a general price index is not available for South Carolina before 1732. However, Table 1 reproduces the sterling exchange rate series reported by McCusker (1978). As can be seen, during the first 20 years of experience with paper currency, depreciation was the rule. By the late 1720s, the quantity of sterling purchasable with one pound of South Carolina currency was barely more than one-fifth of its 1710 level. Moreover, quantity theoretic kinds of predictions perform reasonably well. For instance, as indicated in Table 1, from 1710 until 1720, the per capita quantity of paper currency in circulation increased by a factor of slightly more than 4.5. By 1723, the rate of exchange against sterling had increased by a factor of exactly 4.5. In general, in fact, for the first 25 years of this period, increases in the stock of paper money tend to precede currency depreciations. Thus the quantity theory appears to apply fairly well to this period in which paper currency issues were backed only in the most nominal fashion.

After 1727, South Carolina reversed its trend of currency depreciation, maintaining exchange rates at or below their 1727 level until 1736. In

fact, during the entire colonial period South Carolina's exchange rate against sterling was never more than 13% above its 1727 level. Moreover, South Carolina succeeded in this despite continued growth in its currency stock. For instance, in 1731 the outstanding note issue of the colony nearly doubled. Nevertheless, the exchange rate merely returned to its 1727 level, where it remained for five years following this increase. Thus currency depreciation was halted and not rekindled by large changes in the money stock.

The note issue of 1731, and all successive note issues in the colony, were not of a legal tender nature. The British government took a hand and refused to approve any further legal tender note issues in the colony. To compensate the colony resorted to the use of paper instruments known as public orders and tax certificates. While not a legal tender in private transactions, these notes were accepted for taxes, and according to Brock (1975, p. 124), "custom nevertheless caused them to circulate much as the legal tender bills did." As there appears to have been no important difference in practice between public orders and tax certificates, we treat them homogeneously in what follows.

We have already noted that in 1731 outstanding note issue doubled with no apparent effects on the exchange rate. It will now be noted (with reference to Table 1) that after 1731, movements in the outstanding stock of notes generally fail to account for price level or exchange rate movements. For instance, from 1730 until 1749 there is a secular decline in the per capita quantity of notes outstanding (a decline of 40%). Nevertheless, this reduction in the money supply did not have a salutary effect on exchange rates, and similarly, it appears that the price level rose rather than declined.

Similarly, after 1749 we see a marked increase in the per capita quantity of notes. From 1749 until 1755, per capita note issue increased 31%, and from 1755 until 1760, per capita note issue more than tripled. However, the price level in 1755 was 10% lower than that in 1749, and the price level in 1760 was only 7% higher than in 1755. Thus this extremely large increase in per capita note issue (a factor of 4.3 in 11 years) was not reflected in prices (which fell from 1749 to 1760) or exchange rates (which also appreciated).

After 1760 there was a reduction in the note circulation of South Carolina nearly as dramatic as the increase just considered. From 1760 until 1770, the per capita stock of paper currency was reduced by 63%. Despite this large reduction, the price level rose slightly, and exchange rates depreciated. Thus after 1731, quantity theoretic predictions appear to do quite poorly.

Can this poor performance be accounted for in the context of standard theories of money? The answer would appear to be no, for the following reasons. The first way that one might attempt to explain the above results in the context of the quantity theory is to argue that specie flows (or changes in the quantity of some other asset) may have "offset" the above noted changes in the stock of paper money. This appears untenable, however, in that it requires implausibly large changes at certain points in time. In particular, the major injections and withdrawals of money after 1750 were associated (a) with French and Indian War deficit finance, and (b) with taxes levied for the retirement of these note issues. As noted earlier, movements in the stock of colonial specie almost certainly paralleled these movements as (a) Britian sent substantial amounts of specie to the colonies during the war, and (b)

levied substantial taxes on the colonies afterward. In light of this, the possibility of "offsetting" changes in other components in the money supply seems small.

A second way in which one might attempt to salvage the quantity theory is as follows. It might be supposed that colonial money demand could be characterized, say, by a Cagan money demand function. It might also be noted that (as will be discussed below), after 1731 monetary injections were always followed by promised future monetary contractions.. As Sargent and Wallace (1981) have shown, it is possible for the effects of anticipated future monetary changes to dominate current movements in the money supply. Could this account for the observations noted above?

The answer is no. First, the Sargent-Wallace mechanism requires that anticipated future monetary changes exceed current ones in magnitude. As can be seen from Table 1, this is not the case for the post-1750 period. Also, the Sargent-Wallace mechanism operates because the anticipated future deflation supposedly associated with future monetary contractions increases money demand sufficiently to offset the effects of current increases in the money supply. However, as Table 1 indicates, if colonials expected future deflation as a result of the monetary reductions of the 1760s, they were sorely disappointed. Hence this is not a tenable explanation of our observations.

Lastly, we might ask whether the observations above can be explained within the framework of conventional money demand functions (or more broadly, conventional macro models). Some data that one might desire for this purpose are not available, in particular, data on interest rates. However, the period of substantial increase in the money supply is a period of high wartime demand

for goods and services, and the period of monetary contraction appears by most accounts[11] to have contained a fairly standard post-war recession. In light of these facts, the nearly insignificant inflation of 1755-60, and the (also nearly insignificant) inflation of 1760-70 seem difficult to explain absent convenient shifts in money demand functions. In fact, this seems generally true of the post-1731 period. However, this explanation is not consistent with standard presentations of the quantity theory. For instance, Friedman and Schwartz (1963)[12] associate the quantity theory with the existence of highly stable money demand functions. Thus this explanation will not salvage the quantity theory.

In light, then, of the apparent failure of the quantity theory, can the Sargent-Wallace view account for the observations at hand? The answer is yes. As we have seen, when note issues are poorly backed the quantity theory becomes a special case of this view. Thus it is consistent with our pre-1731 observations. After 1731 we observe major fluctuations in the quantity of money. For instance, we have seen that in 1731 the money stock doubled, yet this had no effect on exchange rates. Later monetary changes also had minimal effects on both prices and exchange rates. We will now argue that this is because note issues after 1731 were carefully backed by future tax receipts. Thus the Sargent-Wallace view accounts for the absence of effects on currency values.

With respect to the post-1750 issues, it is clear that these were carefully backed as it was the future tax levies that permitted the post-1760 withdrawal of notes. Note issues between 1731 and 1750 were also carefully backed. Between 1731 and 1745, £259,282 of new issues had occurred. By 1749, only £26,545 of these notes were still in circulation. This indicates that

note issues were well-backed by future tax levies. Thus the statement of Brock (1975, p. 126) regarding this period appears justified; "the orders of the various issues were all with reasonable promptness drawn in by taxes. . . ."

It would seem, then, that the Sargent-Wallace view that the quantity of currency can fluctuate widely without affecting its value (if currency is carefully backed) is borne out by the experience of South Carolina. It will also be noted that its experience is similar to that of the four hyperinflation countries examined by Sargent (1981). Specifically, South Carolina (as did Sargent's four countries) ended a decline in the value of its (poorly backed) currency by replacing it with a currency which was carefully backed.

Finally, this experience is suggestive of the thought experiment conducted by Barro (1974). Specifically, colonial finance has the feature that current expenditures were financed by government issue of liabilities, accompanied by future tax levies. This is the finance scheme contrasted by Barro with current tax financing of expenditures. The minimal price level impact of money issues seems to bear out Barro's analysis in the sense that it indicates that the timing of tax levies had no significant effect even on price level movements.

B. North Carolina

In most respects, the monetary history of North Carolina parallels that of South Carolina. In 1712, when the Carolinas split, North Carolina had £4,000 of its currency in circulation. As can be seen in Table 2, this quantity tripled the next year, and then the stock of paper currency doubled again by 1715. Thus, as was the case in South Carolina, North Carolina's history was one of rapid early expansion of its money stock.

In addition to this paper currency, North Carolina had a number of rated commodities of a legal tender nature (with a legally fixed exchange rate into currency, which could differ from the market price of the commodity). We have already commented above on the general acceptability of this currency. Finally, as we have noted previously, "it appears certain that there was never any substantial amount of coin in the colony throughout the period."[13/]

As can be seen from Table 2, there is no evidence in favor of the quantity theory arising from North Carolina's experience. From 1715 until 1722 (from which point the money stock was held constant until 1729), the money supply of the colony was cut in half. Nevertheless, exchange rates depreciated dramatically. Then in 1729, when North Carolina first instituted its loan office, the money supply of the colony more than quadrupled. While a large depreciation did occur, the exchange rate never (much) exceeded twice its 1729 level. Moreover, it took ten years for this doubling to occur. Thus both directions of change before 1748 (we refer here to the 1715-29 period), and relative magnitudes of changes are not supportive of quantity theoretic predictions for the period.

Before 1748, it is clear from Table 2 that currency values declined markedly in North Carolina. In 1748 a currency reform was implemented. A new set of notes was issued to replace those in circulation, with one new note to replace seven and a half old ones. According to Brock (1975), this tripled the effective money supply of the colony. Then after 1748, while exchange rates were hardly stable, they never exceeded their 1748 level by more than 50%. This constitutes a major success when compared with the nearly 600% depreciation of 1715-48. How did North Carolina succeed, then, in slowing so dramatically its rate of currency depreciation? Further examination of Table

2 indicates that this was not achieved by reducing rates of money growth. In fact, from 1750 to 1755, the per capita money stock in North Carolina more than doubled. The exchange rate depreciated only 20%. From 1750 to 1760, the money stock grew by 142% in per capita terms. This occasioned only a 43% depreciation in the exchange rate. Hence for the first dozen or so years after the currency reform, money growth far outstripped currency depreciation.

After 1761, the money supply declined, as it did in all colonies, due to the retirement of notes provided for in their emission. By 1768, the per capita money stock was only half of what it had been in 1760. Nevertheless, North Carolina's exchange rate appreciated only 5%.

Clearly, then, the quantity theory cannot account for any of the North Carolina experience. How do we account for it based on the Sargent-Wallace approach? First, we should note that prior to 1748 there was no meaningful sense in which North Carolina backed its notes. The reduction in the money supply between 1715 and 1722 represents the only time prior to 1748 during which any notes were retired through taxation. Hence monetary expansions were not accompanied by increased future government revenue streams, and we should not be surprised by currency depreciation. Of course since the quantity theory becomes a special case of the Sargent-Wallace view when money is unbacked, the failure of the quantity theory is also a failure of this viewpoint. Naturally, though, the Sargent-Wallace approach does no worse for this period than the quantity theory.

The Sargent-Wallace approach does permit an explanation for the relative success of the 1748 currency reform, however. We have already noted that, prior to 1748, paper money was essentially unbacked. In fact, the fiscal situation in the colony was generally poor. According to Brock (1975, p. 112-3),

> With the exception of the years 1715 to 1722, no bills seem ever to have been retired by taxation. The loan office was badly managed. To make matters worse, North Carolina remained a barter colony. Until the law of 1748 provided for payment of taxes in gold, silver, or bills of credit, they had been payable in the rated commodities. The result was, as successive governors complained, that the taxes were paid in the commodity rated highest in proportion to its actual value, and of that commodity each person tendered his most inferior stock. It is small wonder, then, that the sums raised in taxes for the retirement of the outstanding bills were so frequently negligible. But the evil did not stop here. Taxes levied to meet the annual cost of government proved similarly unproductive. The colony fell into debt; and in order to pay the debt, a new issue of bills was emitted.

Thus, it is not surprising that with poor revenue prospects on the part of the government, its liabilities were little valued.

After 1748, as pointed out by Brock, taxes were no longer payable in commodities. Moreover, retirement of notes through the provision of taxes for this purpose was much more of a factor. Table 3 reports the cancellation of notes by this method after 1748. As can be seen, this retirement of notes occurred on a regular basis, and constituted a generally significant fraction of total notes in circulation. Hence we can, at least partially, account for the success of the currency reform by the superior nature of the backing provided for notes after this date.

Again, one might wonder whether our analysis has failed to pick up important changes in other components of the money supply which account for the poor showing of the quantity theory above. Again, the answer would appear to be no. Some of the reasons for this have been previously elaborated, so we restrict ourselves to two points here. Consider the period of post-currency reform. This period is divided roughly in half in Table 2; an initial period of large increase in note circulation, followed by a period of large reduction. Could these movements in the stock of paper currency have been offset by changes in other components of the money supply?

It would appear that they could not have been offset to any signficant degree by specie movements. In particular, our earlier comment about the scarcity of specie in North Carolina appears to hold for this later period as well.[14/] In addition, changes in the nature of the commodity money system would lead one to believe that the monetary growth of the first half of this period is under rather than overstated. In particular, in 1754 North Carolina established a system of state warehouses and legal tender commodity notes. This must certainly be viewed as having the effect of a monetary expansion. (Although probably not to any great extent.) In short, then, there is no reason to think that our focus on paper currency alone does any substantial injustice to the quantity theory.

Remarks

At this point a few remarks are probably in order. First, when secular movements in the price level fail to mirror secular movements in the money supply, it is typical in studies of this type (see, for instance, Friedman and Schwartz (1963) and their discussion of the greenback period) to explicitly examine movements in real output and velocity. This is not pos-

sible for the colonial period, as there is insufficient knowledge of the behavior of real output. However, given the magnitudes of observed variations in real balances, it is clear that these variations cannot be accounted for by changes in the level of real activity. Hence velocity must have varied substantially during the colonial period. And, of course, such variation in velocity is inconsistent with many presentations of the quantity theory.[15/]

However, some presentations of the quantity theory[16/] make velocity a stable function of some limited set of arguments. Most commonly these would involve a measure of the opportunity cost to holding money, such as a nominal interest rate. Then one might argue that, if the opportunity cost to holding money moved appropriately over time, the variability of velocity would be consistent with the quantity theory. Unfortunately, there are no systematic observations on the behavior of interest rates during the colonial period that would allow this argument to be examined explicitly. However, one observation suggests that the opportunity cost of holding money cannot have varied too substantially during periods of relative exchange rate stability (such as we observe in South Carolina after 1727). In particular, it is known that sterling bills of exchange (discussed above) did not circulate at a discount when they were of sufficiently short maturity. Hence, these assets, which were sterling denominated, did not bear interest. Moreover, if exchange rates were extremely stable, then the implied nominal return on these assets cannot have varied too greatly over the period of interest. To the extent that bills of exchange might be viewed as substitutes for money, then, this argument suggests that variations in velocity in the colonial period cannot be explained by major variations in the opportunity cost of holding money. Hence simple changes in the specification of the behavior of velocity appear as if they will not salvage the quantity theory.

V. The Evidence: Maryland

We have seen that the Carolinas provide a wealth of evidence against the quantity theory. In addition, experience there suggests that the nature of backing for notes was crucial in determination of their value, as in both Carolinas currency depreciation was halted by the expedient of carefully backing notes. In this section we wish to delve more deeply into the question of how well the backing of a note issue accounts for its value.

As we have argued above, Maryland provides a particularly appropriate setting in which to do this. Maryland existed with a monetary system based entirely on specie and a commodity money (tobacco) until 1733. In that year, a paper currency was introduced explicitly to provide a medium of transaction for the (by now significant) part of the colony which did not grow tobacco. Most of this currency was injected into the economy via classic lump-sum transfers, and was backed in a way unique in colonial experience. The proceeds of designated taxes were to be invested by agents of the colony in Bank of England stock. This investment was to constitute a sinking fund for the notes. Of the £90,000 issued at this time,[17] on the order of £60,000 was backed by this sinking fund. The remainder was issued through land banks. In addition, during the French and Indian War there were additional note issues to finance government deficits. These were not claims against the sinking fund, but rather were backed in conventional (colonial) fashion by future tax receipts.

At specified dates, in 1748 and 1764, notes were to be redeemed for sterling (or more precisely, sterling bills of exchange). One third of the outstanding notes were to be redeemed in 1748, and the remaining two-thirds in 1764. These redemptions occurred as scheduled. For our purposes, however,

the unique feature of this system is that Maryland notes were backed by a fund whose (current) market value is easily ascertainable at any point in time. Thus we may investigate the extent to which changes in the market value of the sinking fund account for exchange rate fluctuations. This seems particularly appropriate, as in addition to serving as a medium of exchange, these notes were simply claims for future delivery of sterling. As the exchange rate is merely the rate at which sterling could be converted into paper currency, this is the sterling price of a future claim on sterling. We investigate how changes in the market value of this sinking fund affected the value of these claims.

The format of this section is as follows. In order to illustrate the kind of role which the market value of backing can play, a highly simplified model of how paper money might be priced as an asset is presented. Then some statistical evidence on the relative importance of the quantity of money, the market value of backing, and the colony's track record on honoring its commitments is presented. It will be seen that currency values in Maryland depended entirely on the latter two factors. The quantity of money is irrelevant in the determination of currency values.

A. An Illustrative Model

It will be recalled that, among their other functions, notes in Maryland were claims to future delivery of sterling (bills of exchange). In this section we attempt to see to what extent empirically an extremely simple asset pricing model can account for movements in Maryland currency values. The model presented is oversimplified, in fact, for brevity of presentation.

What, then, would be the primary factors in any model attempting to explain asset pricing? Obviously the most important factors would be the

kinds of promised future payoffs to which assets are a claim, and the probabilities of these promises being honored (or in a contingent claims setting, of the relevant states occurring). Thus it is necessary to discuss the kinds of promises made by Maryland, and how these promises were (in all likelihood) perceived by the residents of the colony.

The promise of Maryland to redeem a third of its notes for sterling in 1748, and the remaining two-thirds in 1764 (at the rate of 4 Maryland pounds for 3 pounds sterling) was (at least on its face) uncontingent. However, so were the promises of South Carolina to retire note issues via taxation before 1731. Before Maryland ever had resort to a paper currency, then, most of the colonies had established by long experience that these promised redemptions or retirements were, in fact, contingent. On what were they contingent, then? First, funds earmarked for retirement of notes were often appropriated in the face of government expenditure needs. The larger the market value of the sinking fund, then, the greater the ability of the government to redeem notes and meet its additional revenue needs (if any) from the proceeds of the sinking fund. Second, when funds provided for the retirement of notes proved insufficient, this retirement was typically postponed. Hence the larger the market value of the sinking fund, the smaller the probability that retirement would not occur as scheduled.

We now introduce some notation. Let MV_t denote the market value of the sinking fund at date t, and let T denote the announced redemption date.[18/] In light of our previous remarks, assume redemption will actually occur at T only if MV_T meets or exceeds some critical value, R. Let $F_T[x|MV_t, MV_{t-1},\ldots]$ be the conditional probability that $MV_T < x$ evaluated at t, where in principal there could be a number of variables upon which this probability

might depend. To simplify matters, we assume that the only relevant conditioning variables are the historical market values of the sinking fund. In addition, we make the plausible assumption that $F_T[x|y_t^*, y_{t-1}^*, \ldots] \leq F_T[x|y_t, y_{t-1}, \ldots]$ for all x and for any sequences $\{y_t\}$, $\{y_t^*\}$ such that $y_t^* \geq y_t$.

Finally, suppose $MV_T < R$. Then a simple assumption is that redemption will occur at the first date for which the value of the sinking fund is at least R. Let $F_{T+i}[x|MV_{T+i-1} < R, MV_{T+i-2} < R, \ldots, MV_t, MV_{t-1}, \ldots]$ be the conditional probability at t that $MV_{T+i} \leq x$, given that $MV_{T+i-s} < R$, $1 \leq s \leq i$, and given the realized sequence of market values.

Given these notational conventions, let us proceed with a simple model in which currency values are determined as if they were conventional asset prices. Let e_t denote the sterling value of a Maryland pound note. Let r be (an exogenously given) discount factor.[19/] Then an absence of (expected) arbitrage opportunities implies

$$(1) \qquad e_t = \frac{{}_te_{t+1}}{1+r}; \; t < T-1,$$

where ${}_te_{t+1}$ is the date t expected value of e_{t+1}. At date T - 1, redemption will occur next period if $MV_T \geq R$. Hence for $t \geq T-1$,

$$(2) \qquad e_t = \left(\frac{1}{1+r}\right)\{[1-F_T(t)](3/4)+F_T(t)\,{}_te_{t+1}\},$$

where $F_T(t) \equiv F_T(R|MV_t, MV_{t-1}, \ldots)$, e_{t+1} is the exchange rate at t + 1 if redemption has not yet occurred, and 3/4 is the promised rate at which Maryland pounds were to be converted into sterling.

Solving (1) and (2) forward, we obtain

$$(3) \qquad e_t = \left(\frac{1}{1+r}\right)^{T-1}{}_te_{T-1}$$

$$(4) \qquad {}_te_{T-1} = [1-F_T(t)]\left(\frac{.75}{1+r}\right) + F_T(t)[1-F_{T+1}(t)]\frac{(.75)}{(1+r)^2} + F_T(t)F_{T+1}(t)\frac{{}_te_{T+2}}{(1+r)^2},$$

with an obvious notation in (4). Applying repeated substitutions to (4), the latter term vanishes if, for instance, ${}_te_{T+k}$ is bounded $\forall$ k, and if r > 0. Then ${}_te_{t-1}$ will be, through the relevant conditional probability distributions, a function of the sequence $\{MV_{t-i}\}_{i=0}^{\infty}$. Let us denote this as ${}_te_{T-1} = \psi(MV_t, MV_{t-1},\ldots)$. Then (3) and (4) imply

$$(5) \qquad e_t = \left(\frac{1}{1+r}\right)^{T-1} \psi(MV_t, MV_{t-1},\ldots).$$

Moreover, it is apparent that $\psi(-)$ is monotone nondecreasing in MV_{t-i}; i > 0.

Our method of applying this model is as follows. From equations (3) and (4), our model predicts that the ratio of e_t to the redemption rate (3/4) is related positively to market values of the sinking fund. Therefore we estimate below the equation

$$(6) \qquad par_t = a_0 + a_1M_t + a_2MVI_t + a_3D_t + \varepsilon_t,$$

where $par_t \equiv .75e_t - 1$, M_t is the quantity of notes in circulation at t, and D_t is a dummy taking the values

$$(7) \qquad D_t = 0;\ t < 1748$$
$$D_t = 1;\ t > 1748.$$

The role of this variable is that Maryland did, in fact, honor its commitment to redeem notes in 1748. Until this point there was no reason for colonists to particularly believe that this commitment would be honored.[20/] According to the view that money is priced in the same way as any other asset, a record

of its issuer honoring promises should enhance the value of this currency. The variable MVI_t is the value of the sinking fund at t divided by its value in 1764. Finally, as should be clear from (3) and (4), par_t--the percentage the exchange rate at t is above the relevant redemption rate--is an appropriate dependent variable. According to the Sargent-Wallace view, then, we expect $a_2 < 0$, $a_3 < 0$, and $a_1 = 0$.

Obviously, this is hardly a sophisticated approach to pricing money symmetrically with other assets. In principle far more sophisticated asset pricing models along the lines of Hansen-Singleton (1982) or Mehra-Prescott (1983) could be applied and directly implemented empirically. However, as can be seen from Table 5, the number of available observations is small. Hence the best we can hope for is a fairly general indication of whether the Sargent-Wallace hypothesis accounts for the data. In fact, this limited number of observations accounts for the absence of lagged variables in (6).

B. The Evidence

The evidence presented in this section is derived from application of ordinary least squares to (6). This procedure should yield consistent parameter estimates for the following reason. Clearly the only right-hand side variables whose exogeneity is suspect are the money supply and the market value of the sinking fund. With respect to the money supply, all authorized changes in it were made either in 1733, before any observations on exchange rates were available, or were a result of wartime deficit finance. This latter component might appear partially endogenous, as changes in exchange rates may have altered the nominal value of government expenditures. However, as inspection of Table 5 will confirm, exchange rates were fairly stable during the French and Indian War (1756-63), so that this factor should not have been operative.

With regard to the market value of the sinking fund at any date, this was the sum of three factors; tax proceeds from an excise tax on tobacco exports invested in Bank of England stock, dividends paid on the sinking fund, which were reinvested in the fund, and capital gains or losses on the stock held. Certainly we may take Bank of England stock prices and dividends paid on this stock as unaffected by events in Maryland. In principle, tax proceeds on tobacco exports could have been affected by Maryland exchange rate variation to the extent that this influenced tobacco exports. However, this is a question on which some evidence can be produced. In particular, from the results of Sims (1972), it is known that there exists a model in which MVI is strictly econometrically exogenous with respect to par only if MVI is not Granger caused by par. In Table 4 tests of Granger causality are presented which show that, at a very high marginal significance level, MVI is not Granger caused by par. Thus we cannot reject that this necessary condition for strict exogeneity is satisfied. In addition, Table 4 reports tests of whether par Granger causes EXS (exports from Maryland to Scotland). These would be almost entirely tobacco exports. We use Scottish rather than English exports because the U.S. Bureau of the Census (1976) does not separate Virginia from Maryland in its data on exports to Britain. As can be seen, at a marginal significance level of .43, we cannot reject the hypothesis that exports are not caused by exchange rates. Hence the suspect component of MVI does not appear to be correlated with the error term in (6). Therefore, we may proceed with our OLS estimation of (6) with some degree of confidence.

The data used are as follows. Data on exchange rates are taken from McCusker (1978), who reports the number of Maryland pounds required to purchase a sterling bill of exchange. Data on the money supply is taken from

Brock (1975). Incidentally, it should be noted that Brock reports that it is not possible to tell exactly how fast authorized wartime monetary increases were actually spent, or exactly how fast these were retired. Hence the numbers reported for 1756-62 have some errors, with the earlier and later numbers probably somewhat overstating the true money supply. Thus the usual caveats regarding error laden variables apply. Finally, data on the sterling value of the sinking fund appear in the Scharf Collection of the Maryland Historical Society, which contains the surviving periodic reports of the London trustees for the sinking fund.[21] Bank of England stock prices are reported by Mirowski (1981). All of this data is reproduced in Table 5.

In order to get a feel for the magnitudes by which different factors influenced currency values, three different versions of (6) are reported. First, to gauge the extent to which monetary changes affected currency values, (6) was run with the constraints $a_2 = a_3 = 0$ imposed. The resulting equation, with t-statistics in parentheses, was

$$(7) \qquad par_t = \underset{(.896)}{.310} + \underset{(.263)}{(1\times10^{-6})M_t}$$

$$R^2 = .003 \qquad DW = .411$$

$$Q(13) = 48.33.$$

DW is the Durbin-Watson statistic, and Q(13) is the value of the Box-Pierce (1970) serial correlation test statistic with 13 degrees of freedom. The marginal significance level of the Q statistic is 6×10^{-6}, and for the coefficient a_1 it is .80.

Clearly the quantity of money alone has no impact on currency values. Its coefficient is extremely small and we cannot reject the hypothesis

that it is zero even at extremely high significance levels. Finally, of course, (7) performs extremely poorly.

Next, (6) was run subject to the constraint $a_3 = 0$. The resulting equation is

$$(8) \qquad par_t = \underset{(2.04)}{.84} + \underset{(2\times10^{-2})}{(1\times10^{-7})}M_t - \underset{(2.82)}{.91}\ MVI_t$$

$$R^2 = .364 \qquad DW = 1.21$$

$$Q(8) = 2.50$$

This equation is much better behaved than (7). The marginal significance level of the Q statistic is .96, so this suggests no serial correlation. The coefficient on the money stock continues to be extremely small and highly insignificant. And finally, the coefficient on the (index of the) market value of the sinking fund is large, significant at the 1% level, and has its theoretically predicted sign. In particular, increases in the market value of the backing for notes result in an appreciation in the value of Maryland currency.

Finally, as noted above, Maryland's track record for redeeming notes as promised may significantly affect the value of its currency. The result of running (6) is

$$(9) \qquad par_t = \underset{(2.92)}{.90} - \underset{(.26)}{(9\times10^{-7})}M_t - \underset{(1.30)}{.37}\ MVI_t - \underset{(3.49)}{.43}\ D_t$$

$$R^2 = .671 \qquad DW = 2.19$$

$$Q(8) = 4.59$$

Several things should be noted about this equation. First, it is surprisingly successful. For instance, Hodrick (1978) estimates an exchange rate equation between Britian and the U.S. over the period 1972-75 which contains no lagged terms. His equation has five explanatory variables involving relative money supplies, output levels, and interest rates. In addition, like our equation (9), it is estimated on the basis of relatively few (36) observations. Hodrick reports an R^2 of .73. He also estimates a similar regression for the U.S.-German exchange rate with six explanatory variables and 28 observations. An R^2 of .66 is reported for this regression. Our equation (9) has similar explanatory power, without the benefit of contemporaneous income or interest rate data. Hence it would appear that the Sargent-Wallace hypothesis applied to Maryland has good explanatory power.

Second, the marginal signficance level of the Q statistic is .80. This, along with the Durbin-Watson statistic, gives no suggestion of serially correlated residuals.

Third, as predicted by the Sargent-Wallace hypothesis, $a_2 < 0$ and $a_3 < 0$. Thus a history of honoring promised redemptions and a large accumulated backing for notes both enhance their value. Moreover, the marginal significance level of a_3 is 4×10^{-3}, so the history of the colony in honoring promised redemption dates is highly significant. The marginal significance level of the market value coefficient is only .22. While this is not particularly high, the value of the sinking fund is far more significant than the quantity of money. In addition, the coefficient on the market value term is fairly large, albeit not very precisely estimated. Hence it is not clear that one should conclude that it is insignificant.

Finally, the coefficient on money has a marginal significance level of .80, and has the wrong sign (according to the quantity theory). Hence it is clearly the case that the nature of promises backing notes, and not the quantity of notes, determines their value.

Again in defense of the quantity theory one might ask whether some important component of the money supply is omitted in equations (7)-(9). The answer is no. The exchange rate used in these equations is the rate between Maryland paper currency and sterling. Specie in Maryland as well as tobacco money circulated at market determined rates with paper currency. Hence it would be inappropriate to aggregate these with paper currency.

V. Conclusions

The current study encompasses a seventy year period and three colonies with somewhat, but not completely similar monetary arrangements. In all of this experience, only that of South Carolina before 1731 is supportive of quantity theoretic propositions. In this instance, it is also true that the quantity theory is a special case of the Sargent-Wallace approach. However, in contrast to the performance of the quantity theory, the Sargent-Wallace approach generally accounts well for the successes of the Carolina currency reforms, and for exchange rate behavior in Maryland.

Moreover, we have argued that the success of the one approach, and the failure of the other, cannot be accounted for by omissions in our monetary figures. Nor can they be accounted for by the effects of anticipated future changes in money stocks that tended to accompany current changes.

How can one attempt to rescue standard approaches to monetary theory, then, in which money is treated asymmetrically from other assets? One suggestion is that standard money demand functions may have characterized

colonial currency holding behavior, but that these demand functions shifted at convenient points in time. In addition to having no empirical content, this view is one highly detrimental to the quantity theory. For instance, Friedman and Schwartz (1963) attempt to explain U.S. monetary history in the century following the Civil War on the basis of a stable demand function for money. Then a demonstration that money demand functions were highly unstable for a 70-year period in the colonies would be greatly at variance with their approach.

A second suggestion is that the economy of colonial North America was sufficiently primitive so as not to be a "monetized economy." Certainly, however, no one would apply this claim to Europe of the same period. Yet existing indications are that money-income ratios were higher in the (British) North American colonies than in any European country other than Britain itself. Thus such a suggestion would appear to be without basis in fact.

We are left, then, with the conclusion that there is a long period of history, and a number of locations,[22] to which the quantity theory of money does not apply. Other views of money which do not treat money differently from other assets do appear successful in explaining this period. Thus it would appear that these views deserve greater claim on the attention of monetary economists than they appear to have received.

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Footnotes

1/Except in Maryland after 1766, where dollars became the unit of account.

2/This practice of issuing notes backed by land may appear reminiscent of the real bills doctrine. However, the quantity of notes issued was fixed exogenously by colonial legislatures.

3/There were several such problems. One is that much of the specie circulating in North America was badly worn and underweight. Hence it was necessary to compensate for this in transactions. A second is that much specie circulated in relatively large denominations. For the reason just mentioned, there were not constant returns to scale in the division of specie. Hence the use of specie in standard transactions created problems, as did tax payments in specie. This problem is frequently mentioned in the literature. Two interesting papers on this topic are by Hanson (1979, 1980).

4/Gould (1915), p. 38.

5/Commodity notes were circulating warehouse receipts for the commodity in question, as will be recalled from section I.

6/Brock (1975), p. 107-8.

7/McCusker (1976), p. 97.

8/See McCusker (1978), p. 7, note 9. More strongly, Smith (1776) asserts that "almost all the ordinary transactions of its [North America's] interior commerce [are] being thus carried on by paper."

9/One additional comment might be made on the question of paper currency issues displacing specie. Adam Smith (1776) suggested that paper currency issues might have exactly this effect, with new issues of currency displacing equal amounts of specie and having no price level effects. The absence of price level effects is roughly what we observe for parts of our

samples. Monetarists should probably not find such an outcome encouraging, if they believe this is what actually occurred. On this point one might consult Mints (1945), for instance, who states (p. 30) that on this issue Smith and others "were completely wrong in their conclusions. . . ."

10/On this point see the discussion in Brock (1975), p. 116-123.

11/See, e.g., Ernst (1973).

12/See their conclusion.

13/Brock (1975), p. 107-8.

14/See Brock (1975), p. 443.

15/See, e.g., Friedman and Schwartz (1963, 1982).

16/Friedman (1956).

17/Actually, the £90,000 was only authorized at this time. It took some years for total circulation to approach this level.

18/We assume a single redemption date for simplicity.

19/Data on interest rates are unavailable.

20/This is certainly the case, as only a minority of other colonies had regularly and strictly honored their commitments with respect to retirement of paper currency.

21/The relevant data was kindly provided to me by Jacob Price.

22/In addition to this work see Smith (1983).

Table 1

South Carolina

Date	Paper Currency Outstanding (£)[a]	Pounds per 1,000 pop.[b]	Exchange Rate[c] (£ S.C. per £100 sterling	Price Level[d] (average of (1762-74 = 100)
1703	4,000		150	---
1707	12,000		150	---
1708	14,000		150	---
1710	14,000	1,286	150	---
1711	20,000		150	---
1712	56,000		150	---
1714	---		200	---
1715	---		300	---
1716	90,000		---	---
1717	---		575	---
1718	---		500	---
1720	100,000	5,866	400	---
1721	---		533	---
1722	80,000		580	---
1723	120,000		675	---
1724	---		650	---
1725	---		672	---
1726	---		700	---
1727	106,500		700	---
1728	106,500		700	---
1729	106,500		700	---
1730	106,500	3,550	644	---
1731	211,275		700	---
1732	---		700	79
1733	---		700	80
1734	---		700	108
1735	---		700	105
1736	---		743	96
1737	---		753	117
1738	---		775	125
1739			792	84
1740	---		796	77
1741	---		691	97
1742	---		699	85
1743	---		700	70
1744	---		700	64
1745	---		700	46
1746	---		---	45
1747	---		761	69
1748	---		762	88
1749	133,045	2,142	725	96
1750	---		702	100
1751	---		700	83
1752	---		700	97
1753	152,322		700	112
1754	156,156		700	86
1755	221,359	2,801	700	86
1756	311,816		714	77
1757	542,837		700	78
1758	595,567		700	86
1759	521,369		700	112
1760	863,827	9,182	700	92
1761	867,744		700	80
1762	---		700	77
1763	584,916		717	92
1764	585,246		718	86
1765	472,378	4,327	709	87
1766	446,673		707	100
1767	344,147		700	94
1768	481,999		700	102
1769	497,654			104
1770	424,154	3,414	717	93
1771	---		762	108
1772	---		679	137
1773	391,391		728	116
1774	258,971		700	104

[a] Source: Brock (1975), p.106-126, and Table XV.
[b] Source: Brock (1975), and U.S. Bureau of the Census (1976), p. 1168.
[c] Source: McCusker (1978), p. 222-224.
[d] Source: Taylor (1932).

Table 2

North Carolina

Date	Notes in Circulation[a]	£ per 1,000 population[b]	Exchange Rate[c] (£ N.C. per £100 sterling)
1712	4,000		---
1713	12,000		---
1715	24,000		150
1722	12,000		500
1724	12,000		500
1728	12,000		---
1729	52,000		500
1731	52,000		650
1734	54,500		
1735	---		720
1736	---		700
1737	---		867
1739	---		1,000
1748[d]	21,350		1,033
1749	21,160		
1750	20,647	283	133
1751	20,119		
1752	19,028		
1753	18,289		
1754	57,951		167
1755	56,054	611	160
1756	57,951		180
1757	68,255		
1758	70,253		
1759	69,512		185
1760	75,806	686	190
1761	95,335		200
1762	85,322		200
1763			200
1764	73,378		193
1765			200
1766	67,880		
1767			173
1768	60,106	334	180

[a] Source: Brock (1975), p. 108, 112, and Table XIV.
[b] Source: U.S. Bureau of the Census (1976), p. 1168, and Brock (1975).
[c] Source: McCusker (1978), p. 217-19.
[d] Currency reform. New monetary unit employed.

Table 3

Note Cancellation via Taxation
in North Carolina

Date	Amount Cancelled[a] (£)
1748	---
1749	190
1750	514
1751	527
1752	1,091
1753	739
1754	338
1755	1,897
1756	1,809
1757	4,527
1758	9,544
1759	---
1760	5,853
1761	619
1762	10,013
1763	---
1764	11,944
1765	---
1766	5,498
1767	---
1768	7,774

[a] Source: Sum of cancellations reported by Brock (1975), Tables XXIII and XXIV.

Table 4

Exogeneity Tests[a,b]

$$MVI_t = a + \sum_{i=1}^{q} b_i MVI_{t-i} + \sum_{i=1}^{s} c_i par_{t-i}$$

	q	s	F(s,24-s)	Marginal Significance Level
(i)	1	1	0.57	.57
(ii)	1	2	1.10	.35

$$EXS_t = a + \sum_{i=1}^{q} b_i EXS_{t-i} + \sum_{i=1}^{s} c_i par_{t-i}$$

	q	s	F(s,20-s)	Marginal Significance Level
(iii)	1	1	1.13	.27
(iv)	2	2	0.88	.43

[a] Sources: the sources for all data other than exports are reported in the text. Scottish exports are from U.S. Bureau of the Census (1976), p. 1177-8.

[b] Summary statistics for the regression equations are as follows:

(i) $R^2 = .15$, DW = 1.51, Q(13) = 8.82 (significance level = .79)

(ii) $R^2 = .21$, DW = 1.73, Q(13) = 11.40 (significance level = .58)

(iii) $R^2 = .44$, DW = 1.88, Q(12) = 5.69 (significance level = .93)

(iv) $R^2 = .44$, DW = 1.94, Q(11) = 4.53 (significance level = .95)

Table 5

Maryland

Date	Note Circulation (£)[a]	Per Capita Circulation (per 1,000 population)[b]	Bank of England Stock Price (£ Sterling)[c]	Face Value of Sinking Fund[d] (£ Sterling)	Exchange Rate (£ Md. per £100 sterling)[e]
1735	56,495	545	140.45	---	140.00
1736	57,864		149.10	2,000	230.00
1737	69,856		145.88	4,000	250.00
1738	69,856		142.11	---	225.00
1739	79,820		140.12	6,000	212.34
1740	78,523	676	140.49	7,500	228.08
1741	83,444		140.54	9,500	238.17
1742	82,072		140.22	---	275.00
1743	82,252		146.81	12,500	285.13
1744	83,058		145.54	15,000	166.67
1745	83,058	646	142.83	---	200.00
1746	83,058		127.34	18,800	210.00
1747	85,309		125.48	21,000	225.22
1748	86,040		124.15	24,000	200.61
1749	62,000		134.16	12,000	184.58
1750	62,000	439	134.13	---	177.92
1751	62,000		139.14	11,000	166.83
1752	62,000		145.18	---	155.62
1753	62,000		139.92	16,000	151.75
1754	62,000		133.63	---	153.75
1755	62,000	409	126.10	19,500	---
1756	96,017		117.94	---	170.00
1757	96,017		118.84	19,500	145.00
1758	96,017		119.59	19,500	150.00
1759	96,017		113.81	---	150.00
1760	96,017	592	110.46	27,500	146.25
1761	96,017		109.49	---	148.48
1762	96,017		101.58	35,500	144.45
1763	62,000		120.32	---	140.00
1764	41,295		116.50	40,800	136.67
1765	---	---	---	---	133.33

[a] Source: Brock (1975), p. 104-5, and 417-421.
[b] Source: Brock (1975) and U.S. Bureau of the Census (1976), p. 1168.
[c] Source: Mirowski (1981), p. 569-70.
[d] Source: Scharf Collection, Maryland Historical Society.
[e] Source: McCusker (1978), p. 202-3.

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