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CAUSALITY AND ASSOCIATION BETWEEN MONEY, PRICES AND GOVERNMENT DEBT

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Ten years ago Sargent and Wallace [1981] provided with the simple and elegant analysis that has now become the classic "unpleasant monetarist arithmetic": a fall in the rate of monetary expansion without a corresponding fall in the primary deficit is not only doomed to be transitory, but will eventually bring about an inflation rate higher than before the change. The reason is of course very simple: there is limit to government debt, and eventually not only the transitory stabilization will be called off, but at that time a higher rate of monetary growth (and inflation) will be needed to finance not only the same primary deficit than before the change, but also the higher flow of interest payments on the stock of government debt accumulated in the interim.

Sargent and Wallace's "unpleasant arithmetic" is one of the first discussions exploiting the fertile marriage of rational expectations and an explicit government budget constraint.[1] In forward-looking scenarios in which the public can correctly anticipate events, and in which government enacts policies which are ultimately "inconsistent" with its budget constraint, the anticipation of the eventual demise determines the response of the economy from the very beginning of those policies. Inconsistent stabilization programs receive a (post-dated) death certificate together with their birth certificate.

The purpose of this paper is to discuss a "variation" on the Sargent-Wallace theme with features that seem to correspond to at least one important empirical episode.[2] In the Sargent-Wallace analysis, the monetary authority follows a ***monetary rule***, given by a constant rate of monetary growth, while the fiscal authority determines an exogenous constant primary deficit. The difference between the latter and the revenues from money creation (positive or negative) is made up by borrowing, i.e., by the accumulation (positive or negative) of government debt. In this paper, we take up the case in which interest on the outstanding government debt is exclusively paid by the issuing of new debt, while money creation is exclusively determined by

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1 Since the publication of the Sargent and Wallaces'work a number of papers has been devoted not only to scrutinize some of the particulars of the analysis, but also to consider similar cases and to generalize their discussion. Among the first, see for example Liviatan [1984] and Drazen [1985]. Among the second, Leeper [1991] is a good example.

2 For example, this seems to have been the case of Brazil during the period preceding the Collor Plan in early 1989 (Rodriguez [1991], p.4).

the financing of the exogenous primary deficit. In our case, then, the "exogenous" variable is the revenue from money creation equal to the primary deficit to be financed, while the rate of monetary growth becomes endogenous. As in the original "unpleasant arithmetic" case, a limit to the size of government debt (i.e., the impossibility for government to play indefinitely a "Ponzi game") requires an eventual break down of the policy, with the *total* deficit (primary deficit plus payment of interest) being from then on financed exclusively through money creation. From the very beginning, then, events are dominated by the anticipation of future inflation, and the result is a forward looking model, in which real money and prices adjust to future changes in the money supply --rather than to contemporaneous or past changes, as in the case of "old fashioned" adaptive expectations models.

Not only the case is interesting *per se*, in that points out to the danger of certain policies, but there are two other reasons that motivate the analysis. First, it provides yet with another example of the richness of the overall budget constraint as a framework, with components that can generate many different "stories" under slightly different assumptions. Second, it clearly illustrates how misleading (for both the diagnosis of inflation and its cure) the isolated observation behavior of some monetary aggregates can be unless the overall process is taken into consideration.

The organization of the paper is as follows. Section 1 presents the simple model, the nature of the solution and the basic results, as well as the outcome of some simulations. Section 2 interprets the implications of the results, and Section 3 summarizes the conclusions.

1.- The Basic Model and Results

The Basic Model

We consider the simplest case of a closed stationary economy in which real income and the real interest are exogenous (constant, for simplicity). There is perfect foresight.

The simplest form of the flow **aggregate** government (central government *cum* central bank) budget constraint, in nominal terms, is the identity

$$(Db/dt) + (dM/dt) \equiv D + B\,i$$

where B is the stock of outstanding nominal government debt, M is the nominal money stock,

D is the nominal primary government deficit, and i is the nominal interest rate. For simplicity, assume a simple scenario without a commercial banking system (or with one hundred per cent reserves on demand deposits)[3], and the government debt to be of very short (instantaneous) maturity, and with the principal being denominated in real terms. Then, the government budget constraint can be expressed in real terms as

[1] $$(db/dt) + m\,\mu \equiv d + b\,r$$

where b, m and d are the real levels of debt, money and the primary deficit, respectively, r is the real interest rate and μ is the rate of (nominal) monetary expansion.

Consider now the policy rule in which

[2] $$(Db/dt) = B\,i$$

i.e., in which interest on the outstanding debt is entirely paid by the issue of more debt, and vice-versa, i.e., all debt creation is for purposes of paying interest on the debt. This implies, of course, that nominal debt grows at the nominal rate of interest, and that the real debt grows at the real rate of interest, i.e.,

[2′] $$(db/dt) = b\,r$$

Then, the path of real debt over time is

[2″] $$b(t) = b(o)\,exp(rt)$$

where $b(o)$ is an initial level given by past history.

The government budget constraint [1] can then be written as

[3] $$m\,\mu = d,$$

or

[3′] $$(dm/dt) = d - m\,\pi$$

where π is the inflation rate.

Notice two points. First, that for a constant primary deficit d the rate of monetary expansion μ becomes endogenous. Second, that either [3] or [3′] appear to be the standard equations considered in the traditional literature on the revenues from money creation, where the revenue is used to finance the primary deficit and all other components of the government budget

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[3] Then, of course, the nominal money stock, M, is the monetary base.

constraint are ignored, **implicitly** assuming $b = (db/dt) = 0$ but disregarding the fulfillment of a transversality condition.[4] In the analysis of this paper, these "other" components, dr and (db/dt), whose behavior is determined by [2'], play a fundamental role. Notice also, once more, the difference between the policy specification and its implications in this case and the case discussed in Sargent and Wallace [1981] and the subsequent literature. In the latter, the rate of monetary expansion is exogenous, and set at a value insufficient to finance the primary deficit, and this insufficiency is the sort of inconsistency. In our case, the real revenue from money creation (the l.h.s. of expression [3]) becomes exogenous, and equal to the primary deficit, with the debt creation policy becoming the source of inconsistency. In other words, in the Sargent and Wallace case the "residual" or "passive" element is the flow of borrowing; in ours, the residual or passive element is monetary growth. In what follows, for purposes of easy reference, we call the policy analyzed by Sargent and Wallace, a ***"passive borrowing"*** policy, and the policy defined by [2], that we analyze, a ***"passive monetary growth"*** policy.

Take the demand for money (equal at all times to the actual money stock) to be of the form

[4] $$m = \mathcal{L}(r + \pi).$$

where $r + \pi = i$ is the nominal interest rate. With the real interest rate being constant, then the inverse of [4] is a function relating the inflation rate to the real money stock, of the form

[4'] $$\pi = \ell(m).$$

Replacing [4'] into [3'] yields

[5] $$dm/dt = d(t) - m\,\ell(m)$$

For an exogenous given path of the primary deficit $d(t)$ for $t > 0$, expression [5] is a differential equation in the real money stock, m, relatively easy to solve for a "simple"[5] path of $d(t)$. In what follows we will assume that the primary deficit is constant at a level d^*. Linearization of [5] yields the general solution

[6] $$m(t) = \{m(o^+) - m^*\} \exp(F_m \cdot t) + m^*$$

where $m(o^+)$ is an initial value at $t = 0^+$, and m^* is the level of the real money stock satisfying

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[4] See, for example, Friedman [1972], or Auernheimer [1974].

[5] In the mathematical sense.

[7] $$m^* \ell(m^*) = d^*$$

(where d^* is the deficit during the implementation of the policy, i.e., between $t=0$ and $t=\tau$), and

$$F_{m^*} = \partial(m\, \ell(m))/\partial m > 0,$$

evaluated at $m = m^*$. The initial level of real government debt, $b(o)$, is of course given by past history (most likely, as the result of past primary deficits).

A particular solution yielding the actual path of the real money stock, though, requires the specification of conditions allowing to assign either an initial or a terminal value to the real money stock. The particulars of the policy "experiment" provide such terminal conditions. They are as follows:

- As in Sargent and Wallace [1981] we assume that there is a limit to the stock of real debt government can hold, below which government can borrow at the constant real interest rate, and above which it cannot borrow at all.[6] This limit is known by the public.
- At some initial time $t = 0$ government starts implementing the policy described in [2]. For an initial positive real level of the government debt, this means that from there on the real debt grows at a rate equal to the real interest rate, so that the limit is eventually reach. The policy is, then, non-sustainable, or inconsistent.
- Consistency is ultimately brought about at the time $t = 0$ at which the limit level of government debt is reached. The fundamental of the "crisis resolution" is that at that point the monetary authority switches to a "passive borrowing policy": from $t = \tau$ on, the ***total*** real deficit (primary deficit plus the interest on the existing outstanding debt) is financed exclusively with the revenue from the inflation tax. If from $t = \tau$ on the primary deficit is constant at a level $d(\tau)$, then from then on

[8] $$m(\tau)\, \ell(m(\tau)) = d(\tau) + b(\tau)\, r,$$

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[6] Such a limit could be rationalized as the present value of the sum of all future primary surpluses and the maximum long-run revenues from the inflation tax. A more realistic (and more complicated) specification would be for the real interest rate on government debt to be an increasing function of the level of real outstanding debt. What we assume (a constant real interest rate and a maximum possible level of real debt) is an infinitely elastic supply of credit to government up to a certain stock (a constant interest rate), and a zero elasticity beyond such stock (an infinite interest rate).

where the l.h.s. is the terminal revenue from the inflation tax, and the r.h.s. the terminal total deficit to be financed

The terminal condition can be specified either in terms of a level of the debt, $b(\tau)$, or in terms of time, τ, or in terms of the final steady state inflation rate, $\pi(\tau)$. If a terminal maximum inflation rate is specified, then [8] determines the terminal real money stock and the revenue from the inflation tax (the l.h.s. of [8]), and therefore the permissible terminal level of the debt, $b(\tau)$, with [2''] yielding the terminal time. If either a terminal time τ or a terminal debt level $b(\tau)$ is specified, then the r.h.s. of [8] (the terminal required financing) is determined, and therefore the revenues to be raised via the inflation tax.[7] An additional constraint is that if either a terminal date or a terminal level of the debt is specified, the latter needs to be such that its interest, plus the primary deficit at that time, $d(\tau)$, should not exceed the maximum possible long run revenue from the inflation tax.

In the analysis and the simulations that follow, we specify a terminal inflation rate, that can be equal, smaller or larger than the rate that in the long run maximizes the revenue from the inflation tax. Obviously, the particular case in which the terminal inflation rate is equal to the long-run revenue maximizing rate is of particular interest. As it will be shown, it is the rate for which the length of the "transition period" (τ) is the longest.

The terminal conditions having been specified, the path of adjustment during the interim period $0 \leq t \leq \tau$ is given by the general solution [6] and a straightforward application of the *asset price continuity principle*, i.e., the requirement that in a world of perfect foresight no discrete capital gains or losses can take place except at times of a "surprise". In our case, the resolution of the inconsistency at $t=\tau$ is perfectly anticipated, and the principle implies that no discrete changes in the price level are to take place at $t=\tau$.[8] If no discontinuities in the nominal money

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[7] Note that in the second case there will in general be two inflation rates (and levels of real money) compatible with the required revenue. A reasonable assumption is that the lower inflation rate is chosen.

[8] In fact, given the assumption of perfect foresight, price level discontinuities are not feasible for any $t > 0$.

stock are anticipated[9] then price level continuity implies continuity of the real money stock. This can be more formally expressed as

[9] $$m(\tau^-) = m(\tau^+) = m(\tau) \qquad t>\tau$$

where $m(\tau^-)$ is the real money stock "just before" $t=\tau$ and $m(\tau^+)$ is the real money stock "just after" $t=\tau$, i.e., the final long run steady state value.

In what follows we assume that the real primary deficit is constant throughout, i.e., that $d(o^-) = d^* = d(\tau) = d$. Although any combination of values of these constant levels for $t < 0$, $0 < t < \tau$ and $t > \tau$ can be easily handled, we use this assumption not only for computational simplicity, but also in order to isolate the pure effects of the imposition of the policy, other things being the same. Under these conditions, the initial value $m(o^+)$ that provides with a particular solution of [6] is solved from [6] and [9], which imply

$$m(\tau) = \{m(o^+) - m^*\} \exp(F_m \cdot \tau) + m^*$$

or, solving explicitly for $m(o^+)$,

[11] $$m(o^+) = m^*(1-\exp(-F_m \cdot \tau)) + m(\tau) \exp(-F_m \cdot \tau)$$

where, given the constancy of the primary deficit throughout, $m^* = m(o^-)$ is the preexisting level of the real money stock.

Some of the previous results can be visualized with the aid of Figures 1, 2 and 3. Figure 1, which is self-explanatory, describes the behavior of the real government debt following the adoption of the policy, at $t=0$, until its demise at $t=\tau$.

Figure 2 portraits the behavior of the real money stock, and makes clear the procedure for identifying the relevant path of the variable during the adjustment. The general solution in expression [6] generates an infinite number of paths (a few of which are shown as dotted lines), one for each initial or terminal value. The relevant path is the one for which the value of the real money stock coincides, at $t=\tau$, with the level $m(\tau)$ resulting from the specification of the terminal conditions. The particular path shown in Figure 2 reflects the assumption of a primary deficit that is constant throughout.

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[9] A discontinuity in the nominal money stock (and hence in the real money stock) at $t=\tau$ would take place in the case in which government engages at that time in a once-and-for-all purchase of outstanding debt. This possibility can be handled without much complication.

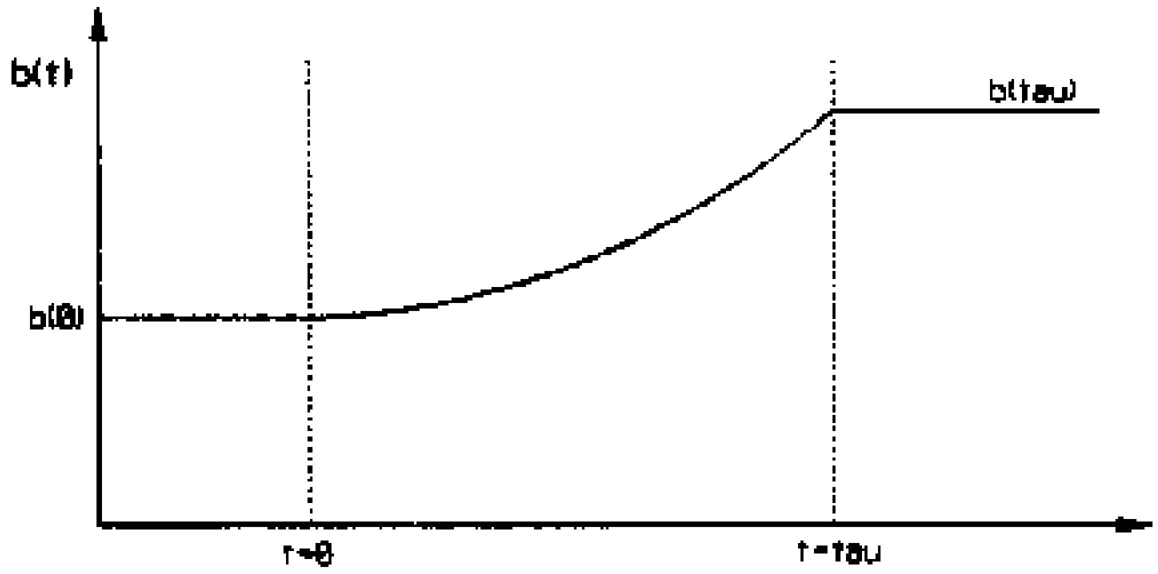

Figure 1

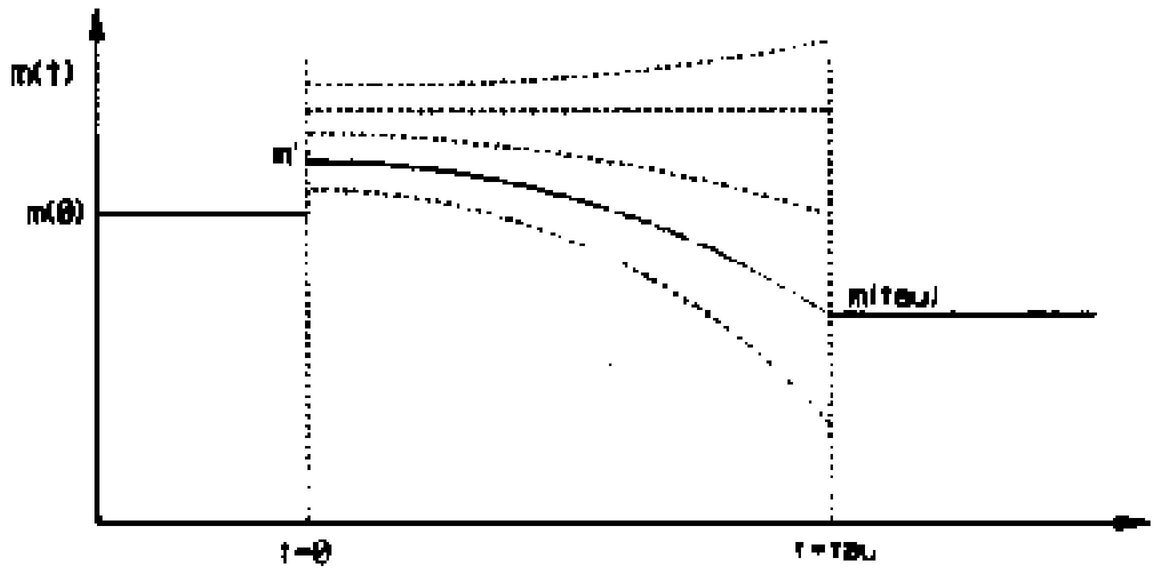

Figure 2

Finally, the graph in Figure 3 describes the paths of both the inflation rate and the rate of monetary growth. The former is of course a reflection of the path of the real money stock (expression [4']); the second is obtained from expression [3], and is discussed below.

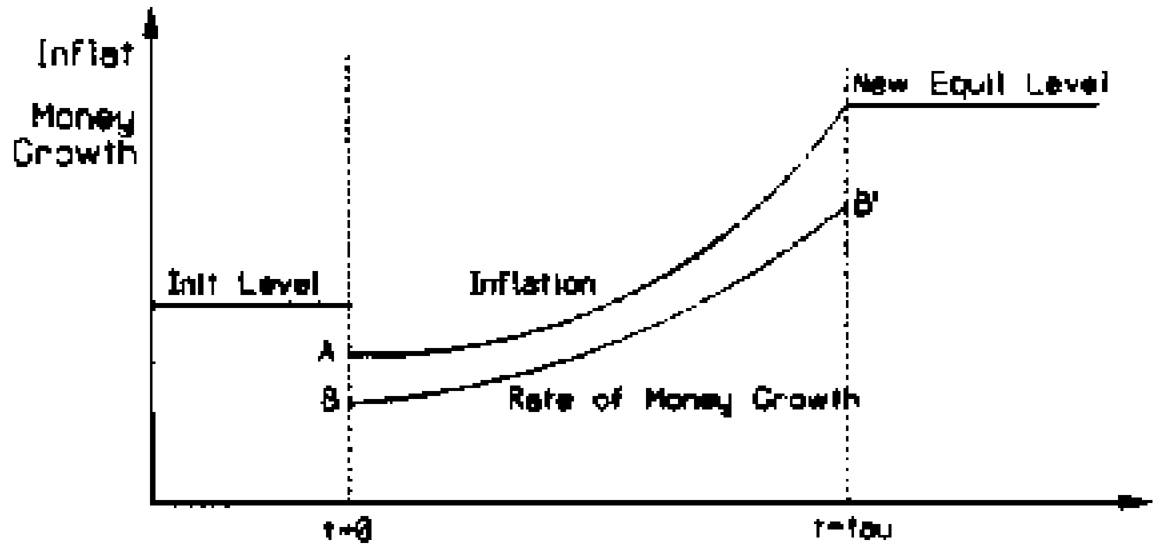

Figure 3

Some additional particulars of the solution deserve elaboration:

• In general, the enactment of the "passive monetary growth" policy, for an unchanged level of the primary deficit, brings about an ***immediate fall in the inflation rate***, that from there on starts to rise, surpasses its initial level and by the time of the "crisis resolution" reaches a level higher than before the policy change. It is possible to show, though, that for certain values of the initial debt and the terminal conditions it is indeed possible for the initial inflation rate to rise discretely at the time of the enactment of the policy. This is similar to the results in the original "experiment" discussed by Sargent and Wallace [1981].[10]

• As it was mentioned before, and is clear from [3], the rate of monetary expansion under the "passive monetary growth" policy becomes endogenous. The level of the primary deficit, d, is one of the magnitudes determining the path of adjustment of the real money stock m; given this path, monetary growth adjusts at every period in order to satisfy [3]. In the hypothetical case described in Figure 3, for example, a positive primary deficit implies that as the real money stock falls during the adjustment, the rate of monetary expansion needs to be rising. But a similar path of a falling real money stock would also obtain with a zero or negative primary deficit, what means that the rate of monetary growth could be zero or negative --in the latter case with a nominal monetary contraction becoming more and more pronounced as the adjustment takes place.[11]

• Finally, notice the interrelationship between the terminal values of the inflation rate, $\pi(\tau)$ (and hence the real money stock, $m(\tau)$), government debt, $b(\tau)$, and the length of time the policy is implemented, τ. From expressions [2''] and [8] we can write

[12] $$m(\tau)\,\ell(m(\tau)) = d(\tau) + r\,b(o)\,\exp(r\tau),$$

where the l.h.s. is the long-run revenue from money creation (the "inflation tax") at $t = \tau$ and

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[10] We recall once more that in the Sargent and Wallace case the "experiment" was a lowering of the exogenous rate of monetary growth, without any change in the primary deficit. In this case, although the ultimate inflation rate will be always eventually higher than before the change, in most cases the initial response would be a fall of the inflation rate. A series of papers has been written to elucidate the conditions under which the initial response could be a rise in the rate. See, for example, Liviatan [1984] and Drazen [1985].

[11] This is indeed the case analyzed in the simulations presented in the following Section.

thereafter, which can be expressed as $m(\tau)\, \ell(m(\tau)) = \mathcal{L}(r+\pi(\tau))\, \pi(\tau) = R(\pi(\tau))$, so that [12] becomes

$$R(\pi(\tau)) = d(\tau) + r\, b(o)\, exp(r\tau). \qquad [12']$$

Differentiating [13'] with respect to τ we obtain

$$\partial R/\partial\tau = r^2\, b(o)\, exp\,(r\tau) \qquad [12'']$$

which will be higher, lower or equal to zero depending on whether the terminal inflation rate (specified explicitly, or implicitly by the specification of τ or $b(\tau)$) corresponds is lower, higher or equal to the "long run inflation tax revenue maximizing rate".[12] What this means is that the longest possible length of time from the enactment of the policy until the crisis resolution, is attained when the terminal inflation rate is the "maximizing rate". For any rate below or above the time will be shorter, and that the time becomes shorter and shorter the more the final inflation rate departs from such level. The intuitive reason for this is very simple: up to a point, a higher terminal inflation means a higher final long run revenue from the inflation tax, and therefore the longer the wait until the corresponding level of final debt is reached. After that point, higher terminal inflation rates bring about lower final inflation tax revenues, and shorter times until debt accumulates whose interest payments can be ultimately financed.

Some Simulation Results

As mentioned in the introduction, one of the interesting points that emerge from the analysis is the set of associations that can be observed among various magnitudes during the transitional period at which the "passive monetary growth" policy is implemented. We discuss this point in the next Section, together with other results. As a framework for that discussion, we report here on the results of some simulations.

We use a specific Cagan-type[13] demand for money function

$$m(t) = exp\,(-a\,[r + \pi(t)]), \qquad [13]$$

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[12] I.e., whether the elasticity of the demand for real cash balances with respect to the inflation rate is lower, higher or equal to minus one.

[13] As it is well known, this is a form with considerable computational advantages. It is linear in its logarithmic form, and the long run inflation tax revenue maximizing rate is equal to $(1/a)$.

and assume a value $\alpha = 3$. We take the following initial values prior to the change:

r (the real interest rate) = .05

$b(o) = 1.0607$

$m(o^{\cdot}) = .8607$

$\pi(o^{\cdot}) = .05$

$d(o^{\cdot}) = d^{*} = d(\tau) = -.0103045$

We assume the terminal inflation rate to be $\pi(\tau) = .75$, to which there correspond a time $\tau = 10.36$ at which the crisis is resolved, and a terminal level of the debt equal to $b(\tau) = 1.781$. Notice that a negative primary deficit implies a negative rate of growth of the money supply. This is assumed in order to dramatize the significance of some of the results.

Figure 4 shows the paths of the real stocks of the real money stock, government debt and the sum of money plus government debt -- what we call *MB*, which for purposes of easy reference we can call "expanded aggregate". Notice, first, the initial fall in the real money stock immediately following the implementation of the policy. Real outstanding government debt rises throughout the interim period, and the "expanded aggregate" initially rises before starting to fall.

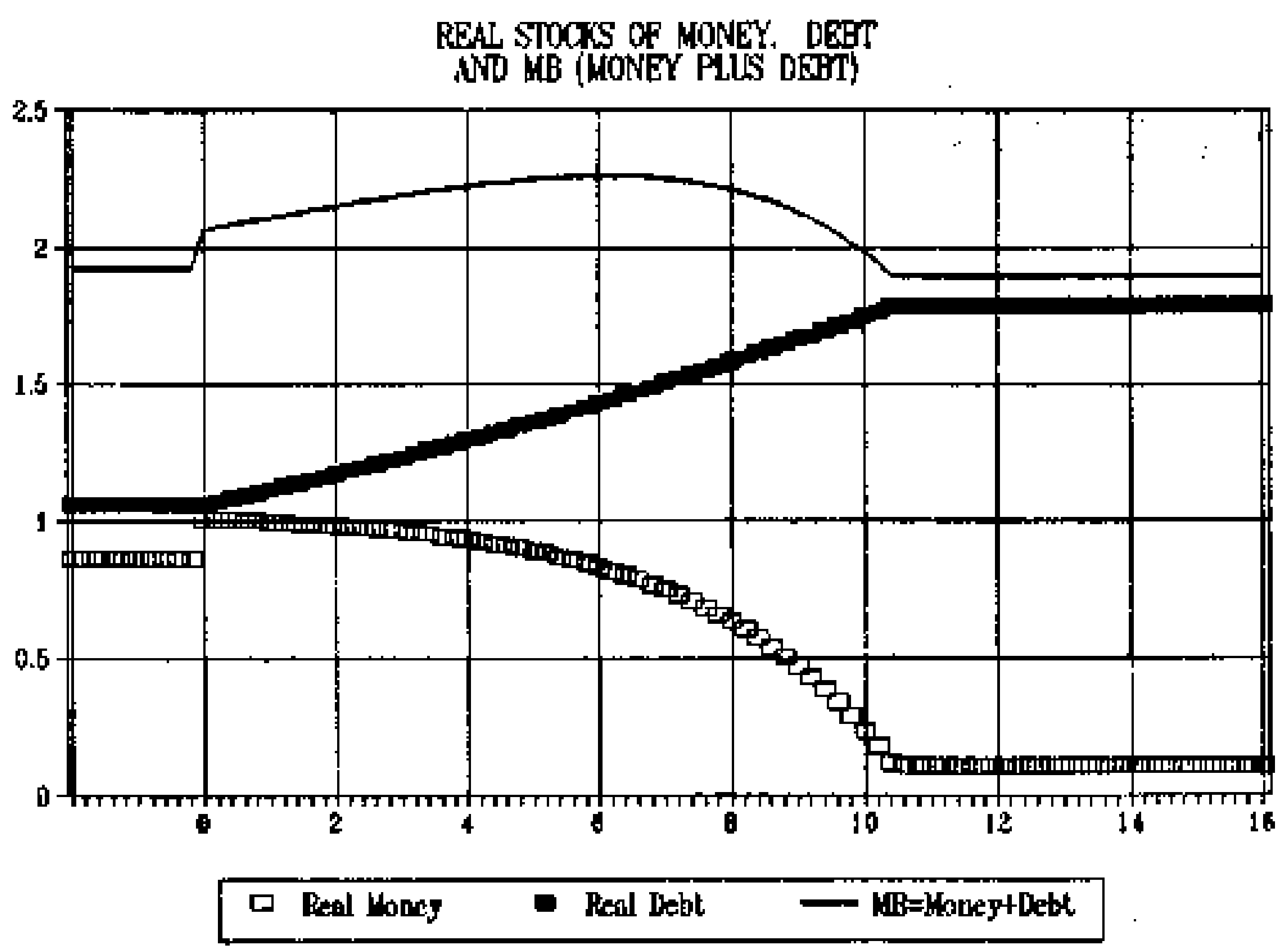

Figure 4

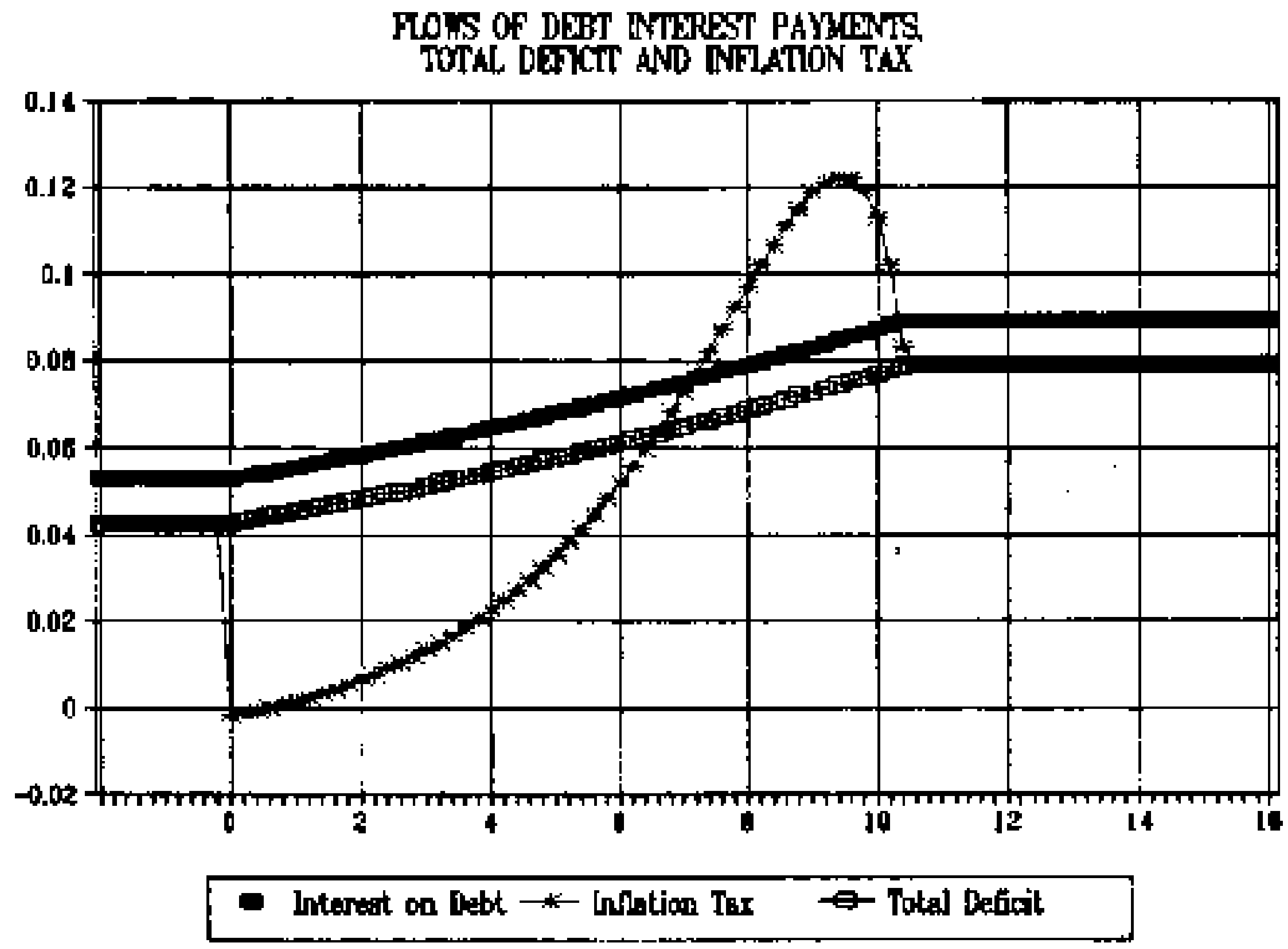

Figure 5

Figure 5 depicts the behavior of the flows of interest debt payments, the ***total*** deficit (which is smaller than the former, the difference between the two being the negative constant primary deficit), and the revenues from the "inflation tax", $m(t)\ \pi(t)$. Notice that the latter, after an initial discrete fall, rises up to a maximum and then falls before the time of the crisis resolution. This is due, of course, to the fact that the specified terminal inflation rate of $\pi(\tau) = .75$ is higher than the long-run maximizing inflation rate revenue, which in this case is $(1/\alpha) = .33$.

Figure 6 portraits the rates of inflation, monetary expansion and "expanded aggregate" expansion.[14] Notice, first, the negative rate of monetary expansion after the policy starts to be implemented; nominal money is "retired" by the magnitude of the primary surplus (negative deficit). The rate of inflation is the reflection of the path of the real money stock: there is an immediate "jump" at $t = 0$, and from there on a continuous rise. The rate of growth of the nominal "expanded aggregate" *MD* shows two important features: first, a very close association

[14] I.e., the proportional rate at which $MB = M(t) + B(t)$ is rising.

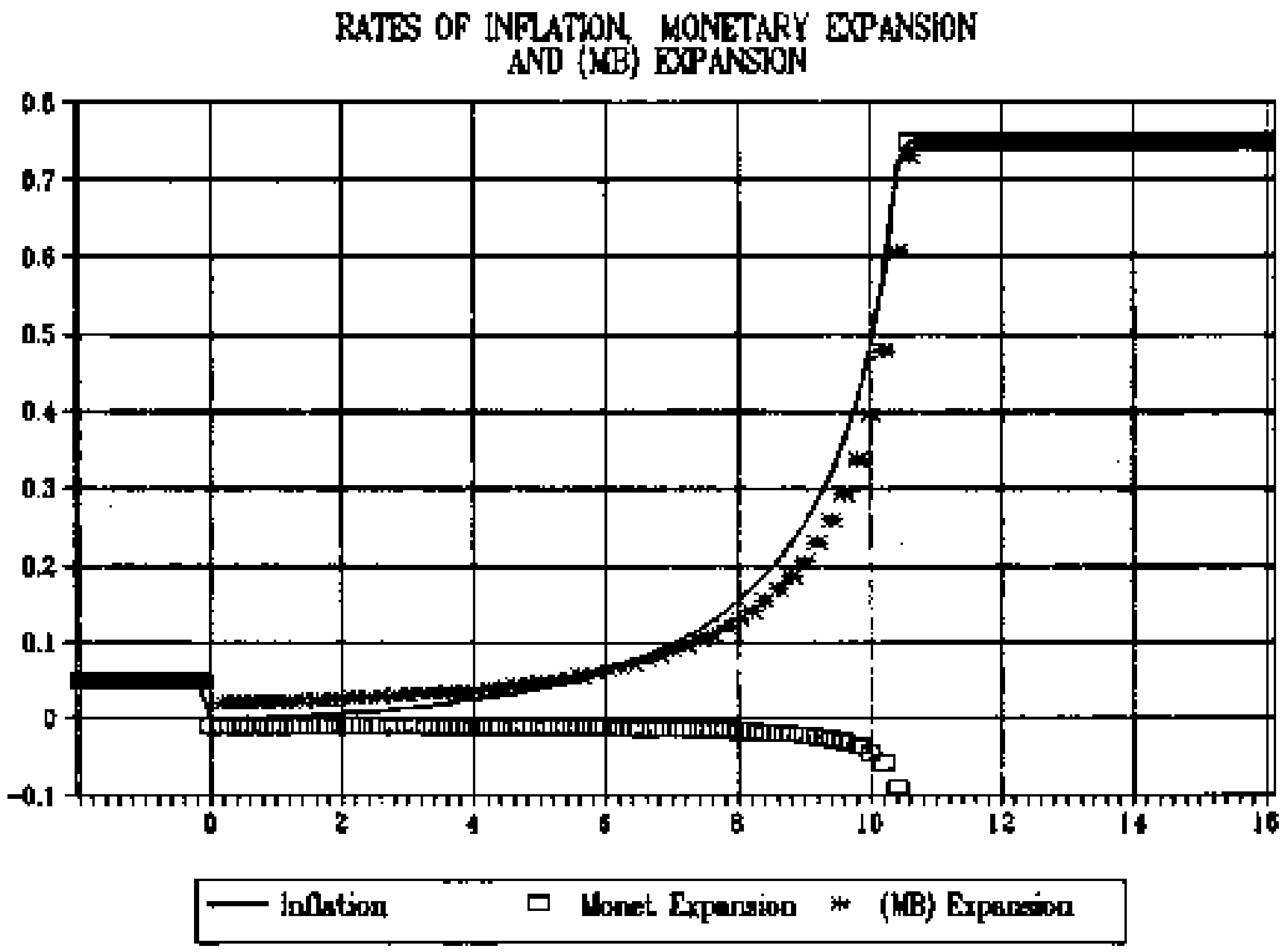

Figure 6

with the inflation rate of inflation and, second, during the last part of the adjustment, it *precedes* the inflation rate. We elaborate later on the significance of these points.

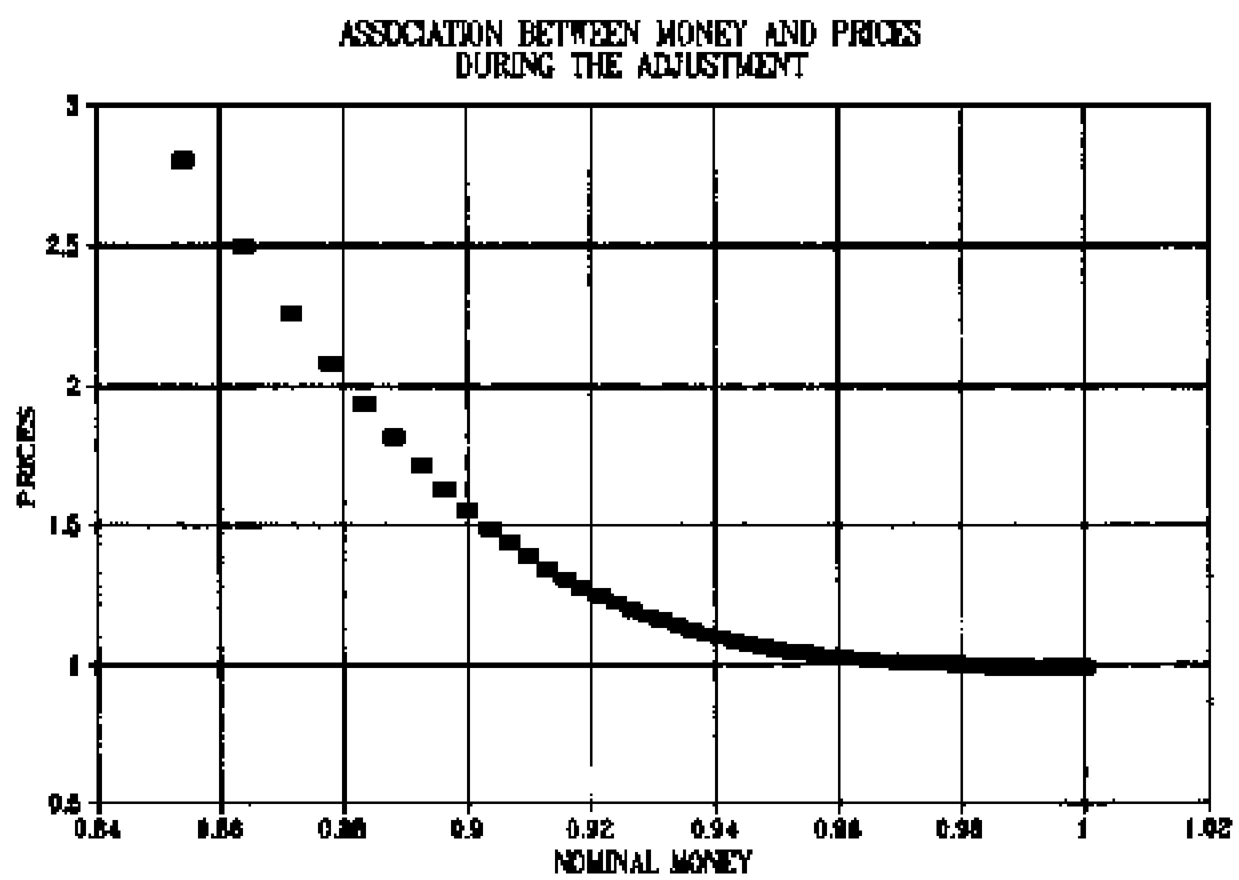

Figure 7

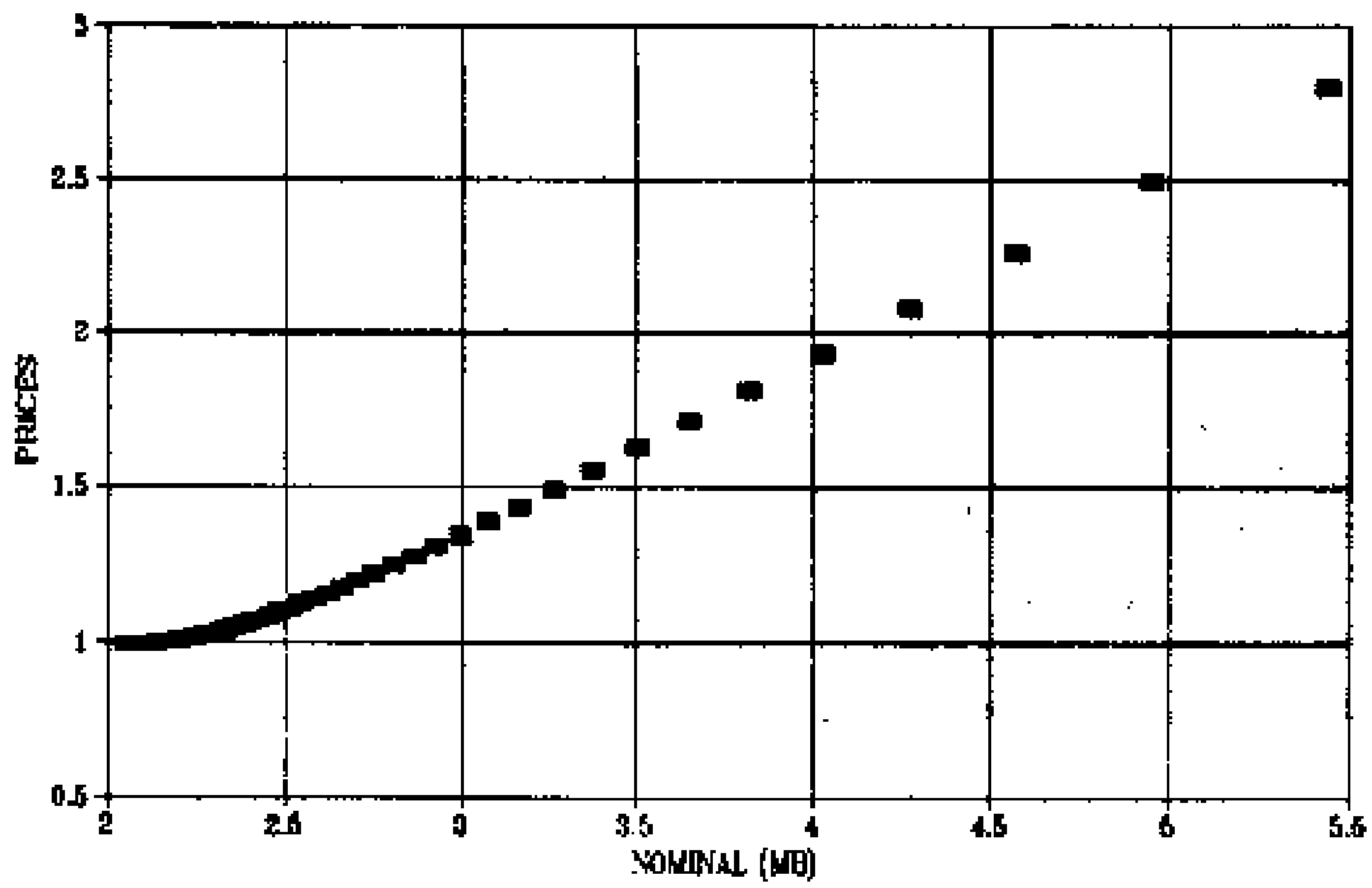

Figure 8

Figures 7 and 8 show the associations observed, during the implementation of the policy, between the level of prices and the level of the money stock, on one side, and the level of the "expanded aggregate" on the other. The first is, obviously, very different (in fact, just the opposite) of what the unaware "monetarist" would expect. The association between prices and the broader, "expanded aggregate" in Figure 8 seems to provide "a better fit".

Figures 9 and 10 tell a similar story. Figure 9 pictures the observed association between the rate of change of the money supply (which for the case of a negative primary deficit is negative and becoming more negative as the adjustment proceeds) and the rate of change of prices, i.e., the inflation rate. This association is ***negative***. Figure 10, instead, shows a clear ***positive*** association between the rate of change of the "expanded aggregate" and inflation. Again, casual observation would seem to lend little support that there is a connection between money and prices, or monetary expansion and inflation.

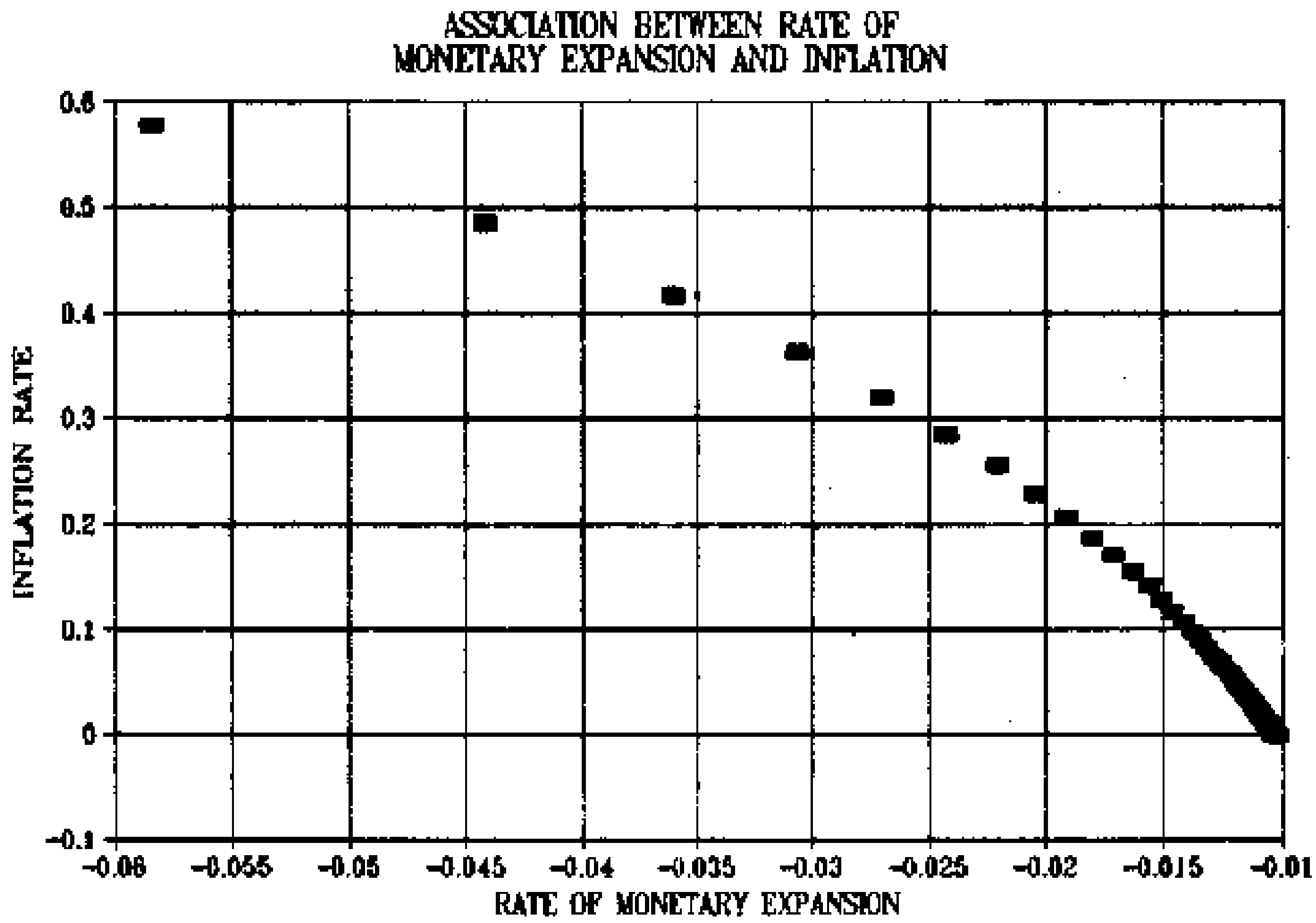

Figure 9

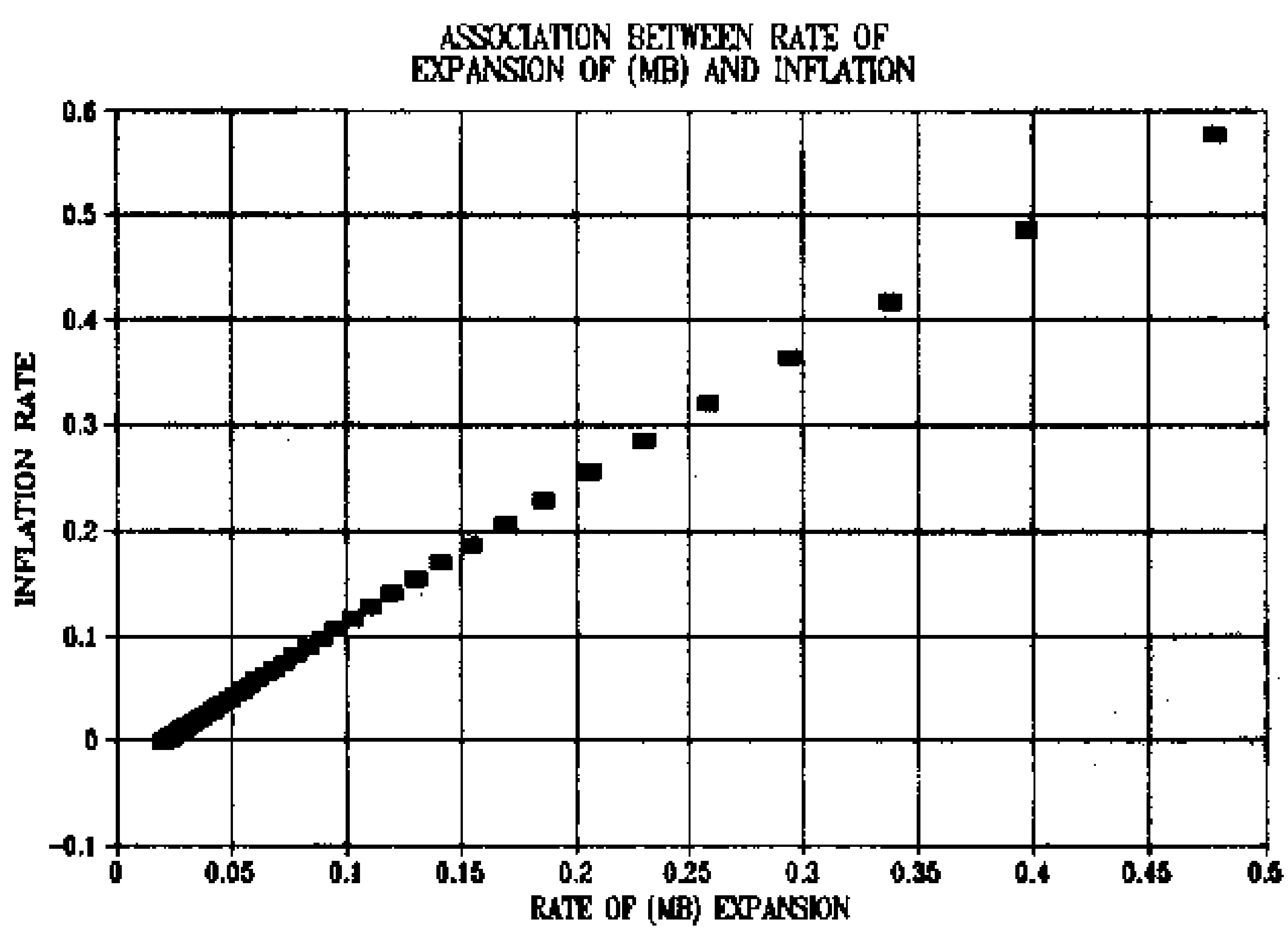

Figure 10

What about the "demand for money"? Of course, in the world of stylized facts described by the model, observation of the contemporaneous association between the real money stock and the inflation rate would show the correct result, that is simply the one stated by expressions [4] or [4']. But notice, on the other side, the association between the inflation rate and the level of the real "expanded aggregate", *MD*, shown in Figure 11: for the last part of the adjustment process, it is also a negative relationship.

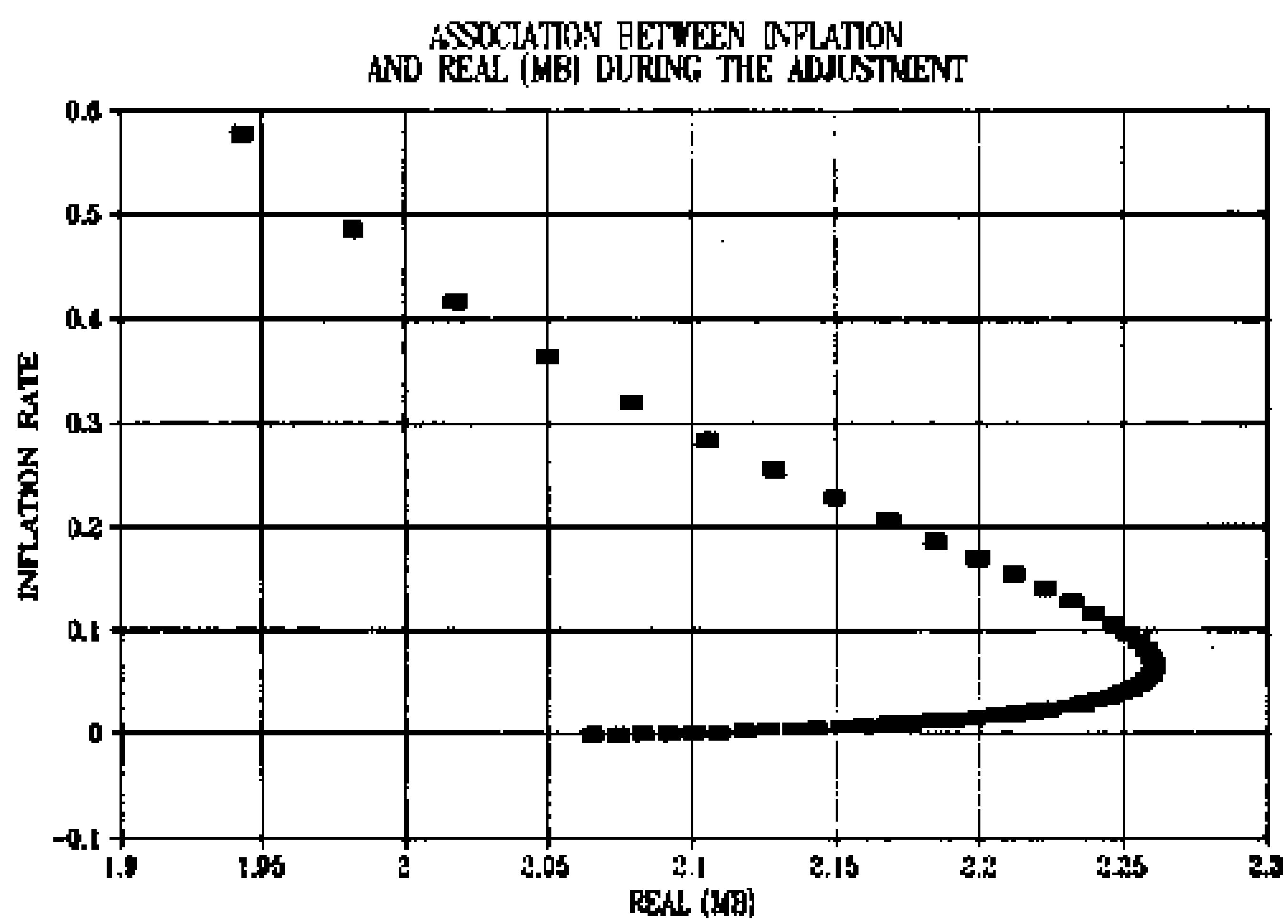

Figure 11

The nature, significance and possible implications of these associations are discussed in the following Section.

causes rises in this broad aggregate? Certainly not. Do changes in velocity *per se* cause inflation? Certainly not. Although changes in velocity do take place (velocity is increasing throughout the adjustment process), they should interpreted as a consequence of the inflationary episode, rather than as a cause of it. It is true that the financing of a constant real primary deficit requires an increasing rate of monetary expansion during the adjustment, but this is so only because the real money stock is falling, which again is part of the inflationary process being driven by the anticipation of higher future inflation. In fact, in the example we have used for the simulations, there was a primary surplus, and the rate of monetary expansion was decreasing throughout during the interim period.

What is the appropriate definition of money in our framework? There is, clearly, a stable function for "money" narrowly defined, which has indeed been the basis for the functioning of the model and the generation of the results. A correct prediction about the argument in the demand for money (the inflation rate), knowing the level of the nominal money stock, generates an exact prediction of the level of prices. The very monetarist idea that in a fundamental sense prices are associated with nominal money is preserved. All the conditions seem to be fulfilled for anybody to agree that the non-interest bearing money defined in this framework is what should be defined as "money".

What aggregate should be used for monetary control? At any given point in time the monetary authority cannot control the sum of money and debt (MD), but it is clear that changes in the composition of this total aggregate make the crucial difference for the future level of both its components. If the central bank is faced with an initial real outstanding debt and a given primary deficit, either a change in the rule according to which this composition is changed over time, or a one-time open market operation purchasing interest debt in exchange for non-interest bearing money, can stabilize the economy at a lower inflation rate. The paradox is, of course, that a higher rate of monetary growth (or a once-and-for-all increase in the nominal money stock) today can result in lower inflation and lower prices in the future. Is this an "antimonetarist" proposition? Certainly not. It is derived from the most "monetarist" of models.

Consider, instead, some of the conclusions that *could* be drawn based on partial observation, and disregarding the global interaction of the variables.

The first of those mistaken conclusions (and the easiest to dismiss) is that prices and inflation do not have much to do with monetary events, and that therefore "heterodox" policies are called for (price and wage controls) at least as complementary.

A more sophisticated interpretation would point out to the superiority of the "expanded aggregate" *MD* (the sum of money and debt) over money narrowly defined as both a predictor of prices and inflation, and the variable to be controlled. I.e., the "appropriate" definition of money would be the expanded aggregate *MD*. As it is clear from the simulations, regression analysis results in much better "fits" between *MD* and prices than between money and prices. Within this interpretation it would be easy to suggest not only that the best aggregate to take into consideration is the "expanded aggregate", but also, base on the "precedence" noted in Figure 6 for the final stages of the adjustment process), that prices "cause" the growth of *MD*, rather than the other way around. In fact, what is happening is that both variables (*MD* and prices) are driven by the "forward-looking" adjustment to a <u>future</u> higher rate of monetary expansion brought about by the initial conditions, the particular rule used by government and the terminal conditions. It is true, as it was pointed out earlier, that the constant primary deficit, financed exclusively through base money creation, requires ever increasing rates of growth of narrowly defined money. But notice that here it happens exactly the opposite, since we have a primary surplus.

Finally, there is also a corresponding mistaken interpretation concerning "monetary control": changes in the expanded aggregate is the best predictor and the "cause" for changes in prices, but in the short run the monetary authority cannot change this aggregate: an open market operation (a purchase of government debt) would not change *MD*. This mistaken observation leads to the frequent complaint that "the central bank has no 'instruments' or 'control' over monetary policy. The answer to this observation is, of course, that the important thing is not the total level of *MD*, but ***its composition***. Precisely, what the "passive monetary growth" policy did is to generate an inappropriate "mix" of the two assets money and debt, and a reversal back to inflation tax financing of the *total* deficit can anticipate the resolution of the crisis, at a long-run inflation rate lower than otherwise. Indeed, as mentioned before in the paper, there is the possibility of an unanticipated "once-and-for-all" purchase of part of outstanding debt. Such an operation would in general result in a once-and-for-all rise in prices, but it is possible, depending on the time at which it is implemented, for the proportion of the price rise to be smaller than the rise in money.

3.- Concluding Remarks

There is only a couple of concluding remarks.

- We have presented a "variation" of the classical Sargent and Wallace "unpleasant arithmetic". The policy, which seems to correspond to some observed episodes, is different than the "monetary rule" policy in Sargent and Wallace, but its consequences are very much the same.
- We find particularly interesting the associations implied by the policy, and the way in which they can be (and actually are) misleading in the interpretation of the causes for inflation, the appropriate definition of money and monetary control.
- Finally, it is fair to stress that we have not tried to explain why government would engage in such a policy (i.e., we have not "endogenized" government. Important (and difficult) as it is, this is clearly beyond the scope of this paper. The usual, often not rigorously specified explanations are the desire to trade less inflation today for higher inflation tomorrow, or the "political cycle". An additional possibility (also unproven) would be the requirements of a quick fall in the rate of monetary expansion emanating from international lending institutions.

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