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The Quantity Theory Favorably Reconsidered: II

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I have benefitted in writing this paper from extensive conversations with my colleagues, Tom Sargent and Neil Wallace. They are not responsible for any errors, and it should be point out that they disagree with the line of argument of the paper.

ABSTRACT

This paper considers a view commonly associated with the "quantity theory of money": that banks should face 100 percent reserve requirements. It argues first that the objectives of the quantity theorists' proposals were more than merely price level stability, and that in fact, price level stability was at most a secondary objective of their proposals. Second, it argues that these theorists had a world with distortions in mind with respect to their proposals. These are present in a special setting examined that (a) supports the imposition of 100 percent reserve requirements (on the basis of an unconstrained Pareto criterion), and (b) supports the view that these restrictions stabilize the price level and make its movements more "predictable."

The Quantity Theory Favorably Reconsidered: II

A long-standing debate focuses on the regulation of borrowing and lending, and whether or not a cogent economic rationale can be established for it. While at one time such regulation was concerned with the borrowing and lending of a large number of economic agents[1], the modern focus has been on whether or not "banks" should face limitations on lending. With regard to this question, one school of thought has held that banks should face 100 percent reserve requirements, or simply be money warehouses.[2]

This view has received little support. At one time this was no doubt due to its perceived "unrealistic"[3] nature. More recently, however, it has been argued that such a scheme is based on a misplaced emphasis on price level stability, and in fact, results in outcomes which are dominated by the "no intervention" competitive equilibrium outcome. In particular, Sargent and Wallace (1981, 1982) have constructed a model in which a subset of agents is prohibited from making loans. The portfolios of these agents consist entirely of stored fiat money. It is then shown that, for a special economy, this arrangement is not Pareto optimal. A laissez-faire arrangement is. Moreover, this is true despite the fact that restrictions on lending stabilize the price level in the Sargent-Wallace setting. Thus it is argued that restrictions on lending, which they refer to as a "quantity theory" regime, are suboptimal.

The Sargent-Wallace analysis is carried out for economies that "satisfy the quantity theory claims about the degree of price level fluctuations and even price level determinacy that

prevails with and without restrictions. Yet despite all this, the examples do not support the quantity theory position."[4] Sargent and Wallace then discuss in some detail the "weakness in the quantity theory view--namely, the basing of policy conclusions on assertions about desirable price level paths" (1981, p. 24).

This paper is an attempt to focus on two issues: what in fact the "quantity theory view" was/is, and whether or not some case can be made for such extreme restrictions on borrowing and lending as 100 percent reserve requirements, and the proposal made by Simons (, p. 165) that "all property (be) held in a residual equity or common stock form," which he clearly views as being on the same footing as reserve requirements. The line of argument that will be made is as follows. First, some quantity theory adherents, such as Simons, had no particular concern with what were "desirable price level paths." Rather price level stability was viewed as the means to achieving an end rather than as an end in itself. Second, it will be argued that the quantity theory adherents of price stability had in mind economies with various types of distortions. Thus, the Sargent-Wallace argument that a competitive equilibrium with complete markets is Pareto optimal while restricted lending is not, is not inconsistent with the quantity theory view. Third, it will be argued that the quantity theory position, as espoused by Simons, is meant to be applied only to economies with some kind of market incompleteness. Finally, a very specific setting is displayed in which markets are incomplete, and a cogent rationale can be constructed for the quantity theory position. In particular,

preventing certain agents from lending (a) stabilizes the price level, as in Sargent-Wallace (1981), (b) is Pareto improving, and (c) (somewhat redundantly) is deflationary relative to laissez-faire.

The scheme of the paper is as follows. Section I attempts an analysis of the quantity theory position, and in particular, of the kind of world its advocates had in mind. Section II presents a model very similar to that of Sargent and Wallace which validates some of the quantity theory claims. The only substantive feature of the economy which differs from that of Sargent and Wallace is the presence of random endowments, realized in such a way that this randomness cannot be insured against. This gives a setting in which markets are incomplete, so as to be in accord with the world envisioned by Simons. Section III contrasts the welfare properties of competitive equilibria in the presence and absence of lending restrictions which stabilize the price level. For particular parameter values, it is shown that the quantity theory regime dominates laissez-faire. Moreover, this is true even though the examples are structured so that all agents are risk-neutral with respect to the return on their portfolios. This risk neutrality is, in turn, meant to be favorable to laissez-faire regimes.

As a final point, it should be noted that the difference between the results here and those of Sargent and Wallace are driven by the incompleteness of markets in this paper, rather than the introduction of uncertainty per se. In particular, Sargent and Wallace state that (p. 24) "some may argue that our model is

rigged against the quantity theory because it abstracts from uncertainity.... We doubt that merely complicating the model to deal with additional phenomena would change its basic message." While this is true if markets are complete, such completeness does not seem consistent with the quantity theory view. When incompleteness is allowed for, government intervention of the quantity theory type can correct (partially) for some market incompleteness.

I. What is the Quantity Theory?

In order to evaluate the quantity theory advocacy of 100 percent reserve banking, it is necessary to determine how advocates of this position viewed the world. Sargent and Wallace associate the quantity theory position with two notions (p. 2):

> Quantity theorists take it for granted that it is desirable to avoid price level fluctuations and Wicksellian price level indeterminacy. They propose to accomplish this by legal restrictions on private intermediation. The legal restrictions are meant to separate "money creation" from credit creation."....

Sargent and Wallace then provide a critique of associating privately issued liabilities with fiat money, and of the inherent desirability of price level "stability," meaning for them lack of any movement in the price level over time.

This paper proceeds from the viewpoint that the Sargent-Wallace critique of this way of thinking about money is correct. However, it is not clear that leading advocates of the quantity theory "took for granted" the inherent desirability of price level stability. Thus, this section attempts to consider what the objectives of the quantity theorists were, and why these were viewed as worthy goals of policy. In order to do this, three reasonably clear statements of proposals for 100 percent reserve requirements are considered in some detail. The expositions chosen are those of Simons ( ), Friedman (1948), and Mints (1950).

A. The Desirability of Stable Prices

The Sargent-Wallace critique directs itself at advocates of smoothing predictable price level movements. In general, however, it is not clear that a "quantity theory position" can be associated at all directly with the inherent desirability of price stability, and more specifically, with any concern about predictable price level movements. With regard to the first point, Simons states that (p. 169) "some students propose...the stabilization of various price indexes...Of all...schemes, those which contemplate stabilization of price indexes are least illiberal; but they, too, are unsatisfying." He goes on to mention that (p. 174) "the shortcomings of price-index stabilization, as the fundamental basis of a monetary system, are numerous and serious..." However, "only the advocates of price-index stabilization have offered a feasible way out" (p. 175) of monetary policy dilemmas. Simons argues, by the way, that such stabilization

could best be achieved through alteration of government expenditure and taxation. In short, Simons did not take for granted that price stability was desirable, and we shall see below that he viewed such stability as a means to an end, rather than as an end in itself.

Generally speaking, it is not easy to find in these writers a concern with predictable variations in the price level. Even Irving Fisher, who Mints described (p. 10) as "the strongest (recent) supporter of a policy of stabilizing the price level" was not overly concerned with predictable movement. He argued (1925, p. 198) that nominal interest rates and inflation, rather than real interest rates alone, should be studied separately because "the rate of interest (in money) is always perceived while the rate of appreciation of money is not." Moreover, Fisher was concerned with producing stable and predictable inflation rates because of wage rigidities, and the subsequent effects of price variation on output. In particular (p. 179), "those fluctuations largely predetermine...fluctuations in trade." His concern was not with the price level itself.

Finally, Mints himself states that (p. 126) "we should not unnecessarily add the risks of unpredictable and devasting waves of inflation and deflation to those of changing demand..." Moreover, he makes clear (p. 125) why price level stability is desired.

> It should also be noted that as long as labor monopolies exist a rising price level not only invites labor disputes, it makes them

> inevitable. In a free labor market, wage rates would spontaneously rise with a rise in the price level, although possibly with some lag; but where wage rates are fixed by written contract, there is no way of raising them to the equilibrium level except by negotiation. A most certain way of bringing on industrial warfare in an extreme form is to encourage labor monopolies and then adopt a policy of constantly raising the price level. Because of the resulting work stoppages and of the uncertainties created by rising prices, it is highly probable that in fact the volume of output under conditions of rising prices would be less than with stable prices, despite the fact of a high level of employment and general prosperity.

In short, none of these authors seem concerned with price stability for its own sake, and several of them seem little concerned with predictable variations. In fact, we have seen that for Mints and Fisher, price stability was a means to the end of stabilizing output and labor markets (and, one might add, distorted labor markets). For Simons as well, price stability was not an end. He argues that (p. 181) it "matters little whether price-level stabilization is conceived as a definitive reform or as a transition expedient in a long-term program pointed toward the ultimate stabilization of the quantity of money." In short,

stability of the money supply is held as having more importance than stability of the price level. In fact, Simons claimed that (p. 183)

> A monetary rule of maintaining the constancy of some price index, preferably an index of prices of competitively produced commodities, appears to afford the only promising escape from present monetary chaos and uncertainties. A rule calling for outright fixing of the total quantity of money, however, definitely merits consideration as a perhaps preferable solution in the more distant future.

It is significant that price-level stability is viewed as an expedient, and that monetary stability is given ultimate priority.

At the least, then, one can argue that quantity theorists did not immediately assume that price-level stability had first priority as a policy objective, particularly when price level movements were viewed as predictable in nature. At most, one can interpret the quantity theory claim as a statement that price-level stability is a byproduct and an indication of an appropriately structured policy, but of minor interest in its own right. At any rate, it seems incorrect to conclude that (at least this set of) quantity theorists were willing to base "policy conclusions on assertions about desirable price level paths" independently of other considerations.

B. The Quantity Theory and the Structure of Markets

In this section it is argued that, in order to make sense of the quantity theory position, it is necessary to consider their proposals in the context of a world with distortions, and more generally, of a world where markets are incomplete.

In order to see this, we begin by noting that Simons and Mints coupled their proposals for 100 percent reserve banking with proposals for forcing corporations to be 100 percent equity financed. In particular, Simons proposed that (p. 171) "demand deposit banking would be confined (in effect, at least) to the warehousing and transferring of actual currency...Narrow limitation of the borrowing powers of other corporations would obviously be required..." to make the first restriction effective. However, Simons also refers to "the 100 percent reserve scheme-for which I still have no great enthusiasm save as part of a gradualist program whose objective is recognized...as gradual reduction and ultimate denial of borrowing and lending powers to all corporations..." (p. 229). Thus, Simons proposed complete equity finance of corporations. Mints also argues that (p. 186) "as part of the desirable changes in monetary-institutional arrangements in the United States, the volume of business indebtedness should be substantially reduced..."

The rationale for these joint proposals had to do with the presence of distortions in the economy. Simons states clearly that an economic arrangement where "short-term lenders are continuously in a position to demand conversion of their investments...is workable only on the basis of utopian flexibility of

prices and wage rates," (p. 166) and that "with adequate price flexibility, we could get along under almost any financial system" (p. 170). In other words, Simons appears to argue that under conditions of perfect competition: full-information, complete markets, and market clearing in atomless economies, there is no need to be concerned with the financial structure which arises. Mints also concerns himself with the degree of price flexibility, as does Friedman.

The distortions which Simons, Mints, and Friedman mention specifically have to do with monopoly and wage stickiness. These are recurring themes in all three works. Clearly, then, these authors have in mind a world with distortions. They also have in mind a world with much (presumably uninsurable) uncertainty. Mints deplores the (p. 8) "utter confusion and uncertainty in our monetary system," and argues that "a deliberately provided, definite, known monetary policy is a unique and indispensable means of reducing to a minimum variations in the expectations of the public" (p. 9).

More strongly, though, a modern economic theorist can only be at a loss if he/she attempts to make sense of the Simons-Mints proposal in the context of a complete markets setting. Their emphasis on equity versus debt finance of corporations cannot be made sense of in a complete markets model, as anyone familiar with the Modigliani-Miller theorem will be aware. Thus, any attempt to translate the Simons-Mints proposal into modern terms, which is not clearly doomed at the outset, requires that their views be considered in the context of a model where, at the

very least, markets are incomplete. Moreover, this seems not to be inconsistent with what they had in mind. Or, put otherwise, Simons (at least) seems to be aware that in a complete markets setting (such as that of Sargent and Wallace), the conclusion will be that no intervention in prevailing financial arrangements is necessary for efficiency.

In short, then, as Friedman states (p. 262), "the equilibrating mechanism (of the proposed changes) does not prevent disturbances from arising." What it "does accomplish is, first, to keep governmental monetary and fiscal operations from themselves contributing disturbances and, second, to provide an automatic mechanism for adapting the system to the disturbances that occur." We now turn our attention to the development of a model in which the quantity theory arrangements do help to mitigate the economic impact of certain disturbances.

II. The Model

A. Description

The model is a slight variant of the overlapping-generations model presented by Sargent and Wallace (1981). Time is discrete, and indexed by $t = 0, 1 \ldots$. At $t = 0$ there is a set of initial old agents who are in the last period of their life. Let C_1 (scalar) be consumption (of any agent) when young, and C_2 be consumption when old. Then the utility of these agents is simply C_2.

There are also a set of initial young agents at $t = 0$. These agents are of three types, α, β, and γ. They then become

old at t = 1, their last period of life. At t = 1 there appears a new young generation, etc. Each generation has (large) equal numbers of each type of agent, and within each generation there are equal numbers of α, β, and γ agents.

At the time each agent appears, he/she realizes a lifetime endowment stream, which for some agents is random. Let there be two states of nature, indexed by s = 1, 2, each occurring with probability (1/2). Then the state of nature is drawn prior to trading (perhaps prior to an agent's birth), so that in each period trading occurs poststate.

There are two kinds of commodities that an agent could (potentially) trade. The first is fiat money, and the second is consumption loans. We choose the single consumption good as numeraire. Money trades for the good at the rate Q(s) in state s (we focus on steady states, and hence omit time arguments) at each date, and circulates in fixed amount M forever. One unit of the consumption good lent in state s returns R(s) with certainty one period hence, so R(s) is the gross real rate of interest. There is no market in state contingent claims, which does not affect any results, but which does economize on notation.

The (state t dependent) preferences of agents are as follows: For an agent of type i we denote preferences by $[U_i(C_1,C_2,s)]$; i = α, β, γ. The presence of s as an argument indicates that when young, an agent realizes a particular form of his utility function as well as his endowment stream. Then, for purposes of constructing an example consistent with the quantity theory position, we let

$$U_\alpha(C_1,C_2,1) = C_1 + C_2$$

$$U_\alpha(C_1,C_2,2) = \ln C_1 + (.08765)\, C_2$$

$$U_\beta(C_1,C_2,s) = \ln C_1 + \phi(s)\, C_2$$

$$U_\gamma(C_1,C_2,s) = \ln C_1 + \rho(s)\, C_2.$$

We employ a very specific example, as we want merely to establish the possible desirability of restrictions on lending. The endowments of agents are as follows. If $s = 1$, type α agents have endowment stream $(\alpha_1,0)$, type β agents have endowment stream $(\beta_1,0)$, and type γ agents have endowment stream $(0,\gamma_1)$. If $s = 2$, these endowment streams are $(\alpha_2,0)$, $(0,\beta_2)$, and $(\gamma_2,0)$ respectively. Parameter values are $\alpha_1 = 5$, $\alpha_2 = 5.02$, $\beta_1 = 10$, $\beta_2 = 20$, γ_1, $= 20$, $\gamma_2 = 15$, $\phi(1) = \rho(1) = 1/8$, $\phi(2) = 1/12$, and $\rho(2) = 1/4$.

Finally, let $l_i(s)$ and $M_i(s)$ be the lending and money holdings respectively of a young type i agent when s is the realized state in his youth. $l_i(s) < 0$ implies that agents of type i are borrowers.

B. Equilibrium Under Laissez-Faire

Following Sargent and Wallace, we wish to compare the rational expectations competitive equilibrium which emerges under unrestricted borrowing and lending with that emerging under restrictions preventing certain types of agents from making loans. This section considers the laissez-faire (LF, or unrestricted) competitive equilibrium.

Under rational expectations and LF, agents' behavior is described by the solutions to the following set of maximization problems. Type α agents solve

$$\max \quad \alpha_1 - Q(1)M_\alpha(1) - l_\alpha(1)$$

$$+ \quad R(1)l_\alpha(1) + \left[\frac{EQ(s)}{Q(1)}\right] Q(1)M_\alpha(1)$$

if $s = 1$, and

$$\max \quad \ln[\alpha_2 - Q(2)M_\alpha(2) - l_\alpha(2)] + (.08765)$$

$$\{R(2)l_\alpha(2) + \left[\frac{EQ(s)}{Q(2)}\right] Q(2)M_\alpha(2)\}$$

if $s = 2$ by choice of $l_\alpha(s)$ and $M_\alpha(s) \geq 0$, taking $R(s)$ and $Q(s)$ as parametric. Type β agents solve

$$\max \quad \ln[\beta_1 - Q(1)M_\beta(1) - l_\beta(1)]$$

$$+ (1/8)\ \{R(1)l_\beta + \left[\frac{EQ(s)}{Q(1)}\right] Q(1)M_\beta(1)\}$$

if $s = 1$, and

$$\max \quad \ln\left[-l_\beta(2)\right] + \left(\frac{1}{12}\right)\left[\beta_2 + R(2)l_\beta(2)\right]$$

if $s = 2$, subject to $M_\beta(s) \geq 0$. Similarly, type γ agents solve

$$\max \quad \ln\left[-l_\gamma(1)\right] + (1/8)\left[\gamma_1 + R(1)l_\gamma(1)\right]$$

if $s = 1$, and

$$\max \quad \ln[\gamma_2 - l_\gamma(2) - Q(2)M_\gamma(2)]$$

$$+ (1/4)\ \{R(2)l_\gamma(2) + \left[\frac{EQ(s)}{Q(2)}\right] Q(2)M_\gamma(2)\}$$

if $s = 2$, subject to $M_\gamma(s) \geq 0$.

If we restrict our attention to equilibria in which fiat money has value ($Q(s) > 0$ $\forall s$), then an equilibrium under LF will have at least one agent holding both loans and money in positive amounts $\forall$ s. This requires

$$(1) \qquad R(s) = \frac{EQ(s)}{Q(s)} \quad \forall\ s.$$

Then in equilibrium, the optimizing choices $l_i(s)$ and $M_i(s)$; $i=\alpha, \beta, \gamma$, obey

$$(2) \qquad \begin{aligned} &Q(1)M_\alpha(1) + l_\alpha(1) = \alpha_1;\ R(1) > 1 \\ &Q(1)M_\alpha(1) + l_\alpha(1) \in [0,\alpha];\ R(1) = 1 \\ &Q(1)M_\alpha(1) + l_\alpha(1) = 0;\ R(1) < 1, \end{aligned}$$

$$(3) \qquad Q(2)M_\alpha(2) + l_\alpha(2) = \alpha_2 - (.08765)\ R(2)^{-1}$$

$$(4) \qquad \begin{aligned} &Q(1)M_\beta(1) + l_\beta(1) = \beta - \frac{8}{R(1)} \\ &-l_\beta(2) = \frac{12}{R(2)},\ M_\beta(2) = 0 \\ &-l_\gamma(1) = \frac{8}{R(1)},\ M_\gamma(1) = 0 \end{aligned}$$

$$(5) \qquad Q(2)M_\gamma(2) + l_\gamma(2) = \gamma_2 - \frac{4}{R(2)}.$$

Definition. A rational expectations competitive equilibrium (with valued fiat money) is a positive vector $[R(1), R(2), Q(1), Q(2)]$ such that $\forall$ s

a) $$\sum_i l_i(s) = 0$$

b) $$\sum_i M_i(s) = M.$$

It is easy to compute equilibrium values for this economy. These are $R(1) = 1.164$, $R(2) = .8765$, $Q(1)M = 1.254$, and $Q(2)M = 1.666$. For future reference, it will be useful to compute the levels of expected utility realized by agents who are young in different states under this equilibrium. As a shorthand, let $EU_i(LF,s)$ denote the expected utility attained by agents of type i under LF when the realized state in their youth is s. Then

$$EU_{\alpha}(LF,1) = .82$$

$$EU_{\alpha}(LF,2) = 46.8974$$

$$EU_{\beta}(LF,1) = 2.383$$

$$EU_{\beta}(LF,2) = 3.2834$$

$$EU_{\gamma}(LF,1) = 2.5943$$

$$EU_{\gamma}(LF,2) = 3.805.$$

C. Equilibrium Under a "Quantity Theory" Regime.

Following Sargent and Wallace, a quantity theory (QT) regime prohibits certain agents from lending. This is meant to be an analog to restricting banks from lending (100 percent reserve requirements). Rather than impose a legal minimum on the real value of loans, as Sargent and Wallace do, however, we simply impose

$$l_{\alpha}(s) = 0;\ s = 1,2. \quad (6)$$ 5/

Under these circumstances, type α agents are clearly limited to the storing of money when young. Then their desired portfolio, given (6) obeys

$$Q(1)M_{\alpha}(1) = \alpha_1;\ \frac{EQ(s)}{Q(1)} > 1$$

$$Q(1)M_{\alpha}(1) \in [0,\alpha_1];\ \frac{EQ(s)}{Q(1)} = 1 \quad (7)$$

$$Q(1)M_{\alpha}(1) = 0;\ \frac{EQ(s)}{Q(1)} < 1$$

if $s = 1$ and by

$$Q(2)M_{\alpha}(2) = \alpha_2 - \left[\frac{.08765}{EQ(s)}\right]Q(2) \quad (8)$$

if s = 2. It is also the case that under QT (restriction (6)), type β and γ agents never hold money. Hence the desired portfolios of these agents are described by (4) and (5) plus

(9) $\quad M_i(s) = 0;\ i = \beta,\gamma,\ s = 1,2.$

An equilibrium for this economy is defined as previously. It is then easily verified that the rational expectations, competitive equilibrium under QT has R(1) = 1.6, R(2) = 1.067, and Q(1)M = Q(2)M = 4.932. We can also compute

$$EU_\alpha(QT,1) = 0$$

$$EU_\alpha(QT,2) = 53.8388$$

$$EU_\beta(QT,1) = 2.61$$

$$EU_\beta(QT,2) = 3.0868$$

$$EU_\gamma(QT,1) = 2.2761$$

$$EU_\gamma(QT,2) = 4.3227.$$

III. A Welfare Comparison of Regimes.

A. Choice of Criterion

In this section a welfare comparison of the LF and QT regimes is undertaken on the basis of the following criterion. The expected utility of the initial old, and of young agents of each type at all dates is computed on the basis of information available prior to the realization of any state of nature (including that for t = 0). By this means of evaluating utility under the two regimes, we will show that the QT regime Pareto dominates LF. However, there are various other ways to evaluate the two regimes, so that some time is taken now to defend this criterion.

What we have in mind for our criterion is that a policy-maker, prior to observing state realizations for an economy, must make a once-and-for-all decision about which regime is to prevail. Hence the criterion chosen is an intuitively appealing one. However, there are alternate views regarding the appropriate welfare criterion. Neil Wallace has suggested that an appropriate criterion is to ask whether the QT regime makes all agents in all states better off than does the LF regime. This would constitute evaluating the welfare properties of equilibria on the basis of the Social Nash Optimality criterion advanced by Grossman (1977). Since under fairly weak assumptions any competitive equilibrium is a Social Nash Optimum, the LF regime will not be dominated by the QT regime under this criterion.

However, this seems to me not to be an attractive criterion for this purpose. First, the QT proposals are meant to be changes in market structure. Hence it is inappropriate to evaluate them on the basis of welfare criteria that evaluate allocations relative to market structure. Moreover, relatively weak optimality criteria, such as Social Nash optimality, are meant primarily as means of characterizing equilibria. They are not proposed as "concept(s) a planner would desire to use."[6/] Thus, we proceed here with the unrestricted optimality concept described above.

B. Superiority of QT

From data in section B, we can compute that the ex ante expected utility values under LF $((1/2)EU_i(LF,1) + (1/2)EU_i(LF,2))$ are

$$EU_{\alpha}(LF) = 23.8587$$

$$EU_{\beta}(LF) = 2.8332$$

$$EU_{\gamma}(LF) = 3.1997.$$

From data in Section C we have

$$EU_{\alpha}(QT) = 26.9194$$

$$EU_{\beta}(QT) = 2.8484$$

$$EU_{\gamma}(QT) = 3.2994.$$

Thus, on the basis of an unconstrained Pareto comparison, the QT regime dominates LF for all young agents at all dates. The QT regime is also preferred by the initial old regardless of their utility functions, as real balances rise in each state under QT relative to LF.

Thus, the QT regime Pareto dominates the LF regime, as claimed. It also has associated with it a lower price level than that obtaining under LF in either state, and QT stabilizes the price level. This latter result deserves some discussion.

Examination of the optimal portfolio for type α agents young in $s = 1$ indicates that if $Q(1) = Q(2)$, any level of real balances in the closed interval $[0,5]$ leads to the same level of expected utility. Thus, it might seem that $Q(s)$ should be indeterminate under QT. However, the only equilibrium level of real balances in $s = 1$ is 4.932. ($QM = 0 \neq s$ is also an equilibrium, but following Sargent and Wallace we ignore this possibility.) To see this, suppose that there was an equilibrium with $Q(1) \neq Q(2)$. Then there are two possibilities. (i) $EQ(s) > Q(1)$. In this case, $Q(1)M = 5$. However, then $EQ(s) < Q(2)$, so $Q(2)M < 4.932$. Clearly $Q(1)$ cannot be less than $EQ(s)$ as claimed,

so a contradiction results. (ii) $EQ(s) < Q(1)$. Then $Q(1)M = 0$, and $EQ(s) < Q(1)$ is impossible. Hence the only equilibrium has $Q(1) = Q(2)$. But if $Q(2) = EQ(s)$, $Q(2)M = 4.932$, and so $Q(1)M = 4.932$ must hold as well. Thus, the equilibrium price level is determinate and stable under QT.

C. Comments

At this point several comments are in order. The first is that, as the nature of the example indicates, it is fairly challenging to produce an economy for which all of the quantity theory claims hold (if one attempts to include complete price level stability across states). One-hundred percent reserve banking is a fairly extreme proposal, and for general economies not easy to validate. This point is of more importance than merely as a caveat, however. The proponents of the quantity theory uniformly tend/tended to emphasize the limitations of economists' knowledge, and to use this as one (of several) rationale(s) for "rules over discretion." It should be noted that a great deal of highly specific knowledge regarding an economy would be required to determine whether QT dominates LF for even very simple economic structures, or even whether QT would succeed in stabilizing the price level. This seems to be one reason to be highly skeptical of the quantity theory proposal.

The second is that even the example above does not validate the quantity theorists' proposals if these are taken to include the abolition of private credit. If $l_i(s) = 0$ ~~v~~ i,s, is imposed on the economy considered, price level stability is impossible to attain. In fact, price level variance would be

larger under such a regime than under LF. This is another reason for skepticism regarding the quantity theory proposals.

Finally, though, it should be noted that only a minor step has been taken here towards the economic world described by the quantity theorists. Additional market incompleteness, monopoly power, and informational limitations could provide further support for the quantity theory view. In particular, private information could provide grounds other than efficiency for the quantity theory proposals. However, on the basis of efficiency grounds alone, Smith (1982) provides some reason to think that informational limitations and the presence of (some) monopoly would place emphasis on a rediscounting role of a central bank, which the quantity theorists propose to eliminate.

IV. Conclusions

Restrictions on the ability of various agents to lend have a long history. In 15th century England, for instance, there were restrictions against lending by various private (i.e., non-bank) agents.[7] The model of the previous sections captures this quite closely. In the modern period, these restrictions have typically been against banks. The model above can be viewed as an analog to a world in which some agents (bankers) face prohibitions on lending (100 percent reserve requirements). This type of world corresponds to that suggested by Friedman (1960), Mints (1950), and Simons ( ).

The "frequent anticredit measures of the Crown"[8] in the 15th century have been viewed by contemporary economists as simply growing out of bullionist sentiment. Similarly, the quantity

theory restrictions discussed here have been viewed as being based on a misplaced emphasis on price level stability. In fact, however, in a world where markets are incomplete, welfare justifications for these types of restrictions are easy to construct.

The quantity theory view, at least as expounded by Simons, Mints, and Friedman (1948), is also much more complex than merely an argument in favor of stable prices. Rather, it is a proposal for how monetary policy should be conducted in an economy with distortions of various types, and in which uncertainty impinges on the decisions of investors. While it is far from clear that the presence of these elements validates the quantity theory view, it is also far from clear that the quantity theory position lacks internal coherence.

Footnotes

1/ Postan (1927).

2/ See Friedman, pp. 65-75, or Simons, p. 163.

3/ Friedman, p. 75.

4/ Sargent-Wallace (1981), p. 4.

5/ For the parameter values of the example, there is no legal minimum which is adequate to stabilize the price level and maintains positive levels of private credit. However, it would present no difficulty to alter parameter values in a way which would permit the Sargent-Wallace restriction to work here.

6/ Grossman and Hart (1979), p. 318.

7/ See the discussion by Postan, pp. 240-243.

8/ Postan, p. 241.

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