On the Quantity Theory of Money, Credit, and Seigniorage

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Absrtract

According to this note, the sectoral approach towards a quantity theory of credit is too vague in its predictions. A quantity theory of seigniorage approach is proposed in its place, arriving at the conclusion that the financial system may be held responsible for price and output fluctuations to the extent commercial bank seigniorage alters the stock of money in circulation considerably. If not, the financial sector can become the source of instability by affecting profitability in the real sector through a Goodwin-type interaction. These trends could be countered by an interest rate rule based on deposit habits and on the deposit rate, and supplemented perhaps by a policy of influencing these habits and manipulating the deposit rate.

Keywords: Quantity theory, Commercial bank seigniorage, Instability
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1. Introduction: The Sectoral Quantity Theory

Professor Werner has been advocating a quantity theory of credit as a means of answering questions about *inter alia* the definition of money, the declining velocity, and financial crises, (see e.g. Werner, 1992, 1997, 2009, 2012). By breaking down Fisher's (1911) equation of exchange into one part referring to the real sector of the economy, and into a second part regarding the financial sector, as proposed originally by Keynes (1930), Werner focuses in essence on the propagation of the business cycle by the financial system, which was a matter of similar concern by the early Chicago version of the quantity theory of money, (see e.g. Simons 1936). Nevertheless, although breaking down the equation of exchange as proposed not only by Keynes but by Fisher himself too can be empirically important, such a break-down proves to be of limited predictability.

Let total nominal transactions, Y, be the sum of the transactions Y_1 and Y_2 in sectors 1 and 2 of the economy, respectively:

$$Y \equiv Y_1 + Y_2 \qquad (1)$$

And, let the total stock of money, M, consist of the stocks employed in these two sectors:

$$M \equiv M_1 + M_2 \qquad (2)$$

Following Keynes (1930), the overall velocity of the economy, $V=Y/M$, is the sum of the true, sectoral velocities, $V_1=Y_1/M_1$ and $V_2=Y_2/M_2$, weighted the former by $m=M_1/M$ and the latter by $1-m=M_2/M$:

$$V = mV_1 + (1-m)V_2 \qquad (3)$$

The total differential of (3) is: $dV=mdV_1+(1-m)dV_2$. Setting $dV=0$ and solving for dV_2/dV_1, one obtains that:

$$dV_2/dV_1 = -m/(1-m) = -M_1/M_2 \qquad (4)$$

which in the space V_1-V_2 of Figure 1 is depicted as the "iso-velocity" line *AB*; the slope $\varphi \equiv -m/(1-m) = -M_1/M_2$.

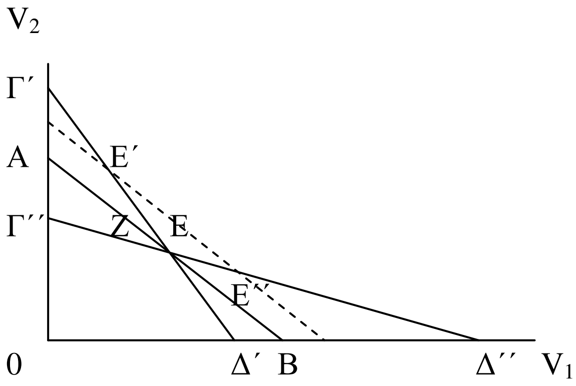

Figure 1

Next, substituting the sectoral velocities, $V_1 = Y_1/M_1$ and $V_2 = Y_2/M_2$, in (2) yields that:

$$M = (Y_1/V_1) + (Y_2/V_2)$$

whose total differential gives when $dM=0$ that:

$$dV_2/dV_1 = -(1-y)/y = -Y_2/Y_1 \qquad (5)$$

where $y = Y_1/Y$ and $1-y = Y_2/Y$. The "iso-money" line $\Gamma\Delta$, having slope $\psi \equiv -(1-y)/y = -Y_2/Y_1$, thus obtains in Figure 1. It may coincide with *AB*, or cut it from above, as $\Gamma'\Delta'$ does, or below, as $\Gamma''\Delta''$ does. Two points need to be made now: Firstly, given $\Gamma\Delta$, its intersection point with *AB*, point *E*, is the point at which both $dV=0$ and $dM=0$. Suppose, for instance, that *AB*, $\Gamma'\Delta'$, and *Z* is the case. *Z* is on a $\Gamma\Delta$ below $\Gamma'\Delta'$; that is, given the *V* connected with *AB*, the stock of *M* required to sustain the volume of transactions associated with $\Gamma'\Delta'$ is too small. Increasing this stock, the iso-money line passing through *Z* will start shifting upward, sliding from *Z* to *E*. The second point needed to be made is that ψ gives the sectoral composition of *Y*, and that a single φ can be consistent with many ψ's as Figure 1 illustrates by having $\Gamma'\Delta'$ and $\Gamma''\Delta''$ passing through the same point *E* on *AB*. Figure 2 illustrates that a single ψ can be consistent with various φ's, too.

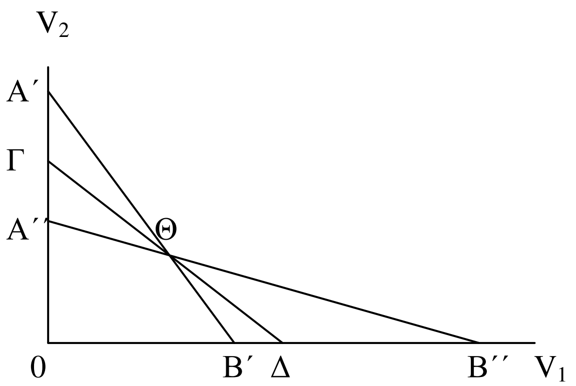

Figure 2

Therefore, a change in the sectoral velocities with unchanged the overall one, V, a pivot of AB centered at E in Figure 1, provides no information about a would-be change in the sectoral composition and volume of total transactions. Similarly, a pivot of $\Gamma\Delta$ centered at Θ in Figure 2, offers no insight as to would-be changes in V and in sectoral velocities. Also, a change, an increase, say of V given its sectoral composition, a parallel shift of AB upwards, cutting $\Gamma'\Delta'$ and $\Gamma''\Delta''$ at E' and E'', respectively, can be taken to mean one out of four things. Given the composition of transactions, either that $\Gamma'\Delta'$ has shifted to the right passing now through E'', or that $\Gamma''\Delta''$ has shifted upwards passing now through E'. And, given the overall volume of transactions, either that its composition has changed from that described by $\Gamma'\Delta'$ to the one captured by $\Gamma''\Delta''$, or the opposite. These are the four eventualities in case of a shift in AB including a change in slope as well. Analogous remarks can be made about the shifts of $\Gamma\Delta$ given AB in Figure 2, all pointing to the conclusion that without guidance from empirical observation towards the identification of that "eventuality" which is empirically relevant,… anything goes.

2. A Quantity Theory of Seigniorage

There do exist a few empirical investigations of sectoral velocities, notably by Selden (1961), McGouldrick (1962), Garvey and Blyn (1969), and Ireland (1991). To our knowledge, they are the only ones, and they too reflect implicitly or explicitly that the ultimate concern is the financial instability coming out of commercial bank seigniorage, in the spirit always of the early Chicago tradition. Indeed, the nexus between such seigniorage and real economic activity is what prompts in the first place the interest in disaggregation, in a quantity theory of credit. But, disaggregation, differentiation of the source of instability, is one thing, and decomposition, the explicit sectoral modeling, another. The focus is on the interaction between these sources and not on the sources *per se*. Toward this direction, note that the distinction between central and commercial bank seigniorage does reflect such a source differentiation. Consequently, once a quantity theory of seigniorage is advanced, once central and commercial bank seigniorage are incorporated directly in the equation of exchange as a sum, disaggregation becomes built in this sum. It is an approach to instability, which will not have to cope eventually with the vagueness characterizing sectoral modeling results as follows:

In the absence of commercial banks or the same, under a 100% reserve system, and central bank only seigniorage, S, we have that, $S=i(H/P)$, where H is the monetary base, P is the price level, and i is the nominal interest rate. From the real-sector quantity-theory equation, $H=kPQ$ and hence, $S=i(kPQ/P)=>S=ikQ$, where Q is real income and $1/k=V$ is the velocity of circulation. In the presence of a commercial banking system benefiting from commercial bank seigniorage, $Ş=[i(1-\rho)-r_n]D/P$, under a required reserve ratio $\rho\leq 1$ on deposited money $D/P=\lambda Q$ and under a deposit rate r_n, total seigniorage is the sum $S+Ş=(ik-\lambda r_n)Q$, given that $H=F+D$, where F is cash (see e,g. Baltensperger and Jordan, 1997). Now, note that what banks do mostly is producing bank money out of their own bank money given a token of D. That is, $PŞ$ is the output and money of the banking system, or in terms of the sectoral notation above, Y_2 and M_2, implying that V_2=1, dV_2=0, and $dV=dV_1$: An additional unit of bank money can be produced instead of rotating an already existing one, and any observed change in velocity comes out not from change in the financial sector *per se*, but from the impact of financial change on the real sector.

So, letting $M \equiv S+Ş=(ik-\lambda r_n)Q$ the overall quantity equation, $MV=PQ$ becomes: $(ik-\lambda r_n)QV=PQ =>=[i(1/V)-\lambda r_n]V=P=>(i-V\lambda r_n)=P=>$

$$i=P+V\lambda r_n$$

which in conjunction with the definition that $i=r+\pi$, implies that: $P+V\lambda r_n= r+\pi=>$

$$V=(r+\pi-P)/\lambda r_n \qquad (6)$$

where r is the real rate of interest and π is the inflation rate. Setting dV=0 in the total differential of (6), yields that: $dr+d\pi-dP=(r+\pi-P)[(1/\lambda)d\lambda+(1+r_n)dr_n]$, which given that from (6), $r+\pi-P=V\lambda r_n$, the velocity, V^*, which is consistent with dV=0 is:

$$V^*=(dr+d\pi-dP)/(r_n d\lambda+\lambda dr_n) \qquad (7)$$

Noting that $\pi=(P-P_{-1})/P_{-1}$ and $\pi_{-1}=(P_{-1}-P_{-2})/P_{-2}$, (7) may be rewritten as follows:

$$PP_{-2}-P_{-1}^2+P_{-1}P_{-2}[dr-V^*(r_n d\lambda+\lambda dr_n)]=0 \qquad (8)$$

where subscripts "-1" and "-2" denote time lags. We have clearly a complicated cubic equation in prices, capturing price instability with constant V at V^*. Setting $P=P_{-1}=P_{-2}$ in (8), which would be the case of price stability, the condition that $dr-V^*(r_n d\lambda+\lambda dr_n)$ =0 has to be satisfied. It is a necessary but not sufficient condition, because zeroing the bracketed term in (8) gives that $PP_{-2}-P_{-1}^2$=0, which again is a necessary but not sufficient condition by itself for price stability. Stability presupposes the satisfaction of both conditions. Setting for simplicity but plausibly P_{-2}=1 in (8), the latter condition becomes: $P=P_{-1}^2$; it is a condition for geometric price reduction.

Next, setting dM=0 and dV=0 in the total differential of $M=[i(1/V)-\lambda r_n]Q$, one obtains that $Qdi+idQ=V^*(r_n d\lambda+\lambda dr_n)Q+V^* \lambda r_n dQ$, or letting $dQ=Q-Q_{-1}$ and Q/Q_{-1}= 1+g:

$$Q\{(1+g)[i+di-V^*(r_n d\lambda+\lambda dr_n)-V^* \lambda r_n]-(i-V^* \lambda r_n)\}=0 \qquad (9)$$

According to (9), given M and V, the composition of M alone does provoke output instability too, as expected, because keeping M and V constant, price changes should be offset by output changes. This can be seen by solving (8) for $V^*(r_n d\lambda+\lambda dr_n)$ and inserting the resulting expression of P's in (9). Note that under price stability, that is, under $dr-V^*(r_n d\lambda+\lambda dr_n)$=0 and $d\pi$=0, (9) given that $di=dr+d\pi$ becomes: $gQ(i-V^* \lambda r_n)$=0, which implies that steady growth under price stability presupposes an i equaling to $V^* \lambda r_n$. This interest rate rule that $i=V^* \lambda r_n$, takes the place of the condition of geometric price decline, needed for price stability beyond the condition that $dr-V^*(r_n d\lambda+\lambda dr_n)$=0. V, λ, and r_n are not quantities that change every day. V and λ reflect *inter alia* consumer habits while r_n changes sporadically. Consequently, in practice, the interest rate rule is really one about interest rate stability; price stability would be indeed corroborated by interest rate stability. This is what the condition that $dr-V^*(r_n d\lambda+\lambda dr_n)$=0 is about too, because if in practice $d\lambda$=0 and dr_n=0, this condition amounts to dr=0, which when coupled with $d\pi$=0, implies that $di=dr+d\pi$=0+0=0. It appears that in practice, one should be the policy rule, namely that di=0.

It also appears that the stricter, Friedman's rule that i=0 would apply only if r_n=0; both S and $Ş$ would be zero in this case, which of course would be in the spirit under which this rule was advanced initially disregarding commercial banking: namely, elimination of central bank seigniorage. Incorporating commercial banks into the discussion, the elimination of commercial bank seigniorage too, would come as the natural extension of Friedman's rule. But, would such an extended Friedman rule would be sensible policy-wise beyond the weaker requirement that di=0? According to (8) and (9), failure to abide by this weaker rule does produce price and output instability even if M and V are held constant; but much more so when M changes since $M=(ik-\lambda r_n)Q$. And, responsible for this change should be held the financial system given that the bulk of M is easily expandable commercial bank seigniorage. It seems to the authors that under these circumstances the extended Friedman rule should be a must if of course it was decided to be followed. Nevertheless, the k-percent rule advanced by Friedman (1960) too, is more practical and a policy of di=0 should be seen as its natural companion.

3. Conclusion: Instability and Monetary Policy

Bank money has own life for which discretionary monetary policy cannot do much. For example, a policy keeping M constant under a Goodwin-type interaction between bank and firm profitability, would be ineffective as follows: Total firm revenues are $PQ \equiv Y \equiv MV$, and are made possible through lending Π_b to pay capital and labor expenses in such a manner that:

$$d\Pi_f/dt=\Pi_f(Y-\beta\Pi_b) \qquad (10)$$

where f and b designate the firms and the bank sector, respectively, t is time, β is some positive constant reflecting the availability of lending, and Π captures profits. That is, the change rate of profit for firms depends on whether lending is enough to keep sustaining a given volume of transactions. Variations in lending that leave Y constant by manipulating prices and quantities on the part of firms, become fully mapped into profit variations.

The profit of the banking sector is the bank money loaned to the firms, and based on $D=\zeta d\Pi_f$, i.e. $(i-r_n)\zeta d\Pi_f$, in such a manner that: $(i-r_n)\zeta d\Pi_f= \beta\Pi_b+\xi$, and that:

$$d\Pi_b/dt=\Pi_b[(i\text{-}r_n)\zeta d\Pi_f-\xi] \qquad (11)$$

The term $\xi=(1-\beta)\Pi_b$ is a constant, reflecting normal profit by the banks, covering their opportunity cost and that would keep them in operation under the worst of circumstances. In effect, bank money, bank lending, and commercial bank seigniorage become synonymous to supernormal bank profit.

Equations (10) and (11) are Lotka-Volterra ones, having firms being the prey of predating banks for bank profit beyond the normal one. The two critical points for stationariness are: $\Pi_f^*=\xi/(i\text{-}r_n)\zeta$ and $\Pi_b^*=Y/\beta$ in connection with a cycle of period equal to $2pi/\surd Y\xi$ and with the firms cycle leading by (1/4)th of this period, where pi=3.14159… Now, having S changing over the cycle to be keeping M constant would not alter this course of things given that $(i\text{-}r_n)\zeta d\Pi_f$=Ş. Such a policy would be useful only to the extent that V does not respond adequately to the cycle as it did happen with the Great Crash in 1929.

References

Baltensperger, E. and T.J. Jordan (1997), "Seigniorage, Banking, and the Optimal Quantity of Money", *Journal of Banking & Finance*, 21(6), pp. 781-796.

Fisher, I. (1911), *The Purchasing Power of Money*, New York: Macmillan.

Friedman, M. (1960), *A Program for Monetary Stability*, New York: Fordham University Press.

Garvy, G. and M. R. Blyn (1969), *The Velocity of Money*, New York: Federal Reserve Bank of New York.

Goodwin, R. M. (1967), "A Growth Cycle", in C. H. Feinstein (ed.): *Socialism, Capitalism and Economic Growth*, Cambridge, pp. 54-58.

Ireland, P. N. (1991), "Financial Evolution and the Long-Run Behavior of Velocity: New Evidence from U.S. Regional Data", *Federal Reserve Bank Richmond Economic Review*, vol. 77 (November / December), pp.16-26.

Keynes, J.M. (1930), *A Treatise on Money*, London: Macmillan.

McGouldrick, P. F. (1962), "A Sectoral Analysis of Velocity", *Federal Reserve Bulletin*, December issue, pp.1557-1570.

Selden, R. T. (1961), "The Postwar Rise in the Velocity of Money : A Sectoral Analysis", *Journal of Finance*, 16(4), pp. 483-545.

Simons, H. (1936), "Rules versus Authorities in Monetary Policy", *Journal of Political Economy*, Vol. 44(1), pp. 1-30.

Werner, R. A. (1992), "Towards a Quantity Theorem of Disaggregated Credit and International Capital Flows", Royal Economic Society Annual Conference, York, April 1993.

Werner, R. (1997), "Towards a New Monetary Paradigm: A Quantity Theorem of Disaggregated Credit, with Evidence from Japan", *Kredit und Kapital*, Vol. 30, pp. 276-309.

Werner, R. (2009), "Applying the Quantity Theory of Credit: The role of the ECB in the propagation of the European financial and sovereign debt crisis and the policy implications", link at: www2.euromemorandum.eu/uploads/werner_ qtc_ ecb_and_policy.pdf.

Werner, R. (2012), "Towards a New Research Programme on "Banking and the Economy"- Implications of a Quantity Equation Model for the Prevention and Resolution of Banking and Debt Crises", *International Review of Financial Analysis*, Vol. 25, pp. 94-105.