Paying with a type of government bond as a supplement in a dollarized country

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November 25, 2016

Abstract

A country that does not issue its own currrency is dependent on a foreign currency, for example USD or EUR (we use "$" for convenience in this note). The country's government is then extra constrained, because it cannot create more national currency when needed. At the same time there may be a strong political resistance to leaving the foreign currency and (re)introducing a national currency. This paper discusses the alternative of introducing some nationally issued instrument that can function as an *additional* means of payment, not only from the government to providers, but also between agents in the private sector. The option launched here is a form of bond that the government uses to pay providers and individuals, in addition to using the scarce foreign currency. For such bonds to gain confidence, it is assumed that they may be used to pay taxes, counting at the nominal foreign currency value of the issued bond.The bond exists only as an electronic deposit at the central bank, not as a paper document.

This paper will discuss the workings of a parallel means of payment, a measure introduced by a Central Bank and government in a situation where the country does not issue its own currency. The foreign money used in the country will for convenience here be called "dollars", with symbol ”$”. But the analysis applies also to eurozone countries. We refer to figure 1.

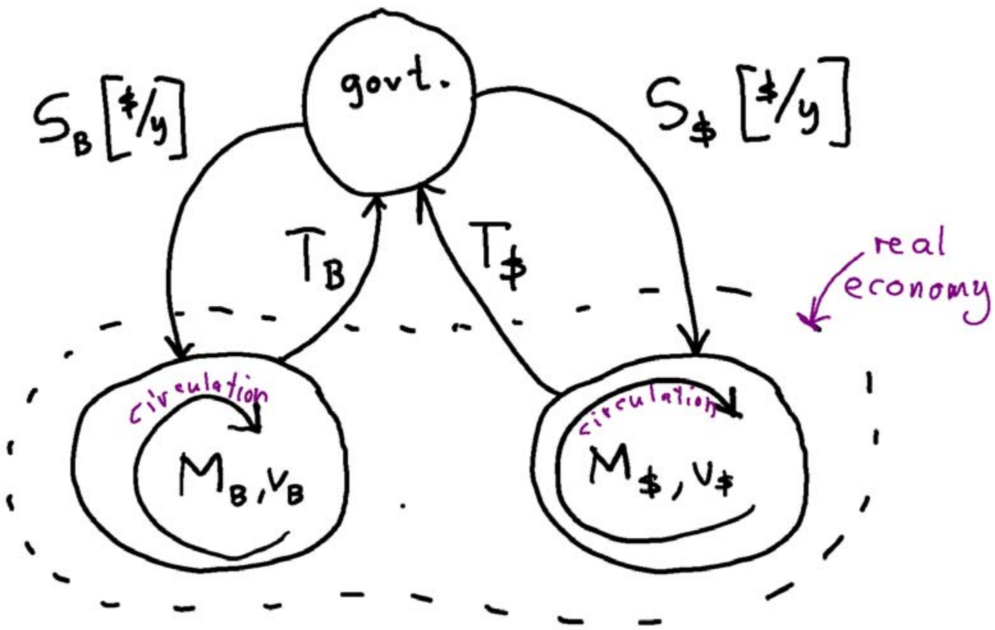

Figure 1: Two parallel monetary circuits

We define:

$M_\$(t)$ = circulating regular money stock [$].

$M_B(t)$ = circulating bonds [$].

$v_\$(t)$ = velocity of circulating regular money stock – i.e. dollars – as seen from the government's perspective [$1/year$].

$v_B(t)$ = velocity of circulating bonds as seen from the government's perspective [$1/y$].

$S_\$(t)$ = government dollar spending flow [$\$/y$].

$S_B(t)$ = government bond "spending" flow [$\$/y$].

$T_\$(t)$ = government dollar taxation flow [$\$/y$].

$T_B(t)$ = government bond taxation (= bond extinguishment) flow [$\$/y$].

$T(t)$ = total taxation = $T_\$(t) + T_B(t)$ [$\$/y$].

Both the dollars and the bonds are used as means of exchange between agents, and thus two parallel circuits in the real economy is created, as indicated in the figure. Any agent can and will probably – after a while – participate in both circuits. The bonds are assumed to be stored and moved between bond accounts at the Central Bank. The bonds are only stored electronicallly and do not exist as paper. Bonds are moved betwen accounts by mobile phone, computer or via a sort of debit card. They can correspond to any amount, and are denominated in $. An agent can transfer (a share) of his bond to another agent, as (part of) payment, just as with regular money. The bonds are not traded in a financial market, they only move between acounts as payment to another agent, or to pay taxes. Individual agents may trade bonds for dollars or the other way around (which may be illegal but difficult to avoid), but this will probably not constitute a significant part of account movements. When used for tax payment, the nominal $ value of the bond corresponds fully to a regular $ payment of the same amount.

A bond is in general a form of financial paper that receives interest payments ("coupons") at fixed intervals to the holder, and is paid back with its entire nominal value at maturity. The suggested bond here is somewhat different, since we wish it to be used for transactions, resembling regular money. Therefore there are no fixed-interval coupon payments, but a continuous flow of interest (see appendix). Furthermore the bond is a perpetuity, there is no maturity for the lender to be repaid. This is acceptable since the bond will be extinguished anyway when used to pay taxes.

Discussion

In contrast to dollars, this bond cannot be used for purchases overseas and is not as acceptable to vendors for payment of goods with a significant import content. Following Gresham's law ("bad money drives out good"), holders will then prefer to pay other agents and taxes with bonds instead of using their dollars.

Let us therefore start with a skeptic, "devil's advocate" assessment of the bond proposal. Bonds spent into the economy by the government will come faster back as tax, than the dollars spent into the economy: we have $v_B(t) > v_\$(t)$. There will probably be a strong and quite immediate "leakage" out of the real sector and back to the government for tax payments, *using bonds.* The high bond money velocity $v_B(t)$ is due to two factors: the average lag τ_B ofr each agent in holding bonds, and the degree to which the agents choose to pay taxes instead of using (part of) their bonds for paying other agents. We refer to (Andresen 1998, pp 6–10): for a defined aggregate of agents, money flowing out of this aggregate is called "outside spending", and the concept of an *outside spending coefficent* ρ_B, $0 < \rho_B < 1$ is introduced. We define the network of real economy agents (firms and households) as the aggregate for the case here, while the government is defined as on "the outside". Using an equation derived in the referred paper, the velocity of the bonds seen from the government's (outside) position will be

$$v_B = \rho_B / \tau_B \tag{1}$$

A ρ_B close to 1 means that agents mostly use received bonds to pay taxes, and (sadly) not for ("inside") purchases from other agents which is what the government wanted.

But an optimist might reply to this that there will be an upper bound for v_B: the government is in control of its bond "spending" (issuance) flow $S_B(t)$. This might ensure such an upper bound: Let us assume that to run the economy at the intended capacity, the government practices a rule that makes the bond spending some fraction of its dollar spending flow,

$$S_B = \alpha S_\$ \tag{2}$$

where α for instance might be in the order of –say– 0.3. The real economy will have to adjust to this and in an average sense pay taxes in the same proportion between bonds and dollars. If agents try to deviate from this proportion towards more bonds for tax payments (getting rid of "bad money" first), there would soon be a lack of available bonds, which are only supplied by the government. This could theoretically lead to a "black market" for buying bonds for dollars, with an exchange rate just below par but never above since dollars always will be more attractive.

Therefore there will be an upper bound on v_B, and taxes will be paid with dollars basically in the share $1/(1+\alpha)$, and with bonds in the share $\alpha/(1+\alpha)$. We have

$$T(t) = T_\$(t) + T_B(t), \text{ with } T_\$(t) = \frac{1}{(1+\alpha)} T(t) \text{ and } T_B(t) = \frac{\alpha}{(1+\alpha)} T(t) \tag{3}$$

To this, however, the skeptic may object that one can't depend on the premise that agents will abide with the government policy when deciding on whether to use their bond account or their $ account to pay taxes when these are due. Agents will just consider their own situation and use any available amount in the bond account first. So v_B will be too high: the intention of the government to get the bonds circulating in the real economy as a means of payment, will mostly be defeated.

The optimist replies that any agent holding a mix of bonds and dollars would want to use his money for *purchases* before paying taxes: tax payment will always be postponed until it is due. Then the agent will primarily try to use his bonds for a purchase instead of dollars. And the recipient may be in the situation that it is either a question of accepting bonds as payment, or there will be no sale. There is some flexibility here, since the potential purchase can be briefly negotiated between the parties for a solution that is payment in a mix of dollars and bonds, and/or perhaps with a bond component that is slightly higher than if the purchase was only done with dollars.

Weighing the pro et contra arguments above, the position of this author ends up fairly optimistic: the strong need for a medium of exchange in addition to dollars will lead to use and acceptance of bonds as (part of) payment in purchases, and this acceptance will grow as bonds gain confidence with increased use.

Reference

Andresen, Trond (1998). The macroeconomy as a network of money-flow transfer functions, *Modeling, Identification and Control*, vol. 19 no. 4.

Appendix

The motivation for this appendix is to discuss a type of bond where there is indifferent *when* one uses the bond for payment. One should not have to consider whether a coupon payment was close to being due, but ignore this and be able to pay with the bond at any time. This is achieved by letting the bond receive a small *continuous* constant flow of interest payments, with an interest rate that has the equivalent effect of corresponding regular coupon payments.

We start by defining some entities (brackets [ ] signify denomination):

V_0 = nominal value of the bond [\$], created at time $t = 0$.

t_M = time to maturity [y].

V_{t_M} = value of the bond at maturity if all coupons are accumulated and not spent [\$]

N = number of coupon payments for today-type bond, the last one occurs at maturity [ ]

$\Delta = t_M/N$ = interval between coupon payments [y]

i_1 = interest rate for coupon payments for today's time-discrete-type bond [$1/y$]

$i_1\Delta V_0$ = amount paid on each coupon [\$]

i_2 = interest rate for continuous-time interest payment bond [$1/y$].

We have

$$V_{t_M} = V_0 + i_1V_0[1 + (1 + i_1) + (1 + i_1)^2 + ... + (1 + i_1)^{N-1}] \tag{4}$$

The part in brackets is a geometric series, so we get

$$V_{t_M} = V_0 + i_1\Delta V_0\frac{(1 + i_1\Delta)^N - 1}{(1 + i_1\Delta) - 1} = V_0 + i_1\Delta V_0\frac{(1 + i_1\Delta)^N - 1}{i_1\Delta} = V_0(1 + i_1\Delta)^N \tag{5}$$

This is not surprising, because it is the same end result as if one had a bond with no coupons until maturity, but instead received the original loan together with accumulated interest on it.

We now wish to find an interest rate i_2, which with a continuous interest flow gives the same end result V_{t_M}. We have

$$V_{t_M} = V_0e^{i_2t_M} \tag{6}$$

where $e^{i_2t_M}$ is an exponential function. Combining (5) and (6) gives

$$V_{t_M} = V_0e^{i_2t_M} = V_0(1 + i_1\Delta)^N \tag{7}$$

Removing V_0 on both sides and solving for i_2 gives

$$i_2 = \frac{1}{t_M}\ln[(1 + i_1\Delta)^N] \tag{8}$$

Let us do two tests with numerical values:

First, it gives $i_2 = 0$ when $i_1 = 0$. As expected.

Secondly, assume a bond with time-discrete payments but with Δ now being a very short time interval between coupons. The shorter the time interval, the more this bond will resemble the continuous-payment bond. Let us check this. We have $\Delta = t_M/N$, and (7) may be written

$$V_{t_M} = V_0e^{i_2t_M} = V_0(1 + i_1\frac{t_M}{N})^N \tag{9}$$

If we let $N \to \infty$, then $(1 + i_1\frac{t_M}{N})^N \to e^{i_1t_M}$. From (9) we see that this implies $i_1 \to i_2$. Our "very-frequent-coupon-payments"-bond converges towards a corresponding continuous-payments bond.

In the Central Bank computer one may set Δ to – say – a perfectly computationally achievable time interval of 5 minutes = $1/(365 \cdot 24 \cdot 12)$ [y] = $\frac{1}{105\,120}$ [y] = 0.00000951293 [y]. An interest rate of 2% or 0.02[$1/y$] then gives the coupon amount as $i_1\Delta V_0 = 0.02 \cdot 0.00000951293 \cdot V_0 = V_0 \cdot 1.902\,6 \times 10^{-7}$.

Conclusion: The "coupon payments" on his type of bond will be so tiny that the payment timing doesn't matter (even if this is admittedly not a perfect continuous-time bond in the strict mathematical sense).

Actually – and this may constitute a political problem to get the "bonds" accepted – this type of bond resembles very much regular deposit money, which also usually has (a small) interest added to it in a semi-continuous way.