Loanable funds vs. endogenous money: Krugman is wrong, Keen is right

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Abstract
In his recent article, Keen resumes the debate with Krugman about the effects of debt upon the economy. It is hard to see how the question can be settled as long as all participants apply their idiosyncratic models. Hence the issue boils down, as Krugman rightly put it, to the deeper question: "how should one do economics." Sketched with a broad brush, the consensus is that Orthodoxy has failed and that Heterodoxy has no convincing alternative to offer. The conceptual consequence of the present paper is to restart from a firm common formal ground. This relocation makes the debate solvable.

JEL codes B59, E21, G00

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1. The point at issue

> Keen then goes on to assert that lending is, by definition (at least as I understand it), an addition to aggregate demand. I guess I don't get that at all. If I decide to cut back on my spending and stash the funds in a bank, which lends them out to someone else, this doesn't have to represent a net increase in demand. Yes, in some (many) cases lending is associated with higher demand, because resources are being transferred to people with a higher propensity to spend; but Keen seems to be saying something else, and I'm not sure what. I think it has something to do with the notion that creating money = creating demand, but again that isn't right in any model I understand. (Krugman, 2012)

Steven Keen, in his recent article *Secular stagnation and endogenous money* (2014), resumes the debate with Paul Krugman about the effects of household sector debt upon the economy, and upon employment in particular. It is hard to see how the question can be settled as long as all participants in the discussion apply their idiosyncratic models. Hence the issue boils down, as Krugman rightly put it, to the deeper question: "how should one do economics."

Sketched with a broad brush, the consensus is that Orthodoxy has failed on all counts (Ackerman and Nadal, 2004; Quiggin, 2010) and that Heterodoxy has no convincing alternative to offer.

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Standard economics rests on behavioral assumptions that are formally expressed as axioms (Debreu, 1959; Arrow and Hahn, 1991; McKenzie, 2008). Axioms are indispensable to build up a theory that epitomizes formal and material consistency. The fatal flaw of the standard approach is that human behavior and axiomatization are disjunct (for details see 2014c).

Orthodoxy has a strong formal basis which, however, is unacceptable. Heterodoxy has not yet agreed upon any axiomatic foundation at all and is therefore formally at a great disadvantage.

The conceptual consequence of the present paper is to discard the subjective-behavioral axioms and to take objective-structural axioms as the formal point of departure. The relocation to a firm common ground makes the Krugman-Keen debate solvable. This is a first step to overcome the indigenous secular stagnation of economics.

In the following, Section **Error! Reference source not found.** first provides the new formal foundations with the set of four structural axioms. These represent the pure consumption economy as the most elementary economic configuration. In Section 3 the interaction of money, financial assets/liabilities, saving/dissaving and profit is put to life in a simulation. With the requisite elements in their proper places it is possible to reconstruct the respective positions of Krugman and Keen consistently in structural axiomatic terms. Section 4 concludes.

2. The sole alternative to an axiomatic approach is a better axiomatic approach

> I always try to find the simplest representation I can of whatever story I'm trying to tell about the economy. The goal, in particular, is to identify which assumptions are really crucial — and in so doing to catch yourself when you're making implicit assumptions that can't stand clear scrutiny. (Krugman, 2012)

Storytelling is not science. Contrary to the intuition of the psycho-sociological mindset, the formal foundations of theoretical economics must be non-behavioral and epitomize the interdependence of the real and nominal variables that constitutes the monetary economy.

2.1 Axioms

The first three structural axioms relate to income, production, and expenditure in a period of arbitrary length. The period length is conveniently assumed to be the calendar year. Simplicity demands that we have for the beginning one world economy, one firm, and one product. Axiomatization is about ascertaining the *minimum number* of premises.

Total income of the household sector Y in period t is the sum of wage income, i.e. the product of wage rate W and working hours L, and distributed profit, i.e. the product of dividend D and the number of shares N. Nothing is implied at this stage about who owns the shares.

$$Y = WL + DN \quad | t \tag{1}$$

Output of the business sector O is the product of productivity R and working hours.

$$O = RL \quad | t \tag{2}$$

The productivity *R* depends on the underlying production process. The 2nd axiom should therefore not be misinterpreted as a linear production function.

Consumption expenditures *C* of the household sector is the product of price *P* and quantity bought *X*.

$$C = PX \quad | t \tag{3}$$

The axioms represent the pure consumption economy, that is, no investment, no foreign trade, and no government.

The period values of the axiomatic variables are formally connected by the familiar growth equation, which is added as the 4th axiom.

$$Z_t = Z_{t-1}\left(1+\hat{Z}_t\right) \qquad \text{with} \quad Z \leftarrow W, L, D, N, R, P, X, \text{K} \tag{4}$$

The path of the representative variable Z_t is then determined by the initial value Z_0 and the rates of change $\hat{Z}_t$ for each period:

$$Z_t = Z_0\left(1+\hat{Z}_1\right)\left(1+\hat{Z}_2\right)\text{K}\left(1+\hat{Z}_t\right) = Z_0\prod_{t=1}^{t}\left(1+\hat{Z}_t\right). \tag{5}$$

For a start it is assumed that the elementary axiomatic variables vary at random. This produces an evolving economy. The respective probability distributions of the change rates are given in general form by:

$$\begin{aligned} &Pr\left(l_W \le \hat{W} \le u_W\right) \quad Pr\left(l_R \le \hat{R} \le u_R\right) \\ &Pr\left(l_L \le \hat{L} \le u_L\right) \quad Pr\left(l_P \le \hat{P} \le u_P\right) \\ &Pr\left(l_D \le \hat{D} \le u_D\right) \quad Pr\left(l_X \le \hat{X} \le u_X\right) \\ &Pr\left(l_N \le \hat{N} \le u_N\right) \qquad\qquad | t. \end{aligned} \tag{6}$$

The four axioms, including (6), constitute a simulation. There is no need at this early stage to discuss the merits and demerits of different probability distributions. It is, of course, also possible to switch to a completely deterministic rate of change for any variable and any period. The structural formalism does not require a preliminary decision between determinism and indeterminism.

The upper (u) and lower (l) bounds of the respective intervals are, for a start, symmetrical around zero. This produces a drifting or stationary economy as a limiting case of the growing

economy. The four axioms then generate at every run an outcome like that shown in Figure 1 which is the archetype of the monetary economy.

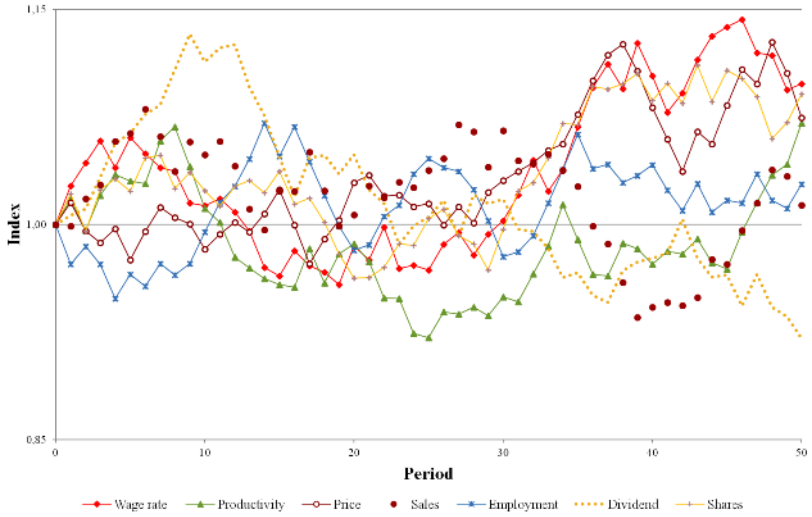

Figure 1: The evolving consumption economy consists initially of entirely independent random paths of the seven elementary axiomatic variables (shown here) and the paths of composed variables

The economic content of the four axioms is plain. One point to mention is that total income in (1) is the sum of wage income and *distributed profit* and not of wage income and profit. This distinction makes all the difference between good or bad economics. Neither Krugman nor Keen got the profit theory right (for details see 2013a; 2013b). This formally invalidates both approaches.

Note further that equilibrium in whatever definition is not taken into the premises. Methodologically, this would amount to a *petitio principii* (cf. Mill, 2006, pp. 819-827).

2.2 Definitions

Income categories

Definitions are supplemented by connecting variables on the right-hand side of the identity sign that have already been introduced by the axioms. With (7) wage income Y_W and distributed profit Y_D is defined:

$$Y_W \equiv WL \qquad Y_D \equiv DN \quad | t. \tag{7}$$

Definitions add no new content to the set of axioms but determine the logical context of concepts. New variables are introduced with new axioms.

Given the paths of the elementary variables, the development of the composed variables is also determined. From the random paths of employment L and wage rate W follows the path of wage income Y_W. Likewise follows from the paths of dividend D and number of shares N the path of distributed profit Y_D. From the 1st axiom then follows the random path of total income Y.

Key ratios

We define the sales ratio as:

$$\rho_X \equiv \frac{X}{O} \quad | t. \tag{8}$$

A sales ratio $\rho_X = 1$ indicates that the quantity bought/sold X and the quantity produced O are equal or, in other words, that the product market is cleared.

We define the expenditure ratio as:

$$\rho_E \equiv \frac{C}{Y} \quad | t. \tag{9}$$

An expenditure ratio $\rho_E = 1$ indicates that consumption expenditures C are equal to total income Y, in other words, that the household sector's budget is balanced.

Stock of money

Money follows consistently from the given axiom set. If income is higher than consumption expenditures the household sector's stock of money increases. The change in period t is defined as:

$$\Delta\bar{\mathrm{M}}_{\mathbf{H}} := Y - C := (1 - \rho_E) Y \quad | t. \tag{10}$$

The alternative identity sign $:=$ indicates that the definition refers to the monetary sphere. An alternative wording of (10) is: depending on the actual expenditure ratio the change of the stock of money can either be positive or negative or zero.

The stock of money $\bar{\mathrm{M}}_{\mathbf{H}}$ at the end of an arbitrary number of periods $\bar{t}$ is defined as the numerical integral of the previous changes of the stock plus the initial endowment:

$$\bar{\mathrm{M}}_{\mathbf{H}t} \equiv \sum_{t=1}^{t} \Delta\bar{\mathrm{M}}_{\mathbf{H}t} + \bar{\mathrm{M}}_{\mathbf{H}0}. \tag{11}$$

The changes in the stock of money as seen from the business sector are symmetrical to those of the household sector:

$$\Delta\bar{\mathrm{M}}_{\mathbf{B}} := C - Y := (\rho_E - 1) Y \quad | t. \tag{12}$$

The business sector's stock of money at the end of an arbitrary number of periods is accordingly given by:

$$\bar{\mathrm{M}}_{\mathbf{B}t} \equiv \sum_{t=1}^{t} \Delta\bar{\mathrm{M}}_{\mathbf{B}t} + \bar{\mathrm{M}}_{\mathbf{B}0}. \tag{13}$$

The development of the stock of money follows without further assumptions from the axioms and is ultimately determined by variations of the elementary variables. Figure 2 shows the interdependencies between the flows and the stock. During the time span of observation, the household sector first builds up overdrafts and then reduces them again to almost zero.

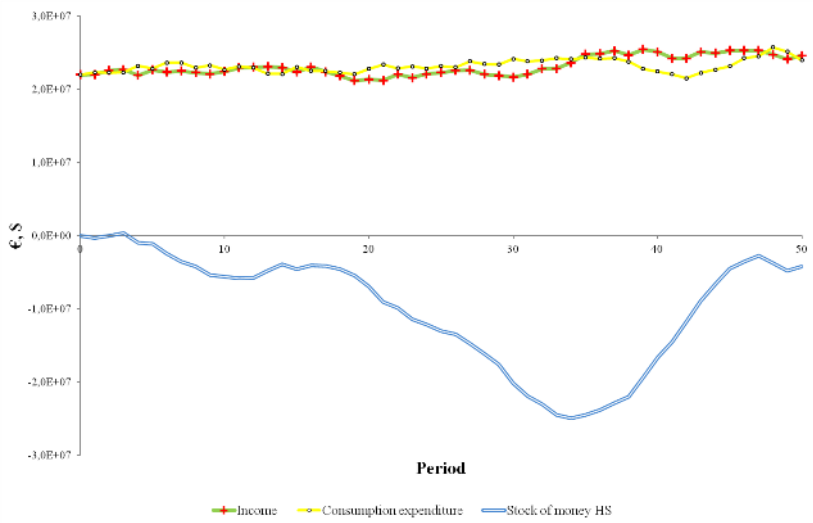

Figure 2: The difference between total income and consumption expenditure in successive periods, i.e. saving or dissaving, produces the variations of the households sector's stock of money, which consists here of overdrafts (refers to Figure 1).

Quantity of money

In order to reduce the monetary phenomena to the essentials it is supposed that all financial transactions are carried out without costs by the central bank. The stock of money then takes the form of current deposits or current overdrafts. Initial endowments can be set to zero. Then, if the household sector owns current deposits according to (11) the current overdrafts of the business sector are of equal amount according to (13) and vice versa if the business sector owns current deposits. Money and credit are symmetrical. The current assets and liabilities of the central bank are equal by construction. From its perspective the quantity of money at the end of an arbitrary number of periods is given by the absolute value either from (11) or (13):

$$\bar{M}_t \equiv \left| \sum_{t=1}^{t} \Delta \bar{M}_t \right| \quad \text{with} \quad \bar{M}_0 = 0. \tag{14}$$

While the stock of money can be either positive or negative the quantity of money is always positive. It is assumed at first that the central bank plays an accommodative role and simply supports the autonomous market transactions between the household and the business sector. For the time being, money is the *dependent* variable.

No restrictions

The stock of overdrafts is the initial form of financial liabilities and can be replaced at any time by other forms, for instance longer term mortgage loans. In other words, overdrafts represent here the complete portfolio of household sector's debt. At the moment we are not interested in the structure of this portfolio.

In the inverse case of continuous household sector saving the curve of deposits would run in Figure 2 from zero upwards in the north-eastern direction. The stock of deposits is the initial form of the household sector's portfolio of financial assets. Deposits can be replaced at any

time by other forms, for example longer term savings accounts. In the following, the endless variety of forms is ignored and we deal exclusively with plain deposits and overdrafts.

The household sector can freely switch from a positive stock of money (=deposits) to a negative stock of money (=overdrafts). The household sector's stock is at any time exactly mirrored by the business sector's stock. The development of the stocks depends alone on the overall expenditure ratio ρ_E if the household sector consists of a uniform population of agents who either save or dissave. If the population is composed of both savers and dissavers things are different as we shall see presently.

Monetary profit

Total profit consists of monetary and nonmonetary profit. Here we are at first concerned with monetary profit. Nonmonetary profit is treated at length in (2012).

The business sector's monetary profit/loss in period t is defined with (15) as the difference between the sales revenues – for the economy as a whole identical with consumption expenditure C – and costs – here identical with wage income Y_W :

$$Q_m \equiv C - Y_W \quad | t. \tag{15}$$

Because of (3) and (7) this is identical with:

$$Q_m \equiv PX - WL \quad | t. \tag{16}$$

This form is well-known from the theory of the firm.

The Profit Law

From (15) and (1) follows:

$$Q_m \equiv C - Y + Y_D \quad | t \tag{17}$$

or, using the definitions (8) and (9),

$$Q_m \equiv \left(\rho_E - \frac{1}{1+\rho_D} \right) Y$$

$$\text{with} \quad \rho_D \equiv \frac{Y_D}{Y_W} \quad | t. \tag{18}$$

The four equations (15) to (18) are formally equivalent and show profit under different perspectives. The Profit Law (18) tells us that total monetary profit is zero if $\rho_E = 1$ and $\rho_D = 0$. Profit or loss for the business sector as a whole depends on the expenditure and distributed profit ratio and nothing else (for details see 2013a).

Retained profit

Once profit has come into existence for the first time (that is: logically – a historical account is an entirely different matter) the business sector has the option to distribute or to retain it. This

in turn has an effect on profit. This effect is captured by (17) but it is invisible in (15). Both equations, though, are formally equivalent.

Retained profit Q_{re} is defined for the business sector as a whole as the difference between profit and distributed profit in period t :

$$Q_{re} \equiv Q_m - Y_D \quad \Rightarrow \quad Q_{re} \equiv C - Y \quad | t. \tag{19}$$

Retained profit is, due to (17), equal to the difference of consumption expenditures and total income. As can be seen in comparison with (12), retained profit increases *uno actu* the business sector's stock of money at the central bank.

Saving

The household sector's monetary saving is given as the difference of income and consumption expenditures (for nonmonetary saving see 2012):

$$S_m \equiv Y - C \quad | t. \tag{20}$$

In combination with (19) follows:

$$Q_{re} \equiv -S_m \quad | t. \tag{21}$$

Monetary saving and retained profit always move in opposite directions. This is the Special Complementarity. It says that the complementary notion to saving is negative retained profit; positive retained profit is the complementary of dissaving. There is no such thing as an equality of saving and investment in the consumption economy, nor, for that matter, in the investment economy (for details see 2013c).

If distributed profit is zero then follows as a corollary of (21):

$$\begin{aligned} Q_m &= -S_m \\ &\quad | t. \\ \text{if} \quad Y_D &= 0 \end{aligned} \tag{22}$$

Profit is zero in the limiting case of zero distributed profit and zero saving. Otherwise profit is equal to dissaving, loss is equal to saving in a given period. To simplify matters for the next section distributed profit is set to zero, that is, eq. (22) holds.

3. Vexing: individual saving and household sector's saving

> If I decide to cut back on my spending and stash the funds in a bank, which lends them out to someone else, this doesn't have to represent a net increase in demand. (Krugman, 2012)
>
> I await the IS-LM or New Keynesian DSGE model that Krugman will presumably produce to provide an explanation for the persistence of the crisis in terms that, however tortured, emanate from conventional economic logic in which banks and money are ignored (though private debt is finally

considered), and in which everything happens in equilibrium. But however clever it might be, it will not be consistent with the data. (Keen, 2014, p. 11)

3.1 Saver, dissaver, neutral

We now split the income recipients into three groups: savers s, dissavers d, neutrals n, and rearrange total income (1) accordingly:

$$\begin{aligned} Y &= \underbrace{Y_{Ws} + Y_{Wd} + Y_{Wn}}_{Y_W} + \underbrace{Y_{Ds} + Y_{Dd} + Y_{Dn}}_{Y_D} \\ Y &= \underbrace{Y_{Ws} + Y_{Ds}}_{Y_s} + \underbrace{Y_{Wd} + Y_{Dd}}_{Y_d} + \underbrace{Y_{Wn} + Y_{Dn}}_{Y_n} \end{aligned} \quad |\, t. \tag{23}$$

Analogously, consumption expenditures are split up between the three groups:

$$C = C_s + C_d + C_n \quad |\, t. \tag{24}$$

Analogously to the overall expenditure ratio (9) we define the group expenditure ratio for savers:

$$\rho_{Es} \equiv \frac{C_s}{Y_s} \quad \rho_{Es} < 1 \quad |\, t, \tag{25}$$

dissavers:

$$\rho_{Ed} \equiv \frac{C_d}{Y_d} \quad \rho_{Ed} > 1 \quad |\, t, \tag{26}$$

and finally the neutrals:

$$\rho_{En} \equiv \frac{C_n}{Y_n} \quad \rho_{En} = 1 \quad |\, t. \tag{27}$$

From (24) and (9) then follows:

$$\frac{C}{Y} = \rho_{Es} \frac{Y_s}{Y} + \rho_{Ed} \frac{Y_d}{Y} + \rho_{En} \frac{Y_n}{Y} \quad |\, t. \tag{28}$$

By substituting the respective income share of each group this reduces to:

$$\begin{aligned} &\rho_E = \rho_{Es}\, \rho_{Ys} + \rho_{Ed}\, \rho_{Yd} + \rho_{En}\, \rho_{Yn} \\ &\text{with} \quad \rho_{Ys} \equiv \frac{Y_s}{Y}, \rho_{Yd} \equiv \frac{Y_d}{Y}, \rho_{Yn} \equiv \frac{Y_n}{Y} \\ &\rho_{Ys} + \rho_{Yd} + \rho_{Yn} = 1 \quad |\, t. \end{aligned} \tag{29}$$

The overall expenditure ratio ρ_E is the weighted average of the groups' expenditure ratios. We now simplify matters by excluding the neutrals and by assuming that the income shares of savers and dissavers are equal:

$$\rho_E = \frac{1}{2}\left(\rho_{Es} + \rho_{Ed}\right)$$
$$\text{if} \quad \rho_{Ys} = \rho_{Yd}, \rho_{Yn} = 0 \quad | t. \tag{30}$$

The overall expenditure ratio is in this simplified case the average of the group expenditure ratios with ρ_{Es} always below unity and ρ_{Ed} always above unity.

3.2 The loanable funds case

From the quote above it is clear that for Krugman savers and dissavers are not independent. For someone who saves there is someone else who takes the money, courtesy of the intermediation of the banking system, and spends it. Hence there is no effect on the rest of the economy.

Let us start with an initial period which is characterized by zero saving and dissaving, i.e. by an overall expenditure ratio of unity. Then, starting with the next period, the expenditure ratio of the savers varies randomly. Since, figuratively, for every patient lender there is an impatient borrower (30) turns to:

$$\rho_{Ed} = 2 - \rho_{Es}$$
$$\text{if} \quad \rho_E = 1, \rho_{Ys} = \rho_{Yd}, \rho_{Yn} = 0 \quad | t. \tag{31}$$

The dissavers as a whole are the mirror image of the savers as a whole. Over time the savers' deposits and the dissavers' overdrafts develop as shown in Figure 3.

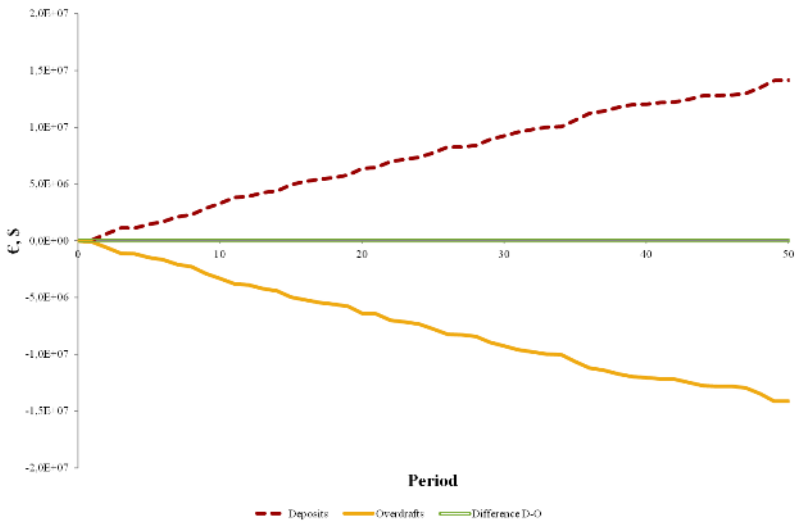

Figure 3: In the loanable funds case the dissavers' overdrafts, i.e. debt, are at any time the exact mirror image of the savers' deposits.

In more general terms: the development of the dissavers' debt portfolio is the exact mirror image of the savers' portfolio of financial assets, except for the detailed inner composition. The difference of both stocks is at any time exactly zero.

Starting with an overall expenditure ratio of $\rho_E = 1$ the savers' random expenditure ratio of $\rho_{Es} < 1$ is, according to (31), exactly compensated by the dissavers' expenditure ratio of $\rho_{Ed} > 1$. The overall expenditure ratio therefore stays at unity, that is, the household sector's budget is balanced from the initial period onwards, no matter what the savers do. Krugman is right, seen from the business sector there is neither a net increase nor decrease of demand. Total consumption expenditures are invariably equal to total income. The growth and magnitude of the stock of financial assets and liabilities is of no consequence.

From the Profit Law (18) follows that profit is zero throughout. The business sector's stock of money stays at zero according to (12) and (13) if the initial endowment was zero. Overall zero profit – ni bénéfice ni perte – is the defining characteristic of Walras's model, but not of economic reality.

3.3 The endogenous money case

Let us consider the alternative that the behavior of savers and dissavers is independent, that is, we return to (30) which is reproduced here:

$$\rho_E = \frac{1}{2}\left(\rho_{Es} + \rho_{Ed}\right)$$
$$\text{if} \quad \rho_{Ys} = \rho_{Yd}, \rho_{Yn} = 0 \quad | t. \tag{32}$$

The savers' and dissavers' respective expenditure ratios now *both* vary at random. The result is depicted in Figure 4.

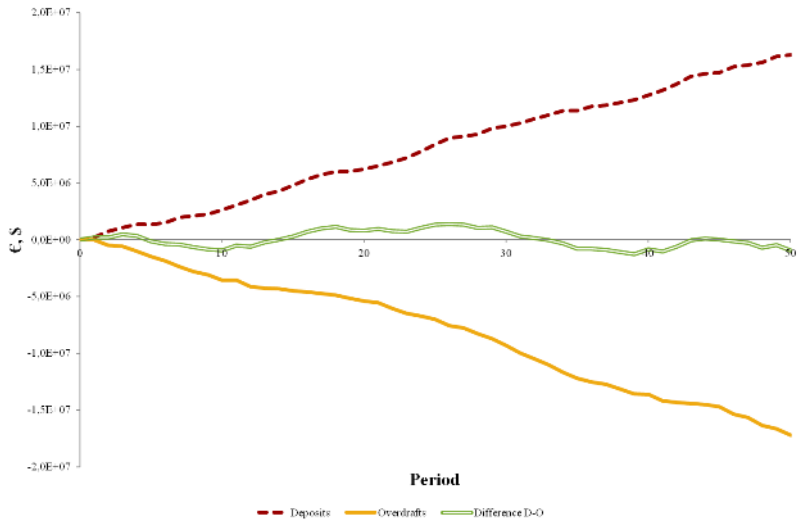

Figure 4: In the endogenous money case the dissavers' overdrafts, i.e. debt, grow independently from the savers' deposits

The overall expenditure ratio ρ_E as an average is in any period different from unity. If the savers outpace the dissavers in the period under consideration then the overall expenditure ratio is below unity. In the opposite case, the overall ratio is above unity. The household sector's budget is no longer balanced; consumption expenditures can be higher than income in the current period due to some underlying intertemporal optimization. If the household sector's overdrafts grow faster than deposits, Keen is right, there is additional demand $C > Y$. For the central bank there is no problem to let the households' overdrafts expand faster than the deposits. The chief characteristic of the banking system is that it decouples lending and borrowing.

From the Profit Law (18) follows that profit is greater than zero if the overall expenditure ratio is greater than unity. Profit or loss change the business sector's stock of money according to (19) and (12). The business sector's deposits make up for the difference between the household sector's deposits and overdrafts.

When the business sector's deposits are added in Figure 4 to the household sector's deposits the sum is equal to the household sector's overdrafts. Both sides of the central bank's balance sheet are equal at all times, of course, even if the amount of the household sector's total financial assets is different from total financial liabilities. The curve that meanders around the abscissa shows the development of the business sector's deposits and overdrafts, i.e. of the cumulated profits and losses which in turn mirror cumulated saving and dissaving. Eq. (22) provides the mirror. Note that losses vanish almost completely as soon profit distribution is taken into account.

3.4 The market clearing price

From (3), (8), and (9) follows the price as dependent variable:

$$P = \frac{\rho_E}{\rho_X}\frac{W}{R}\left(1+\frac{Y_D}{Y_W}\right) \quad |t. \tag{33}$$

This is the general structural axiomatic law of supply and demand for the pure consumption economy with one firm (for the generalization see 2014a). In brief, the price equation states that the market clearing price, i.e. $\rho_X = 1$, is equal to the product of the expenditure ratio, unit wage costs, and the income distribution. Note that the quantity of money is not among the determinants. This rules the commonplace quantity theory out. The structural axiomatic price formula is testable in principle.

Under the condition of market clearing and zero distributed profit follows:

$$P = \rho_E \frac{W}{R}$$
$$\text{if} \quad \rho_X = 1, Y_D = 0 \quad |t. \tag{34}$$

The market clearing price depends now alone on the expenditure ratio and unit wage costs. All changes of the wage rate, of the productivity, and of the average expenditure ratio affect the market clearing price in the period under consideration. We refer to this formal property as

conditional price flexibility because (34) involves no assumption about human behavior, only the purely formal condition $\rho_X = 1$.

3.5 How to settle the issue

How can we discriminate between the loanable funds and the endogenous money case? There is no use to look at the time series of household sector's debt alone. What is decisive is the *difference* of all financial assets and all financial liabilities. If there is a difference between both magnitudes that changes over time as shown in Figure 4 then Keen is right, if the difference is zero throughout as shown in Figure 3 then Krugman is right. In an economy with a banking system this is rather improbable, to say the least.

3.6 The debt-profit-employment connection

Keen has found a strong correlation between the change of debt and changes of unemployment (2014, p. 9). How does this fit into the structural-axiomatic analysis? The link is as follows. The household sector's debt increases according to (10) and (11) if the overall expenditure ratio is above unity. At the same time profit is positively affected according to (18). The missing link is a positive effect of profit on employment. Granted this effect, we would indeed expect from the foregoing analysis a correlation between changes of household sector's debt and changes of unemployment.

3.7 Extensions

Since the pure consumption economy is the most elementary economic configuration, solely analytical extensions are feasible. The first is to take distributed profit into account which has been set to zero in the foregoing analysis in order to keep the focus on the main point.

Profit is, in addition to the household sector's period deficit, i.e. $\rho_E > 1$, and in addition to profit distribution, i.e. $\rho_D > 0$, positively affected by a public budget deficit, by the configuration $I > S$, or by a surplus of exports over imports when we split the world economy into regional economies and consider each in isolation.

The extensions do not affect the elementary insights from the structural axiomatic analysis of the pure consumption economy.

4. Conclusion

> And then the question is, how should one do economics? (Krugman, 2012)

… since Orthodoxy has failed on all counts, certainly no longer like Krugman (see also 2014b). Economics has to be done in a fundamentally new way. There can be no reasonable doubt about this.

The standard approach is based on indefensible subjective-behavioral axioms which are in the present paper replaced by objective-structural axioms. The set of four structural axioms

constitutes the most elementary case of an evolving consumption economy. The formalism is absolutely transparent, the logical implications are testable in principle.

The main results of the structural axiomatic analysis of the Krugman-Keen controversy about the real effects of household sector's debt are:

- The loanable funds model is a limiting case of the endogenous money model under the condition that both models are derived from the same formal basis. The original formal foundations of both models are insufficient. Neither Krugman nor Keen applies the correct profit definition.

- It is possible to empirically discriminate between the two models.

- The structural axiomatic analysis leads to the prediction that Krugman's loanable funds model will be clearly refuted. It simply does not happen in the actual monetary economy that saving and dissaving of the households is exactly equal.

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