Essentials of Constructive Heterodoxy: Money, Credit, Interest

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Abstract

The goal of theoretical economics is to explain how the monetary economy works. The fatal methodological defect of Orthodoxy is that it is based on behavioral axioms. Yet, no specific behavioral assumption whatever can serve as a starting point for economic analysis. From this follows for Constructive Heterodoxy that the subjective axiomatic foundations have to be replaced. This amounts to a paradigm shift. Nobody can rest content with a pluralism of false theories. Based on a set of *objective* axioms all economic conceptions have to be reconstructed from scratch. In the following this is done for the theory of money.

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Keywords new framework of concepts; structure-centric; Structural Law of Supply and Demand; stock of money; monetary profit; transaction unit; banking unit

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1 From storytelling to science

> When the premises are certain, true, and primary, and the conclusion formally follows from them, this is demonstration, and produces scientific knowledge of a thing. (Resume of Aristotle's Posterior Analytics)

The goal of theoretical economics is to explain how the monetary economy works. Political economics is quite different. It consists in the main of speculations about the rational or irrational behavior of agents and agenda pushing. Taking behavioral assumptions as starting point of the analysis does not – and cannot in principle – lead to a materially and formally consistent theory about how the actual economy works. Rather, it ends up with storytelling. The failure of all kinds of behavioral approaches can be taken as a proof.

The fatal methodological defect of Orthodoxy is that it is based on behavioral axioms. Yet, no specific behavioral assumption can, for compelling methodological reasons, serve as a starting point for economic analysis. From this follows for Constructive Heterodoxy as first priority that the accustomed subjective axiomatic foundations have to be replaced. This amounts to a paradigm shift. Most economists are consciously or unconsciously aware that a paradigm shift is inescapable. Nobody can rest content with a pluralism of false theories.

Based on a set of *objective* axioms all economic conceptions have to be consistently reconstructed. High on the agenda are central phenomena like market, profit, aggregate demand, employment, or money. It is the theory of money which is reconstructed from scratch in the following (see also 2011a; 2011b).

Section 2 renders the formal description of the most elementary economic configuration, that is, the pure consumption economy. From these minimalistic premises follows in Section 3 the market clearing price as result of the Structural Law of Supply and Demand. In Sections 4 and 5 the interrelation between money/credit, dissaving/saving and profit/loss is formally determined. Sections 6 and 7 make the transition from period analysis to the simulation of the development of the market clearing price and the different stocks of money. Sections 8 and 9 introduce the two functionally different departments of the central bank: the transaction and the banking unit. The latter produces loans, in the actual case for the household sector. In Section 10 the loan interest rate is objectively determined under the zero profit condition. Section 11 concludes.

2 Foundations of the logical edifice

> Yet even Plato, Aristotle's teacher, had no idea of syllogism. He did talk of scientific propositions following from some basic truths, but a clear picture of the logical edifice of knowledge did not appear before

> Aristotle. And the important fact is that even Aristotle himself was inspired by some *Elements of Geometry* which existed in his time and have come down to us in highly polished form from the hands of Euclid. (Georgescu-Roegen, 1966, p. 6)

What is needed for a start is the simplest possible description of the monetary economy. The correct formal starting point is given with the most elementary economic configuration. The pure consumption economy is defined by:

$$Y_W = WL \tag{1}$$

wage income Y_W is equal to wage rate W times working hours L,

$$O = RL \tag{2}$$

output O is equal to productivity R times working hours L,

$$C = PX \tag{3}$$

consumption expenditure C is equal to price P times quantity bought/sold X.

The first three equations 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.[1]

For the graphical representation of the pure consumption economy see Figure 1.

At any given level of employment L, the wage income that is generated in the consolidated business sector follows by multiplication with the wage rate. On the real side, output follows by multiplication with the productivity. Finally, the price follows as the dependent variable under the conditions of budget balancing, i.e., $C = Y_W$ and market clearing, i.e., $X = O$. Note that the ray in the southeastern quadrant is *not* a linear production function; the ray tracks *any* underlying production function. Note also that it is methodologically inadmissible to take the assumption of decreasing returns into the premises. Note finally that W is the *average* wage rate if the individual wage rates are different among the employees, which is normally the case.

If the wage rate W is lowered, the market clearing price P falls. If the number of working hours L is increased the price remains constant, provided productivity R does not change. If productivity decreases the price rises. If productivity increases

[1] The three equations are a subset of the complete structural axiom set, see (2014a, Sec. 2.2). The present analysis goes without distributed profit.

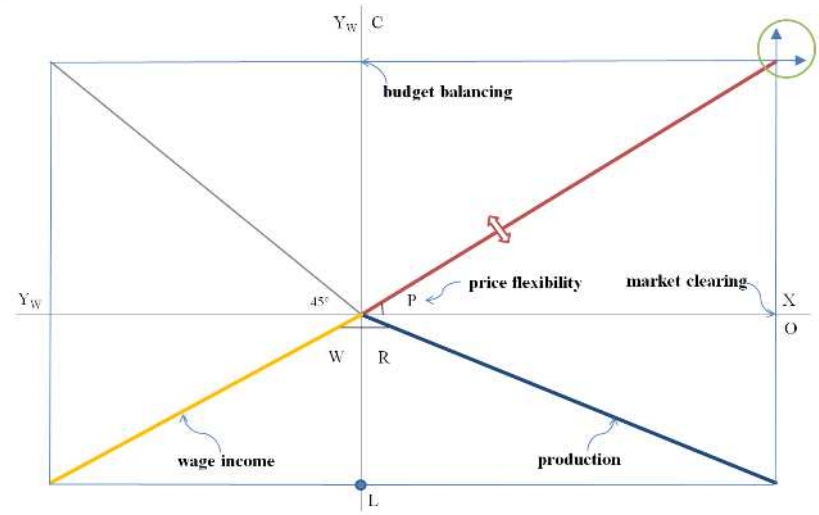


Figure 1: Pure consumption economy with market clearing and budget balancing

the price falls. If wage rate and productivity vary in step the price stays put. All this can be directly read off from the four-quadrant graphic.

In any case, labor gets the whole output, and profit for the business sector as a whole is zero. All changes in the system are directly reflected by the market clearing price.

Who thinks eqs. (1) to (3) are too simple to capture the complexity of the actual monetary economy is mistaken. As the still unsurpassed master of economic methodology put it:

> Simplicity in the present treatise is not to be understood as an aesthetic criterion but as a heuristic principle. The simplest supposition which accords with any of the most obvious facts, is the best to begin with; because its consequences are the most easily traced. (Mill, 2006, pp. 496-497)

3 The market clearing product price

The sales ratio is defined as:

$$\rho_X \equiv \frac{X}{O}. \tag{4}$$

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.

The expenditure ratio is defined as:

$$\rho_{EW} \equiv \frac{C}{Y_W}. \tag{5}$$

An expenditure ratio $\rho_{EW} = 1$ indicates that consumption expenditures C are equal to wage income Y_W, in other words, that the household sector's budget is balanced.

From the first three equations and the two definitions follows the price as dependent variable:

$$P = \frac{\rho_{EW}}{\rho_X} \frac{W}{R}. \tag{6}$$

Under the condition of market clearing this reduces to:

$$\begin{aligned} P &= \rho_{EW} \frac{W}{R} \\ \text{if} \quad \rho_X &= 1. \end{aligned} \tag{7}$$

This is a rather elementary version of the Law of Supply and Demand for the pure consumption economy with one firm. In brief, the price equation states that the market clearing price is always equal to the product of unit wage costs $\frac{W}{R}$ and the expenditure ratio. Employment is not a determinant of the price (nor is the quantity of money).

With constant unit wage costs the market clearing price depends alone on the variations of nominal demand which are formally incorporated in the expenditure ratio. Note that no subjective or behavioral concepts like optimization or market power enter into the price determination. The price formula is testable in principle and fully replaces supply-function–demand-function–equilibrium.

4 Money and credit

If income is higher than consumption expenditures the household sector's stock of money increases. It decreases in the opposite case. The change in period t is defined as:

$$\Delta \bar{\mathrm{M}}_{\mathbf{H}} := Y_W - C := (1 - \rho_{EW})\, Y_W. \tag{8}$$

The alternative identity sign := indicates that the definition refers to the monetary sphere. There is no change of stock if the expenditure ratio is unity.

The stock of money $\bar{\mathsf{M}}_{\mathbf{H}}$ 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:

$$\bar{\mathsf{M}}_{\mathbf{H}t} \equiv \sum_{t=1}^{t} \Delta\bar{\mathsf{M}}_{\mathbf{H}t} + \bar{\mathsf{M}}_{\mathbf{H}0}. \tag{9}$$

The interrelation between the expenditure ratio and the households sector's stock of money, is then given by:

$$\bar{\mathsf{M}}_{\mathbf{H}t} \equiv \sum_{t=1}^{t} (1 - \rho_{EWt})\, Y_{Wt} \quad \text{if} \quad \bar{\mathsf{M}}_{\mathbf{H}0} = 0. \tag{10}$$

The household sector's actual stock of money depends on the preceding sequence of expenditure ratios. Wage income is the scale factor.

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

$$\Delta\bar{\mathsf{M}}_{\mathbf{B}} := C - Y_W. \tag{11}$$

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

$$\bar{\mathsf{M}}_{\mathbf{B}t} \equiv \sum_{t=1}^{t} \Delta\bar{\mathsf{M}}_{\mathbf{B}t} + \bar{\mathsf{M}}_{\mathbf{B}0}. \tag{12}$$

The development of the household or business sector's stock of money follows without further assumptions formally directly from the elementary formalism that is given with eqs. (1) to (3).

In order to reduce the monetary phenomena to the essentials it is supposed that all financial transactions are carried out (at first 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 (10), the current overdrafts of the business sector are of equal amount according to (12) and vice versa if the business sector owns current deposits. Money and credit are symmetrical; the stock of money of each sector can be either positive or negative. 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 (10) or (12):

$$\bar{\mathsf{M}}_t \equiv \left| \sum_{t=1}^{t} \Delta\bar{\mathsf{M}}_t \right| \quad \text{if} \quad \bar{\mathsf{M}}_0 = 0. \tag{13}$$

The *quantity* of money is always ≥ 0 and is sometimes owned by the household sector and sometimes by the business sector. This depends on the path of the expenditure ratio until period t. The quantity of money in period t is *not* exogenously predetermined by the central bank; it is predetermined by the preceding actions of the economic agents.

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. Money is the *dependent* variable.

5 Profit/loss and dissaving/saving

Monetary profit/loss Q_m of the business sector as a whole is defined as the difference of consumption expenditure C and wage costs Y_W:

$$\begin{gathered} Q_m \equiv C - Y_W \\ \text{or} \\ Q_m \equiv (\rho_{EW} - 1)\, Y_W . \end{gathered} \tag{14}$$

Monetary saving of the household sector S_m as a whole is defined as the difference of income and consumption expenditures:

$$\begin{gathered} S_m \equiv Y_W - C \\ \text{or} \\ S_m \equiv (1 - \rho_{EW})\, Y_W . \end{gathered} \tag{15}$$

From these two definitions follows as a corollary:

$$Q_m \doteq -S_m . \tag{16}$$

In the elementary consumption economy monetary profit and monetary saving always move in opposite directions. That is, the complementary notion to saving is loss; profit is the complementary of dissaving. Profit has nothing at all to do with capital or productivity. Both, orthodox and heterodox profit theories are false (see Desai, 2008 and 2014b).

In the case of budget balancing, i.e., $\rho_{EW} = 1$ or $S_m = 0$, monetary profit is zero. The zero profit economy is, of course, an analytical limiting case. In actuality, the expenditure ratio differs from unity.

6 Change and the market clearing price

The period values of the variables are formally connected by the familiar growth equation.

$$Z_t = Z_{t-1}\left(1+\dddot{Z}_t\right)$$

or

$$Z_t = Z_0\,(1+\dddot{Z}_1)\,(1+\dddot{Z}_2)\ldots(1+\dddot{Z}_t) = Z_0\prod_{t=1}^{t}(1+\dddot{Z}_t)\,. \tag{17}$$

with

$$Z \leftarrow W, L, D, N, R, P, X, \ldots$$

The path of the representative variable Z_t is determined by the initial value Z_0 and the discrete rates of change $\dddot{Z}_t$ for each period. The three dots indicate that the rate of change refers to a period of predefined length. The dots do *not* symbolize the third derivative. Each path has three segments past, present, future. The past rates of change are known and can be inserted in (17). The future rates are unknown and their values follow from assumptions that have a high degree of plausibility.

For a start, the wage rate W, the productivity R, and employment L are kept fix. The expenditure ratio is initially set to $\rho_{EW} = 1$ and we assume that it subsequently changes randomly in each period. The respective probability distribution of the change rates is given in general form by:

$$Pr\left(l_\rho \leq \dddot{\rho}_{EW} \leq u_\rho\right) \tag{18}$$

With this, the formal apparatus is complete. The defining equations, conditions and the probability distribution constitute a simulation. A simulation is a well-defined mathematical object.

Before the formalism can be applied a concrete assumption about the upper (u) and lower (l) bounds of the probability distribution has to be made. It is assumed then that the the expenditure ratio varies symmetrically around unity with the lower bound at -1 percent and the upper bound at 1 percent. Accordingly, the expenditure ratio varies randomly within the range $0,99 - 1,01$, that is, the budget of the household sector is never exactly balanced. Consumption expenditures are either above or below wage income. These demand variations affect the market clearing price according to eq. (7); all other price determining factors have been frozen for the moment.

The random variations of the expenditure ratio happen from period 1 to 30 and then stop. Figure 2 is the graphical representation of the product market. It shows one aspect of the total simulation. The rest of the formal apparatus is implicit in the selected picture.

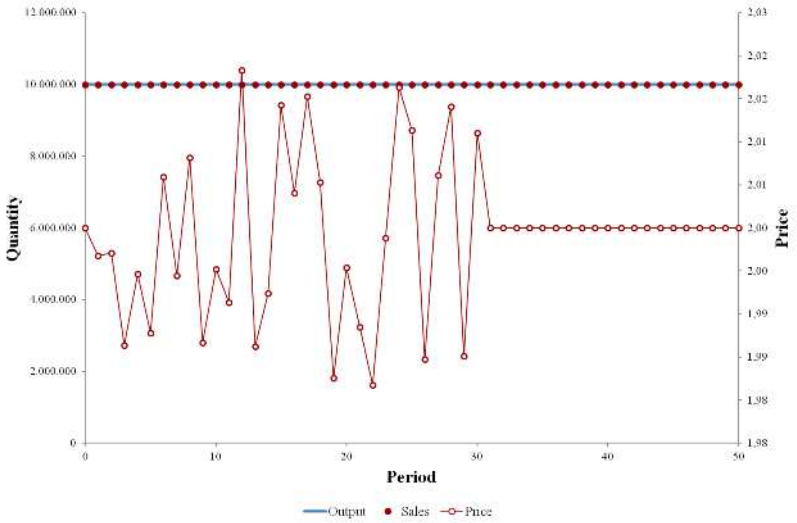


Figure 2: Supply and demand quantities (left axis), market clearing price (right axis), time (horizontal axis). The congruent paths of output O and quantity sold/bought X indicate market clearing over the whole time span of observation. The price is throughout the market clearing price. The random changes of the expenditure ratio end in period 30, subsequently the market clearing price becomes stationary.

The supply quantity is fix because employment and productivity are fix; the output path O runs parallel to the horizontal time axis. Real demand X is equal to supply O. Both paths are perfectly congruent, which is the graphical expression of market clearing. The price variations depend alone on the variations of nominal demand which are determined by the symmetric random variations of the expenditure ratio. The symmetry condition makes that the market clearing price oscillates around a stable average, which is anchored by the constant unit wage costs.

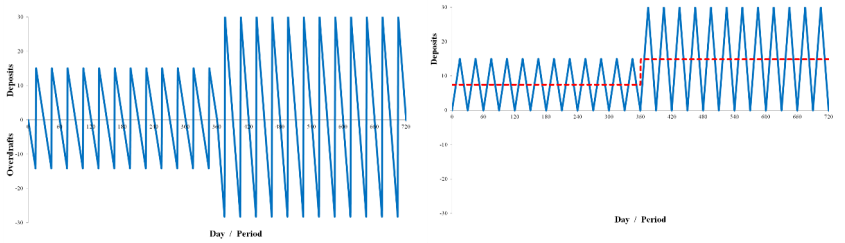
Figure 2 is the correct representation of the product market and replaces the unacceptable supply-demand-cross of the textbooks.

7 Transaction money

In the initial period the conditions of market clearing and budget balancing hold, i.e., $\rho_X = 1$, $\rho_{EW} = 1$. The central bank provides the transaction medium and creates money out of nothing. Loosely speaking, it finances the business sector's payroll, whatever it is.

By sequencing the initially given period length of one year into months the *idealized* transaction pattern that is displayed in Figure 3a results. It is assumed that the monthly income $Y_W/12$ is paid out at mid-month. In the first half of the month the daily spending of $Y_W/360$ increases the current overdrafts of the households. At mid-month the households change to the positive side and have current deposits of

$Y_W/24$ at their disposal. This amount reduces continuously towards the end of the month. This pattern is exactly repeated over the rest of the year. At the end of each sub-period, and therefore also at the end of the year, both the stock of money and the *quantity of money is zero*. Money is present and absent depending on the time frame of observation.



(a) Transactions **(b)** Average stock of transaction money $\hat{\mathrm{M}}_T$

Figure 3: Household sector's transaction pattern for different nominal incomes in two periods

In period 2 the wage rate and the price is doubled. Since no cash balances are carried forward from one period to the next, there results *no* real balance effect provided the doubling takes place exactly at the beginning of period 2.

From the perspective of the central bank it is a matter of indifference whether the household or the business sector owns current deposits. The pattern of Figure 3a translates into the average amount of current deposits in Figure 3b. This average stock of transaction money depends on income according to the transaction equation

$$\hat{\mathrm{M}}_T \equiv \kappa Y_W . \tag{19}$$

The variable $\hat{\mathrm{M}}_T$ is not to be taken as the demand for transaction balances; it is a straightforward period average which results from the autonomous transactions between the business and the household sector.

For the transaction pattern that is here assumed as an idealization the index is $1/48$. Different transaction patterns are characterized by different numerical values of the transaction pattern index.

Taking (19), (4) and (5) together one gets the explicit transaction equation for the limiting case of market clearing and budget balancing:

$$\begin{gathered} \text{(i)}\ \hat{\mathrm{M}}_T \equiv \kappa RLP \quad \text{(ii)}\ \frac{\hat{\mathrm{M}}_T}{P} \equiv \kappa O \\ \text{if} \quad \rho_X = 1, \rho_{EW} = 1. \end{gathered} \tag{20}$$

We are now in the position to substantiate the notion of accommodation as a money-growth formula. According to (i) the central bank enables the average stock of

transaction money to expand or contract with the development of productivity, employment, and price. In other words, the real average stock of transaction money, which is a statistical artifact and no physical stock, is proportional to output (ii) if the transaction index is given and if the ratios ρ_E and ρ_X are unity. Under these *initial* conditions money is endogenous and neutral in the structural axiomatic context. Money emerges from *autonomous* market transactions and has three aspects: stocks of money ($\bar{\mathrm{M}}_{\mathbf{H}}$, $\bar{\mathrm{M}}_{\mathbf{B}}$), quantity of money (here $\bar{\mathrm{M}} = 0$ at period beginning and end because of $\rho_{EW} = 1$) and average stock of transaction money ($\hat{\mathrm{M}}_T > 0$).

Eq. (7) says that the market clearing price doubles if the wage rate doubles under the condition of budget balancing, i.e., $\rho_{EW} = 1$. Eq. (20) says that in this case the average stock of transaction money (i) doubles, while the real stock (ii) remains unchanged. If, on the other hand, employment L in (20) doubles, then the average stock of transaction money (i) doubles *and* the real stock (ii) doubles, too. In the first case we find a correlation between the average stock of transaction money and the market clearing price, i.e., the commonplace Quantity Theory is confirmed, in the second case not. Note that the quantity of money according to (13) is zero at period start and end.

8 The transaction unit

Hitherto it has been assumed that the central bank works costless. This assumption is now dropped.

The business sector consists now of a consumption good producing firm 1 and the central bank as the second firm 2. To begin with, the central bank handles only the money transactions. Total employment is given by:

$$L \equiv L_1 + L_2. \tag{21}$$

To focus exclusively on the monetary phenomena variations of total employment are excluded.

Total wage income consists according to (1) now of the wage incomes of both firms. To streamline the analysis the wage rates for all firms are set equal.

$$Y_W = \underbrace{W_1}_{W} L_1 + \underbrace{W_2}_{W} L_2. \tag{22}$$

The household sector apportions its consumption expenditures between the purchase of the consumption good and the purchase of transaction services. With X_2 the number of transactions per period that are carried out by the central bank on behalf of the households is denoted:

$$C = P_1 X_1 + P_2 X_2. \tag{23}$$

Consumption expenditures are equal to income over all periods, i.e., $\rho_{EW} = 1$. The household sector as a whole neither saves nor dissaves.

Overall monetary profit is differentiated for the two firms:

$$\begin{aligned} Q_{m1} &\equiv P_1 X_1 - W L_1 \\ Q_{m2} &\equiv P_2 X_2 - W L_2. \end{aligned} \tag{24}$$

Under the condition that both markets are cleared, i.e., $\rho_X = 1$, this can be rewritten as:

$$\begin{aligned} Q_{m1} &\equiv P_1 R_1 L_1 \left(1 - \frac{W}{P_1 R_1}\right) \quad \rho_{X1} = 1 \\ Q_{m2} &\equiv P_2 R_2 L_2 \left(1 - \frac{W}{P_2 R_2}\right) \quad \rho_{X2} = 1. \end{aligned} \tag{25}$$

Overall profit is zero because of $C = Y_W$ according to (14). The zero profit condition for a single firm reads $\frac{W}{PR} = 1$. Under this conditions follows from (25) that absolute prices are equal to unit wage costs, i.e., $P_1 = \frac{W}{R_1}$ respectively $P_2 = \frac{W}{R_2}$, and that relative prices $\frac{P_1}{P_2}$ are equal to the inverse productivity ratio $\frac{R_2}{R_1}$. In sum: both markets are cleared, the household sector's budget is balanced and profits are zero for both the consumption good producing firm and the transaction unit of the central bank. Money transactions consume resources, the less so, the higher the productivity of the transaction unit is. The price the households pay for each transaction P_2 follows from (25) and the zero profit condition.

The elementary zero profit consumption economy with a transaction services producing central bank is reproducible for an indefinite time. If the wage rate doubles, both the product price and the service price double, but the real variables employment, productivity, and output remain unchanged.

9 The banking unit

The transaction unit handles the day to day transactions between the household and the business sector which consist of wage payments and consumption expenditures. The market clearing price of the transaction services covers exactly the unit wage costs. Up to this point only interest-free overdrafts but no loans have been provided.

It is now assumed that the household sector dissaves in period 1, i.e., $\rho_{EW} > 1$. This makes that the overdrafts increase in period 1. As a mirror image the business

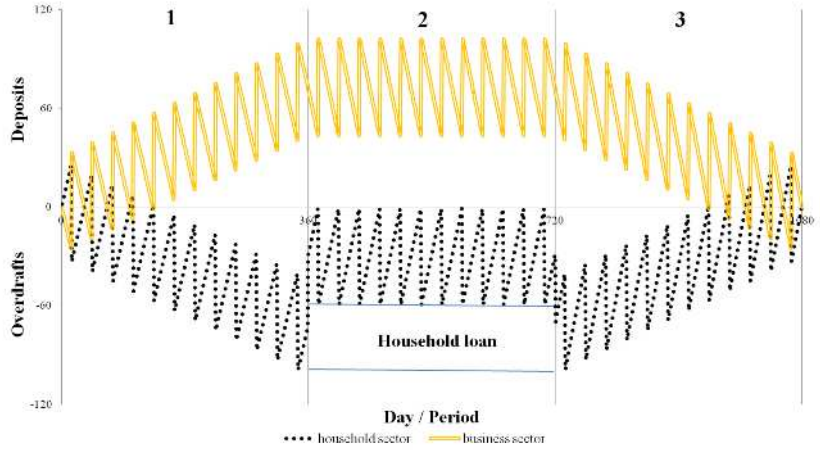


Figure 4: Household sector's overdrafts and business sector's deposits at the central bank due to an expenditure ratio >1 in period 1 and <1 in period 3 with the household sector taking up a loan in period 2

sector's deposits increase. According to (13) the quantity of money at the end of period 1 is $\bar{M} > 0$ as can be seen in Figure (4).

So far, only the transaction unit was involved. In period 2 the household sector takes up a one-period loan at the banking unit. This reduces the household sector's overdrafts which are payable on demand and consolidates the total debt in part. The one-period loan reduces the household sector's risk of illiquidity in period 2. Dissaving takes place in period 1, saving follows in period 3. The inverse sequence would give rise to a loan demand of the business sector.

The respective owners of current deposits could, for example, switch to interest bearing longer term savings accounts at the central bank. This option is left out of the picture here.

The inclusion of the banking unit entails that the given resources of the business sector L have first to be reallocated:

$$L \equiv L_1 + L_2 + L_3. \tag{26}$$

As a consequence total wage income is then given by:

$$Y_W = \underbrace{W_1}_{W} L_1 + \underbrace{W_2}_{W} L_2 + \underbrace{W_3}_{W} L_3. \tag{27}$$

The interest payments to the banking unit have to be subsumed under consumption expenditures:

$$C = P_1 X_1 + P_2 X_2 + J_3 \bar{A}_3. \tag{28}$$

The price is replaced by the interest rate J_3 and the quantity bought from the banking unit X_3 is replaced by the amount of the loan $\bar{A}_3$.

The reallocation of labor input is neutral with regard to the price of the consumption good. When labor input L_3 is taken away from firm 1 output falls. At the same time consumption expenditures are redirected away from purchases of consumption good to purchases of the loan services of the banking unit, i.e., C_1 goes down and C_3 goes up. This leaves the price of the consumption good unaffected under the given conditions. The household sector buys less of the consumption good and more services from the central bank and according to this demand shift the unaltered total labor input is reallocated.

Profit for each firm is zero, i.e., $\frac{W}{PR} = 1$:

$$\begin{aligned} Q_{m1} &\equiv P_1 R_1 L_1 \left(1 - \frac{W}{P_1 R_1}\right) \quad \rho_{X1} = 1 \\ Q_{m2} &\equiv P_2 R_2 L_2 \left(1 - \frac{W}{P_2 R_2}\right) \quad \rho_{X2} = 1 \\ Q_{m3} &\equiv J_3 \bar{A}_3 \left(1 - \frac{W}{J_3 \frac{\bar{A}_3}{L_3}}\right) \quad \rho_{X3} = 1. \end{aligned} \tag{29}$$

The zero profit conditions define the relations of product price, transaction price and rate of interest. The relationships P_1, P_2, J_3 are inverse to the objectively given productivities in the respective firms R_1, R_2, R_3. The inclusion of the banking unit and the appearance of a rate of interest on loans results in a reallocation of demand and resources. The loan interest rate is, at first, alone determined by the production conditions of the banking unit. The banking unit's interest earnings are equal to its wage costs and profit is zero just like in the other firms.

10 The interest rate as objective constant

From the banking unit's profit definition

$$Q_{m3} \equiv J_3 \bar{A}_3 - W L_3 \tag{30}$$

follows as a corollary under the zero profit condition in period 2:

$$
\begin{aligned}
J_{32}\bar{A}_{32} &\doteq W_{.2}L_{32} \\
\text{if} \quad Q_{m32} &= 0.
\end{aligned}
\tag{31}
$$

Let us assume that the loan is revolved in period 3 and that the wage rate increases:

$$
J_{32}\bar{A}_{32}\left(1+\ddot{W}_{.3}\right) \doteq W_{.2}\left(1+\ddot{W}_{.3}\right)L_{32}. \tag{32}
$$

From (29) follows that the product price of firm 1 and the service price of the transaction unit increase with the same rate. Therefore, the relation of both prices remains unchanged.

The banking unit could satisfy the zero profit condition by increasing the interest rate $J_{33} = J_{32}\left(1+\ddot{W}_{.3}\right)$. However, eq. (32) can obviously also be satisfied by increasing the nominal amount of the household sector's loan.

Let us first define the real amount of the loan in period 2 as quotient of the nominal amount and the wage rate:

$$
\bar{A}_{32}^{real} \equiv \frac{\bar{A}_{32}}{W_{.2}}. \tag{33}
$$

With this, (32) reduces to:

$$
J_{32}\bar{A}_{32}^{real} \doteq L_{32}. \tag{34}
$$

And for the rate of interest follows finally:

$$
\begin{aligned}
J_{32} &\doteq \frac{1}{R_{32}} \\
\text{with} \quad R_{32} &\equiv \frac{\bar{A}_{32}^{real}}{L_{32}}.
\end{aligned}
\tag{35}
$$

The rate of loan interest only depends on the loan processing productivity R_{32} in the banking unit. Loans are produced like any other good. As long as the productivity remains constant the rate of interest remains constant, no matter how the wage rate, and the market clearing price with it, develops. What is required is that the nominal loan is indexed with the wage rate. As long as the nominal amount of the loan increases or decreases with the wage rate the real amount of the loan remains constant, that is:

$$
\bar{A}_{3t}^{real} \equiv \frac{\bar{A}_{3t-1}\left(1+\ddot{W}_{t}\right)}{W_{t-1}\left(1+\ddot{W}_{t}\right)}. \tag{36}
$$

With given employment, the productivity in the banking unit (35) remains constant and therefore the rate of interest is unaffected by wage rate and price changes. The Fisherian distinction between real and nominal interest rate falls flat. The indexing of overdrafts and loans in turn implies that the stock of deposits must also be indexed. This keeps the purchasing power of the stock of deposits constant. As a result, both sides of the central bank's balance sheet vary in step. Thus, the changes of wage rate and market clearing price, which are coupled for the pure consumption economy as a whole by:

$$P = \frac{W}{R} \qquad \text{if} \quad \rho_X = 1, \rho_{EW} = 1. \tag{37}$$

and for each firm by (29) have no real effect. Under the condition of indexed assets and liabilities of the central bank, the interest rate is completely independent of nominal changes – it is the fixed star of the economic firmament.

11 Extensions and conclusion

The obvious extensions are: loans to the business sector, liquidity management and interest on longer term accounts at the central bank, establishing the link between the interest rates on both sides of the the central bank's balance sheet, securitization and the establishment of credit relationships outside the central bank, differentiated wage rates, and finally generalization for a consumption economy with positive overall profit as well as profit distribution. Subsequently, the transition from the consumption to the investment economy has to be analytically accomplished.

The main results of the analysis of money in the pure consumption economy are:

- While it is true in a very general sense that 'supply and demand' determine the product price there is no such thing as supply-function–demand-function–equilibrium.
- The Structural Law of Supply and Demand for the consumption economy with one firm states that the product price is equal to the product of unit wage costs and the expenditure ratio under the condition of market clearing.
- The crucial systemic fact of the pure consumption economy is that the budget is never balanced. Since the expenditure ratio is never equal to unity there is profit/loss for the business sector as a whole. Profit/loss is exactly complementary to dissaving/saving. By the same token, there are continuous endogenous changes of the quantity of money.

- The quantity of money in period t is *not* exogenously predetermined by the central bank; it is predetermined by the preceding actions of the economic agents.
- In the elementary consumption economy monetary profit and monetary saving always move in opposite directions. That is, the complementary notion to saving is loss; profit is the complementary of dissaving.
- Under the condition that both the asset and liability side of the central bank's balance sheet is indexed, the one-period loan rate of interest depends on the loan processing productivity in the banking unit. The loan interest rate is unaffected by changes of the wage rate and the market clearing price.

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