Essentials of Constructive Heterodoxy: Financial Markets

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Abstract

What stands before all eyes as failed Orthodoxy is ultimately caused by the wrong answer to Mill's Starting Problem. It is now pretty obvious that one cannot put utility maximization, equilibrium, well-behaved production functions, ergodicity or any other physical or psychological or sociological or behavioral assumption into the premises. No way leads from such premises to the explanation of how the actual market economy works. The logical consequence is to discard them. Having first secured a superior formal starting point, the present paper addresses the question of how the various types of financial markets emerge from the elementary monetary circuit.

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Keywords new framework of concepts; structure-centric; Law of Supply and Demand; Profit Law; IOU; complementarity of retained profit and saving; securities; bonds; common stock; mortgages; consumer financing

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1 Right from the start

> Could it be that there is something deeply wrong with mainstream economics . . . ? (Blaug, 1984, p. 973)

What is so deeply wrong with economics is methodology, or, in more personal terms, economists never understood what, for instance, physicists always understood very well. Take Einstein as an example; not his physics, but his methodology. And here comes a big surprise, Einstein got his ideas from an economist. Indeed, physicists understood J. S. Mill better than the hordes of confused economists from classical times onwards.

> "They [Einstein and Dirac] agreed that science was fundamentally about explaining more and more phenomena in terms of fewer and fewer theories, a view they had read in Mill's *A System of Logic*." (Farmelo, 2009, p. 137)

Mill in turn was quite clear that the first task of every science is to get the fundamentals right. This is Mill's Starting Problem.

> "What are the propositions which may reasonably be received without proof? That there must be some such propositions all are agreed, since there cannot be an infinite series of proof, a chain suspended from nothing. But to determine what these propositions are, is the *opus magnum* of the more recondite mental philosophy." (Mill, 2006, p. 746)

And now all is pretty obvious: one cannot put utility maximization, equilibrium, well-behaved production functions, ergodicity or any other physical or psychological or sociological or behavioral assumption into the premises. No way leads from such premises to an explanation of how the actual market economy works.

What stands before all eyes as failed Orthodoxy is ultimately caused by the wrong answer to Mill's Starting Problem. Historians of economic thought will certainly explain some day in greater detail how this embarrassing scientific aberration could happen.

Conventional economics rests on behavioral assumptions that are formally expressed as axioms (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 does not yield to axiomatization. Thus, the axiomatic-deductive method could not help to produce results in theoretical economics that compare to other domains.

The logical consequence of the present paper is to discard the subjective-behavioral axioms and to take objective-structural axioms as the formal point of departure. This is the precondition to tackle any economic problem whatsoever.

Having secured a superior formal starting point, the question is then addressed how various types of financial markets emerge from the elementary monetary circuit. The interconnectedness of qualitatively different markets is the pivotal subject of theoretical economics. The accustomed supply-demand-equilibrium account has always been unconvincing. That economists have solved the so-called coordination problem is folklore.

> It is good to have [the technically best study of equilibria], but perhaps the time has now come to see whether it can serve in an analysis of how economies behave. The most intellectually exciting question of our subject remains: is it true that the pursuit of private interest produces not chaos but coherence, and if so, how is it done? (Hahn, 1984, p. 102)

Section 2 first provides the correct formal foundations with the set of four structural axioms. From these minimalistic premises follows in Section 3 the purely structural Law of Supply and Demand, the quantity of money, the average stock of transaction money, the Profit Law and the complementarity of retained profit and saving. In Section 4 it is shown how from intra-sectoral saving/dissaving the market for IOUs emerges. In Section 5 it is shown how from the extra-sectoral saving/dissaving the commercial bond market, the mortgage market and other specialized markets for consumer financing emerge. In Section 6 the analysis is extended to investment financing. Section 7 concludes.

2 The spirit of exact investigation

> The axiomatic method is indeed and remains the one suitable and indispensable aid to the spirit of every exact investigation no matter in what domain; ... To proceed axiomatically means in this sense nothing else than to think with knowledge of what one is about. (Hilbert, quoted in Kline, 1982, p. 193)

We now advance from the behavioral axioms of yore to objective structural axioms as formal incarnation of the evolving economic system. Human beings are thereby moved from the analytical foreground to the background.

A theory is an articulated mental representation of the real thing. Theory and real thing are different but correspond at crucial touch points. Abstract analysis must eventually arrive with the highest precision at concrete facts. The correct theory describes the real reality.

2.1 Axioms

The new formal foundations of theoretical economics define the interdependencies of the real and nominal variables that constitute the monetary economy.

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.

$$Y = WL + DN \tag{1}$$

The period counter t runs from 0, the initial period, to ∞. An anchoring in historical time is possible but not necessary at the very beginning of the analysis.

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

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

The productivity R depends on the underlying production process. The 2nd axiom should therefore not be misinterpreted as a linear production function. Geometrically the 2nd axiom is a ray from the coordinate origin that tracks underlying discontinuous non-linearities; it does not contain any implicit assumption about increasing or decreasing returns.

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

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

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.

$$Z_t = Z_{t-1}\left(1+\dddot{Z}_t\right)$$
or
$$Z_t = Z_0\,(1+\dddot{Z}_1)\,(1+\dddot{Z}_2)\ldots(1+\dddot{Z}_t) = Z_0\prod_{t=1}^{t}(1+\dddot{Z}_t)\,. \tag{4}$$
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 rates of change $\ddot{Z}_t$ for each period. Each path has three segments: past, present, future. The past rates of change are known and can be inserted in (4). The axioms contain the minimum number of variables. Seven of the variables are elementary, three are composed. Figure 1 is the graphical representation of the first four axioms.

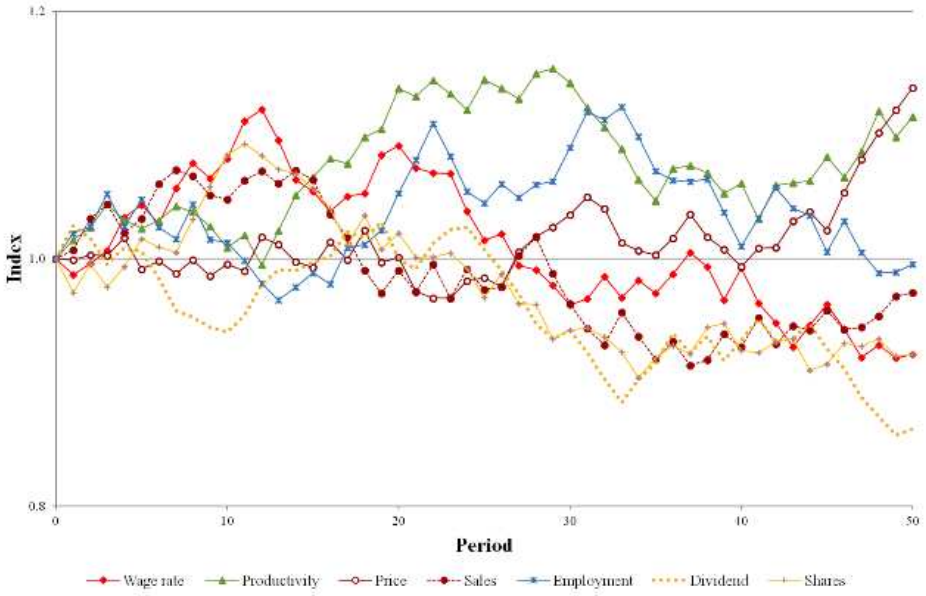


Figure 1: The pure consumption economy: paths of the seven elementary axiomatic variables W, L, D, N, R, P, X from the initial period $t = 0$ until period $t = 50$ as defined by independent symmetrical random rates of change. All paths are numerically expressed in terms of their respective initial values, therefore they start collectively at the index point 1.

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 (5) wage income Y_W and distributed profit Y_D is defined:

$$Y_W \equiv WL \qquad Y_D \equiv DN. \tag{5}$$

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 and defined variables is also determined.

Key ratios

We define the sales ratio as:

$$\rho_X \equiv \frac{X}{O}. \tag{6}$$

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:

$$\rho_E \equiv \frac{C}{Y}. \tag{7}$$

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.

We define the factor cost ratio as:

$$\rho_F \equiv \frac{W}{PR}. \tag{8}$$

A factor cost ratio $\rho_F = 1$ indicates that the nominal value of one hour's labor input W is equal to the value of output PR which implies that profit per hour, respectively per unit of output, is zero.

We define the distributed profit ratio as:

$$\rho_D \equiv \frac{DN}{WL}. \tag{9}$$

The distributed profit ratio may, for instance, assume a value between zero and 10 percent.

2.3 Assumptions

Assumptions are a necessary ingredient of any theory. Their justification or, as the case may be, their futility materializes in the course of the analysis.

For a start it is now 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:

$$\begin{array}{ll} Pr\left(l_W \leq \ddot{\dot{W}} \leq u_W\right) & Pr\left(l_R \leq \ddot{\dot{R}} \leq u_R\right) \\ Pr\left(l_L \leq \ddot{\dot{L}} \leq u_L\right) & Pr\left(l_P \leq \ddot{\dot{P}} \leq u_P\right) \\ Pr\left(l_D \leq \ddot{\dot{D}} \leq u_D\right) & Pr\left(l_X \leq \ddot{\dot{X}} \leq u_X\right) \\ Pr\left(l_N \leq \ddot{\dot{N}} \leq u_N\right) & \end{array} \tag{10}$$

The four axioms, including (10), constitute a stochastic simulation.

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.

Before the formalism can be applied concrete assumptions about the initial conditions and the upper (u) and lower (l) bounds of the probability distributions have to be made. This is the point where input from experience is needed. We know from observation for instance that productivity changes lie normally between, say, 5 percent and 0 percent per period. But it may happen that the rate of change is -100 percent in case a plant burns down or is cut off from the power supply or is paralyzed by a software bug or something else of this sort. In order to bring the simulation as close as possible to reality, we take the probability distribution from experience, and in order to make it simple, we first exclude all kinds of accidents.

We know that probability distributions may change over time and that accidents do happen. What we do not know is the exact date and extent of a possible accident in the future. For a start these features of reality are excluded from the analysis. They may be taken in as soon as the elementary relationships have been clarified.

A simulation yields a scenario and not a prediction. Each scenario is fully determined, explicit, and traceable in every detail. A simulation as defined by the four structural axioms and the probability distributions is a well-defined mathematical object just like a system of equations. While they are formally on the same footing, both mathematical objects yield different kinds of outputs: the system of equations yields a solution vector, a simulation yields a bundle of paths. This bundle has a counterpart in reality.

The upper (u) and lower (l) bounds of the respective probability distributions are, for a start, taken to be symmetrical around zero. This produces the drifting or stationary economy as shown in Figure 1. There is no need at this early stage to discuss the merits and demerits of different probability distributions. Eq. (10) represents the general stochastic case which in the limit $u - l \to 0$ shades into determinism. The evolving consumption economy is a well-defined mathematical object that contains no subjective elements.

3 Market clearing and budget balancing

> But even these cases go to show all the more impressively that it is not the cost of production which rule values, but the demand and supply of the products. (Jevons, 1911, p. 199)

3.1 The Law of Supply and Demand

From (3) and the other axioms and the definitions follows the price as dependent variable:

$$P = \frac{\rho_E}{\rho_X}\frac{W}{R}\left(1+\frac{DN}{WL}\right). \tag{11}$$

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 price is equal to the product of the expenditure ratio ρ_E, the inverse of the sales ratio ρ_X, unit wage costs $\frac{W}{R}$, and the distributional factor $1+\rho_D$. The structural axiomatic price formula is testable in principle and fully replaces supply-function–demand-function–equilibrium.

Under the condition of market clearing one gets:

$$\begin{gathered} P = \rho_E \frac{W}{R}\left(1+\frac{DN}{WL}\right) \\ \text{if} \quad \rho_X = 1. \end{gathered} \tag{12}$$

The price reflects all changes on the right hand side. Conditional price flexibility is, clearly, an algebraic concept. Nothing is said about the behavior of the firm. We have axioms and conditions, that is all. No green-cheese assumptions and no nonentities.

3.2 The non-balanced budget

There exists no such thing as an immutable law of budget balancing in the same period. Logically, we have three possible cases $\rho_E < 1$, $\rho_E = 1$, $\rho_E > 1$. For the market clearing price follows from (12) under the condition of zero profit distribution:

$$\begin{gathered} P = \rho_E \frac{W}{R} \\ \text{if} \quad \rho_X = 1, \rho_D = 0. \end{gathered} \tag{13}$$

With given unit wage costs, the market clearing price moves in parallel with nominal demand which in turn is determined by the expenditure ratio and total period income. Loosely speaking, the price rises and falls with demand. At first, the expenditure ratio follows a random walk that is defined by:

$$\rho_{Et} = 1 + \ddot{\ddot{\rho}}_E$$
$$\text{with} \quad Pr\left(l_\rho \leq \ddot{\ddot{\rho}}_E \leq u_\rho\right). \tag{14}$$

The random rates of change of the expenditure ratio are symmetrically distributed around zero, that is, the expenditure ratio varies symmetrically around unity. This is a convenient behavioral assumption to start with, not an economic law.

Eq. (13) says that the market clearing price variations are dependent on the expenditure ratio, the wage rate, and the productivity. These independent variables in turn vary at random with the possible rates of change distributed symmetrically around zero. The random changes of employment have no effect on the price. Accordingly, the market clearing price follows a well-defined random path as shown in Figure 2.

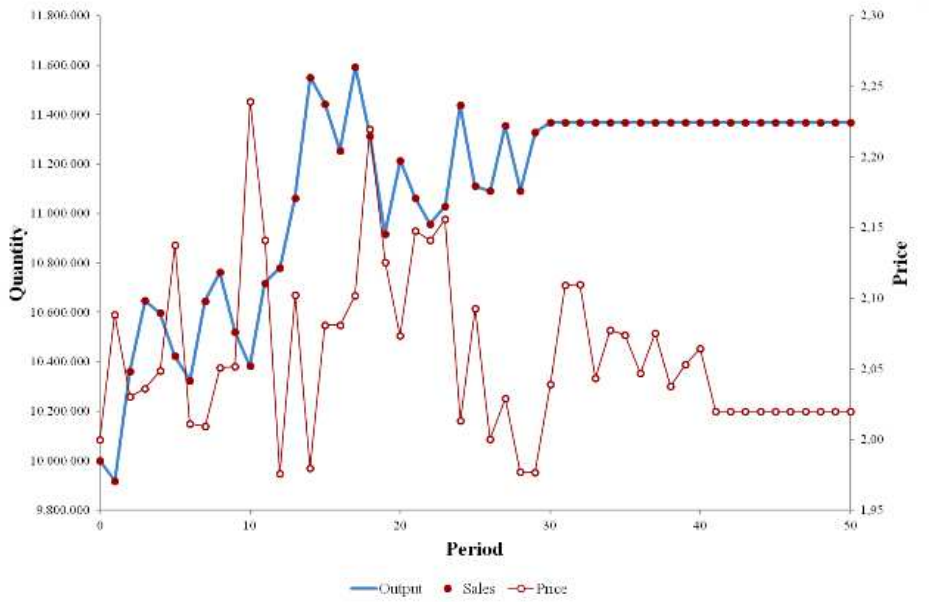


Figure 2: That's the market. The conditional market clearing price in the three dimensional product market is dependent on the random paths of the expenditure ratio, the wage rate, and the productivity. The random employment variations have no effect on the price. Other independent variables are here left out for simplicity.

Market clearing shows up in the congruent paths of output and sales. The price varies with the random changes of the independent variables. This means, the price in the current and future periods is not predictable. However, the structural axiomatic Law of Demand and Supply is testable in principle. All one has to do is to put the realized past rates of change into the equation and to calculate the price. What is to be expected from the correct theory is that the calculated price is equal to the observed price (plus/minus a small error term). This is an important distinction: the price is uniquely determined but not predictable – it is, so to say, redictable. This is crucial for empirical tests.

In the simulation that is reproduced in Figure 2 the random changes of the independent variables are switched off in the following sequence: L in t=25, R in t=30, W in t=35, ρ_E in t=40. Because of this, output is flat beginning with period 30. Unit wage costs are flat beginning with period 35; the price is then only moved by changes of nominal demand which end in period 40. Thereafter, the product market is stationary. It is tempting, but would be utterly false and misleading, to characterize this state as equilibrium. Equilibrium is a nonentity and all equilibrium models are false.

3.3 Stocks and quantity of money

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

$$\Delta\bar{\mathsf{M}}_{\mathbf{H}} := Y - C := Y\,(1-\rho_E)\,. \tag{15}$$

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:

$$\bar{\mathsf{M}}_{\mathbf{H}t} \equiv \sum_{t=1}^{t} \Delta\bar{\mathsf{M}}_{\mathbf{H}t} + \bar{\mathsf{M}}_{\mathbf{H}0}. \tag{16}$$

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

$$\bar{\mathsf{M}}_{\mathbf{H}t} \equiv \sum_{t=1}^{t} Y_t\,(1-\rho_{Et}) \quad \text{if} \quad \bar{\mathsf{M}}_{\mathbf{H}0} = 0. \tag{17}$$

The household sector's actual stock of money ultimately depends on the preceding sequence of expenditure ratios.

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

$$\Delta\bar{\mathsf{M}}_{\mathbf{B}} := C - Y. \tag{18}$$

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

$$\bar{\mathsf{M}}_{\mathbf{B}t} \equiv \sum_{t=1}^{t} \Delta\bar{\mathsf{M}}_{\mathbf{B}t} + \bar{\mathsf{M}}_{\mathbf{B}0}. \tag{19}$$

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 (17) the current overdrafts of the business sector are of equal amount according to (19) 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 (17) or (19):

$$\bar{\mathsf{M}}_t \equiv \left| \sum_{t=1}^{t} \Delta \bar{\mathsf{M}}_t \right| \quad \text{if} \quad \bar{\mathsf{M}}_0 = 0. \tag{20}$$

The development of the household sector's stock of money is shown in Figure 3. The business sector's stock is perfectly symmetrical and not depicted here.

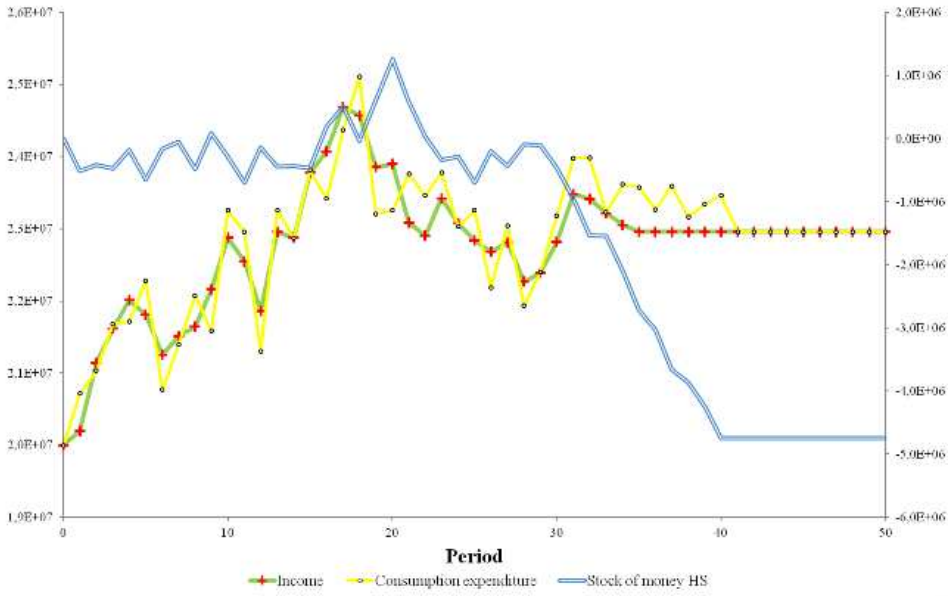


Figure 3: Household sector's stock of money as derived from the paths of total income and consumption expenditure which are interconnected by the randomly varying expenditure ratio which is fixed in period 40 at $\rho_E = 1$ (refers to Figure 2)

In Figure 3 the household sector dissaves in the first periods and this brings about the initial increase of their current overdrafts. This corresponds to the increase of the market clearing price in Figure 2 which depends on the expenditure ratio, but also on wage rate and productivity changes. The expenditure ratio is frozen at $\rho_E = 1$ in period 40. Subsequently there is neither saving nor dissaving and the quantity of money remains unchanged.

Dissaving increases the household sector's current overdrafts and increases the business sector's current deposits which are equal to the quantity of money. Thus, the latter is determined by the autonomous transactions between the household and business sector. The central bank is entirely passive. Note that the market clearing price is determined by (13) and not by the quantity of money which is the dependent variable.

3.4 Profit, saving, retained profit

Total profit consists of monetary and nonmonetary profit. Here we are at first concerned with monetary profit. Nonmonetary profit is treated in (2011a).

The business sector's monetary profit/loss in period t is defined with (21) 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:

$$Q_m \equiv C - Y_W. \tag{21}$$

Because of (3) and (5) this is identical with:

$$Q_m \equiv PX - WL. \tag{22}$$

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

From (21) and (1) follows:

$$Q_m \equiv C - Y + Y_D. \tag{23}$$

or, using the definitions (7) and (9),

$$Q_m \equiv \left(\rho_E - \frac{1}{1+\rho_D}\right) Y. \tag{24}$$

The four equations (21) to (24) are formally equivalent and show profit under different perspectives. The Profit Law (24) 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 (for details see 2013). Total income Y is the scale factor.

It is a unique fact of the history of economic thought that neither Classicals, nor Walrasians, nor Marshallians, nor Marxians, nor Keynesians, nor Institutionialists, nor Monetary Economists, nor Austrians, nor Sraffaians, nor Evolutionists, nor Game theorists, nor EconoPhysicists, nor RBCers, nor New Keynesians, nor New Classicals ever came to grips with profit. Most economists have no true conception

of the two central phenomena in the economic universe: profit and income. This explains why economics is a failed science.

The household sector's monetary saving/dissaving is given as the difference of income and consumption expenditures (for nonmonetary saving see 2011a):

$$S_m \equiv Y - C \equiv (1 - \rho_E)\, Y. \tag{25}$$

Saving varies inversely with the expenditure ratio. The two statements: the household sector saves or the expenditure ratio is less than unity, are interchangeable; likewise: the household sector dissaves or the expenditure ratio is greater than unity.

From the definition of monetary profit (23) and the definition of saving (25) follows:

$$\begin{gathered} Q_m \equiv Y_D - S_m \quad \rightarrow \quad Q_m \doteq -S_m \\ \text{if} \quad Y_D = 0. \end{gathered} \tag{26}$$

Under the condition of zero distributed profit follows the corollary that 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.

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 (23) but it is invisible in (22). 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:

$$Q_{re} \equiv Q_m - Y_D \quad \Rightarrow \quad Q_{re} \equiv C - Y. \tag{27}$$

Retained profit is, due to (23), equal to the difference of consumption expenditures and total income.

In combination with (25) follows:

$$Q_{re} \equiv -S_m. \tag{28}$$

In the general case with distributed profit greater zero, i.e., $Y_D > 0$, monetary saving and *retained profit* always move in opposite directions. This means that the complementary notion to saving is *not* investment but negative retained profit. Positive retained profit is the complementary of dissaving. From the general case (28) the special case (26) follows.

3.5 The balanced budget

In the last step the pure consumption economy is reduced to the bare bones with the assumption that, in addition to the other conditions, now the household sector's budget is balanced.

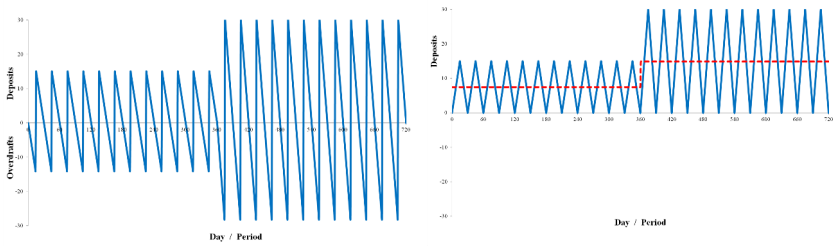
$$P = \frac{W}{R} \qquad \text{if} \quad \rho_E = 1, \rho_X = 1, \rho_D = 0. \tag{29}$$

The original Law of Demand and Supply (11) reduces to the equality of price and unit wage costs. Note that the three conditions of market clearing, budget balancing, and zero distributed profit are the standard classical and neoclassical assumptions. Note also that no subjective behavioral assumptions like utility or profit maximization play any role in the price determination. These assumptions are dispensable, nay, inadmissible because their admission amounts to formal overdetermination.

3.6 Transaction money

In the initial period the conditions of market clearing and budget balancing hold, i.e., $\rho_X = 1$, $\rho_E = 1$. 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. At the moment the transaction price is zero and the central bank works cost free.

By sequencing the initially given period length of one year into months the *idealized* transaction pattern that is displayed in Figure 4a results.



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

Figure 4: Household sector's transaction pattern at the central bank for different nominal incomes in two periods

It is assumed that the monthly income $Y/12$ is paid out at mid-month. In the first half of the month the daily spending of $Y/360$ increases the current overdrafts of the

households. At mid-month the households change to the positive side and have current deposits of $Y/24$ 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.

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 4a translates into the average amount of current deposits in Figure 4b. This average stock of transaction money depends on income according to the transaction equation

$$\hat{\mathrm{M}}_T \equiv \kappa Y. \tag{30}$$

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 (30), (6), (7) and (2) together one gets the explicit transaction equation for the limiting case of market clearing and budget balancing:

$$\begin{gathered} \text{(i) } \hat{\mathrm{M}}_T \equiv \kappa RLP \quad \text{(ii) } \frac{\hat{\mathrm{M}}_T}{P} \equiv \kappa O \\ \text{if} \quad \rho_X = 1, \rho_E = 1. \end{gathered} \tag{31}$$

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 $\rho_E = 1$) and average stock of transaction money ($\hat{\mathrm{M}}_T > 0$).

Eq. (29) says that the market clearing price doubles if the wage rate doubles under the condition of budget balancing. Eq. (31) 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 (31) 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 correlation of the commonplace Quantity Theory is confirmed, in the second case not. Note that, in contrast, the quantity of money according to (20) is zero at period start and end.

4 Saving/dissaving and the emergence of financial markets

> If modern production begins and ends with money, money cannot be neutral. (Wray, 2002, p. 30)

4.1 Saver, dissaver, neutral

Eq. (12) and $\rho_E = 1$ which simplifies to (29) in the case of $Y_D = 0$.

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

$$\begin{aligned} Y &= \underbrace{Y_{Ws} + Y_{Wd} + Y_{Wn}}_{Y_W} + \underbrace{Y_{Ds} + Y_{Dd} + Y_{Dn}}_{Y_D} \\ Y &= \underbrace{Y_{Ws} + Y_{Ds}}_{Y_s} + \underbrace{Y_{Wd} + Y_{Dd}}_{Y_d} + \underbrace{Y_{Wn} + Y_{Dn}}_{Y_n} \end{aligned} \tag{32}$$

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

$$C = C_s + C_d + C_n. \tag{33}$$

Analogously to the overall expenditure ratio (7) we define the group expenditure ratio for savers

$$\rho_{Es} \equiv \frac{C_s}{Y_s} \quad \rho_{Es} < 1, \tag{34}$$

dissavers

$$\rho_{Ed} \equiv \frac{C_d}{Y_d} \quad \rho_{Ed} > 1, \tag{35}$$

and finally the neutrals

$$\rho_{En} \equiv \frac{C_n}{Y_n} \quad \rho_{En} = 1. \tag{36}$$

From (33) and (7) then follows:

$$\frac{C}{Y} = \rho_{Es}\frac{Y_s}{Y} + \rho_{Ed}\frac{Y_d}{Y} + \rho_{En}\frac{Y_n}{Y}. \tag{37}$$

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

$$\begin{gathered} \rho_E = \rho_{Es}\rho_{Ys} + \rho_{Ed}\rho_{Yd} + \rho_{En}\rho_{Yn} \\ \text{with} \quad \rho_{Ys} \equiv \frac{Y_s}{Y}, \rho_{Yd} \equiv \frac{Y_d}{Y}, \rho_{Yn} \equiv \frac{Y_n}{Y} \\ \rho_{Ys} + \rho_{Yd} + \rho_{Yn} = 1. \end{gathered} \tag{38}$$

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:

$$\begin{gathered} \rho_E = \frac{1}{2}(\rho_{Es} + \rho_{Ed}) \\ \text{if} \quad \rho_{Ys} = \rho_{Yd}, \rho_{Yn} = 0. \end{gathered} \tag{39}$$

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.

4.2 Perfect intra-sectoral complementarity

> A pun by N. Kalecki says that economics is the science of confusing stocks with flows.

All depends now on whether savers and dissavers are dependent or independent. Let us first assume dependency, i.e. 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 absolutely *no effect* on the rest of the economy. From the behavioral perspective this implies, clearly, agents with complementary time preferences.

Let us start with an initial period which is characterized by zero saving/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, by assumption, for every patient lender there is an impatient borrower eq. (39) turns to:

$$\rho_{Ed} = 2 - \rho_{Es}$$
$$\text{if} \quad \rho_E = 1,\ \rho_{Ys} = \rho_{Yd},\ \rho_{Yn} = 0. \tag{40}$$

The dissavers as a whole are the mirror image of the savers as a whole (so the direction of causality is in the last instance of no consequence). Over time the savers' deposits and the dissavers' overdrafts develop as shown in Figure 5. The curves depict savings in the form of current deposits as an accumulated stock of period saving, and debt as accumulated stock of period dissaving.

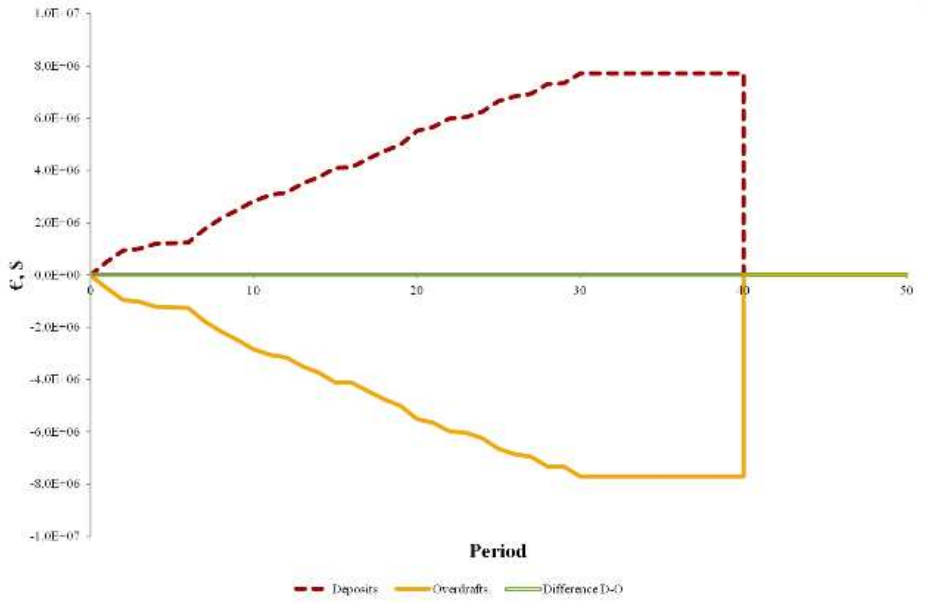


Figure 5: In the case of perfect interdependency the dissavers' overdrafts at the central bank are at any time the exact mirror image of the savers' deposits; in period 40 a direct borrower-lender relationship within the household sector is established and deposits/overdrafts at the central bank vanish here completely.

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 D-O 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 (40), exactly compensated by the dissavers' expenditure ratio of $\rho_{Ed} > 1$. The overall expenditure ratio therefore stays exactly at unity, that is, the household sector's budget is balanced from the initial period onwards, no matter what the savers do. The consumption good industry is not affected by the saving/dissaving within the household sector. 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 for the consumption good industry. Note

that the quantity of money increases and decreases without any effect on the market clearing price.

In period 30 saving/dissaving comes to a halt and the central bank's balance sheet remains constant for the time being. In period 40 the households switch to a direct lender-borrower relationship in the form of IOUs which we need not specify here. The effect is that the central bank's deposits and overdrafts drop to zero. The central bank is now out and all credit relationships within the household sector are in a sense private. So ultimately neither the consumption good industry nor the central bank is affected by the perfectly symmetrical saving/dissaving within the household sector.

What is shown in Figure 5 is the creation of the market for IOUs in a big-bang-all-out fashion. What form this market takes is open. In principle, IOUs can after initial issuance, which is equal to the vanishing deposits/overdrafts, also be bought and sold on a secondary market. This presupposes some form of standardization and securitization.

The maximum volume of the market is given by the stocks of the households' deposits and overdrafts. Obviously, it is not necessary that the maximum amount of deposits and overdrafts is consolidated to IOUs and it is not necessary that this happens at one single point in time. As a matter of fact, the switch from central bank deposits/overdrafts to 'private' credit/debt can happen at any point along the time axis. This switch is reversed by redemption. Thus the composition of current deposits/IOU+ and overdrafts/IOU- is always mirror-inverted. The relationship of current deposits to IOU+ can be interpreted as a measure of liquidity of the savers. Here the notion of liquidity preference comes in. The upper half of Figure 5 is traditionally referred to as loanable funds.

Figure 6 shows the development of the volume and composition of the elementary financial market over time. The outer curves represent total volume of the households' financial assets and liabilities, i.e., HFA respectively HFL. These curves are determined by the household sector's accumulated saving/dissaving. Saving/dissaving takes first the form of deposits/overdrafts. In a logically second step the total volume is differentiated into all kinds of financial assets. In our elementary case the total volume of financial assets is partitioned between deposits and IOUs. Here, the financial assets above the x-axis are exactly mirrored by financial liabilities below the x-axis.

The deposits may be interpreted as potential supply of loanable funds which is here always equal to the potential demand. Why the households hold these 'idle balances' instead of turning to interest bearing financial assets has been exhaustively discussed since Keynes introduced his liquidity preference. There is no need to enter into the old discussion about 'hoarding' here, except for one point. It is the partitioning between deposits and IOUs which is sensitive to the interest rate and not the accumulated volume of period saving. Therefore, it is not saving which is 'rewarded' with interest, it is the switch from deposits to IOUs. Hence it is

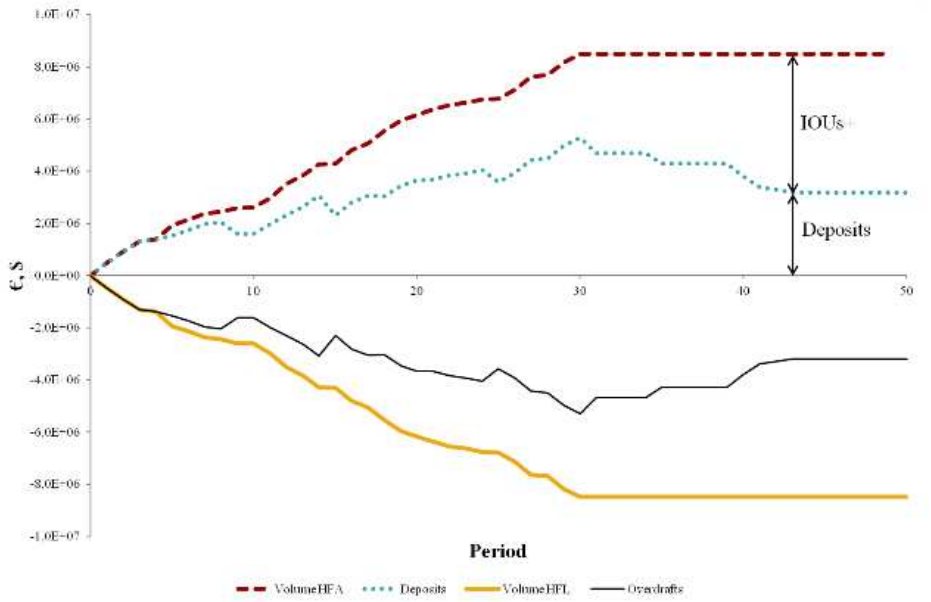


Figure 6: Comprehensive view of the elementary financial market's main quantitative components and their development over time

incorrect to write a saving function that makes saving dependent on the rate of interest. All accumulated saving can be kept in the form of deposits at the central bank which yield zero interest. In this limiting case, there is obviously no relation at all between interest and saving, and the accustomed supply function simply does not exist. This in turn means that saving/dissaving or the intertemporal optimization of consumption cannot be made dependent on the rate of interest. Interest governs the composition of accumulated period saving (stock) and only very indirectly the amount of period saving (difference of flows) itself.

It is important to keep saving/dissaving and the transformation of central bank assets/liabilities into financial assets/liabilities strictly apart. Saving/dissaving relates to a period of predefined length, the transformation to an arbitrary point in time. In mathematical terms saving is the first derivative of the stock of deposits or, the other way round, the stock of deposits is the numerical integral of period saving. Normal mathematical differentiation/integration, however, does not apply because of thoroughgoing discontinuities.

Until now the central bank has been assumed to be entirely passive. It is, of course, possible that the central bank enters the elementary financial market and actively buys and sells IOUs from the households. This open market operations alter the market's liquidity and thus probably the rate of interest. We do not follow this line of analysis further here because this would lead us too far into the field of monetary policy.

The interest payments between the households Y_J increase the disposable income of the lenders and diminish the disposable income of the borrowers.

$$Y = (Y_s + Y_J) + (Y_d - Y_J) \tag{41}$$

Total income of the household sector remains unaffected. Since total consumption expenditures are by assumption equal to total income the real share of consumption goods of the lenders increases and that of the borrowers decreases. How the rate of interest is determined is left open for the moment.

Since the perfectly symmetric case has no effect outside the household sector it can, more often than not, be left out of the picture. This does not apply to the general case.

4.3 The general case

Let us consider the alternative that the behavior of savers and dissavers is independent, that is, we return to (39) which is reproduced here:

$$\begin{gathered} \rho_E = \frac{1}{2}(\rho_{Es} + \rho_{Ed}) \\ \text{if} \quad \rho_{Ys} = \rho_{Yd},\, \rho_{Yn} = 0. \end{gathered} \tag{42}$$

The savers' and dissavers' respective expenditure ratios now *both* vary at random. The result is depicted in Figure 7.

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 there is additional demand $C > Y$ i.e. $\rho_E > 1$ which affects the market clearing price according to the Law of Supply and Demand.

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 the saving/dissaving of households.

Figure 7 shows differences in the growth of deposits and overdrafts due to non-complementary saving/dissaving within the household sector. Therefore, the difference between deposits and overdrafts, i.e., the D-O resultant curve, is no longer zero but meanders around the x-axis.

From the Profit Law (24) follows that profit is greater than zero if the overall expenditure ratio is greater than unity under the condition $\rho_D = 0$. Profit or loss

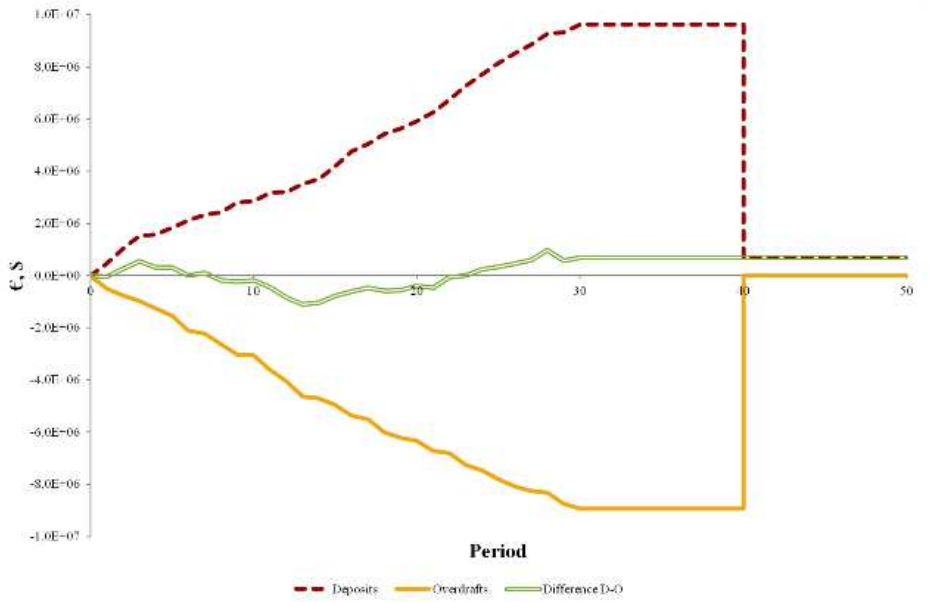


Figure 7: In the non-complementary case the dissavers' overdrafts grow independently from the savers' deposits; in period 40 a direct borrower-lender relationship within the household sector is established. The household sector's remaining deposits are equal to the business sector's overdrafts which are not depicted here because the are the exact mirror image of the D-O curve.

change the business sector's stock of money according to (19) and (18). The business sector's overdrafts/deposits make up for the difference between the household sector's deposits/overdrafts.

When, after t=30, the business sector's overdrafts are added in Figure 7 to the household sector's overdrafts the sum is equal to the household sector's deposits. 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 its 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. Eqs. (26) and (28) provide the mirror.

In period 40 the deposits/overdrafts of the household sector are consolidated and transformed into IOUs. This, again, creates the IOU market. Because deposits are higher than overdrafts in Figure 7 the households are left with deposits after the complete consolidation of the overdrafts. These deposits are exactly equal to the overdrafts of the business sector with are here not shown. As always, both sides of the central bank's balance sheet are equal.

5 Extra-sectoral saving/dissaving

> However, if the propensity to save is greater than zero, firms will have to issue securities in the financial capital market, and hopefully capture the total of the flow of household savings withheld from the commodities market in order to extinguish their short-term debt with the banks. (Bougrine and Seccareccia, 2002, p. 63)

All intra-sectoral saving/dissaving is now excluded. The focus is on the financial relationships between the household and the business sector.

5.1 Financing when saving predates dissaving

In the pure consumption economy monetary profit is in the general case given as:

$$\begin{aligned} Q_m &\equiv Y_D - S_m \\ \text{or} \quad Q_{re} &\equiv -S_m := -\Delta \bar{\mathrm{M}}_{\mathbf{B}} \ . \end{aligned} \tag{43}$$

This follows from (26), (27) and (18). Eq. (43) says that retained profit is the complementary to monetary saving/dissaving and is mirrored on the monetary side by a decrease/increase of equal amount of the business sector's stock of money. If saving is zero then retained profit is zero and this means that profit and distributed profit are equal. For the quantity of money it does not matter what the amounts of profit and distributed profit are, it matters only for the average stock of transaction money. This average stock is the higher the greater profits/distributed profits are, but with $\rho_E = 1$ the quantity of money is zero at period beginning and end.

In Figure 8 the interconnection between saving/dissaving and the changes of the two sectors' stocks of money is exemplified.

In the initial period the expenditure ratio is $\rho_E = 1$. Money is a pure transaction medium. The quantity of money is zero at the beginning and the end of the initial period. The zigzag transaction curve refers back to Figure 4a.

In period 1 the expenditure ratio is $\rho_E < 1$. The households save and money now acquires the role of a store of value in addition to its primary role as transaction medium. The quantity of money increases from period beginning to period end through the autonomous transactions between the two sectors. At the same time, the business sector's stock of overdrafts increases as a mirror image according to (43).

In period 2 the expenditure ratio is again $\rho_E = 1$. The household sector now has deposits at its disposal and the business sector seeks to consolidate its overdrafts. Roughly speaking, supply and demand of loanable funds is quantitatively equal. In a sense, the savers collectively create the demand for their loanable funds. Which

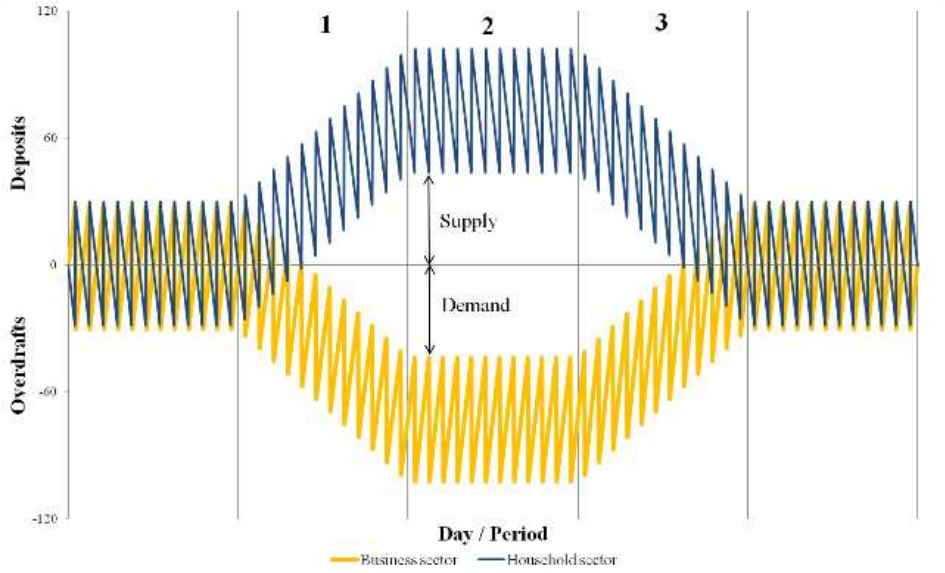


Figure 8: In period 1 the households save and their stock of deposits increases in successive monetary transactions. As a mirror image the business sector's current overdrafts increase because of loss. The saving is reversed in period 3 through dissaving. Loosely speaking, the 'eye' measures potential supply/demand of loanable funds which is quantitatively equal.

amount of the potential supply and demand will be realized under which terms and at what point on the time axis remains at first open. Only the potential market volume is given. Note that the disposition of loanable funds is entirely decoupled from saving/dissaving and may happen at any point on the time axis. Basically, the business sector has the alternative to issue securities in the form of common stocks or bonds. When we ignore stocks here then the stage is set for the emergence of the commercial bond market which looks exactly like Figure 6 with IOUs replaced by bonds.

In period 3 the expenditure ratio is $\rho_E > 1$. The household sector dissaves, the business sector posts a profit and this makes that the quantity of money is again reduced to zero at the end of period 3. Seen over the whole cycle of saving/dissaving cumulated loss/profit adds up to zero.

The saving/dissaving cycle of the household sector causes a temporary financing demand in the business sector. In analogy to Figure 6 the household sector splits the total amount of loanable funds=current deposits between bonds and deposits. The amount of bonds is symbolized with $\bar{A}$. Thus, the composition of the household sector's financial assets changes. The total amount of financial assets is defined by saving/dissaving in preceding periods.

The interest payments of the business sector increase the total income of the household sector. The 1st axiom (1) changes to:

$$Y = WL + J\bar{\mathrm{A}} + DN. \tag{44}$$

The rate of interest is symbolized by J. In the case of budget balancing $\rho_E = 1$ consumption expenditures increase and this effects a rise of the market clearing price analogous to a wage rate increase in (12). This in turn effects a redistribution of the unaltered output to the receivers of interest. In real terms the business sector does not pay any interest.

The profit formula changes from (22) to:

$$Q_m \equiv PX - WL - J\bar{\mathrm{A}}. \tag{45}$$

And the Profit Law from (24) to:

$$\begin{gathered} Q_m \equiv \left(\rho_E - \frac{1+\rho_J}{1+\rho_J+\rho_D}\right) Y \\ \text{with} \quad \rho_J \equiv \frac{J\bar{\mathrm{A}}}{WL}. \end{gathered} \tag{46}$$

To sum up. As long as the expenditure ratio is unity in the pure consumption economy no financing between the household and the business sector is required. When saving predates dissaving first deposits/overdrafts increase in step and this sets the stage for the emergence of security markets of various types. The existence of the bond market changes the income/expenditure flows between the business and the household sector. Profit is not affected by interest payments in the limiting case of $\rho_D = 0$ and in the zero profit case $\rho_D = 0$, $\rho_E = 1$. Interest effects a redistribution of consumption good output under the conditions of market clearing and budget balancing.

5.2 Financing when dissaving predates saving

Figure 9 reverses the sequence of saving/dissaving of Figure 8. This reverses the financing relationship between the household and the business sector.

In period 1 the expenditure ratio is $\rho_E > 1$. The households dissave and increase at first their current overdrafts. At the same time, the business sector's stock of deposits increases as a mirror image according to (43). The quantity of money increases from period beginning to period end through the autonomous transactions between the two sectors.

Dissaving occurs, for example, when the households buy durable consumption goods like cars or houses on credit. The financing of family homes poses no problem for

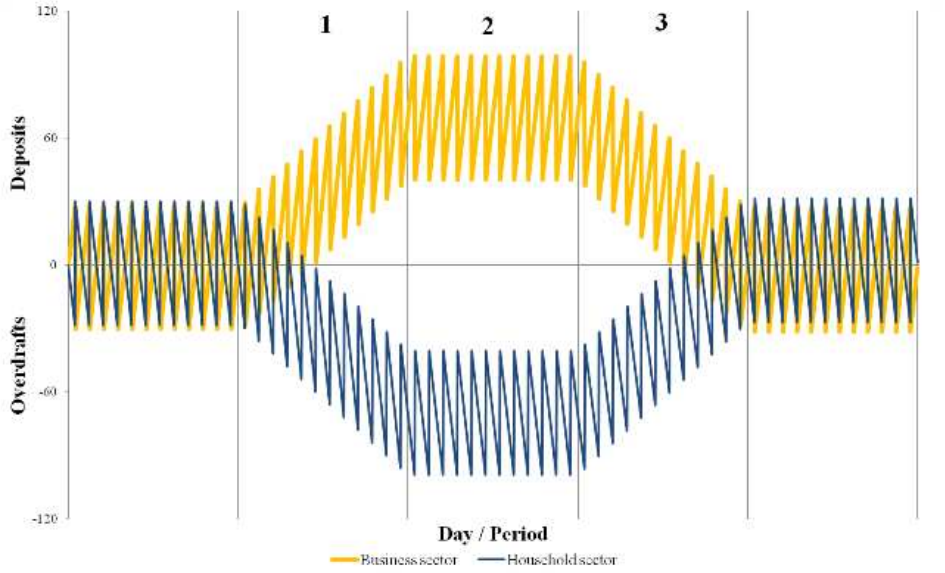


Figure 9: In period 1 the households dissave and their stock of overdrafts increases with successive monetary transactions. As a mirror image the business sector's current deposits increase because of profit. The dissaving is reversed in period 3 through saving. Loosely speaking, the 'eye' measures potential supply/demand of loanable funds which is quantitatively equal.

the banking sector under the condition that a house provides an acceptable collateral and the annuity can be paid safely out of current income.

Under these conditions Figure 9 sets the stage for the emergence of the mortgage financing market. If the consumption goods consist of cars and other long lived items many specialized markets of consumer financing emerge. The total volume of the market, however, is given by the preceding dissaving/saving.

Note that, for instance, the mortgage market can expand smoothly for an indefinite number of periods provided the time tested rules of low risk financing are observed. It has long been known that problems arise if the financing exceeds well-known limits with regard to valuation of real estate and the borrower's income. Normally these limits are institutionalized in banks that are specialized in mortgage financing. Despite the fact that mortgage financing is a trivial business some countries lack the required institutions and are therefore prone to self-reinforcing bubbles. Bubbles are always and everywhere the result of institutional deficits.

The dissaving is favorable for the business sector. Overall monetary profit is given by

$$Q_m \equiv Y_D - S_m \tag{47}$$

and because of dissaving the minus sign turns into a plus sign. The profit accrues in the main in the consumption good industry which then owns the deposits. However,

total profit according to (47) can in different ways be redistributed within the business sector between industry and banks.

In period 3 the expenditure ratio is $\rho_E < 1$. The household sector saves and reduces its debt again to zero. The business sector posts a loss and this makes that over the whole cycle of dissaving/saving cumulated profit/loss adds up to zero.

The income of the household sector remains unchanged but expenditures have to be restructured. In the case of an expenditure ratio of unity we have:

$$Y = C = PX + J\bar{\mathrm{L}}. \tag{48}$$

The symbol $\bar{\mathrm{L}}$ denotes the household sector's liabilities, J the rate of interest. The amount PX goes to the consumption good industry, the amount $J\bar{\mathrm{L}}$ to the banks – in our simplified case to the financing unit of the central bank.

To sum up. We are still in the pure consumption economy. When dissaving predates saving first overdrafts/deposits increase in step and this sets the stage for the emergence of all types of markets for consumer financing. The most important market segment is normally the mortgage financing market. The interest payments on consumer financing change the expenditure flows between the household and the business sector.

6 Investment financing

The business sector is now split into the consumption good and the investment good industry. Each industry consists of one firm (for more details see 2011b).

In the investment economy total monetary profit is given by (see 2014b, Sec. 4):

$$\begin{aligned} Q_m &\equiv Y_D + I - S_m \\ \text{or} \quad Q_{re} &\equiv I - S_m. \end{aligned} \tag{49}$$

Retained profit is equal to the difference of investment expenditures and the household sector's monetary saving. From this follows as a corollary:

$$I - Q_{re} \doteq S_m. \tag{50}$$

The business sector as a whole can finance part of the investment expenditures out of retained profit. This, to be sure, holds for the business sector as a whole. Normally, the firms which invest are not the same firms which have retained profits at their disposal. This means that intra-sectoral financing relationships between different firm emerge. These are ignored here. Hence, eq. (50) says that the business sector

has a financing residual of the amount S_m, i.e., the saving of the household sector. This situation is analogous to Figure 8.

For the limiting case $I = 0$ eq. (50) reduces to (43). For the limiting case $S_m = 0$ eq. (50) says that business sector investment is fully financed out of retained profit. There is no financing relationship between the household and the business sector (but certainly some within the business sector). For the limiting case $Q_{re} = 0$ the business sector's investment expenditures are fully financed by the household sector's monetary saving. This is the classical case, which, to be sure, never happens in the real world. Note that the equality of investment expenditure and household sector saving does not say anything about whether the financing relationship consists of deposits/overdrafts at the central bank or commercial bonds or any other security.

At the beginning of period 2 the business sector has to consolidate part or all of current overdrafts which are here equal to S_m. Again, the business sector has the alternative to issue securities in the form of common stocks or bonds. When we ignore stocks here then the stage is set for the emergence of the commercial bond market.

The amount of bonds held as financial asset by the household sector is denoted as $\bar{\text{A}}$. The rate of interest is again symbolized with J; how it is determined is left open for the moment. The income equation (1) is then a bit more intricate:

$$Y = W_C L_C + W_I L_I + J\bar{\text{A}} + DN \tag{51}$$

Total income of the household sector is composed of wage income out of consumption and investment good production, interest income, and distributed profit.

Profit of the consumption good industry is given by:

$$Q_{mC} \equiv PX - W_C L_C - J\bar{\text{A}}. \tag{52}$$

Profit of the investment good industry is given by:

$$Q_{mI} \equiv I - W_I L_I. \tag{53}$$

With the definition of total wage income

$$\begin{gathered} WL \equiv W_C L_C + W_I L_I \\ \text{with} \quad L \equiv L_C + L_I \end{gathered} \tag{54}$$

the formula for total profit as sum of (52) and (53) reduces to:

$$Q_m \equiv C + I - WL - J\bar{\text{A}}. \tag{55}$$

Total monetary profit of the investment economy is given as difference between consumption and investment expenditures on the one side and wage and interest income on the other. And this yields a more elaborate Law of Profit in comparison to the pure consumption economy (24):

$$\begin{aligned} Q_m &\equiv \left(\rho_{EC} + \rho_{EI} - \frac{1+\rho_J}{1+\rho_J+\rho_D}\right) Y \\ \text{with} \quad \rho_{EC} &\equiv \frac{C}{Y},\ \rho_{EI} \equiv \frac{I}{Y},\ \rho_J \equiv \frac{J\bar{\mathrm{A}}}{WL}. \end{aligned} \tag{56}$$

To sum up. In the investment economy the business sector normally has a financing residual vis-à-vis the household sector which is determined by monetary saving. This gives rise to the securities market. It is assumed here that the business sector issues bonds. The existence of the bond market changes the income/expenditure flows between the business and the household sector. Profit is not affected by interest payments in the limiting case of $\rho_D = 0$ and in the zero profit case $\rho_D = 0$, $\rho_{EC} + \rho_{EI} = 1$. Only in the limiting case of equality of profit and distributed profit there is an equality of investment expenditure and monetary saving. Otherwise both variables develop independently and this gives rise to a continuously varying financing residual between the business and the household sector.

7 Conclusion

Orthodoxy gave the wrong answer to J. S. Mill's Starting Problem. The standard approach is based on indefensible subjective-behavioral axioms. They are in the present paper replaced by objective-structural axioms.

Having secured the correct formal starting point the question has been addressed how financial markets emerge from the elementary monetary circuit. The main results of the systemic analysis of the interdependence of markets are:

- The structural axiomatic Law of Supply and Demand for the pure consumption economy with one firm states that the market clearing price is equal to the product of the expenditure ratio, unit wage costs, and the distributional factor in any given period t.
- The market clearing price follows from the set of axioms and the objective conditions of market clearing and budget balancing. Behavioral assumptions are inadmissible because their admission amounts to formal overdetermination. In other words, supply-demand-equilibrium and all implied assumptions have to be discarded.

- The manifold variants of financial markets emerge ultimately from the household sector's saving/dissaving.
- From intra-sectoral saving/dissaving emerges the market for IOUs.
- When saving predates dissaving in the pure consumption economy first deposits/overdrafts increase in step and this sets the stage for the emergence of security markets of various types. The existence of the bond market changes the income/expenditure flows between the business and the household sector. Profit is not affected by interest payments in the limiting case of zero distributed profit and in the zero profit case with budget balancing and zero distributed profit. Interest income gives rise to a redistribution of consumption good output under the conditions of market clearing and budget balancing.
- When dissaving predates saving in the pure consumption economy first overdrafts/deposits increase in step and this sets the stage for the emergence of all types of markets for consumer financing. The most important market segment is normally the mortgage financing market. The interest payments on consumer financing change the expenditure flows between the household and the business sector.
- In the investment economy the business sector normally has a financing residual vis-à-vis the household sector which is determined by monetary saving. This gives rise to the securities market. It is assumed here that the business sector issues bonds. The existence of the bond market changes the income/expenditure flows between the business and the household sector.

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