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Kakarot-Handtke, Egmont

University of Stuttgart, Institute of Economics and Law

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Primary and Secondary Markets

Egmont Kakarot-Handtke*

Abstract

The analytical starting point determines the course of a theoretical investigation and ultimately the productiveness of an approach. The classics took production and accumulation as their point of departure, the neoclassics exchange. Exchange implies behavioral assumptions and notions like rationality, optimization, and equilibrium. It is widely recognized that this approach has led into a cul-de-sac. To change a theory means to change its premises or, in Keynes's words, to 'throw over' the axioms. The present paper swaps the standard behavioral axioms for structural axioms and applies the latter to the analysis of the emergence of secondary markets from the flow part of the economy. Real and nominal residuals at first give rise to the accumulation of the stock of money and the stock of commodities. These stocks constitute the demand and supply side of secondary markets. The pricing in these markets is different from the pricing in the primary markets. Realized appreciation in the secondary markets is different from income or profit. To treat primary and secondary markets alike is therefore a category mistake. Vice versa, to take a set of objective propositions as analytical starting point yields a comprehensive and consistent theory of market exchange and valuation.

JEL D40, D50

Keywords new framework of concepts; structure-centric; axiom set; residuals; real and monetary stocks; money; credit; financial saving; nonfinancial saving; net worth; financial profit; nonfinancial profit; retained profit; appreciation; wealth

*Affiliation: University of Stuttgart, Institute of Economics and Law, Keplerstrasse 17, D-70174 Stuttgart. Correspondence address: AXEC, Egmont Kakarot-Handtke, Hohenzollernstraße 11, D-80801 München, Germany, e-mail: handtke@axec.de

One view frequently expressed is that the neoclassical theory is pre-eminently concerned with the allocation of given resources among alternative uses and that it is thus best considered as relevant to a theory of exchange, rather than to a theory of production and growth. For example, it is said that the theory begins "not with production but with exchange" and then "adds on" production "to make possible the indirect exchange of factor services for final commodities" This is then contrasted with classical theory which apparently "starts" with production. It is very hard to make anything of this argument. I do not see in what sense General Equilibrium Theory, except perhaps historically, "starts" with exchange or, for that matter, with production. (Hahn, 1980, p. 127)

This, unfortunately, leaves open the question where general equilibrium theory in earnest starts.¹ The point of departure is crucial for the further course of the analysis: 'Wer das erste Knopfloch verfehlt, kommt mit dem Zuknöpfen nicht zu Rande.'² (Goethe). The general thesis of the present paper is that standard economics missed the first buttonhole. This problem has not been resolved by ever more rigorous buttoning (Ackerman and Nadal, 2004).

Each theory starts from a small set of foundational 'hypotheses or axioms or postulates or assumptions or even principles' (Schumpeter, 1994, p. 15). General equilibrium theory rests on a set of *behavioral* axioms (Arrow and Hahn, 1991, p. v). The standard set of behavioral axioms is in the present paper at first replaced by structural axioms.

By choosing objective structural relationships as axioms behavioral hypotheses are not ruled out. On the contrary, the structural axiom set is open to *any* behavioral assumption and not restricted to the optimization calculus (for details see 2011a).

The case for structural axiomatization has been made elsewhere (2012b), thus we can leave standard economics unbuttoned and throw a glance at what is in the offing. The minimalistic formal frame is set up in Section 1. Then, in Section 2, real and nominal residuals are derived from the axiom set. The residuals change the stock of products and the stock of money, respectively. In Section 3 the forms of money and credit are defined. In Section 4 the concepts of financial saving, nonfinancial saving and consumption are consistently derived from the axiom set. Household sector's net worth as numerical integral summarizes the twofold process that generates the household sector's stock of nonfinancial assets and the stock of money, thereby establishing the quantitative frame of supply and demand in the secondary market. This is the precondition for the analysis of wealth creation in

¹ "In the history of neoclassical economic theory, there have been two major categories of rejoinders to critics of the theory: one, that the critics did not adequately understand the structure of the theory, and thus mistook for essential what was merely convenient; or, two, that the criticism was old hat, and had been rendered harmless by recent (and technically abstruse) innovations with which the critic was unacquainted." (Mirowski, 1986a, p. 75)

² Roughly: He, who misses the first buttonhole, will not succeed in buttoning up.

the secondary market that is advanced in Section 5. In Section 6 the concepts of financial profit, nonfinancial profit and retained profit are consistently derived from the axiom set. Business sector's net worth as numerical integral summarizes the twofold process that generates the business sector's valued stock of products and its stock of money. Section 7 concludes.

1 Axioms

The first three structural axioms relate to income, production, and expenditures in a period of arbitrary length. For the remainder of this inquiry the period length is conveniently assumed to be the calendar year. Simplicity demands that we have at first one world economy, one firm, and one product. Axiomatization is about ascertaining the *minimum* number of premises. Three suffice for a start.

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 \bar{N} .

$$Y = WL + D\bar{N} \quad |t \quad (1)$$

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

$$O = RL \quad |t \quad (2)$$

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

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

$$C = PX \quad |t \quad (3)$$

The axioms represent the pure consumption economy, that is, no investment expenditures, no foreign trade, and no taxes or any other government activity. All axiomatic variables are measurable in principle. No nonempirical concepts like equilibrium, rationality or perfect competition are put into the premises.

2 Residuals and the emergence of stocks

Real residuals are a salient characteristic of generality because it is a fact that the quantities produced and sold in a period of given length are virtually never equal. Consider the case of a firm that produces 1,000,100 trucks per year and sells one million. The residual is insignificant, so we can round it off and for all *practical* purposes write $X = O$.

By this, though, reality probably gets out of sight when we have a longer sequence of periods because the residuals may accumulate over time to a sizable magnitude that motivates the firm to take action, for example, to cut the price. Since rounding is analytically inadvisable one has to take $X \neq O$ as the *general* case.

The sales ratio is for formal convenience introduced as:

$$\rho_X \equiv \frac{X}{O} \quad |t. \quad (4)$$

Because of its virtual impossibility $\rho_X = 1$ has to be regarded as a theoretical limiting case. Limiting cases are fully justified in a *Gedankenexperiment*. Their analytical indispensability, though, cannot serve a justification for *imposing* them upon reality. Market clearing is a *formal condition* and no feature of reality.

What holds for real residuals is also true for nominal residuals. It is rarely the case that the households sector's budget balances exactly in period t , in other words, that consumption expenditures are equal to income. As the *general* case we have therefore $C \neq Y$. The expenditure ratio is introduced as:

$$\rho_E \equiv \frac{C}{Y} \quad |t. \quad (5)$$

For a starting point one quite naturally takes the simplest case, i.e. $\rho_E = 1$. In order to arrive at a general theory, or, as Kaldor put it: 'to improve our understanding of how things work' (1985, p. 20), it is essential to proceed subsequently to the sole real and nominal configuration that has a counterpart in the world we happen to live in, that is to $\rho_X \neq 1$ and $\rho_E \neq 1$.

2.1 The stock of products

The change of the stock of finished products in period t is defined as the excess between output O and the quantity bought X by the households:

$$\Delta \bar{O} \equiv O - X \equiv O(1 - \rho_X) \quad |t. \quad (6)$$

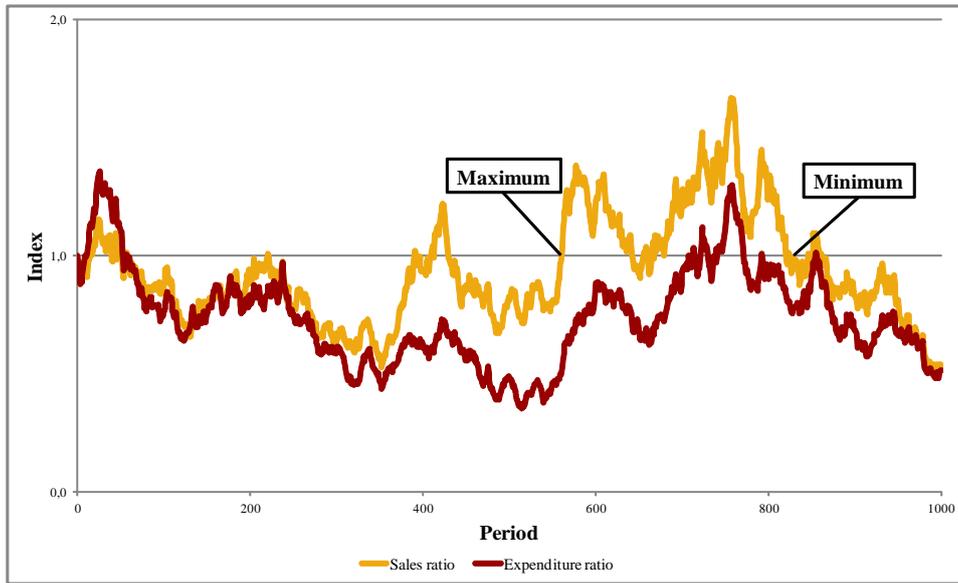
The stock at the end of an arbitrary number of periods \bar{t} is given by definition as the numerical integral of all previous stock changes plus the initial endowment:

$$\bar{O}_{\bar{t}} \equiv \sum_{t=1}^{\bar{t}} \Delta \bar{O}_t + \bar{O}_0 \quad (7)$$

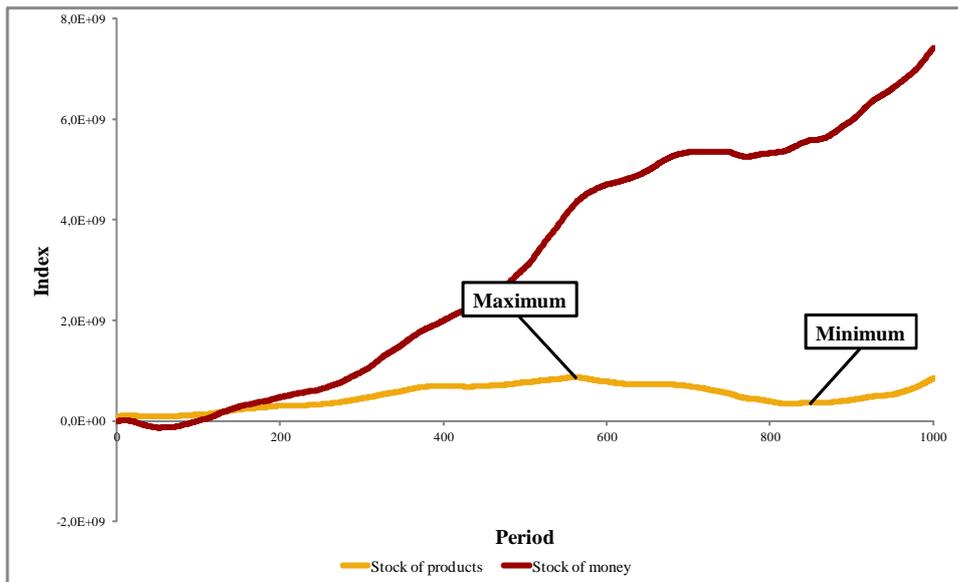
The resulting interrelation between the sales ratio and the stock is given by

$$\bar{O}_{\bar{t}} \equiv \sum_{t=1}^{\bar{t}} O_t (1 - \rho_{Xt}) \quad \text{if } \bar{O}_0 = 0 \quad (8)$$

and depicted in Figure 1.



(a) Random changes of the sales ratio and the expenditure ratio



(b) Business sector's stock of products and household sector's stock of money as determined by the sales ratio and the expenditure ratio

Figure 1: The relation of stocks (numerical integrals) and ratios (derivatives)

It is easy to see that the sales ratio in Figure 1a plays the role of the first derivative of the curve that represents the stock of products in Figure 1b. The main distinction vis-à-vis the continuous calculus is that maxima or minima are indicated by $\rho_X = 1$ instead of $\frac{dx}{dy} = 0$. This discrete calculus is an implicit feature of the structural

axiom set and not a ready-made tool borrowed from the math department.³ It is obviously more versatile than continuous calculus because it does not presuppose the conditions of differentiability and continuity. These rather strong idealizations are therefore not required in the structural axiomatic context.

The development of the stock of output is ultimately determined by the variations of the components of ρ_X , i.e. the elementary variables X , R and L . These are taken to be random because:

The simplest hypothesis is that variation is random until the contrary is shown, the onus of the proof resting on the advocate of the more complicated hypothesis ... (Kreuzenkamp and McAleer, 1995, p. 12)

It may then happen by chance that the period changes of the stock cancel out over time and that the product market is cleared at the end of an *ex ante* unknown period. In this case the sum in (8) is zero and the curve in Figure 1b hits the abscissa. It cannot cross the abscissa (except virtually in a simulation) because real stocks cannot become negative.

The discrete first derivative of the stock of output has a concrete economic meaning, i.e. $\rho_X = X/RL$, and is a random variable that produces the random walk of hitherto unsold products.

2.2 The stock 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:

$$\Delta \bar{M}_{\mathbf{H}} \equiv {}^m Y - C \equiv {}^m Y (1 - \rho_E) \quad |t. \quad (9)$$

The identity sign's superscript m indicates that the definition refers to the monetary sphere.

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

$$\bar{M}_{\mathbf{H}t} \equiv \sum_{t=1}^{\bar{t}} \Delta \bar{M}_{\mathbf{H}t} + \bar{M}_{\mathbf{H}0}. \quad (10)$$

The interrelation between the expenditure ratio and the households sector's stock of money, which is depicted in Figure 1a and 1b, is then given by:

$$\bar{M}_{\mathbf{H}t} \equiv \sum_{t=1}^{\bar{t}} Y_t (1 - \rho_{Et}) \quad \text{if} \quad \bar{M}_{\mathbf{H}0} = 0. \quad (11)$$

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

³ "... perhaps the most legitimate research program in economics should generate its own mathematical tools simultaneously with its development of the economic theory, ...". (Mirowski, 1986b, p. 221), see also (Velupillai, 2005, pp. 866-870), (Morishima, 1984, p. 67)

$$\Delta \bar{M}_{\mathbf{B}} \equiv {}^m C - Y \quad |t. \quad (12)$$

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

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

The development of the stock of money follows without further assumptions from the axioms and is determined by random variations of the elementary variables P , X , W and L . While the stock of money can be either positive or negative the quantity of money is always positive and given by:

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

The quantity of money follows from either (11) or (13).

3 Money and credit

In order to reduce the monetary phenomena to the essentials it is supposed that all financial transactions are carried out by the central bank.⁴ The stock of money then takes the form of current deposits or current overdrafts. Initial endowments are 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 (13). Money and credit are symmetrical.

In period₁ income and consumption expenditures are equal, i.e. $\rho_E = 1$. The monthly income $Y/12$ is paid out at mid-month as shown in Figure 2. Expenditures are evenly distributed over the month.

With the beginning of period₂ households start to save and thereby their current deposits increase until period end. Business, taken as a whole, cannot recoup total wage income and by consequence its current overdrafts increase as an exact mirror image. It is just the other way round if households taken as a whole dissave.

It is assumed for the time being that the central bank plays a purely accommodative role in supporting the autonomous market transaction between the household and the business sector.

4 Saving

For the specification of household saving the set of axioms is extended at first because additional variables have to be introduced. The 6th axiom states that total saving has a financial and nonfinancial component:

⁴ For a more detailed account of the central bank's role see (2011b).

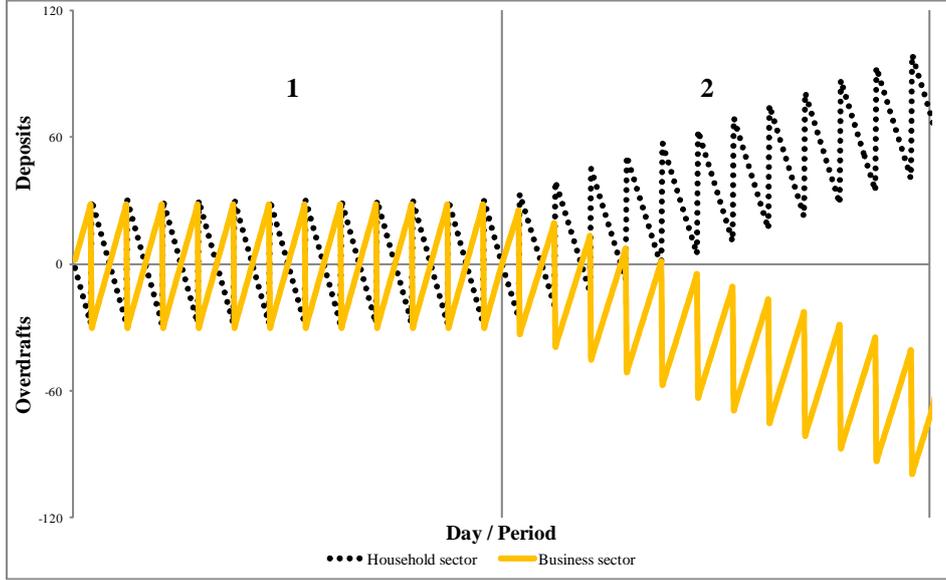


Figure 2: Financial saving leads in period₂ to an increase of the household sector's current deposits and the business sector's current overdrafts and vice versa for financial dissaving

$$\Delta \bar{S} = \Delta \bar{S}_{fi} + \Delta \bar{S}_{nf} \quad |t. \quad (15)$$

This is the implicit form; the explicit form is given by (26).

4.1 Financial saving

Financial saving is defined as the difference of income and consumption expenditures.

$$\Delta \bar{S}_{fi} \equiv Y - C \quad |t \quad (16)$$

In combination with (9) this yields the straightforward relation:

$$\Delta \bar{S}_{fi} \equiv Y - C \equiv^m \Delta \bar{M}_H \quad |t. \quad (17)$$

Financial saving and the change of the household sector's stock of money are *two aspects* of the same flow residual.

4.2 Consumption and nonfinancial saving

For the determination of the nonfinancial component of saving first real consumption is needed as new variable. With U , that part of the quantity bought denoted by X that vanishes for good from the household sector's stock of commodities because it has been used up completely in the current period. Nonfinancial saving is defined

as the valued increase of the commodity stock $X - U$ and the change of valuation of the already existing stock in period t , which is captured by $\Delta\bar{G}_H$:

$$\Delta\bar{S}_{nf} \equiv P(X - U) + \Delta\bar{G}_H \quad |t. \quad (18)$$

If the quantity bought is used up completely in each period, i.e. $X = U$, the first part of nonfinancial saving is always zero. This is the case when the whole output consists of nondurables. Under this condition there is no addition to the stock of commodities, which is initially zero. That means we have, as limiting case, a pure hand-to-mouth economy with no stocks at all. Real residuals fill this empty economy with an ever increasing stock of durable commodities. The households build it up from zero or, in Adam Smith's moral wording, this stock 'is increased by parsimony, and diminished by prodigality and misconduct.' (2008, p. 199).

Not before $X > U$ the household sector's stock of commodities starts to grow. Then, a new vintage of commodities is added to the stock as long as $X_t > U_t$. At any point in time the household sector's stock is therefore composed of l commodities with a vintage index.

The symbol l denotes the 'finite number of distinguishable commodities' or the 'universe of discourse' that 'must always be explicitly listed at the outset' (Debreu, 1959, pp. 32, 3). It is worth emphasizing that according to the structural axiomatic approach no such listing of givens takes place. To the contrary: it is demonstrated how they follow consistently from the set of structural axioms. Therefore, from the structural axiomatic viewpoint, Debreu's givens are a surface phenomenon that is explicable by proceeding from a deeper level. This has the methodological implication that *production* is analytically prior to exchange (Rochon and Rossi, 2003, p. xxv), (Lavoie, 1992, pp. 13-14), (Barrère, 1988, pp. 15-16). To recall: 'Walras's comprehensive analysis of general equilibrium' started from 'the case of two-person, two-commodity barter' (Blaug, 1998, p. 551).

The quantity of the h^{th} commodity is, in Debreu's notation,⁵ given by:

$$\bar{X}_{ht} \equiv \sum_{t=1}^t (X_h - U_h - \bar{X}_{hu})_t \quad (19)$$

The subscript u denotes that the quantity in question has vanished from the household sector's stock in period t . The commodity space is not \mathbb{R}^l because it is not assumed 'that quantity can be any real number', that is to say, perfect divisibility is *not imposed* (cf. Debreu, 1959, p. 30). Accordingly, the commodity space is \mathbb{N}^l . Seen from the consumer real quantities are natural numbers; all divisible goods are packaged. Prices are rational numbers. The assumption of perfect divisibility is not required in order to make the structural axiomatic formalism applicable. To the contrary, from the structural axiomatic viewpoint standard economics has borrowed the wrong numbers from the math department. As Mirowski rightly asserts:

⁵ The symbol h defines a subset of l , in this case the commodities that the households possess. The meaning of h depends here and in the following on the actual context.

An empirical regularity concerning the history of markets is that prices have always and everywhere been expressed as rational numbers – that is, as ratios of natural numbers – and, further have been denominated in monetary units that are discrete and possess an arbitrary lower bound. This empirical regularity is not simply due to “convenience” or some virtual cost of calculation; it is a direct consequence of the algorithmic character of markets. The penchant of the Cowles economist for the real orthant is entirely a figment of the imagination (Mirowski, 2002, p. 543), see also (Nadal, 2004, p. 36)

There are items among the household sector’s stock of commodities whose value increases over time, but the greater part decreases in value because of wear and tear. The complete stock of commodities is therefore divided in each period into two mutually exclusive parts. The overall change of value of the existing stock is then given by appreciation $\Delta\bar{G}_{\mathbf{H}}^+$ and depreciation $\Delta\bar{G}_{\mathbf{H}}^-$:

$$\Delta\bar{G}_{\mathbf{H}} \equiv \Delta\bar{G}_{\mathbf{H}}^+ - \Delta\bar{G}_{\mathbf{H}}^- \quad |t. \quad (20)$$

For all items with a loss of value taken together the depreciation is given by:

$$\Delta\bar{G}_{\mathbf{H}}^- \equiv \sum_{h=1}^l (B_{ht}\bar{X}_{ht} - B_{ht-1}\bar{X}_{ht-1}) \quad \text{with} \quad B_{ht} < B_{ht-1}. \quad (21)$$

Depreciation is the difference of the valued stock of remaining items in the current period and the valued stock of the previous period. The valuation price B is introduced as a new variable with the 6th axiom (15).

The households have some leeway in the valuation of their stock. Whether the valuation prices are ‘realistic’ or not remains to be seen until the respective commodity is offered on the secondary market. Normally, the households do not care much about the valuation of their stock of commodities. They simply keep it, thus indicating that they value each item higher than the price attainable on the secondary market. As a rough and ready first approximation the valuation price can be calculated from the purchase price, the life expectancy of the item in question, and the time that has elapsed since the purchase. This entails that $B_t < B_{t-1}$. The minimum price is one cent. If the life expectancy of the item in question is virtually infinite this pragmatic calculation leads to $B_t = B_{t-1}$. Until some good reasons for a re-evaluation appear over time the valuation price is therefore equal to the price that has been paid on occasion of the purchase out of current production.

Some items of the households’ stock of commodities may increase in value. For these items the appreciation is, as a total, given by:

$$\Delta\bar{G}_{\mathbf{H}}^+ \equiv \sum_{h=1}^l (B_{ht}\bar{X}_{ht} - B_{ht-1}\bar{X}_{ht-1}) \quad \text{with} \quad B_{ht} \geq B_{ht-1}. \quad (22)$$

Appreciation or depreciation of the stock of commodities in each period originates therefore from the largely subjective change of the valuation price B of each

hitherto not consumed vintage. Over- or under-valuations automatically cancel out as the end of the life expectancy is approached and the valuation price tends to zero. Subjective valuations therefore produce not much more than self-correcting time shifts of nonfinancial saving.

Equation (18) can be rewritten in combination with (20) as:

$$\Delta\bar{S}_{nf} \equiv PX - \underbrace{PU - \Delta\bar{G}_{\mathbf{H}}^-}_{K} + \Delta\bar{G}_{\mathbf{H}}^+ \quad |t. \quad (23)$$

Consumption K is finally defined as the sum of the valued quantity that is used up in the current period and the decrease of the value of the not yet consumed stock of durable commodities. Depreciation gives a rough measure of the services which the durable commodities yield in one period (Morishima, 1977, p. 72).

$$K \equiv PU + \Delta\bar{G}_{\mathbf{H}}^- \quad |t \quad (24)$$

The greater the accumulated stock of durable commodities, the greater $\Delta\bar{G}_{\mathbf{H}}^-$ becomes.

Nonfinancial saving (23), then, is the difference between consumption expenditures and consumption plus the appreciation of the remaining stock of commodities:

$$\Delta\bar{S}_{nf} \equiv C - K + \Delta\bar{G}_{\mathbf{H}}^+ \quad |t. \quad (25)$$

There can be consumption without consumption expenditures. In this case one has nonfinancial dissaving and the valued stock of commodities decreases.

Consumption expenditures C include *all* products bought by the household sector, be it nondurables or durables like cars and houses. By consequence, the consumption of the services of durables, which is measured by the depreciation, progressively takes a greater share of consumption K as the economy develops. If consumption and consumption expenditures are equal in period t nonfinancial saving is equal to the appreciation of the existing stock.

The households satisfy their needs and wants in the current period by physical consumption of U units and by usage of the existing stock of commodities. Consumption K embraces both sources of satisfaction and is the formal interface between the axiom set and consumption theory. If a consumption function in the proper sense should exist (in analogy to the Keynesian consumption *expenditure* function, which refers to C ; cf. Boulding, 1945, p. 3) it would refer to K . And if the households actually intend to optimize their consumption over time they have to focus on K . With C households buy consumption goods for the current period and a stream of future consumption that is subsequently realized. This realization is coarsely expressed by $\Delta\bar{G}_{\mathbf{H}}^-$.

The 6th axiom (15) finally takes the explicit form:

$$\Delta\bar{S} = (Y - C) + (C - K + \Delta\bar{G}_{\mathbf{H}}^+) = Y - K + \Delta\bar{G}_{\mathbf{H}}^+ \quad |t. \quad (26)$$

Total saving as the sum of financial and nonfinancial saving is in period t given as the difference of income Y and consumption K plus the appreciation of commodities that the household sector possesses. If there is no appreciation total saving is given by:

$$\Delta\bar{S} = Y - K \quad |t. \quad (27)$$

In the simplest case total saving is the difference between income and consumption.

4.3 Household sector's net worth

With the final step the household sector's net worth \bar{S} at the end of an arbitrary number of periods is now defined as the numerical integral of the changes of financial and nonfinancial saving from the first period onwards plus the initial endowment:

$$\bar{S}_t \equiv \sum_{t=1}^t \Delta\bar{S}_t + \bar{S}_0. \quad (28)$$

Taking (26) and (10) into account this reads in explicit form:

$$\bar{S} \equiv \underbrace{\bar{M}_{\mathbf{H}}}_{\text{stock of money}} + \underbrace{\sum_{t=1}^t (C - K + \Delta G_{\mathbf{H}}^+)}_{\text{nonfinancial assets}} + B_0 \bar{X}_0 + \bar{S}_0 \quad | \bar{t}. \quad (29)$$

This equation summarizes the twofold process that generates the household sector's stock of nonfinancial assets and stock of money until period t . The latter may actually consist of either current deposits or current overdrafts.

The stock of money is set at first to zero, which implies $\rho_E = 1$ in all periods up to t . This does not exclude that there is a group of households A , which has accumulated current deposits, and a complementary group B , which has accumulated current overdrafts of exactly the same amount (for details see 2011b). In other words, overdrafts are at any moment the zero-sum complement of deposits:

$$\bar{M}_{\mathbf{H}} = 0 \quad \Rightarrow \quad \bar{M}_{\mathbf{H}A}^d - \bar{M}_{\mathbf{H}B}^o = 0 \quad | \bar{t}. \quad (30)$$

It is obvious that this strong condition is only needed to keep nominal residuals out of focus for a while.

The 1st axiom contains the number of shares \bar{N} . For completion the value of these shares has finally to be substituted for \bar{S}_0 in (29):⁶

⁶ In order to avoid discussion of diverse legal forms it is assumed here that the price of one share is fixed as under the legal form of the German cooperative. Households can buy the shares directly from the firm at the fixed price and sell it back on notice of termination. There is a dividend on the share but no nominal capital gain or loss. This kind of share is a typical buy-and-hold financial asset that combines elements of a pure joint-stock company and a partnership. B_{N0} is therefore no market price.

$$\bar{S} \equiv \underbrace{\bar{M}_{HA}^d - \bar{M}_{HB}^o}_{\text{stock of money}=0} + \underbrace{\sum B_h \bar{X}_h}_{\text{nonfinancial assets}} + \underbrace{B_{NO} \bar{N}}_{\text{ownership}} \quad | \bar{t}. \quad (31)$$

This means, that – without further explanation of the origin of the property rights – the household sector owns the firms that comprise the business sector.

Hicks suggested a concept of income that reiterated the moral stance of Adam Smith in welfare terms:

... it would seem that we ought to define a man's income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning. Thus, when a person saves, he plans to be better off in the future; when he lives beyond his income, he plans to be worse off. Remembering that the practical purpose of income is to serve as a guide for prudent conduct; I think it is fairly clear that this is what the central meaning must be. (Hicks, 1939, p. 172)

According to this suggestion income could be defined in structural axiomatic terms as:

$$Y_t^{Hicks} \equiv \bar{S}_t - \bar{S}_{t-1} + K_t \quad (32)$$

Hicks's suggestion amounts to replacing the first axiom (1), which is elementary and transparent, with a notion that contains a host of tacit assumptions and subjective valuations. At closer inspection this is not a very promising idea. The structural axiomatic approach implicates Hicks's definition while the opposite is not true. Hicks's suggestion is therefore rejected as being too woolly and lacking generality.

We now return to (31) and take the stock of nonfinancial assets as the precondition for the emergence of the secondary market.

5 Wealth creation in the secondary market

As Kaldor put it:

The only truly exogenous factor is *whatever exists at a given moment of time*, as a heritage of the past. (Kaldor, 1985, p. 61), original emphasis

Whatever exists in the economy for more than one period are, apart from all initial endowments, cumulated real and nominal residuals. Formally, residuals are the creators of this heritage. Accordingly, the structural framework of the secondary market is given by (31) with the available stock of current deposits and the stock of nonfinancial assets derived in direct lineage from the structural axiom set. The quantitative frame consists of

$$\begin{array}{ccc} \text{demand structure} & \text{supply structure} & \\ \underbrace{\bar{M}_{HA}^d}_{\text{current deposits}} & \parallel \quad \underbrace{\sum B_h \bar{X}_h}_{\text{nonfinancial assets}} & | \bar{t} \end{array} \quad (33)$$

and entails the *distribution* of deposits and commodities among the households. The secondary market concerns only the households; the business sector is not involved. This is the defining characteristic in comparison to the product market. Hence we have *all* current deposits on the side of potential demand and *all* non-financial assets on the side of potential supply. For the general case the demand side has to be supplemented by free overdraft lines. The concept of a market in the monetary economy has been succinctly summed up by the well-known aphorism: ‘Money buys goods and goods buy money; but goods do not buy goods’ (Clower, 1969, pp. 207-208).

Table 1 illustrates the basic features of the secondary market with one single commodity and an exemplary transaction chain.

			<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	\bar{t}	Real. appr.	
Initial distribution of current deposits between the agents	<i>A</i>	0	<i>A</i>	0	1					1	$1-B_{t-1}$
	<i>B</i>	1	<i>B</i>		0	2				2	1
	<i>C</i>	2	<i>C</i>			0	4			4	2
	<i>D</i>	4	<i>D</i>				0	8		8	4
	<i>E</i>	8	<i>E</i>					0	16	16	8
	<i>F</i>	16	<i>F</i>						0	0	0
Σ		31							31		$16-B_{t-1}$

Table 1: Redistribution of current deposits and increase of the household sector’s net worth effected by six transactions in period *t*

We have six agents *A* to *F*. The leftmost column shows the initial distribution of the household sector’s current deposits in period *t*. Agent *A* owns no money but, say, a porcelain vase, bought sometime ago out of current production. The vase has an actual subjective valuation price of B_{t-1} . The table in the middle shows the subsequent transactions. Agent *A* sells to *B*, *B* to *C* and so on and each buyer is supposed to double the price. The subsequent owners resemble the first one as they possess no money but a porcelain vase. The final distribution of the unchanged total amount of deposits is shown on the right side of the exchange table and the realized appreciations of each agent are shown in the rightmost column.

As long as agent *F* can be reasonably sure that he will find a next buyer who is prepared to pay at least 16 money units his net worth remains unchanged and everybody else is better off. The now higher value of the porcelain vase is authenticated by market transactions. The subjective valuation price has become an objective market price. In the final analysis value is created by individual taste and judgment in combination with the willingness to ratify this taste and judgment openly with a certain amount of money (own or borrowed). The secondary market value is, to the greatest possible extent, a social construct.

The market transactions lead in the present example to an increase of the household sector’s net worth according to (29) which is reduced to:

$$\bar{S} \equiv \underbrace{\bar{M}_{\mathbf{H}\mathbf{A}}^d - \bar{M}_{\mathbf{H}\mathbf{B}}^o}_0 + \underbrace{\sum_{t=1}^t B_0 \bar{X}_0 + \Delta \bar{G}_{\mathbf{H}}^+}_{\text{nonfinancial assets}} \quad \text{if } C_t = K_t, \bar{S}_0 = 0 \quad |\bar{t}. \quad (34)$$

The realized appreciations of the agents are something completely different from income as given by the 1st axiom and profit as given by the 5th axiom (35). They affect households' net worth *directly* via nonfinancial saving as given by the 6th axiom (15). The realized appreciations do neither alter the total amount of current deposits nor their distribution, only the names attached to it. In real terms nothing changes in the economy: the stock of money and the physical stock of commodities is the same.

Since the porcelain vase pays no dividends its value consists entirely of a bubble (LeRoy, 2004, p. 786), (Shackle, 1972, p. 412). If there is no next buyer the valuation price is the price that was paid to the last but one transactor. The absence of a next buyer entails a loss. Agent *F* then becomes a casualty of the winner's curse.

The price can rise higher than 16 units if leverage is possible (Kindleberger and Aliber, 2005, pp. 64-72). This presupposes the existence of credit; in our case of free overdraft lines at the central bank. The price increase may be revitalized after *F*'s purchase by some new agents emerging over time from the flow part of the economy with appropriate current deposits. Conversely, if we assume that an *equal* distribution of current deposits emerges each potential next buyers can offer at most 6.2 money units. A major price determining factor in the secondary market is the expanding range of potential next buyers with current deposits or overdraft facilities at their command. To be sure, speculative movements are not the norm; most commodities actually traded in the secondary market have an unspectacular second hand price.

The growth of the household sector's nonfinancial net worth is due to the reshuffling of the existing stock of commodities between households with different subjective valuation prices. From the purely materialistic standpoint this wealth effect is a *creatio ex nihilo*. At least one individual gets better off and no individual gets worse off. It is obvious that this process, which comes as close as possible to the perennial gold maker's dream, can be easily reversed by a change of expectations (Shackle, 2010, p. 246). On the whole the secondary market has not much to do with efficiency or the optimal allocation of scarce resources. The items that compose the stock of commodities move to those agents that value them most in money terms, for whatever reasons.

Ricardo excluded the pricing of 'rare statues and pictures, scarce books and coins' from his formal theory of value and called them non-produced consumption goods (Mandler, 1999, p. 68). Since these goods have been produced, albeit some time ago, their price has to be determined in the secondary market. The pricing in the secondary market is entirely different from the pricing in the primary market.

Hence it is not correct to speak of THE MARKET without qualification (Mirowski, 2002, p. 539). As Tobin put it:

"Market" is one of the most overworked and imprecise words in economics. (Tobin, 1980, p. 796)

In retrospect one can see that the problem of classical value theory stems from the fact that there exists not *one* generic market but (at least) two fundamentally different types: the primary markets (flow) and the secondary markets (stock). Walras's markets are secondary markets by construction. This entails that general equilibrium theory misses the primary part of reality.

One major price determinant in the secondary market is the market structure as given by (33) which has been in direct lineage derived from the structural axiom set. Then we have the behavioral factors. Structural axioms are deliberately mute about behavior, hence the following account of tâtonnement is a purely descriptive add-on that is primarily meant as an alternative to the – often ridiculed (Blaug, 1998, p. 556), but never discarded – Walrasian tâtonnement.

According to the 6th axiom (15) the households assign a valuation price B to each vintage of their individual stock of commodities. It is assumed that the situation is at first inert: the commodity owners are content with their existing stock and the deposit owners are content to hold their liquid means. With regard to the h^{th} commodity the situation in the first periods is as shown in Figure 3.

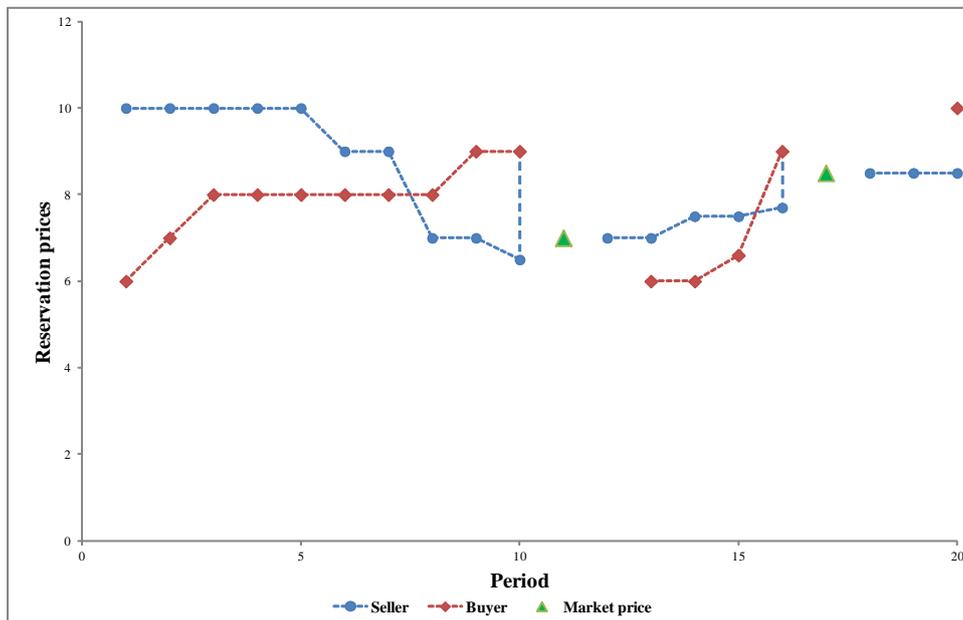


Figure 3: Search and marketing process with changing reservation prices of consecutive sellers and buyers

The valuation price B is assumed to be identical with the reservation price of the owner and potential seller of the h^{th} commodity. This reservation price is too high

compared to the the reservation price of the potential buyer. Hence at first nothing could possibly happen in the market. Changes of taste or other considerations then motivate the potential seller to lower his reservation price and the potential buyer to heighten his reservation price. In period₈ the configuration is such as to enable a transaction. The process is accompanied on both sides by information gathering, searching, public offers and other marketing activities. In period₁₁ the transaction takes place and a market price is established. The price is situated somewhere between the respective reservation prices.

The formation of reservation prices entails expectations about what the next potential buyer will be prepared to pay. This includes the definition of a time horizon. The potential buyer expects that the next potential buyer is willing and able to pay his actual reservation price or more. The ability to pay depends, among other things, also on the availability of credit and the rate of interest (for details see 2012a). The potential seller expects that the next potential buyer after the current buyer will pay less than his actual reservation price. Changes of reservation prices are to a large part due to changing expectations and this means in the last instance to chance. As Shackle put it:

The market cannot solve the problem of expectation. The only price it can distil, for a storable non-perishable good, is one which divides the potential holder of that good into two camps, those who think its price will rise and those who think its price will fall. (Shackle, 1972, p. 83)

Hence there are at least *three* agents involved in a market transaction; one of them is imaginary, yet by no means ineffective. The organization of a market reduces the subjective uncertainty about the number and individual characteristics of potential next buyers.

6 Profit

For the specification of business profit the set of axioms is extended because additional variables have to be introduced. The 5th axiom states that total profit has a financial and nonfinancial component:

$$\Delta\bar{Q} = \Delta\bar{Q}_{fi} + \Delta\bar{Q}_{nf} \quad |t. \quad (35)$$

This is the implicit form; the explicit form is given by (46).

6.1 Financial profit

The business sector's financial profit $\Delta\bar{Q}_{fi}$ in period t is defined with (36) as the difference between the sales revenues – for the economy as a whole identical with consumption expenditures C – and costs – here identical with wage income Y_W :

$$\Delta\bar{Q}_{fi} \equiv C - Y_W \equiv PX - WL \quad (36)$$

$$Y_W \equiv WL \quad \text{and condition} \quad \rho_X = 1 \quad |t.$$

For the business sector as a whole to make a profit consumption expenditures C have to be greater than wage income Y_W in the simplest case. So that profit comes into existence in the *pure consumption economy* the *household* sector must run a deficit at least in one period. This in turn makes the inclusion of the financial sector mandatory (for details see 2011b).

From (36) and (1) follows for the relation of financial profit and distributed profit:

$$\Delta\bar{Q}_{fi} \equiv C - Y + Y_D \quad (37)$$

$$Y_D \equiv DN \quad |t.$$

It needs hardly emphasis that in the investment economy the process of profit generation appears more complex (for details see 2011c).

From the axiom set follows the price as dependent variable:

$$P = \frac{\rho_E}{\rho_X} (1 + \rho_D) \frac{W}{R} \quad (38)$$

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

Financial profit implies $\rho_X = 1$. Under the condition of market clearing the price is determined by the expenditure ratio, the distributed profit ratio, and unit wage costs. This is quite different from the price determination in the secondary market.

6.2 Retained profit

Profits can either be distributed or retained. If nothing is distributed, then profit adds entirely to the financial wealth of the firm. Retained profit $\Delta\bar{Q}_{re}$ is defined for the business sector as a whole as the difference between profit and distributed profit in period t :

$$\Delta\bar{Q}_{re} \equiv \Delta\bar{Q}_{fi} - Y_D \quad |t. \quad (39)$$

Using (37) and (12) it follows:

$$\Delta\bar{Q}_{re} \equiv C - Y \equiv^m \Delta\bar{M}_B \quad |t. \quad (40)$$

Retained profit $\Delta\bar{Q}_{re}$ is the residual $C - Y$ as it appears at the firm; the same residual appears at the central bank as a change of the business sector's stock of money $\Delta\bar{M}_B$. The *two aspects* are kept apart by the notation \equiv^m . It follows

immediately that the development of the business sector's stock of money, which may carry a positive or negative sign, is given by (13).

Financial saving (16) and retained profit (39) always move in opposite directions, i.e. $\Delta\bar{Q}_{re} \equiv -\Delta\bar{S}_{fi}$. This entails that the plans of households and firms are only mutually compatible if both retained profit and financial saving are zero. Since this never happens the plans are never mutually compatible. Therefore, a behavioral equilibrium in the sense of Arrow and Hahn (1991, p. 16), although formally possible, does not exist in the structural axiomatic context: 'Thus important issues in the judgment of decentralized systems are at stake' (1991, p. 29).

6.3 Nonfinancial profit

Nonfinancial profit is defined as the difference between the valued increase of the stock of products in period t and the increase or decrease of the existing stock's value due to changes of quantities and valuation prices which is captured by $\Delta\bar{G}_{\mathbf{B}}$:

$$\Delta\bar{Q}_{nf} \equiv P(O - X) + \Delta\bar{G}_{\mathbf{B}} \quad |t. \quad (41)$$

If more goods are produced than sold in period t , i.e. $O > X$, the stock of products rises according to (6) and accumulates according to (7). It is, of course, possible that more units are sold than produced in a period, i.e. $O < X$. In this case the products are taken from the inventory. The period changes build up or take down the stock of output that therefore consists of different vintages. Initially the valuation price of each vintage is P but the valuation prices change over time. These changes come as appreciation or depreciation:

$$\Delta\bar{G}_{\mathbf{B}} \equiv \Delta\bar{G}_{\mathbf{B}}^+ - \Delta\bar{G}_{\mathbf{B}}^- \quad |t. \quad (42)$$

Changes of the inventory's value originate from the change of the quantity and the valuation price B of each hitherto unsold vintage. For the subset of items with a decrease in value taken together the depreciation is given by:

$$\Delta\bar{G}_{\mathbf{B}}^- \equiv \sum_{h=1}^l (B_{ht}\bar{X}_{ht} - B_{ht-1}\bar{X}_{ht-1}) \quad \text{with } B_{ht} < B_{ht-1} \quad |t. \quad (43)$$

For the subset of items with an increase of value taken together the appreciation is given by:

$$\Delta\bar{G}_{\mathbf{B}}^+ \equiv \sum_{h=1}^l (B_{ht}\bar{X}_{ht} - B_{ht-1}\bar{X}_{ht-1}) \quad \text{with } B_{ht} \geq B_{ht-1} \quad |t. \quad (44)$$

The valuation price B , which refers here to the business sector, is introduced as a new variable with the 5th axiom (35). The firm has some leeway in the valuation of its stock of products. So B usually differs from the market price P . Whether the firm's internal valuation prices are realistic or not remains to be seen until the respective vintage is brought to market.

In periods with an increase of the stock of products total profit (35) is higher than financial profit and vice versa when the stock decreases. Summed over all periods nonfinancial profits and losses are zero when the market is momentarily cleared in some period t . In this case the *sum* of total profits is equal to the *sum* of financial profits. Nonfinancial profits cancel out. By the same token arbitrary valuations automatically cancel out over time and produce not much more than a time shift of nonfinancial profits. Real residuals in the business sector do not create a secondary market.

Taking (37) and (41) into account the profit axiom (35) in its explicit form finally reads:

$$\Delta\bar{Q} = \underbrace{(C - Y + Y_D)}_{\text{financial profit}} + \underbrace{P(O - X) + \Delta\bar{G}_B}_{\text{nonfinancial profit}} \quad |t. \quad (45)$$

The equation summarizes the twofold process that generates the business sector's valued stock of output and the stock of money until period t . This boils down to the explicit form of the 5th axiom:

$$\Delta\bar{Q} = PO - Y + Y_D + \Delta\bar{G}_B \quad |t. \quad (46)$$

Total profit is given as the difference of the valued output and total income, plus distributed profit, plus changes of the value of the stock of final products.

Value changes of inventory cancel out over time. If they are zero total profit is given by:

$$\Delta\bar{Q} = PO - Y_W \quad |t. \quad (47)$$

In the simplest case total profit is the difference between the market value of output and wage income.

Nonfinancial profit implicates $\rho_E = 1$. The price equation (38) therefore changes to:

$$P = \frac{1}{\rho_X} (1 + \rho_D) \frac{W}{R} \quad |t. \quad (48)$$

Under the condition of budget balancing the price is determined by the sales ratio, the distributed profit ratio, and unit wage costs. With (48) we have exhausted the second limiting case of price determination in the primary market.

6.4 Business sector's net worth

To determine the business sector's net worth it is necessary to take profit distribution into account first. From (45) and (39) follows:

$$\Delta\bar{Q}_{re} \equiv (C - Y + Y_D) - Y_D + (PO - C + \Delta\bar{G}_B) \quad |t. \quad (49)$$

The business sector's net worth \bar{Q} at the end of an arbitrary number of periods is defined as the numerical integral of the period changes of retained total profits from the first period onwards plus the initial endowments:

$$\bar{Q}_t = \sum_{t=1}^t (C - Y + PO - C + \Delta \bar{G}_B)_t + \bar{Q}_0. \quad (50)$$

The business sector's net worth consists of its stock of money, i.e. of accumulated retained profits, and of the valued inventory if the period changes of the stock of products have not canceled out until period t :

$$\bar{Q}_t = \underbrace{\sum_{t=1}^t (C - Y)_t}_{\text{stock of money}} + \underbrace{\sum_{t=1}^t (PO - C + \Delta \bar{G}_B)}_{\text{valued inventory}} \quad \text{if } \bar{Q}_0 = 0. \quad (51)$$

The 1st axiom contains the number of shares \bar{N} . For completion the value of these shares has, as an offsetting item to (31), finally to be substituted for the initial endowment in (50):

$$\bar{Q} \equiv \underbrace{\bar{M}_B}_{\text{stock of money}} + \underbrace{\sum B_h \bar{X}_h}_{\text{valued inventory}} - \underbrace{B_{N0} \bar{N}}_{\text{equity}} \quad | \bar{t}. \quad (52)$$

6.5 The wealth of axioms

The household sector's (31) and business sector's (52) net worth add up to the wealth of the whole economy. The household sector's stock of money is the zero-sum complement of the business sector's stock if the initial endowments are set to zero, therefore money drops out of the definition of wealth. That money is not wealth is the accepted viewpoint since Adam Smith enlightened the mercantilists. The value of the firms' shares cancel out, too. When we treat the business sector's stock of products as a temporary phenomenon to be excluded here and set for simplicity all initial endowments to zero then produced wealth is finally given by:

$$\text{Wealth} \equiv \sum_{h=1}^l B_h \bar{X}_h \quad | \bar{t}. \quad (53)$$

Wealth in the pure consumption economy consists of the valued stock of commodities at the end of period \bar{t} . When the axioms are regarded as the formal groundwork then (53) is the apex.

7 Conclusion

Behavioral assumptions, rational or otherwise, are not solid enough to be eligible as first principles of theoretical economics. Hence all endeavors to lay the formal foundation on a new site and at a deeper level actually need no further vindication.

The present paper suggests three nonbehavioral axioms as groundwork for the formal reconstruction of the emergence of secondary markets. The structural axiomatic analysis leads to the following results:

- Production of nondurables is analytically prior to the exchange of durable commodities. The secondary markets emerge from the flow part of the pure consumption economy.
- The households satisfy their needs and wants by physical consumption and by usage of the existing stock of durable commodities. Consumption K embraces both sources of satisfaction. Consumption is different from consumption expenditures C . The difference gives rise to nonfinancial saving.
- Household sector's net worth summarizes the twofold process that generates the household sector's stock of nonfinancial assets and the stock of money. It constitutes the quantitative frame of the secondary market.
- The business sector's net worth consists of its stock of money, i.e. of accumulated retained profits, and of the valued inventory.
- Financial saving and retained profit always move in opposite directions. This entails that the plans of households and firms are only mutually compatible if both retained profit and financial saving are zero. This never happens.
- The standard theory of profit generation and distribution is logically deficient and at variance with the facts of a monetary economy.
- The secondary market concerns only the households; the business sector is not involved. This is the defining characteristic in comparison to the primary market.
- Subjective valuation prices become objective market prices in consecutive transactions on the secondary market. The pricing in the secondary market is entirely different from the pricing in the primary market.
- There are at least three agents involved in a secondary-market transaction; one of them, the potential next buyer, is imaginary, yet by no means ineffective. Without potential next buyers value evaporates in the secondary market.
- The realized appreciations in the secondary market are entirely different from income or profit. They affect the household sector's net worth directly via nonfinancial saving. The realized appreciations do neither alter the total amount of current deposits nor their distribution, only the names attached to it. In real terms nothing changes in the economy by consecutive transactions in the secondary market.
- On the whole, the secondary market has not much to do with efficiency or the optimal allocation of resources. The items that compose the stock of durable commodities move to those agents that value them most in money terms.

- Secondary markets are essentially different from flow markets. To treat them alike is a category mistake.

Whatever exists in the economy for more than one period are, apart from all initial endowments, cumulated real and nominal residuals. Hence real and nominal ‘disequilibria’ are the very creators of economic reality.

References

- Ackerman, F., and Nadal, A. (Eds.) (2004). *Still Dead After All These Years: Interpreting the Failure of General Equilibrium Theory*. London, New York, NY: Routledge.
- Arrow, K. J., and Hahn, F. H. (1991). *General Competitive Analysis*. Amsterdam, New York, NY, etc.: North-Holland.
- Barrère, A. (1988). The Foundations of a Monetary Production Economy. In A. Barrère (Ed.), *The Foundations of Keynesian Analysis*, pages 15–48. Houndmills, London: Macmillan.
- Blaug, M. (1998). *Economic Theory in Retrospect*. Cambridge: Cambridge University Press, 5th edition.
- Boulding, K. E. (1945). The Consumption Concept in Economics. *American Economic Review, Papers and Proceedings*, 35(2): 1–14. URL <http://www.jstor.org/stable/1818427>.
- Clower, R. W. (1969). Foundations of Monetary Theory. In R. W. Clower (Ed.), *Monetary Theory*, pages 202–211. Harmondsworth: Penguin.
- Debreu, G. (1959). *Theory of Value. An Axiomatic Analysis of Economic Equilibrium*. New Haven, London: Yale University Press.
- Hahn, F. H. (1980). General Equilibrium Theory. *Public Interest. Special Issue: The Crisis in Economic Theory*, pages 123–138.
- Hicks, J. R. (1939). *Value and Capital*. Oxford: Clarendon Press, 2nd edition.
- Kakarot-Handtke, E. (2011a). The Propensity Function as General Formalization of Economic Man/Woman. *SSRN Working Paper Series*, 1942202: 1–28. URL <http://ssrn.com/abstract=1942202>.
- Kakarot-Handtke, E. (2011b). Reconstructing the Quantity Theory (I). *SSRN Working Paper Series*, 1895268: 1–26. URL <http://ssrn.com/abstract=1895268>.
- Kakarot-Handtke, E. (2011c). Squaring the Investment Cycle. *SSRN Working Paper Series*, 1911796: 1–25. URL <http://ssrn.com/abstract=1911796>.

- Kakarot-Handtke, E. (2012a). Make a Bubble, Take a Free Lunch, Break a Bank. *SSRN Working Paper Series*, 2167234: 1–32. URL <http://ssrn.com/abstract=2167234>.
- Kakarot-Handtke, E. (2012b). The Rhetoric of Failure: A Hyper-Dialog About Method in Economics and How to Get Things Going. *SSRN Working Paper Series*, 2047177: 1–50. URL <http://ssrn.com/abstract=2047177>.
- Kaldor, N. (1985). *Economics Without Equilibrium*. Armonk, NY: M.E. Sharpe.
- Kindleberger, C. P., and Aliber, R. (2005). *Manias, Panics, and Crashes. A History of Financial Crises*. Hoboken, NJ: Wiley, 5th edition.
- Kreuzenkamp, H. A., and McAleer, M. (1995). Simplicity, Scientific Inference and Econometric Modeling. *Economic Journal*, 105: 1–21. URL <http://www.jstor.org/stable/2235317>.
- Lavoie, M. (1992). *Foundations of Post-Keynesian Economics*. Cheltenham: Edward Elgar.
- LeRoy, S. F. (2004). Rational Exuberance. *Journal of Economic Literature*, 17(September): 783–804.
- Mandler, M. (1999). *Dilemmas in Economic Theory*. Oxford: Oxford University Press.
- Mirowski, P. (1986a). Institutions as a Solution Concept in a Game Theory Context. In P. Mirowski (Ed.), *The Reconstruction of Economic Theory*, pages 241–263. Boston, MA, Dordrecht, Lancaster: Kluwer-Nijhoff.
- Mirowski, P. (1986b). Mathematical Formalism and Economic Explanation. In P. Mirowski (Ed.), *The Reconstruction of Economic Theory*, pages 179–240. Boston, MA, Dordrecht, Lancaster: Kluwer-Nijhoff.
- Mirowski, P. (2002). *Machine Dreams*. Cambridge: Cambridge University Press.
- Morishima, M. (1977). *Walras' Economics*. Cambridge: Cambridge University Press.
- Morishima, M. (1984). The Good and Bad Use of Mathematics. In P. Wiles, and G. Routh (Eds.), *Economics in Disarray*, pages 51–73. Oxford: Blackwell.
- Nadal, A. (2004). Behind the Building Blocks. Commodities and Individuals in General Equilibrium Theory. In F. Ackerman, and A. Nadal (Eds.), *The Flawed Foundations of General Equilibrium*, pages 33–47. London, New York, NY: Routledge.
- Rochon, L.-P., and Rossi, S. (2003). Introduction. In L.-P. Rochon, and S. Rossi (Eds.), *Modern Theories of Money*, pages xx–lvi. Cheltenham, Northampton, MA: Edward Elgar.

- Schumpeter, J. A. (1994). *History of Economic Analysis*. New York, NY: Oxford University Press.
- Shackle, G. L. S. (1972). *Epistemics and Economics*. Cambridge: Cambridge University Press.
- Shackle, G. L. S. (2010). *The Years of High Theory. Invention and Tradition in Economic Thought 1926-1939*. Cambridge, London, etc.: Cambridge University Press.
- Smith, A. (2008). *An Inquiry into the Nature and Causes of the Wealth of Nations*. Oxford: Oxford University Press. (1776).
- Tobin, J. (1980). Are New Classical Models Plausible Enough to Guide Policy? *Journal of Money, Credit and Banking*, 12(4): 788–799. URL <http://www.jstor.org/stable/1992034>.
- Velupillai, K. (2005). The Unreasonable Ineffectiveness of Mathematics in Economics. *Cambridge Journal of Economics*, 29: 849–872.