LAWS OF MOTION AND ATTRACTION IN DISEQUILIBRIUM

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I. Introduction

Economic theory may be interpreted to imply three distinct and basic hypotheses with respect to the *laws of motion* of the elements of a dynamic demand – supply system during a disequilibrium phase. The term disequilibrium phase may be distinctively defined by the corresponding hypothesis. In terms of *attraction,* however, economic theory embodies only *one* law: that *equilibrium* is the center of gravity–whether in equilibrium or disequilibrium analyses.

The term dynamic system here denotes a system which essentially incorporates time-varying parameters to the ordinary variables at different points of time within a historical framework. This stipulatlon closely corresponds to the more or less accepted definition of this term, which is best characterized by what may be called with Frisch – Samuelson synthesis (Frisch, 1936 and Samuelson, 1947). According to this synthesis, a system is dynamic if the behavior of its elements over time is determined by functional relationships within the system which is composed of variables and parameters at different points in time. In such a system, furthermore, allowance should be made for unidirectional time-varying influences from outside of the system proper. These influences are due to the exogenous character of certain variables, or to their predetermination. Depending on the method of analysis, certain exogenous *and* endogenous variables may be pulled together and assumed either constant or behaving in a steady-state manner, in order to simulate the analytical condition of *ceteris paribus.*

Dynamics is subject to alternative definitions. A simpler one, which also closely corresponds to our usage, is Ackley's definition that, "Dynamics is concerned essentially with states of disequilibrium and with change" (1978, p. 11). It should be noted, however, that although our use of this term does not preclude the existence of a Terminal-equilibrium state, it is not meant to be interpreted according to the Hicksian Theory of Traverse (1965). William Baumol's definition of this term and Harrod's use of micro-dynamics complement the above stipulation: "Economic dynamics is the study of economic phenomena in relation to preceding and succeeding events" (1959, p. 4); and "Micro-dynamics should deal with forces governing the rates of change" (1973, p. 11). The term time-varying parameter is also used above in its econometric sense (cf. Belsley and Kuh, 1973 and Arora, 1973).

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According to the basic laws of motion, shortly to be examined, the behavior and decision-making of market participants are reflected primarily in one market variable, which may be called the *adjustment* variable. On the basis of equilibrium methodology, the adjustment variable may be also referred to as the market-clearing variable. If any other adjustment is involved, however, it is assumed to be instantaneous. Thus, these laws of motion are based on the non-instantaneous (or slow) adjustment of the corresponding variables.

With regard to the *adjustor,* theoretical apparatus have often led to the designation of cost-free and centrally-organized, but not centrally-planned, schemes–such as the invisible hand (Smith, p. 447). Variants of the fictitious invisible hand include the Walrasian auctioneer (1874)[1], the Marshallian active force of the market (1920), the Hicksian independent functionary (1977), and Patinkin's central registry (1965). In general, the calls of these authorities, reacting to the market participants' behavior and decision-making interactions, are intended to perform the *tatonnement* process of the adjustment variable–whether of price or of quantity–as the relevant law of motion. These *tatonnement* processes are often formulated according to non-calendar or logical time–including no cost/benefit analysis of the time involved in the processes of production and exhange. Given the proper stability condition, the law of attraction dictates a time-path of the adjustment variable towards the equilibrium. Violation of the law of attraction may form alternative time paths such as explosive, oscillatory, and general fluctuations.

The laws of motion of this adjustment triad consist of the Walrasian Excess-Demand Hypothesis, the Marshallian Excess-Price Hypothesis, and the Cobweb Theorem. None of the first two hypotheses should be regarded exclusively as the propositions of the economists whose names specify them. These are representative of a large body of thought, which existed prior to Walras and Marshall but which attained its elegance and definitiveness through their work. For instance, Adam Smith's and Ricardo's natural price-path may be interpreted as the Excess-Demand Hypothesis (cf. 1776, Ch. VII and 1817, Ch. IV).

In what follows, this triad is interpreted within the frame of the period and process analysis by use of the Myrdallian ex ante-ex post approach.

II. The Walrasian Excess-Demand Hypothesis

This hypothesis dominates economic theory due to the readily observable and statistical nature of its adjustment variable–price–in addition to the mathematical definitiveness of Walras' *Elements.* It clearly dominates Price or Value Theory, as well as monetary analysis of the Quantity Theory of Money. The Keynesian monetary theory also partly relies on this type of adjustment: not in its treatment of the equation of exchange and price of commodities, but in its dealings with the rate of interest. According to the new interpretation of Keynes' *General Theory,* however, this type of adjustment is supposed to have been totally reversed by Keynes (Leijonhufvud, 1968, p. 52). This latter view is dealt with below.

A disequilibrium phase, according to the Walrasian hypothesis, may be defined as a phase at which there exist a *non-zero, ex ante effective excess quantity demanded* (positive or negative according to greater quantity demanded or quantity supplied). The quantities demanded and supplied are supposed to be determined in a pre-market transaction period, at which *a priori* neither the initial price nor the terminal equilibrium price is known. These quantitites reflect the maximization of utility indexes, regardless of any deterministic knowledge of prices. The excess quanity demanded *ex post,* however, is the function of price in the market-transaction period. At the start of the market-transaction period, the centrally-organized authority announces an arbitrary price. If the collected bids and asks do not match, the price would be altered. Therefore, the price is the primary adjustment variable; the adjustor being the auctioneer who acts as a broker under the constraint of no spread.

During a disequilibrium phase, no actual trade may be completed. It is the task of the costless auctioneer to transmit the costless and readily available *information* to prospective sellers and buyers, regardless of the time involved.[2] Accordingly, this process continues until an equilibrium point with a terminal consistent price is reached, at which all quantities demanded and supplied equate.

The term effective, which was used above, should be once more emphasized. It is often supposed in the literature that this term, especially in an aggregate sense, is an innovation of the *General Theory.* Although the definition of this term is not yet universally resolved,[3] it is my opinion that Walras' usage of this term is very much similar to Keynes': a desired quantity in the commodity market which is supported by earning power in the *resource* market.

In a strict Walrasian sense in which no trade is permitted in disequilibrium, the time-path of price, altered by the auctioneer, depends, *ceteris paribus,* on the degree and magnitude of deviation between the initial, *ex ante* quantities demanded and supplied at each period.

In terms of period analysis, this hypothesis may be *generalized* and symbolically represented as:

$$p_t - p_{t-1} = [(q_t^d - q_t^s), (q_{t-1}^d - q_{t-1}^s), (z_t - z_{t-1})], \qquad (1)$$

where p = price, q = quantity, d = demand, s = supply, t = a specified time period, and z = a (microeconomic) vector of *other* variables, such that $z_t - z_{t-1} = \emptyset$, implies the assumption of *ceteris paribus* in that market.

According to the *tatonnement* theorem, the time span(short-run or long-run) is not relevant to the specification of the time period(t) involved. The equilbrium-tatonnement process specifies the time period as having a length which permits the terminal equilibrium price to be reached. Therefore, the Walras' equilibrium, in its restrictive sense, defines a temporal excess demand as:

$$\mathrm{ED}\ [(\emptyset), (\emptyset), (\emptyset)],$$

in which the time path of price is flat(that is, neither positively nor negatively inclined). This condition is defined as temporal Walrasian *strong* equilibrium.

III. The Marshallian Excess-Price Hypothesis

In substance, this hypothesis dictates the reversal of the roles of price and quantity of the Walrasian framework. That is, the adjustment role is assigned to the *quantity* variable, while the prince – in one variant – is exogenous to the individual market participants. Accordingly, the price may be considered more or less fixed during *each* disequilibrium phase.

In terms of Marshall's long-run theory of normal price, however, the price need not be considered fixed. It suffices that the process of price-adjustment is *faster* than the process of quantity-adjustment (cf. Samuelson, 1947, p. 264). In this view, therefore, contrary to what Leijonhufvud has argued (1968, p. 52), this reversal process should be originally attributed to Marshall, and not to Marshall's student, J. M. Keynes. Accordingly, this cannot be considered the evolutionary element of the *General Theory*. Marshall's quantity adjustment process specifically refers to his *Principles* (Book V). In terms of monetary theory, however, Marshall's *primary* emphasis is in terms of price adjustment (1887), vis. the Quantity Theory of Money.

According to this hypothesis, a disequilibrium phase may be defined as a phase in which there exists a *non-zero, ex ante effective excess normal price.* The concept of normal price, in the tradition of Adam Smith and D. Ricardo, is based on the cost of production, or more specifically, on the labor value.

The Marshallian quantity time-path may be generalized and symbolically represented as:

$$q_t - q_{t-1} = EP\ [(p_t^d - p_t^s), (p_{t-1}^d - p_{t-1}^s), (z_t - z_{t-1})], \qquad (2)$$

where the notations are the same as specified previously.

In addition to the above modification of the Walrasian scheme, the role of the market mechanism is assigned either to the representative producer (Marshall, 1920, p. 317), or, through Hicks observation, to the wholesaler or retailer (1977, p. ix). For the sake of simplicity, we shall treat the representative producer-retailer as one entity.

In addition, we shall make use of the short-run Marshallian supply and demand curves, the intersection of which determines the equilibrium price. Any other market price is interpreted to be disequilibrium price.

The interpretation of the Marshallian market operation may be viewed in two alternative ways: with or without inventories. That is, we may consider either Sales curve or Supply curve. In an exchange economy, however, it is the Sales curve which is mor relevant.

In both cases the producer assumes an *ex ante* supply price according to his (known) short-run marginal cost curve. This is the price which he will announce in the market-transaction period. However, he cannot have full knowledge of the other market blade: the *ex ante* demand – except perhaps through what he has learned by doing. It is in the market-transaction period that the producer is confronted *ex post* by the demand price. This demand price may or may not coincide with its profit-maximizing supply price. At each period, the amount produced will be determined by his supply price via his supply schedule.[4] Let us examine the phenomenon of excess-demand disequilibrium, whereby the *ex post* demand price exceeds the *ex ante* supply price.

In the first case, that is, working with the Sales curve, once the producer is confronted with the excess demand price, he may drain his inventories. Without qualification and *a priori,* the solution – i.e., the market price and the actual volume of trade – cannot be known. With certain qualifications, however, we are able to offer two corner solutions.

The first solution, which corresponds to the Hicksian fixprice method, may be called the Lindahl – Baumol solution. According to this framework, the producer drains his (large) inventories in order to *fully* satisfy the demand. The ruling market price is thus the *ex ante* (equal to *ex post*) supply price. The Sales curve, therefore, becomes perfectly elastic at this disequilibrium price (Lindahl, 1939 and Baumol, 1959).

The second corner solution coincides with our second case in which only the Supply curve – exclusive of inventories – is considered. In this case, the demand price becomes the ruling market price, and the actual volume of trade is equal to the amount *supplied* in that period. That is, only the shortside of the market is satisfied. This is Marshall's approach.

In both types of solutions, the producer is *ex post* off his supply curve. The quantity adjustment for the next period is planned accordingly. That is, the producer will, through the active force of the market (Marshall, 1920, p. 345), increase his production for the next period. In general, the laws of diminishing, constant, or increasing returns do not alter the above reasoning (Ibid., p. 346, ft. 1).

However, these two solutions are too limited in scope. In the real world, although it may be presumed that inventories are always relevant, this does not qualify the producer as a full-service producer, who always stands ready to decumulate (accumulate) his inventories in order to fully satisfy the *ex post* demand.

There must exist, therefore, intermediate cases, which includes equilibrium quantity or equilibrium price as possible outcomes (not necessarily in simultaneity). It is also possible to have *both* sides of the market off their short-run schedules. This may occur either where a certain amount of stock is desired to be held, or the producer carries the stock forward.

At each market disequilibrium price, where suppliers are off their schedules, the difference is reflected in the change in producer inventories. When buyers are off their schedules, which ordinarily involves being to the *left* of the demand curve, the distribution of goods must be facilitated by some other rationing scheme than the price machanism, such as first-come-first-served method. According to the concept of consumer inventories, it is also possible for buyers to be off to the *right* of their ordinary demand curve. For instance, in a barter system where double coincidence of wants may be waived by accumulating certain durable goods, the consumer "Buy" curve may become also more elastic at relatively lower prices (idea inspired by Joan Robinson, (1978).

In its restrictive sense, we may define the *Marshall's equilibrium as a* temporal excess price function:

$$EP\ [(\emptyset), (\emptyset), (\emptyset)],$$

according to which the time path of quantity is flat. It should be noted, however, that Marshall had reservations about the interpretation of normal (or natural) values in the long-run, primarily because "we cannot foresee the furture perfectly, and that the general conditions of life are not stationary" (1920, p. 347).

In comparing Marshallian *quantity* theory with Walrasian *price* theory, it must also be noted that although the representative producer may have a stock of inventory, the auctioneer lacks any inventory stock. However, it is still possible to treat these two cases in a symmetrical manner.

It might be helpful to view the auctioneer as possessing a price-inventory rather than quantity-inventory. This concept, which appears as unfamiliar, approximates the monetizing power of a central authority in a credit-money economy.

IV. The Cobweb Theorem

This theorem arose from the independent works of a group of economists composed of Hanau, Ricci, Schultz, and Tinbergen.[5] The Cobweb Theorem recognizes the crucial fact that once proper consideration is accorded to the period of analysis involved in a sequence economy, the usual short-run supply and demand may not always result in a strong ordinary equilibrium. In terms of point-equilibrium statical analysis, a strong ordinary equilibrium is defined as the point at which given short-run supply and demand schedules meet (cf. Ohlin, 1978).

Fundamentally, this theorem proposes that the quantity supplied at each market-transaction period is the result of the adjustment to a previous market price. The price, however, is adjusted instantaneously during the transaction period in order to clear the market.

Therefore, the Cobweb Theorem may be interpreted as an extended combination of Marshallian and Walrasian hypotheses within the frame of a sequence analysis. That is, the adjustment of the quantity produced is Marshallian; but the Marshallian fixed supply price is replaced by the previous market price, and the adjustment of price *during* the transaction period is a version of the Walrasian price mechanism.

This extension may be formally stated in terms of three restrictions: (1) a preliminary division of the periods involved in production and trade; thus, considering the existence of time and the associated lags, (2) an irreversible succession of production and trade, and (3) presence of expectations; hence, linking the past to the present and to the future.

The market clearing price mechanism of this theorem is, however, somewhat different from that of the Walrasian hypothesis. While trade is not permitted at *any* disequilibrium price according to the Walrasian hypothesis, this theorem allows trade to occur at the short-run disequilibrium price. Still, however, trade is *not* permitted at the *market-period* disequilibrium price. That is, demanders are always on their schedule. Accordingly, the demand price, corresponding to the amount supplied at that period, is always the ruling market price.

This point may be elaborated on by comparing the Cobweb Theorem with the Marshallian framework. The quanity-adjustment fixprice framework allows trade at *both* the short-run disequilibrium price as well as at the market-period disequilibrium price. For instance, it is possible to observe both suppliers and demanders off their schedules when storage is arranged. In the Cobweb Theorem, however, since no storage is allowed and no price fixing is considered, the *market-period* price adjusts *fully* to bring about market-period equilibrium. In other words, while the Marshallian sales curve might be perfectly elastic at the fixed-price, the Cobweb's sales curve (exactly equal to the *market-period* marginal cost curve – defined loosely to coincide with the market-period supply curve) is always perfectly inelastic.

This theorem may be formulated in alternative ways according to various time lags and the treatment of price or quantity as the independent variable. Two cases will be considered here. First, the standard case considers and a one-sided lag in an extension of the Marshallian approach. Accordingly, a disequilibrium phase may be defined as a phase at which exists a *non-zero, ex ante effective excess market price, which successively influences the quantity supplied.* Symbolically,

$$q_t - q_{t-1} = EP\ [(p_t^d - p_{t-1}^s), (p_{t-1}^d - p_{t-2}^s), (z_t - z_{t-1})], \qquad (3)$$

where p_{t-2}^s is a datum to the system which the above equation represents.

Second, the above formulation may be represented through the Walrasian hypothesis. Accordingly, a disequilibrium pahse is defined as a phase during which there exists a *non-zero, ex ante effective excess quantity demanded which the price sucessively influences the quantity supplied:*

$$p_t - p_{t-1} = ED\quad [q_t^d - q_t^s(p_{t-1})],\ [q_{t-1}^d - q_{t-1}^s(p_{t-2})],\ [z_t - z_{t-1}] \qquad (4)$$

These last two implied systems may be also intepreted in alternative ways. For instance, equation (4) could imply a recursive system, in the following way. If the most recent period's price determines the current supply, the current supply and demand determine the current price, which instantaneously adjusts to clear the market. In turn, the current price will determine the next period's supply; and so on. In this framework, it is also possible to incorporate leads into this system.

Furthermore, with the extension or lengthening of the periods involved in terms of formation of expectations, other formulations are also possible. An example is the n-order leg of anticipated (A) changes in prices of the St. Louis model (Anderson and Carlson, 1970; cf. equation (6)):

$$\Delta p_t^A = F\,(\Delta p_{t-1}, \ldots\ldots, \Delta p_{t-n}), \qquad (5)$$

where Δ is the (proceeding) difference operator. This last equation is a variant of equation (4).

Finally, consider the types of oscillations in the general Cobweb model. This model is usually formulated in a way to propose three types of oscillations: damped, uniform, and explosive. In my opinion, however, although the first two types are realistic, the explosive type of oscillation cannot continue indefinitely. Marshall's law of diminishing returns and increasing costs rules here. *Ceteris paribus,* once the explosive price reaches the perfectly inelastic upper portion of the supply curve, the oscillations will transform into the uniform type. The same proposition may be generalized to the unfirom type. The same proposition may be generalized to the lower portion of the demand curve, when it becomes perfectly elastic.

V. Market Structure and Market Activity

As noted previously, neither of the first two adjustment processes should be attributed exclusively or inclusively to Walras and Marshall.[6] The task before us, however, is not the labeling of these adjustments, but the relevancy and applicability of each process. In this section, an attempt is made to relate these processes to a specific market structure and market activity of a macroeconomy, which, at first approximation, can be partially disaggregated.

Specifically, the question to be resolved is the following: Upon which critieria and under what conditions do any of these hypotheses become operative, relevant, and applicable? These distinctions will prove useful in the development of this work.

The dominant response to this question in economic theory is that, *a priori*, nothing can be said about the relevancy of these alternative processes to the real world. The task, therefore, is transferred to one of empirical measurement through the confrontation of these alternatives with the empirical evidence.

However, in generating an *ex ante* theory, one is led (or rather forced) to attempt a theoretical appraisal with regard to the problem of applicability, as far as it is possible. On the other hand, in empirical evaluations econometricians are faced with many crucial problems which can lead to inconclusive or even opposing results. As Davies (1963, p. 537) argued, "even an expert econometrician might find it difficult to ferret out autocorrelation, multi-collinearity, and errors of observation, and then properly sort out and label two negatively sloped regressions." Furthermore, the current imperfect state of disequilibrium measurement adds to the problems.

The initial departure in our theoretical appraisal would be to utilize and elaborate on a suggestion by Hicks (1977, pp. viii-ix) on market organization to resolve the problem of applicability.

In order to approach the problem concretely let us classify market structure and activity according to three criteria: (i) production theory (activity) vs. consumption theory, (ii) perfect vs. imperfect competition, and (iii) the timing of the market, according to which the activity of the market under consideration terminates.

(i) It is sometimes suggested that the Walrasian price-adjustment process is relevent to the theory of exchange, while the output-adjustment (or quantity-adjustment) of the Marshallian framework is designed for the theory of production (cf. Newman, 1965, Takayama, 1974, and Davies, 1963). Thus, it is propounded that these two processes are not comparable in the same dimension. This contention, however, is not totally correct. In substance, it fails to recognize that exchange takes place *both* in the realm of production theory as well as in exchange theory.

We must realize that there exist two types of exchange. The first type is for production purposes, that is, the exchange of inputs for a contact, or money, or another good. The second type of exchange is for consumption purposes, which involves finished goods or output traded for a medium of exchange. We may call the first activity the productive exchange; the second activity the consumptive exchange. This classification allows us to extract from the so-called production theory the elements of engineering and techniques of production which are not historically in the domain of economic theory.

The exchange for finished goods, therefore, is carried out in the consumptive-exchange market. The exchange for inputs (which may be generalized to include all resources and intermediate goods) is carried out in the productive-exchange market. It should be noted that by this classification we have no intention of approximating the pre-classical categorization of productive and unproductive exchange. Our functional classification is only useful insofar as it allows that exchange is carried out for different purposes.

In this context, I shall propose that the Walrasian price-adjustment process is *more* applicable to the input or productive-exchange markets. On the other hand, however, the Marshallian quantity-adjustment process is more applicable to the output or consumptive-exchange markets. However, it should be noted that this proposition is restrictively operative in the short-run. Accordingly, it only includes those inputs and outputs which are variable. In conformity with economic theory, therefore, it excludes capital goods. The same may be generalized to consumer durable goods.

The above proposition may be defended by the following explanation. In the short-run, when techniques of production and the scale are assumed to be fixed, the entrepreneur with a given production function (the standard neoclassical and Keynesian short-run assumptions) decides the quantity of output to be produced. The fixed production function, together with the planned output, will determine the level of resource units required. Thus, the planned-purchase quantity of, say, labor man-hours, also becomes fixed before the transaction period. During the transaction period, the producer will bid for the *required* man-hours, by proposing a contract at the going wage rate, or by *adjusting the wage rate,* if necessary. Therefore, the quantity of the exchange item is fixed, while the price is subject to adjustment. In this way, the Walrasian price-adjustment process becomes more applicable to the productive-exchange market.

On the other hand, consider the case when the output produced is brought to the consumptive-exchange market. The price for this output is announced (upon criteria such as the *ex post* cost of production, inventory levels, profit margin, etc.). Therefore, the price is relatively fixed (again, standard neoclassical asumption of given prices in consumer theory), while the consumer adjusts the quantity of output purchased according to his constraints, in order to maximize his utility. In this way, the Marshallian quantity-adjustment process becomes relevant to the consumptive-exchange market.[7]

In summary, we may say that, in the short-run, the Walrasian price-adjustment process is applicable to the productive-exchange markets, which may be called flexprice-fixquantity markets. The Marshallian quantity-adjustment process, on the other hand, is applicable to the consumptive-exchange markets, which can be labeled as fixprice-flexquantity markets.

(ii) The next problem of applicability to be resolved is whether any of these processes can be identified as operative in perfect vs. imperfect competitive markets.

Value and Capital (Hicks, 1946) suggested that the Marshallian framework is more appropriate to conditions of imperfectly competitive markets. This contention has been criticized on the grounds that both price-and quantity-adjustment models could be compatible with perfectly competitive as well as imperfectly competitive markets (cf. Davies, 1963, and Marschak, 1942, and Newman, 1965). The models upon which this criticism is based, however, technically assume equilibrium methodology, in the sense that the seller has perfect knowledge of the demand curve with which he is faced.[8] Accordingly, he can move to his optimum price-quantity point with no uncertainty. He may even jump instantaneously to his optimum point with no phase of trial and error.

But, as Arrow has proposed, this type of behavior is not applicable to markets in disequilibrium. The imbalance of supply and demand impairs the general validity of perfect elasticity of demand with which the perfect competitors are supposed to be faced. Both perfectly competitive and monopolistic markets in *disequilibrium,* "consist of a number of monopolistic facing a number of monopsonists" (1959, p. 47). Regardless of the structure of the market in the sense of number of players and type of good, the participants will exhibit the behavior of monopolist-monopsonist trade. In this framework, Kornai's relative strength of market forces (1971) also becomes relevant in which one side of the market may exert monopolistic influences on the whole.

Therefore, we may conclude that the Walrasian and the Marshallian types of adjustments cannot be satisfactorily generalized to perfect versus imperfect competition. In markets in disequilibrium, monopolistic elements are always present. And, since the monopolist will *ex post* use both price and quantity adjustments, both the Walrasian and Marshallian frameworks are relevant. Even, in perfectly competitive markets, therefore, Jevon's Law of Indifference cannot be expected to be generally valid (cf. Arrow, 1959, p. 46 and Ch. IX below).

(iii) Finally, consider the problem of the relevance of an adjustment process to the proper timing, or the runs, of the market. By the term timing we mean the length of time which is required for the termination of the particular activity of the market under consideration.

On the basis of the false division between theory of exchange and theory of production, it has been argued that since exchange is temporary, the Walrasian price-adjustment becomes applicable. On the other hand, since production can be considered a short-run problem, the Marshallian quantity-adjustment is relevant (cf. Takayama, 1974, p. 299 and Davies, 1963, p. 539 and Newman, 1965, p. 107-8). But according to our classification above, the characterization of exchange as temporary and production as short-run is not illuminating. The terms market and adjustment, by definition, imply exchange, whether being consumptive or productive. Based on this view, it may be noted that the timing appropriate to the exchange theory – whether consumptive or productive – is the short-run. This is the timing length which makes the analysis deterministic in a methodological sense.

The general applicability of short-run timing may be defended for the following reasons. First, in the tradition of Marshall, let us specify three runs: market-period, short-run, and long-run. This classification is restrictively based on the usual theory of production, and specifically upon the variations of inputs. But, as we have noted above, it may be generalized to the usual exchange theory once durable consumer goods are interpreted as analogous to producer capital goods.

On the one hand, the fixed-quantity assumption of the temporary period is not very realistic in terms of the normal economic scene. Stocks of inventories (whether productive or consumptive) are always more or less present and can be carried over to the next period. An economic generalization, therefore, cannot be made in terms of emergency situations. This contention, however, does not deny the quantity constraints imposed by the spcific shape of cost curves.

On the other hand, the theoretical assumptions and specifications of the long-run are equally irrelevant. In this run, everything is supposed to be adjustable, and *no constraints* on economic behavior can be perceived. This crucial assumption, in my opinion, is not warranted. For instance, consider the zero-excess profit adjustment from the perspective of the producer. This assumption requires the existence of an army of entrepreneurs – an unlimited number, if necessary – to enter an industry with minor excess profits. On the other extreme, with minor negative profits, the entrepreneurs must exit. But realistically, the less-advantaged firm is usually taken over through mergers rather than being forced to leave the industry. In general, I believe, the specifications of the long-run impairs the determinancy of an economic theory, and unrealistically assumes away intermarket and interindustry behavior. This is not to approve of the long-run mortality of the Keynesian motto. However, the resulting indetermination leads us to depart from the length of time specified by the purely theoretical long-run.

To summarize the primary conclusion of this section, we have proposed that both the Walrasian and Marshallian adjustment processes are subject to operation in the short-run. The former, however, is more applicable to the operation of a productive exchange market. Furthermore, both of these markets, once in disequilibrium, will show signs of monopolistic-monopsonistic trade.

VI. States of Markets

Our final task in this paper is to concretely classify the states of markets according to two criteria: (i) fixity or flexibility of the primary variables, and (ii) equilibrium or disequilibrium.

(i) As we have seen, the Walrasian adjustment process can be labeled as being applicable to a flexprice-fixquantity productive market. Accordingly, the Marshallian process is relevant to a fixprice-flexquantity consumptive market. Symmetrically, we may recognize two other polar markets: a flexprice-flexquantity market, and a fixprice-fixquantity market. The latter, however, in my opinion specifies a static and dead market, which does not merit consideration. Even in a command economy, the operation of such a market cannot go forever. If, for instance, equity matters, with the usual growth of population, there must be at least quantity widening.

The former case of the flexibility of both price and quantity, however, is the primary market behavior upon which economic theory is founded. Although it cannot be refuted as inapplicable on *a priori* grounds, it should be realized that this is only *one* type of market behavior. Accordingly, only its *universal* applicability cannot be expected to rule.

A critical note should be made at this stage with regard to the *interaction* between the and the Marshallian types of processes. An economy, by definition contains *both* productive and consumptive exchange markets in simultaneity. Without loss of generality, furthermore, the economy's participants may be expected to exchange in both markets.

From the consumer's point of view, the income he expects to receive from the productive exchange market in general provides the earnings upon which his decision in the consumptive exchange market is based; and *vice versa*. From the producer's perspective, the income he expects to receive in the consumptive exchange market provides the earnings upon which his decision in the productive exchange market is based; and *vice versa*.

In general, therefore, *decisions in one market concurrently, contemporaneously, and bidirectionally depend on the decisions in the other market.* This explanation of the interaction of decisions provides the rationale for the dual-decision hypothesis, due to Clower (1965). But once proper consideration is given to more than two markets, and to the dynamic and in-time nature of market behaviors, then multiple decision may be said to become relevant. When expectations are not realized, new rounds of decision-making is necessary. Accordingly, different markets may be subject to spill-over effects. It should be noted that the non-realization of expectations is only a sufficient condition for the dual (multiple) decision hypothesis. A necessary condition is but the *existence* of two (or more) markets.

(ii) Definitions of equilibrium and disequilibrium may be also formally stated at this point. Although literal and mathematical definitions of these concepts are numerous, we shall use the Walrasian specification in order to redefine them in terms of the period analysis. These definitions may be also applied to other framework without loss of generality.

Let equation (1) be repeated by use of the receding difference operator ($\triangledown$), where $\triangledown x_t = x_t - x_{t-1}$. The use of this operator is preferred to that of the preceeding one (cf. equation (5) above), since we are concerned with the description of theory. In this view, it is preferred to look backward in order to refrain from the errors of prediction. We are also, as is usual, designating the variable t as the present. Accordingly, equation (1) may be rewritten as:

$$\triangledown p_t = ED\ [(q_t^d - q_t^s), (q_{t-1}^d - q_{t-1}^s), (\triangledown z_t)]. \tag{6}$$

W We may now recognize four definitions with regard to the state of markets, in accordance with the specification of the Excess Demand.

(i) Strong Equilibrium:

iff $ED\ [(\emptyset), (\emptyset), (\emptyset)]$ Condition (i)

(ii) Weak Equilibrium:

iff $ED\ [(\emptyset), (\emptyset), (\triangledown z_t \neq \emptyset)]$ Condition (ii)

(iii) Weak Disequilibrium:

iff ED $[(q^d_t - q^s_t \neq \emptyset),(q^d_{t-1} - q^s_{t-1} \neq \emptyset), (\emptyset)]$ Condition (iii)

(iv) Strong Disequilibrium:

iff · ED $[(q^d_t - q^s_t \neq \emptyset), (q^d_{t-1} - q^s_{t-1} \neq \emptyset), (\nabla z_t \neq \emptyset)]$ Condition (iv)

Some observations are in order. First, it should be noted that the system which equation (6) represents (as well as previous equations) is specified to be a historical system (cf. Samuelson, 1947, App. B). That is, the time parameter itself is included among the other variables, which are represented by the variable vector (z). Second, we may specify ED $[\emptyset] = \emptyset$, and hence, $\nabla p_t = \emptyset$. by imposing restrictions on the general function of excess demand. Such a system may be called stationary equilibrium, in Frisch's terminology (1936), if in a continuous analysis the second derivatives are also specified to be equal to zero.

Third, although other propositions can be derived by alteration and respecification of the excess demand function, for our purpose the above four classes are sufficient.

Fourth, all magnitudes should be interpreted *ex ante.* Accordingly, in disequilibrium situations, the actual trade is determined by the short-side of the market. This conforms with the basic proposition of disequilibrium theory (ignoring inventories). Hence, at each instance, a storage (sellers') market specifies $q^d_t - q^s_t > \emptyset$, while a surplus (buyers') market implies $q^d_t - q^s_t < \phi$. These last propositions specify the relative strength of market forces. The signs, however, may alternate in accordance with a business cycle. The relevant stability of such systems, furthermore, may best be characterized by the Samuelsonian second kind (1947, p. 262). This last set of propositions are also subject to modifications by introducing changes in inventories, among other variables, as they are represented by the variable vector (z).

Finally, a market might show *signs* of strong equilibrium, not because Condition (i) is necessarily satisfied, but because compensatory effects occur between quantity variables and other variables. Such cases include the spillover effects. Thus, it is not totally correct to argue that, "If demand and supply are equal, the price will be constant" (B. Hansen, 1970, p. 11). Price movement might be constant (that is, flat), even if quantity demanded and supplied are not equal. This case, for instance, may occur even in Condition (iv) according to which Strong Disequilibrium is evident.

Footnotes

1. The designation of auctioneer is only *implied* by the *Elements.* There is no auctioneer present in Walras' work. Cf. also Chapter IX below.
2. We shall return to the costs of auctioneering and the role of information in exchange in Chapter IX and X.
3. The following may be cited as a sample of numerous attempts in defining the term effective demand: Clower (1965), Leijonhufvud (1968), Bennasy (1976a and 1975b), Patinkin (1976 and 1979), and Malinvaud (1977).

4. Price-setting behavior may be assumed to be a function of last period's price and change in inventories. Thus, two adjustment coefficients become relevant: price-induced and stock-induced. The latter coefficient, however, in a model without inventories becomes irrelevant.
5. Circa 1930, cf. (Lachmann, 1936) and (B. Hansen, 1970); Kaldor (1934) also shared its early development.
6. Samuleson observed that the attribution of price-adjustment to Walras and quantity-adjustment to Marshall is an historical error (1941), although his *Foundations* explicitly refer to quantity-adjustment as "Marshall's long-run theory of normal price" (1947, p. 264).
7. A simple real-world example may be mentioned here. A manager of a Milwaukee based food store tells me that the prices are set for each week at the beginning of the week at his supermarket (consumptive-exchange market), and they are rarely changed during the week. Hence, consumers adjust the quantities purchased in a relatively fixprice environment (the Marshallian case). On the other hand, an administrator of a department of a university in St. Louis suggests that he is in need of hiring two instructors (according to the university's production function), but he is willing to negotiate for the price. This is a price-adjustment process at a fixquantity market (the Walrasian case).
8. In equilibrium methodology, the Hicksian contention cannot be criticized on the basis of the sticky behavior of prices (hence, the Marshallian fixprice markets) in two cases. That is, relatively fixed prices may be inferred from two theorems of oligopolistic and monopolisticly competitive markets: (i) the Sweezy-Stigler kinked demand curve, where market share rivalry exists, and (ii) Nichol-Nutter plateau demand curve, where marginal buyers are present, (Nichol, 1934-35) and (Nutter, 1955).

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