A Liquidity Preference Theory of Market Prices

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The ultimate "causes of price"—to use a Classical term—lie deeply embedded in the psychology and techniques of mankind and his environment, and are as manifold as the sands of the sea. All economic analysis is an attempt to classify these manifold causes, to sort them out into categories of discourse that our limited minds can handle, and so to perceive the unity of structural relationship which both unites and separates the manifoldness. Our concepts of "demand" and "supply" are such broad categories. In whatever sense they are used, they are not ultimate determinants of anything, but they are convenient channels through which we can classify and describe the effects of the multitude of determinants of the system of economic magnitudes. These ultimate determinants are, on the one hand, the patterns of choice between alternatives of all individuals, and on the other, the pattern of technical limitation of resources such as labour time and raw materials and the transformation functions of these resources into commodities and services. It is possible to show, algebraically, how these billions of determinants operate to create and to change the structure of economic quantities (prices, volumes, etc.). Such algebraic demonstration, after the manner of the Lausanne school, though logically necessary, is not practically valuable in the solution of particular problems. For this task we need to be able to divide the multitude of causes into a few broad workable categories, of which the Marshallian demand and supply analysis is an admirable example. It is not the purpose of this paper to overthrow the Marshallian methods, or to question their limited validity. Rather is it to suggest a new dichotomy of forces in the special case of market price in a competitive market, not into "demand" and "supply", but into "price determining factors" and "quantity determining factors". For many purposes it would seem that this new dichotomy is much more useful than the old, and leads to results which could not have been attained with the demand and supply apparatus.

It should be noted carefully that the situation discussed in this paper is that of the determination of market price in a perfectly competitive market on a single "day", the "day", of course, being as short as we wish to make it and being defined by the condition that the market is cleared and that all transactions which can be accomplished under existing conditions have been accomplished. This itself, of course, is a fiction, though a useful and necessary one: our mind finds it difficult to grasp the slippery and continuous processes of the actual world without first "fixing" each position in our mind before proceeding to the next. The simplest approach to dynamic economics is through a succession of static pictures, just as the representation of movement on the screen is obtained through a rapid succession of stationary projections. In the "market day" therefore we make the following assumptions: (i) the quantity of exchangeables (goods and money) possessed by all the people in the market does not change during the course of the "day". All that happens is exchange, in the simplest and most literal sense of the world—i.e., a rearrangement of ownership of the goods and money in the market. At the end of the day some people have more money, some less; some have more commodity, some less, but the increases must be exactly balanced by the declines as the total quantities possessed by all marketers have not changed. (ii) We will assume that the price that clears the market is discovered immediately and prevails all through the "day", and that all transactions made during the "day" are made at that price. This assumption does not quite correspond to reality: nevertheless if the "day" is sufficiently short no serious errors are likely to be introduced by it, and it enables us to sidestep a number of highly

1 The brilliant work of Professor Leontief (The Structure of American Economy, 1919—1929) might seem at first sight to disprove this assertion. But even Professor Leontief has to simplify his system of simultaneous equations radically in order to obtain any results.
difficult problems of secondary importance concerning the effect of transactions on the market.\footnote{Marshall, we may note, avoided the same set of problems in his discussion of the "corn market" by assuming that the marginal utility of money remained constant.}

The situation envisaged above must be distinguished sharply from the analysis of normal price by means of long-run demand and supply curves. In the normal price analysis we are considering an equilibrium of flows of commodity on and off the market. The demand curve in this case shows the average rate of consumption, and the supply curve the average rate of production, that would prevail at each price. It is dangerously easy to carry over habits of thought from the long-run analysis into the analysis of the market, yet the two are very distinct, and it must constantly be borne in mind in the following analysis that the quantities refer to stocks, both of commodity and money, that are shifted around in ownership, and do not refer to flows of production, consumption, or income.

We will begin the analysis by considering the situation of a single marketer in a one-commodity market, possessing a quantity of money $m_1$ and a quantity of commodity $a_1$. His willingness to buy or sell can be described by his individual market demand-supply curve or function, showing what quantities of the commodity he will buy or sell at each price. This will normally be a continuous function: at high prices he will sell, at low prices he will buy, and at some intermediate price, which may be called the "null price" he will neither buy nor sell, being satisfied with the quantity in his possession. It is convenient to adopt the convention that purchases (because they add to the stocks of the purchaser) are positive in sign, and that sales are negative. We can then express the individual market demand-supply function by a single equation,

$$q_i = f_i(p) \quad (1)$$

A negative value of $q_i$ here represents an offer to sell, and a positive value an offer to buy.

In the market there will be a number of individuals, 1 to $N$, each having his own demand-supply function, $q_1 = f_1(p), q_2 = f_2(p), \ldots, q_n = f_n(p)$. Knowing these functions we can immediately derive the market demand and market supply schedules by adding, for each value of $p$, the positive $q$'s to get the total quantity demanded, $Q_d$, and the negative $q$'s to get the total quantity supplied, $Q_s$. Thus we obtain the demand function, $Q_d = F_d(p)$ and the supply function $Q_s = F_s(p)$, and the condition that the price must equate the quantity demanded and the quantity offered—i.e., $Q_d = Q_s$, gives us a third equation from which we can now derive the three unknowns, $Q_d, Q_s$, and $p$. This is the usual demand and supply market analysis. There is, however, another way to approach the problem. If we add, algebraically, all the individual $q$'s at each price we get a figure $Q_e = (Q_d - Q_s)$ which represents the excess demand or excess supply, according as it happens to be positive or negative. Thus by simple addition we derive from the individual demand-supply functions, an excess demand-supply function, $Q_e = F_e(p) = \sum f(p)$. Then at the equilibrium price we know that $Q_e = 0$, i.e.,

$$\sum f(p) = 0 \quad (2)$$

What has been done here is to separate out that element in the market situation which is responsible purely for the determination of price. Graphically, the price is given by the point at which the excess demand-supply curve (which I have elsewhere called the "total market curve")\footnote{It is easy to show that when the individual demand-supply functions are linear the market price is the weighted average of the null prices of all the marketers.} cuts the vertical (price) axis. The "height" of the excess demand-supply curve is in some sense an "average" of the heights of all the individual demand-supply curves from which it is derived. That is to say, the market price will be some kind of weighted average (the weight, of course, depending on the type of individual demand-supply function) of the "null prices" of the various marketers.$^3$

\footnote{Boulding, Economic Analysis, p. 73. See also Hicks, Value and Capital, p. 63. It is easy to show that when the individual demand-supply functions are linear the market price is the weighted average of the null prices of all the marketers, weighted by the slopes of each individual demand-supply curve. Thus let the individual demand-supply functions be $p_1 = b_1 q_1 + c_1, p_2 = b_2 q_2 + c_2, \ldots, p_n = b_n q_n + c_n$. Then $c_1, c_2, \ldots, c_n$ are the null prices of the various marketers. The equilibrium price $p$ is given by equation (2), i.e.,

$$\frac{p}{1} - \frac{c_1}{b_1} + \frac{p}{b_2} - \frac{c_2}{b_2} + \ldots + \frac{p}{b_n} - \frac{c_n}{b_n} = 0$$

\text{i.e.,}

$$p = \frac{\frac{c_1}{b_1} + \frac{c_2}{b_2} + \ldots + \frac{c_n}{b_n}}{\frac{1}{b_1} + \frac{1}{b_2} + \ldots + \frac{1}{b_n}}$$}
The "null price" of an individual's demand-supply curve is a measure of his willingness to buy, or what is the same thing, his unwillingness to sell. Any increase in his willingness to buy raises his whole demand-supply schedule, and with it raises his null price. A rise in the market price therefore can only result from a general net increase in the willingness to buy the commodity in question. It is this, and no other factor, that determines price.

It is possible also to separate out those elements in the total market situation which determine the quantity exchanged. If all the demand-supply curves of the individual marketers passed through the same point on the price axis—i.e., if all the marketers had the same null price—the demand and supply curves would intersect on the price axis and there would be no exchanges on the market at all. There might be a market price quoted, but as this would of necessity be equal to the null prices of all the marketers, nothing would be bought or sold at that price. It is only because the different marketers have different degrees of willingness to buy or sell that transactions can take place at all. This property of the market we may call its "divergence", and it is this, and this alone, which determines the quantity exchanged.

The greater the divergence of the individual demand-supply curves—i.e., the greater the spread of the null prices of the various marketers about the market price, the greater will be the quantity exchanged.1 We have now effected our new dichotomy of the forces in the market, dividing them not into "supply" and "demand", but into "price determining" and "quantity determining" factors. The descriptive advantages of such a division are obvious, and it is interesting to compare the description of various changes under our analysis and under the old supply and demand analysis. Suppose, for instance, that we have a "pure" price-raising movement, through a uniform increase in the height of all the individual demand-supply curves. That is, there is a uniform increase in the willingness to buy, or what is the same thing, a uniform decrease in the willingness to sell. This is reflected merely in the price, the quantity exchanged remaining as before. In our analysis it is represented simply by a rise in the total market demand-supply curve, which now cuts the price axis at a higher price than before. In the demand and supply analysis this same movement would be represented by a rise in the market demand curve coupled with a fall in the market supply curve, the new point of intersection being at a higher price, but at the same quantity as before. These movements in the demand and supply curves, however, are not independent; they are both the result of a single force, the increase in the willingness to buy or unwillingness to sell expressed by the rise in the individual demand-supply curves. Indeed, a situation is hardly conceivable in which a change in market demand does not go hand in hand with a change in market supply. It is this interdependence of market demand and supply curves that makes them rather unsuitable for market analysis.

Similarly, when we have a "pure" change in market divergence, resulting in a change in the quantity bought without change in the price, the result is a change in both supply and demand curves, proceeding from the same cause. Suppose that the divergence of the various individual null prices becomes wider, without any change in the market price. The quantity exchanged will increase. The market demand and supply curves will both move to the right, intersecting at a point representing a larger quantity, but the same price as before. The movement of both demand and supply curves thus follows from exactly the same cause: viz., the increase in market

1 Where the individual demand-supply functions are linear an algebraic formula for the quantity exchanged can be derived as follows, using the notation of footnote 3, p. 56. Let \( c_1, c_2, \ldots, c_n \) be the null prices of all those marketers whose null prices are greater than the market price, \( p \). These are the buyers. The amount that buyer \( K \) will buy at the price \( p \) is \( \frac{c_k - p}{b} \), and the total amount bought is:

\[
Q_d = \frac{c_1 - p}{b} + \frac{c_2 - p}{b} + \ldots + \frac{c_n - p}{b}
\]

Similarly the marketers whose null prices are greater than \( p \), \( c_{n+1}, c_{n+2}, \ldots, c_n \), are the sellers, and the quantity sold, \( Q_s \), is given by:

\[
Q_s = \frac{c_{n+1} - p}{b} + \frac{c_{n+2} - p}{b} + \ldots + \frac{c_n - p}{b}
\]

\( Q_s \), of course, is equal to \( Q_d \). The quantity exchanged, therefore, is equal to the weighted sum of either the positive or the negative deviations of the null prices from the market price weighted according to the reciprocal of the slope of the individual demand-supply curve. The greater these deviations—i.e., the greater the "divergence" in the market, the greater the quantity exchanged. If all the null prices were the same, then we should have \( c_1 = c_2 = \ldots = c_n = p \), and both \( Q_d \) and \( Q_s \) would be zero.

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It is evident that the division of the market situation into "demand" on the one hand, and "supply" on the other, does not correspond to any very significant distinction within the structure of the market. The reason for this is clear: in a competitive market "buyers" and "sellers" are not distinct groups of people, separate from each other. Any marketer may be a buyer at one price and a seller at a higher price: every rise in prices induces some who were previously in the buyer's camp to cross over into the seller's, and every fall in prices has the reverse effect. Hence the demand and supply curves cannot be independent: they represent only a momentary division of the market, and will invariably move together except in the unlikely case of exactly counterbalancing changes in eagerness to buy and in market divergence. This is not the case, it should be noticed, in the case of the long-run demand and supply analysis: the producers and consumers of a single commodity are usually different groups of people, with only a little overlapping. In this case it is reasonable to assume that demand and supply curves are independent of each other and of the price, and hence they have much more individual meaning and validity.

We can now take yet another step in the analysis, and actually define an equation for the individual demand-supply curve on a simple and plausible assumption. From this we shall go on to derive a simple yet revolutionary formula which gives us the market price itself. The assumption is that each marketer wishes to hold a certain proportion of his total capital resources in the form of money, which we will call the preferred liquidity ratio, $r$, or his "liquidity preference", and that this proportion is independent of the absolute level of the price of the commodity. As we shall see, the preferred liquidity ratio is by no means independent of anticipated changes in prices, but there seems to be no reason to suppose that it would be affected by the actual level of absolute prices. This assumption alone is sufficient to give us an equation for the individual demand-supply curve and a simple formula for market price.

Let an individual marketer possess a quantity of money $m_i$, a quantity of commodity $a_i$, and suppose that his preferred liquidity ratio is $r_i$. Let $q_i$ be the quantity of commodity that he exchanges in the "day": $q_i$ if positive will represent a purchase, if negative, a sale. Let the price be $p_i$. Then we will assume to begin with that he possesses only commodity $A$ and money, and that no other commodities enter into the market, or, what is perhaps more realistic, that his other possessions and transactions do not affect his transactions in commodity $A$. Then after he has completed his transactions the total amount of commodity he possesses is $a_i + q_i$, and the total amount of money is $m_i - p_i q_i$. The total value of commodity possessed by him is $p_i a_i + q_i$. The total value of his holdings of money and commodity combined is therefore $(p_i a_i + p_i q_i) + (m_i - p_i q_i) = p_i a_i + m_i$. It will be noticed that the total value of his holdings is not affected by the exchanges he makes, as what he receives is always equal in value to what he gives up. After his exchanges have been completed he will possess the ratio of his preferred liquidity ratio, $r_i$, for presumably the object of his transactions was to rearrange the form of his possessions into the desired liquidity ratio. We have, therefore,

$$ r_i = \frac{m_i - p_i q_i}{m_i + p_i a_i} \quad (3a) $$

This equation can also be written:

$$ p_i = \frac{m_i (1 - r_i)}{r_i a_i + q_i} \quad (3b) $$

or

$$ q_i = \frac{m_i (1 - r_i)}{p_i} - r_i a_i \quad (3c) $$

This is the equation of the individual's demand-supply curve, for it shows what quantity of the commodity he will buy or sell at each price in order to achieve his preferred liquidity ratio. It is a rectangular hyperbola, asymptotic to the quantity axis at $q = 0$, and to the line $q_i = - r_i a_i$ at $p_i = \infty$. This expresses the fact that an individual will never sell a greater proportion of the commodity than his liquidity ratio, and will only sell all the commodity he possesses if he wants to have all his holdings in the form of money (i.e., if $r = 1$). The asymmetry between buying and selling is interesting: no matter how high the price rises the amount an individual is willing to sell cannot go beyond a certain point. There is no limit, however, to the increase in the amount that an individual is willing to buy as the price falls, for with each fall in price the purchasing power of his money increases.
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It is now easy to obtain a formula for the market price, knowing the quantities of money and of commodity possessed by each marketer, and knowing the preferred liquidity ratio of each. Denoting the quantities associated with the various marketers by suffices 1, 2, ..., n, and applying equation 2 we have immediately the market price, $p$, given by equation (4):

$$ p = \frac{m_1(l-1) + m_2(l-2) + \ldots + m_n(l-r_n)}{r_1a_1 + r_2a_2 + \ldots + r_na_n} $$

(4)

This is a most instructive equation. It shows at once that an increase in the quantity of money, or a decrease in the quantity of commodity, possessed by any marketer, or a decrease in the preferred liquidity ratio of any marketer, will raise the price. It shows also that the effect on the price produced by a change in the quantity of money or of commodity possessed by any marketer depends on his preferred liquidity ratio. A change in the stock of commodity will have a larger effect on price if it is felt by those marketers with the higher liquidity preference. A change in the stock of money will have a larger effect on price if it is felt by those with a lower liquidity preference. Thus if new money gets into the hands of "hoarders" with high liquidity preference it will have less effect on price than if it gets into the hands of individuals with small liquidity preference (spenders). The equation also shows two interesting extreme cases: that if the preferred liquidity ratio is zero—i.e., if people do not wish to hold any money—the price will be infinite; if the preferred liquidity ratio is 1, so that people wish to hold all their resources in the form of money and none in the form of commodities, then the price will fall to zero. It also shows that when liquidity preference is high, a change in the stocks of commodity produces a greater effect on price than a change in the stocks of money. On the other hand, when liquidity preference is low, changes in the stocks of money produce more effect than changes in stocks of commodities.

If the preferred liquidity ratio of all individuals is the same and equal to $r$, equation (4) reduces to the very simple form

$$ p = \frac{M(1-r)}{Ar} $$

(5)

where $M$ is the total stock of money in the market and $A$ is the total stock of commodity. Even if the preferred liquidity ratios of the various individuals differ, equation (5) is still highly significant: $r$ then means the "average" or "market" liquidity ratio. It is the proportion of the value of liquid property to the value of all property which the market as a whole feels is most desirable. The market liquidity ratio, $r$, is not a simple average of the individual ratios, however, but a complex weighted average.1

The important equation (5) can easily be derived directly, without reference back to individual preferences. The total value of goods and money owned by marketers is $pA + M$. If $r$ is the preferred liquidity ratio for the market as a whole, therefore, we have

$$ r = \frac{M}{pA + M} $$

(6)

If money and commodity were equally distributed among all the marketers this equation would reduce to the simple average of the individual $r$'s—i.e., $r = \frac{\Sigma r_i}{n}$. Where there is not this equal division it should be noticed that the market liquidity ratio, $r$, could change somewhat even if the individual preferred ratios, $r_1$, $r_2$, etc., did not change, through a change in the $a$'s and $m$'s. It is not, therefore, a wholly satisfactory measure of liquidity preference, but the same difficulty is encountered in any weighted average. Yet another simplification can be made: if it is assumed that the ratio of the amount of commodity to the amount of money possessed by each marketer is the same—i.e., $\frac{r_1}{m_1} = \frac{r_2}{m_2} = \ldots = \frac{r_n}{m_n} = K$, then equation 6 reduced to $r = \frac{\Sigma m_i r_i}{A}$, i.e., the market ratio is the weighted average of the individual ratio, weighted by the amount of commodity possessed by each marketer. In such a case a decline in the amount of commodity possessed by a marketer with a liquidity preference, above the average, would tend to lower the market ratio even if the individual ratios did not change. Such an interpretation of the market ratio, however, is not unreasonable, and the assumption on which it is based is not likely to be far from the truth.
which when transposed immediately gives equation (5). This equation should be compared with Fisher’s equation of exchange, to which it bears some resemblance. The liquidity preference concept and the concept of velocity of circulation are at bottom different ways of expressing the same phenomenon. It would be quite possible to apply equation (5) to the general price level. In that case \( p \) would represent the price level, \( M \) the total quantity of money, \( A \) the total quantity of commodities and other valuta not including money, and \( r \) would be the general liquidity preference ratio. An increase in liquidity preference is the same thing as a decline in the velocity of circulation—i.e., it represents an increased desire for money and therefore a decreased willingness to spend it. The ratio \( \frac{(1 - r)}{r} \) may therefore be called the “velocity ratio”, \( v \): it rises and falls, along with the velocity of circulation of money, as \( r \) falls and rises. The differences between equation (5)—which may perhaps be called the “equation of price determination” and Fisher’s equation of exchange are, however, highly significant. Equation (5) interprets prices in terms of stocks of commodities and of money, coupled with a preference factor. Fisher’s equation describes simply an identity of flows: of money on the one hand and of the value of goods on the other. Although useful in many ways, it fails to give any causal explanations of the determination of price, for price and the quantity exchanged are always determined together; hence an equation which includes the volume of transactions is useless as an explanation of prices, for the volume of transactions is one of the unknowns which has to be determined along with price. Equation (5) has the advantage that all its components, except price, are historically determined or are given as data: the stock of money, the stock of goods, and the preferred liquidity ratios are objective facts at any moment of time, and may truly be described as the only short-run determinants of market price. There still remains the question “what determines the stocks and the preferences”: that, however, is a long-run problem of normal price.

From the stocks and preferences data we can also derive a formula which gives the quantity exchanged, or the volume of transactions in the “day”. The null price of marketer 1, \( c_1 \), is found by putting \( q_1 = 0 \) in equation 3b, whence

\[
c_1 = \frac{m_1(1 - r_1)}{r_1 a_1}
\]  

(7)

Substituting the value of \( m_1(1 - r_1) \) from equation 7 into equation (3c) we have:

\[
q_1 = \frac{r_1 a_1}{p} (c_1 - p)
\]

(8)

The volume of transactions is again seen to depend on the divergence of the null prices of the various marketers from the market price. The liquidity preference of each marketer was equal to \( r \), the formula simplifies to:

\[
Q = \frac{r(A_d M_d - A_d M_s)}{M}
\]

(10)

where \( A_d \) and \( A_s \) respectively signify the amounts of commodity possessed by buyers and by sellers, and \( M_d \) and \( M_s \) represent the quantity of money possessed by buyers and sellers. Although this formula is suggestive, it is not as useful as might at first sight appear, for as we have seen there is no clear distinction in the market between buyers and sellers. Nevertheless the formula suggests roughly that a rise in the quantity of commodity, or a fall in the quantity of money held by the “sellers” side of the market will tend to raise the volume of transactions, while a rise in the quantity of commodity or a fall in the quantity of money held by the “buyers” side of the market will have the opposite effect. It also suggests that a rise in liquidity preference, or a fall in the total quantity of money held in the market will have a general tendency to increase the volume of transactions, though this result is not necessary.
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The analysis can now be extended without much difficulty to include any number of commodities. Suppose that there are Z commodities, A, B, C, ..., Z. Let the total value of all these commodities, plus the money held by the marketers be \( v \). By "commodity" we here mean anything that has monetary value: it therefore includes securities and other valuables. We can now express the "commodity preference" for each commodity as the preferred ratio of the value of the commodity to the total value of all things, including money, held in the market. Thus if \( p_a \) is the price of commodity A, and \( A \) is the amount held by the marketers, the "commodity preference ratio" for commodity A, \( r_a \), is given by the equation:

\[
r_a = \frac{A p_a}{v} \tag{11}
\]

If \( M \) is the total quantity of money held in the market, and \( r_m \) is the liquidity preference ratio, we have:

\[
r_m = \frac{M}{v} \tag{12}
\]

Eliminating \( V \) between these two equations we have:

\[
p_a = \frac{M r_a}{A r} \tag{13}
\]

Similarly for the other commodities we have:

\[
p_b = \frac{M r_b}{B r}, \quad p_c = \frac{M r_c}{C r}, \quad \ldots, \quad p_z = \frac{M r_z}{Z r} \tag{13}
\]

It follows that an increase in the quantity of money, or a decrease in liquidity preference, will raise all prices. An increase in the quantity of any one commodity will lower the price of that commodity; if the preferences of the market do not change, however, an increase in the quantity of one commodity will not change the prices of any other commodity.\(^1\) This will only be true where the commodity is neither a substitute for nor a complement of any other commodity: i.e., where \( \frac{\partial r_b}{\partial a} = \frac{\partial r_c}{\partial a} = \ldots = 0 \). If the commodity A has a substitute, B, then an increased quantity of A in the hands of the marketers will cause a decrease in the preference for B: i.e., \( \frac{\partial r_b}{\partial a} \) is negative. If the commodity A has a complement, C, then an increased quantity of A will cause an increase in the preference for C—i.e., \( \frac{\partial r_c}{\partial a} \) is positive. In such a case an increase in the quantity of A will cause a decrease in the price of the substitute, B, and an increase in the price of the complement, C, according to equations (13). We see therefore that this method provides an easy solution for the problem of relatedness in demand.

It must be observed that there cannot be a change in one preference ratio without there being an equal compensating change in the sum of all other preference ratios, for the sum of all the preference ratios must be equal to unity: i.e.,

\[
r_a + r_b + \ldots + r_z + r_m = 1 \tag{14}
\]

It follows that a change in price which is due to a change in preference, as opposed to a change in the quantities of goods or money, must be accompanied by opposite changes in other prices, unless it is counterbalanced by an equal and opposite change in liquidity preference or in quantities. Thus if the preference of the market for commodity A increases, without there being any change in the preference for money or in the quantities held, there must be not only a rise in the price of A but also a fall in the price of other commodities.

The mathematically inclined reader will not find it difficult to derive the general formulæ relating the price of each commodity to the individual preference ratios of each marketer for each commodity and for money. A general formula for the quantities exchanged can also be developed for the many-commodity case. As these formulæ involve complex and unresolvable determinants, however, they are of no practical value that I can discover, and are omitted.

The implications of the above analysis for economic theory are, I believe, profound. It is, in the first place, a powerful instrument for the unification of many

\(^1\) It will, of course, lower the price level in so far as its own price is lowered.
parts of our existing theoretical structure which hitherto have been rather unrelated. It unifies, for instance, the theory of general prices and the theory of particular prices. As we have seen, if \( P \) is the general price level, \( W \) the total stock of all valuta, excluding money, \( R_w \) is the general commodity preference ratio and \( R_m \) the liquidity or money preference ratio, we have a formula for the general price level exactly analogous to equations (13) and (5):

\[
P = \frac{M R_w}{W R_m} \frac{M(1 - R_m)}{W R_m}
\]

(15)

This price-level formula has an important contribution to make to the understanding of the crisis of late capitalism in which we seem to be living. The most striking feature of the past twenty years has been the strength of the deflationary forces in the western world. Equation (15) gives an important clue to this mystery. We see immediately that the total value of the stock of goods \((PW)\) is equal to the quantity of money, \(M\), multiplied by the "preference factor", \(R_w/R_m\). It follows that if the quantity of money and the preference factor are constant, the total value of the stock of goods cannot change, for every increase in the quantity of goods will result in a proportionate decline in their price. In such a case investment, in the financial sense, is absolutely impossible, for by investment we mean the increase through time of the total value of goods. (By "goods", of course, we mean all physical capital.) Investment is only possible if either the quantity of money increases or liquidity preference declines, no matter how rapid the accumulation of physical capital. The rate of investment therefore depends, paradoxically enough, directly on the monetary situation, and only indirectly on the rate of accumulation of goods. It follows immediately that if there is no change in the preference ratios the rate of investment is equal to the rate of growth of the monetary stock. In the absence of a growth of the monetary stock or a fall in liquidity preference the accumulation of physical capital must inevitably result in a deflationary movement of prices.

The commodity preference ratio is likely to fall and the liquidity preference ratio to rise on the expectation of falling prices, for when prices are falling the purchasing power of stocks of money is continually increasing while the money value of a given stock of commodities is declining. This in itself is sufficient to account for the self-justifying nature of price anticipations: if people expect a fall in prices, \(R_m\) will rise and \(R_w\) will fall and \(P\) will fall in the absence of counterbalancing changes, whereas if people expect a rise in prices \(R_m\) will fall and \(R_w\) will rise and a rise in prices will ensue.

There is no reason to suppose also that commodity preference will decline and liquidity preference increase as the total stock of goods increases. There is no point in piling up stocks for ever, and in the course of accumulation the time must come when further accumulation becomes less and less desirable. This will be reflected in a declining rate of profit, which will make the holding of goods less attractive relative to the holding of money. When accumulation has proceeded to the point where stocks of most physical goods are large there will be a deflationary force operating due to the decline in commodity preference. This will be reinforced by the expectation of declining prices; hence even if money stocks keep pace with stocks of goods, there will still be a powerful deflationary force operating. In such a period a rapid increase in money stocks will be necessary to keep the price level constant. The equilibrium of the price system, however, will be difficult to maintain because of the expectational factor.

The present analysis also enables us to see the so-called "liquidity preference" theory of interest as merely a special case of equation (13). The true money rate of interest to be expected from a security is determined at any moment by the price of that security. The higher the price of the security, the lower the rate of interest assuming that the future payments accruing to the owner of the security do not change. There is no such thing, strictly, as a "market rate of interest"—it is not the rate of interest that is determined in the market, but the price of securities—i.e., of expected future payments-series. The rate of interest itself is not a price, like the price of wheat: it does not have the dimensions of price. It is merely a certain mathematical property of a series of expected payments and their present price. The price of securities is not determined by the rate of interest; the expected rate of interest (and all rates of interest are expected) is determined by the security's present price. The price of a security is determined by the same factors that determine the price of any commodity—the quantity of money in the market, the quantity of the security in the market, the liquidity preference ratio and the security preference ratio (the proportion of total resources which the market wishes to hold in the form of the particular
security). Thus if $S$ is the quantity of the security held, $R_s$ the security preference ratio, the price of the security is given by equation (13): $P_s = \frac{MR_s}{SR_m}$. We see therefore that the price of a security will be increased, and the rate of interest will therefore be lowered, by an increase in the quantity of money, by a decrease in the quantity of the security, by an increase in security preference or by a decrease in liquidity preference.

A formal explanation of the difference in apparent yields of various classes and terms of securities can be given in terms of the "security preference" concept. Where a security or other item of property has certain desirable qualities apart from its monetary return—such as, for instance voting privileges, or a high degree of salability, or a certain prestige value, its "security preference" will be high, its price high and the rate of return correspondingly low.

The extension of the principles of this paper to the theory of the firm, to the labour market, and to the theory of monopoly and imperfect competition must wait for another paper. Instead of treating the firm primarily as a profit and loss account, as is done in the usual marginal analysis, it can be treated as a balance sheet, and its decisions described in terms of their effects on the balance sheet rather than on the income account. Thus a purchase of anything, whether it be raw materials, equipment, or labour, involves an asset transfer—a reduction in liquid assets and an increase in illiquid assets. Similarly a sale involves a reduction in illiquid assets and a gain in liquid assets. The willingness of firms to buy and sell can therefore be explained partly in terms of their preferred liquidity ratio. This aspect of a firm's behaviour is strictly analogous to the type of analysis we have employed in this paper. There is, of course, an additional complication that firms buy and sell not merely to change the form of their assets, but to increase their net worth. This is the sole assumption behind the refined marginal analysis. Thus it is assumed that a firm will extend its purchases of each factor of production until the discounted marginal productivity of the factor is equal to its marginal cost. The discounted marginal productivity, however, is what the purchase of the factor adds to the illiquid assets of the firm; its marginal cost is what the purchase of the factor subtracts from the liquid assets. We can rephrase the marginal productivity condition, therefore, and say that a firm will extend its purchases of any factor as long as there is a net addition to its assets. It will be seen immediately that the marginal productivity analysis assumes that the firm is quite indifferent as to the form of its assets—i.e., has an infinite number of preferred liquidity ratios. This assumption is very far from the truth, and changes in the liquidity preference of firms, as well as the composition of their assets, may have profound effects on their demand for factors of production. This is a factor that has been largely neglected in the theory of the firm, although it is implicit in much recent monetary analysis. The effects of an increase in liquid balances on the demand for labour and on the level of employment can hardly be explained without some reference to the liquidity preference factors in the demand for input.

This "asset-transfer" type of analysis provides, I believe, the most useful stepping-stone to the analysis of dynamic problems. Not only does it provide us with an "instantaneous" picture of price determination which can then serve as a basis for the "moving picture" technique of describing dynamic changes, but it also gives us a parameter which can reflect all the forces operating from the side of the future: viz., the preference ratios. Not only, therefore, have we separated out of the chaos of causes the price-determining and the quantity-determining factors; in the price-determining factors themselves we have distinguished between those that operate from the results of the past and those that operate from the expectations of the future. The quantity of money and of goods are given to us as a result of past events. The preference ratios are in part determined by future expectations. It would be difficult to devise a more suitable dichotomy for the analysis of the well-nigh inconceivable fluxes of reality.