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Aspects of a Post Keynesian theory of finance

Unlike other postwar interpretations, the Post Keynesian approach starts with a "monetary" theory of production. Keynes introduced this terminology to emphasize the fact that money was not a "veil," but a "real" factor determining production decisions in a modern economy. Not only was this approach innovative in its treatment of money, it built on Keynes' original formulations of a number of basic propositions in the theory of finance. In addition to the well-known "finance motive," Keynes employed his original theory of interest rate parity and carried out his analysis in terms of forward, futures, and options contracts. Economists working in the Keynesian tradition have usually chosen to ignore these aspects of Keynes' work, while finance theorists have incorporated them into their basic theory and instead concentrate on Keynes' approach to probability, dismissing it as based on a "subjective" approach.¹

This essay calls attention to Keynes' contributions to the modern theory of finance that might serve in the development of a Post Keynesian approach to finance. Three areas are highlighted. The first is the treatment of expectations, and inevitably, the relationship between risk and uncertainty. The second is the importance of this diverse approach to expectations for the determination of prices, in particular of financial assets. The third is the reciprocal of the theory of asset price formation as found in the theory of interest, and in particular the explanation of the yield curve.

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¹ This line starts with Hicks's early work on risk, which took definitive form in his Value and Capital (1939), and is further developed by Tobin in "Liquidity Preference as Behavior towards Risk" (1958), which played a seminal part in the development of the modern theory of finance (see Bernstein, 1996, pp. 69–70). Bernstein considers Keynes as highlighting the subjective evaluation of outcomes, and thus with the expected utility tradition. A linkage between money and finance based on Tobin's work was attempted by Moore's Money in a Theory of Finance (1968).
The theory of monetary production: the influence of changing views about the future

A monetary economy . . . is essentially one in which changing views about the future are capable of influencing the quantity of employment and not merely its direction. But our method of analysing the economic behaviour of the present under the influence of changing ideas about the future is one which depends on the interaction of supply and demand, and is in this way linked up with our fundamental theory of value. [Keynes, 1936, p. vii, emphasis added]

The characteristic feature is that "changing ideas about the future" have a determinant influence on present decisions. The first requirement for a theory of monetary production is thus specification of the way the "changing ideas about the future" are formulated.

Expectations, risk, and uncertainty

The modern approach to the formulation of expectations under uncertainty considers the problem as similar to gambling (see Bernstein, 1996). In this approach, expectations emerge from the theory of statistical inference. It tells us how to evaluate the expectation that a sample statistic represents a population parameter in terms of a probability. But the expectations that are formed are not of future conditions, but of how well a sample statistic predicts an unchanging population parameter on the basis of limited current information. The theory is based on repeated random sampling with replacement of a known and defined population of potential events. In simple terms, what is sought is a "reliable" estimate of the frequency distribution of the population. This provides a view about the future only because the population is unchanging through time, so that predicting the current value is also predicting the value at any past or future date.

To deal with temporal sampling from the population, it is assumed that a stationary stochastic process produces realizations that are equivalent to random sampling with replacement. The same statistical procedures can then be used to estimate the frequency distribution and form expectations of the likelihood of particular realizations of the process, just as we do with an urn of colored balls or the results of the spin of the roulette wheel. But, Keynes warns us, "When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done" (1936, p. 159). We might paraphrase this to say that, when the formation of expectations in economics becomes the
byproduct of the statistical analysis of gambling, it is likely to be ill done. Keynes clearly had something else in mind. He proposed a different "method of analysing" behavior based on the idea of "rational belief." Since "beliefs" are considered by definition to be "subjective," the juxtaposition with rational was meant to highlight the difference in the method of analysis in the same way that money was proposed as a "real" factor of analysis.

It is in the nature of statistical populations to be comprised of objects or events, and it is the nature of objects or events to be "objective." An object is or it is not, an event occurs or it does not, no belief or subjective interpretation is required, just application of a definition of an event and a set of rules called "scientific" observation. A coin is a head or a tail, prices go up, or down, or stay constant. Given the "objective" definition of an occurrence, we arrive quickly at an expectation based on the probability that the sample statistic represents a population parameter. If that event is associated with a payoff to which we can attach a measure such as utility, we have its "expected value," which serves as a basis for rational investment decisions to maximize net wealth.

An obvious criticism is that the uncertainty faced in "real" life is unlike the uncertainty over the outcomes of games of chance, because there is no possibility of random sampling with replacement. What G.L.S. Shackle (1955) called a "crucial experiment" can never be repeated to a sufficient number of realizations to insure statistical significance since its realization changes the underlying structure of the system. A corollary is that individuals taking decisions in the "real" world, unlike gamblers in Monte Carlo, will not be able to specify fully the relevant population of possible outcomes. Shackle thus emphasizes the role of "imagination," or Austrian "purposive action," in taking decisions on less than complete information that change the population from which observations are drawn, and thus the potential outcomes in ways that are inherently unpredictable. Clearly, if the underlying population is not constant, there is no possibility of forming

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2 Keynes drew a distinction between analysis of an economy "subject to change, but where all things are foreseen from the beginning" and "the problems of the real world in which our previous expectations are liable to disappointment and expectations concerning the future affect what we do to-day" (Keynes, 1936, pp. 293–294, emphasis added).

3 Another way of looking at this point is that the population being sampled is time-dependent. This is the basis of the idea behind the Post Keynesian insistence that time is important, and irreversible.
a sample statistic based on expectation of the frequency distribution, irrespective of whether there is sampling with replacement at a given point in time, and no expectation of the likely occurrence of specific realizations can be formed on the basis of standard statistical methods.\(^4\)

Paul Davidson has extended this line of criticism by emphasizing the difference between the processes that generate the realizations that satisfy the requirements of statistical theory,\(^5\) and those processes that produce events that Shackle classified as "unique" or "crucial," about which statistical theory can say nothing. This shifts the criticism from the events themselves to the processes or relationships that produce them. Davidson argues that, since most events of interest to economists are produced by nonstationary, nonergodic processes, the standard theory of statistics cannot be applied.

These criticisms leave the possibility that the standard theory may be applied to any series of realizations that does exhibit (or can be massaged to exhibit via differencing or some other procedure) the necessary stochastic properties. Thus, while most economists accept these criticisms, they nonetheless argue that they do not apply to the vast majority of economic events, such as the behavior of asset prices, because long time series representing repeated realizations do exist and it is possible for these series to be tested to determine whether they come from a stationary stochastic process. A well-known process is a white noise series called a random walk. If asset prices exhibit this property, then standard statistical methods could be justified to provide estimates of means and variances, and expectations of occurrences can be made. In this way the realizations are themselves used to decide whether the characteristics of the underlying population are constant through time, even if its individual components are constantly being renewed.

But it would be totally inappropriate to conclude that since some series of events may be shown to have been produced by an ergodic process that the traditional approach to expectations formation can be retained for these processes. Keynes' idea was that the theory of expectations formation does not relate primarily to "objects" or events or realizations, but instead to the complex of factors that produce the events and

\(^4\) In Bernstein's (1996) version of these events, even if there is mean reversion, it is impossible to know the mean value at any point in time since it is continuously changing.

\(^5\) And to which economic analysis should be restricted according to the approach of rational expectations.
realizations. Even if an ergodic process produces a stationary series of realizations, we may nonetheless be uncertain about the specification of that particular process relative to alternative specifications. In Keynes’ alternative method of analysis of probability, it is not the estimation of the frequency distribution of events or the occurrence of objects that is at issue, but rather the estimation of the probability that a particular specification of the process has actually produced the events that are observed. Expectation formation does not concern the realization of a particular event from a set of possible events (e.g., whether the coin will come up heads or tails or the die will produce snake eyes), but of the theory explaining the occurrence of the event (e.g., how a particular combination of muscle movements and bend of the elbow will produce a head or a tail).

The means by which these expectations are formed is not random, nor is it subjective. “A proposition,” Keynes argued, “is not probable because we think it so. When once the facts are given which determine our knowledge, what is probable or improbable in these circumstances has been fixed objectively, and is independent of our opinion. The theory of probability is logical, therefore, because it is concerned with the degree of belief which is rational to entertain in given conditions, and not merely with the actual beliefs of particular individuals, which may or may not be rational” (Keynes, 1973, VIII, p. 4). This “logical probability” or degree of “rational belief” is defined as follows: “Let our premisses consist of any set of propositions $h$, and our conclusion consist of any set of propositions $a$, then, if a knowledge of $h$ justifies a rational belief in $a$ of degree $\alpha$, we say that there is a probability-relation of degree $\alpha$ between $a$ and $h$” (Keynes, 1973, VIII, p. 4). Expectations are formed as “rational beliefs” concerning a proposition when knowledge of it is not certain.

Keynes considers two ways in which rational belief about a proposition may be reached when perfect knowledge is not available. The first is based on the formulation of a probability reached on the basis of

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6 This is what a stock analyst does when he or she justifies his expectations of a stock’s future price. He has a theory about what determines the price, and expectations are formed about that “theory” relative to the alternative explanations of other analysts, not about the probability that the actual stock price will be 100 or 50 based on past behavior of the price. This is even true of “technical analysis” based on hypotheses about the underlying behavior that is expressed in the objective form of charts of price movements.

7 Keynes writes the probability relation thus defined as $a|b = \alpha$. 
uncertain information, or of “doubtful arguments” (Keynes, 1973, VIII, p. 3). In the second, it is impossible to determine a rational belief. In this case, it is “rational” to allow “animal spirits” to determine actions. It is precisely these two types of uncertainty that traditional theory excludes by assuming that individuals have full or certain knowledge of what Keynes calls the “primary proposition” that one seeks to validate.

The evaluation of the evidence relative to a proposition is thus extremely important in expectations formation. “As the relevant evidence at our disposal increases, the magnitude of the probability of the argument may either decrease or increase, according as the new knowledge strengthens the unfavourable or the unfavourable evidence; but something seems to have increased in either case—we have a more substantial base upon which to rest our conclusion. I express this by saying that an accession of new evidence increases the weight of the argument” (Keynes, 1973, VIII, p. 77). When Keynes evokes the role of confidence in the discussion of how “changing ideas of the future” influence the present decision to undertake an investment in chapter 12 of the General Theory, it is the “weight of the argument” that he has in mind (Keynes, 1973, VII, pp. 148–149). This weight is the determining factor in deciding whether to act on the basis of the probability of a proposition. Animal spirits will determine the moment at which the weight of the argument attached to a proposition is sufficient to make it dominant over all other possible propositions and make it the object of the “spontaneous urge to action rather than inaction.”

It is important to note that Keynes insists that this does not mean that decisions depend on “waves of irrational psychology” (Keynes, 1973, VII, p. 162), but, rather, that this type of decision is securely founded in “rational spirits” (see Kregel, 1987, p. 526), by “our rational selves choosing between the alternative as best we are able, calculating where we can, but often falling back for

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8 Keynes (1936), p. 173. It is at this point in the decision-making process that the subjectivity that resides in the evaluation of different individuals may become dominant, since it is individual experience that will determine the weight assigned to new information. It is necessary to point out that the notion of “weight” poses the problem of the determination of the point in time at which a decision will be made.

Keynes excludes the idea of a maximum weight corresponding to the existing set of available information, arguing that it is not possible to equate the cost of additional information with an increase in weight in such a way that traditional theory relates an increase in information with an increase in certainty: “There clearly comes a point when it is no longer worth while to spend trouble, before acting, in the acquisition of further information, and there is no evident principle by which to determine how far we ought to carry our maxim of strengthening the weight of our argument” (Keynes, 1973, VIII, p. 83.)
our motive on whim or sentiment or chance” (Keynes, 1973, VII, p. 163, emphasis added).

It is difficult to endogenize this process of expectations formation, and as Keynes notes, “the state of long term expectation . . . cannot be inferred from the given factors” (Keynes, 1973, XIII, p. 480) so that these decisions must be considered as being taken outside the “realm of the formally exact” (Keynes, 1973, XIV, p. 2). In such conditions, Keynes suggests that decision makers fall back on their common sense as reflected in “the actual observation of markets and business psychology” (Keynes, 1973, VII, p. 149), rather than on the calculus of statistical probability. Thus, entrepreneurs will first consider their past experience and may presume that “the existing state of affairs will continue indefinitely, except in so far as we have specific reasons to expect a change” (p. 52). Conscious of the lack of information and of the reliability of their individual judgments, entrepreneurs will “fall back on the judgement of the rest of the world which is perhaps better informed” in such a way that behavior permanently conforms to that of the majority or the average, and “the psychology of a society of individuals each of whom is endeavoring to copy the others leads to what we may strictly term a conventional judgement” (Keynes, 1973, XIV, p. 114). It is against this background that Keynes’ remark that, “in practice we have tacitly agreed, as a rule, to fall back on what is, in truth, a convention” (Keynes, 1973, VII, p. 152) should be interpreted. Finally, entrepreneurs may admit that the “existing state of opinion” as expressed by the evaluation of the market is the only one that should be considered the “correct summing up of future prospects” (Keynes, 1973, XIV, p. 114). But included in this market evaluation will be “all sorts of considerations . . . which are in no way relevant to the prospective yield” (Keynes, 1973, VII, p. 152). In fact, in these conditions, the calculations of agents count for less than their “nerves and hysteria, and even digestions and reactions to the weather” (p. 162).

It thus becomes easier to understand why “ideas about the future” may be “changing” in ways that are impossible for the throw of dice, and are subject to sudden, sometimes violent, changes, marked by waves of optimism and pessimism. From this perspective, the conventional methods of calculation are “compatible with a considerable measure of continuity and stability in our affairs, so long as we can rely on the maintenance of the convention” (Keynes, 1973, VII, p. 152). Expectations may thus be extremely volatile but need not be violently unstable. However, the appearance of new fears and new hopes “will, without
 warning, take charge of human conduct. The forces of disillusion may suddenly impose a new conventional basis of evaluation" (Keynes, 1973, XIV, p. 115). Thus, even in the most extreme conditions of uncertainty, Keynes rejects purely subjective or random decision making. That his approach to decision making has been termed "irrational" is due to the failure to recognize that the traditional definition of "rationality" does not apply in such conditions.9

In place of the "statistics" that provide the expectations of the parameters of the distribution of the population of events, Keynes instead introduces convention, self-reference, reflexivity, and self-reinforcing processes, which may quickly jump from one conventional view to the other (in modern terminology, they may bifurcate). The processes that form the expectations need not be uncertain, they may be perfectly known and discoverable—indeed, that is what his theory of probability was meant to do. Yet, they do not produce predictable behavior or stationary stochastic series. Now, this is precisely the type of behavior that one might expect of a chaotic system. The generating function may be perfectly known, yet its realizations may not be statistically predictable.

**How changing ideas about the future influence prices**

The theory of expectations formation was required to explain how ideas about future conditions influence present decisions and lead to changes in the level of activity. Keynes thought that his earlier *Treatise on Money* had failed to take this factor into account and, as a result, "failed to deal thoroughly with the effects of changes in the level of output. My so-called 'fundamental equations' were an instantaneous picture, taken on the assumption of a given output. They attempted to show how, assuming given output, forces could develop which involved a profit-disequilibrium, and thus required a change in the level of output. But the dynamic development . . . was left incomplete and extremely confused." Since profit-disequilibrium represented a divergence of prices from their "normal" values as given by the "fundamental equations," the most important "dynamic development" left unanswered was whether the price adjustments set in motion by the profit-disequilibrium

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9 It would certainly not be correct to interpret the idea that asset prices are determined by convention as indicating that expectations are slow to change, and that as a result there will be stability of interest rates through time (see Bernstein, 1992, p. 69), even though Keynes clearly did believe that high interest rates could represent a dissipative structure à la Prigogine.
would automatically eliminate the imbalance or whether it would lead
to changes in the level of output and employment.

Keynes’ discussion of this process is in a short section on the “short-
period theory of prices” in volume II of the Treatise. Keynes argued
that, if a fall in prices below their “normal” levels, due to an excess of
stocks, generated expectations of further declines, then factors deter-
mining the normal prices of the fundamental equations (i.e., current
costs of production and supply and demand conditions) would become
irrelevant because market supplies were dominated by decisions to sell
from existing stocks, rather than by production decisions. Ideas about
future conditions would then overwhelm current information, and cur-
cent prices would continue to fall as long as producers believed they
could minimize losses by selling today at a price below normal, but
higher than the price at which their expectations suggest they will be
able to sell tomorrow. Prices would continue to fall until they reached
the level at which entrepreneurs could expect to make a competitive
return by waiting to sell at a better price at a future date. In such
conditions the movement of current short-period prices is completely
determined by the “ideas of the future” prices.

The fall in prices would only come to a halt when it was sufficient to
produce the expectation that a competitive return could be earned by
buying (or holding) existing stocks at the reduced current, or spot, price,
and holding them for sale at the normal future or forward price.\textsuperscript{10}

Keynes’ idea can be seen more clearly by considering a commodity
such as wheat. Today, at time $t$, its current market (spot) price is $S_t$. The
decision to sell today or hold for sale at some future date will be
determined by the expectations formed about the future spot price, $S^*$,
expected to prevail at some future date, $t+T$, $T$ days distant. If there is a
market where the commodity may be sold for delivery $T$ days forward,
the forward price, $F_{t,T}$, quoted today at time $t$, for delivery at $t+T$ must
be sufficiently above $S_t$ in order to cover the cost of holding the

\textsuperscript{10} To explain this, Keynes produced a reduced form relation, $pq = xy$, (where $q$ is the
proportionate reduction in normal output due to the fall in price, $x$ is the cost of carry
as a proportion of the expected normal price, $y$ is the time period until the return to
normal conditions, and $p$ is the proportionate fall in the spot price relative to the ex-
pected future price) which summarized the factors that determine the depth and the
length of the cyclical downturn, as well as the evolution of prices.

Of course, the cyclical evolution of prices may itself bring about changes in the fac-
tors that determine “normal” prices and quantities, which is the dynamic aspect that
Keynes recognized subsequently as missing from his analysis in the Treatise.
commodity for $T$ days. This cost of \textquote{\textquote{carry}} may be defined as $cS_t$. If $F_{t,T} - S_t$ were more than this, a profit could be made by buying the commodity today at the current spot price and simultaneously selling it for forward delivery at price $F_{t,T}$, holding it for $T$ days, and making delivery at $t+T$. The carry cost will include the costs of financing, maintenance, storage, insurance, etc. In a balanced market, $F_{t,T} - (1+c)S_t = 0$ and the present value of the commodity will then be given by $(F_{t,T})/(1+c) = S_t$. The expected spot price should also equal the forward price, so $S_{t,T}^{*} = F_{t,T}$.

If the changing ideas about the future suggest a lower expected spot price, a decision not to sell today incurs not only the cost of carry but also a loss due to sale at the lower expected price. Loss minimization would thus lead to the spot sale of all existing stocks. Even agents who foresee a future need for wheat will minimize their costs by selling today and buying wheat for forward delivery since this is cheaper than holding wheat.

In the \textit{General Theory}, Keynes coined the term \textquote{\textquote{user costs}} to make the importance of the expectation of future conditions on present prices more explicit. Since stocks are being held because they are expected to yield a return equal to the difference between their current or \textquote{\textquote{spot}} price and the expected normal, or \textquote{\textquote{forward}}, price, a decision to \textquote{\textquote{use}} them (i.e., either as an input in production or by selling them at the current spot price) will eliminate the possibility of realizing this expected future gain. The implicit cost associated with using stocks today rather than holding them is thus the present value of the expected net future return that could be realized by waiting to sell at the expected normal price.\textsuperscript{11}

Since the decision not to \textquote{\textquote{use}} a commodity is equivalent to retaining the privilege of doing so in future, the decision to hold includes the equivalent of the value of a call option which provides the owner with the right, but not the obligation, to purchase the commodity at a future date or dates at a \textquote{\textquote{strike}} price equal to the spot price prevailing when the decision to hold is taken. The evaluation of current costs should thus take into account the \textquote{\textquote{user}} costs as reflected in the value of the option. To see this more clearly, consider the owner of wheat who wants to sell (use) today without losing the possibility of a future profit that would result should there be a rise in price. He or she could do so by purchasing \textsuperscript{11} A decision to \textquote{\textquote{use}} the commodity today, either by selling it or as an input in production means foregoing the gain in value that will occur between $t$ and $t+T$, which is given by the present value of $F_{t,T} - S_{t,T}^{*}$, or $uS_t$. This is the \textquote{\textquote{user cost}} associated with the commodity.
a call option with a strike equal to the current spot price. If the price rises, the loss due to the precipitous decision to sell can be reversed by exercising the option, which will have a payoff equal to the difference between the sale price and the now higher price. Thus, the calculation of the “supply price” of the commodity should add the option price, representing user cost, to the sale price.\(^{12}\) Keynes considered that his major theoretical innovation in the *General Theory* was “the introduction of the concepts of user costs and the marginal efficiency of capital” (1936, p. 146), although he admitted that the latter was not really his own invention.

User costs are often presented as an elaborate calculation of depreciation, or as the difference between the current costs involved in the operation or use of assets relative to the maintenance costs of keeping them idle.\(^ {13}\) But such an interpretation makes no recognition of the role of user costs in expressing the impact of the future on present returns through the appropriate adjustment to supply prices.\(^ {14}\) Given the impact of the future on the present, current costs of production will no longer be relevant to the supply price of existing capital goods, since the costs incurred in the use of existing capital goods cannot be ignored. User costs provide the solution to this problem by defining the cost of using existing capital goods as the difference between the cost of holding them idle (i.e., the cost of keeping them in good productive condition plus interest charges) and the expected net return from using them to produce output in the future. The rate of discount that equates the expected stream

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\(^{12}\) On the other hand, if price is expected to fall, a covered call option could be written at the current spot price. If the price falls, the premium is retained. If the options were traded in the market, the price of the option would be set by the balance of those who expect prices to rise and those who expect prices to fall, just as user costs are determined by the expectation of price rises and price falls. For the covered call, writers will be supplying the options for the buyers at a premium that is fixed by the balance between them.

\(^{13}\) Davidson (1987) is the major exception, but he notes that the concept has been primarily employed in the analysis of depletable natural resources.

\(^{14}\) Here it is important to note that, while Keynes’ theory was grounded in effective demand, he himself identifies his major departures from traditional theory in the analysis of supply. Recall the argument that labor had no way of choosing its desired position on the labor offer curve. User costs made a similar point concerning the supply curve of output. This point is important, not only because one of the supposed failings of Keynes’ theory that led to the crisis in Keynesian economics of the 1970s was the absence of the analysis of supply factors. Thus, the specification of the theory of effective demand also implies a basic difference in the specification of the supply side.
of future returns to the cost of producing new capital goods, thus, has to compete with the rate of discount that equates the expected stream of future returns to the supply prices of existing capital goods as determined by user costs. Just as in the short-period theory of the *Treatise*, if the prime cost of using existing capital is below the flow supply price for newly produced capital goods, because their prices are expected to continue to fall, no one will demand new investment goods and investment expenditures will fall.\(^{15}\)

Thus, Keynes could declare that “[t]he marginal efficiency of capital is of fundamental importance because it is mainly through this factor (much more than through the rate of interest) that the expectation of the future influences the present” (1936, p. 145). And this is because that impact is reflected in the supply prices of capital goods through the specification of the net present value of an investment. Recognizing the possibility of evaluating user costs through option prices provides a response to those who argue that the appropriate futures markets required for Keynes’ theory (for example, for second-hand capital goods) will not exist, or that the specification of the expectations that determine forward prices is purely subjective and thus irrational. Thus, instead of saying that supply prices have to be adjusted for user costs, we could say that supply prices that are corrected for the impact of the future on the present should include the appropriately calculated values of the imbedded options.

Note that, while “ideas of the future” enter both the demand and supply sides, the rate of interest also enters into the calculation of demand prices through the specification of the appropriate rate of discount, and it enters supply prices through the impact of the interest cost of carry on user costs. Hence, Keynes’ admonition that it is necessary to give “full weight to the importance of the influence of short-period changes in the

\(^{15}\) This is the condition described as “backwardation” in the *Treatise on Money* (and which has gained a place in the finance literature on futures prices). In normal conditions of balanced supply and demand, this will occur when prices for future delivery are driven below current spot prices because long hedgers seeking cover dominate short hedgers and speculators. In conditions of a slump, this requires that the prime costs (user costs of operating) of existing equipment be greater than the prime cost of producing new capital goods so that, given the expectations of the recovery of prices, it is cheaper to order new capacity for future delivery than to buy existing capital goods to hold until future recovery. In the language of the futures market, flow supply prices are below futures prices, which are below spot prices, so the most profitable action is to sell capital goods futures, hedging by producing them for sale at maturity, rather than buying them spot.
state of long-term expectations as distinct from changes in the rate of interest.” By separating them. It was for this reason that Keynes considered a major difference between the General Theory and the Treatise on Money the introduction of a distinction between the determinants of the marginal efficiency of capital and the rate of interest (see Keynes, 1936, p. 173). With the newly defined “marginal efficiency” to determine the rate of return on capital goods, liquidity preference, built on the concept of “bearishness” from the Treatise, was to determine the rate of interest.

Liquidity preference and the concept of the “liquidity premium” have both caused difficulty in interpretation of Keynes’ theory. However, once the concept of user costs is understood as representing the influence of the future in determining the relative costs of holding or using a commodity in production or sale, it seems straightforward to apply it to the decision to hold or use money. Buying investment goods, or consumption goods, or buying financial assets (which includes bank lending to either households or entrepreneurs), or repaying debt means that money will no longer be available to be “used” at a future date when the prices of the assets or goods will be different. The “user cost” of expending money today can then be defined as the present value of the potential future gain or loss that has been foregone or avoided by parting with money today. This future gain or loss will depend on the expected prices of investment goods, consumption goods, and financial assets at future dates. The user cost of money could thus be defined as the equivalent of a call option on a deposit at the current interest rate. Alternatively, holding money uninvested in a portfolio allows you to avoid the sale of an investment asset to meet an unanticipated need for liquid funds. This is equivalent to the value of a put on the investment position written at the expected future appreciation (or depreciation) of the asset. With respect to other financial assets, the user cost of money is the foregone gain (or loss) that could have been earned (or avoided) by waiting to purchase financial assets at lower (higher) prices and higher (lower) yields.

If the “use” of money is defined as becoming “illiquid,” then the premium that is required to convince individuals to become illiquid and to part with money is the equivalent of the “user cost” of money. Liquidity preference determines this liquidity “premium” and is thus also a clear expression of the impact of the expectation of the future movement of asset prices on present prices. The rate of interest can then also be represented by the relation between the spot price and the expected future prices of money. Although few textbooks put it this way, no one should be surprised, for Keynes insisted that his definition of the
rate of interest, unlike the "real" rate determined by the forces of productivity and thrift in traditional theory, was "nothing more than the percentage excess of a sum of money contracted for forward delivery, e.g., a year hence, over what we may call the 'spot' or cash price of the sum thus contracted for forward delivery" (Keynes, 1936, p. 222).

The complete specification of the monetary production economy in which the changing ideas about the future have an influence on the present thus requires the application of user costs to money as well as commodities and produced current and capital goods. In this context, the question of the determinants of the level of employment would be posed in terms of the returns from the decision to employ labor and produce output relative to the returns from the alternatives, which would include holding money as given by the user cost of money, of holding capital goods (or any other durable) idle in terms of the return as given by user costs, and the return from using the capital goods with labor to produce consumption or investment goods as given by the marginal efficiency of capital. Only if the return on the employment of labor and capital to produce output could be held above all other types of "investment" would capital accumulation take place and employment be provided. Expanding employment would require the appropriate manipulation of user costs, that is, expected future prices, and interest rates (which were also determined by expected future price movements). Thus, the "state of expectations" was not a subjective or irrational assessment of what might occur, but the expression of the anticipated costs of alternative courses of action as expressed in their influence on current market prices. The explanation that Keynes offered of underemployment equilibrium thus turns on the different behavior of supply and demand prices as supplies change, relative to the way financial asset prices respond.  

The rate of interest and the yield curve

The implications of Keynes' diverse approach to expectation and price formation can be seen directly with respect to the determination of

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16 Looked at from this perspective, the key to recovery is to produce conditions in which current spot prices stand in relation to future prices such that it again becomes more profitable to purchase newly produced goods rather than existing goods (i.e., "backwardation" exists in the market). The short-period price analysis suggests that the easiest way to do this would be to reduce the rate of interest (to reduce the carrying costs) and to increase demand for existing stocks, by monetary expansion or by government expenditures.
interest rates. The currently accepted explanation of interest rates is based on expectations of future goods prices relative to present goods prices as expressed in the expected rate of inflation or deflation of goods prices. It is the expected future evolution of inflation that then determines the yield curve. This theory is based on a proposition presented in Irving Fisher's *The Theory of Interest* (1930), that was strictly limited to conditions in which "rational tendencies" were based on "rational and empirical laws . . . analogous to rational and empirical laws of physics and astronomy" (Fisher, 1930, p. 321), that is, on conditions in which statistical procedures could be applied. Outside these limited conditions, where actuarial risk is replaced by what Fisher considered "uncertain" conditions and the value of money is unstable, "We must . . . give up as a bad job any attempt to formulate completely the influences which really determine the rate of interest" (p. 321). These are precisely the conditions that Keynes' approach to uncertainty was designed to analyze.

Aside from these differences, Fisher's approach is very similar to that of Keynes. Both specify the rate of interest on a loan as the price of a spot-forward swap of money, or by the excess of the forward price over the par or spot price. Fisher also recognized that, since there will be spot-forward swaps for different maturities, there will be interest rates referring to different periods extending not only from today to different future dates, but from various future dates to farther future dates. More importantly, Fisher, like Keynes (and Sraffa), notes that it is possible to use a spot-forward swap of gold or wheat to produce a rate of interest that could be measured in terms of the commodity itself, and that this makes it necessary "to distinguish between interest expressed in terms of money and interest expressed in terms of other goods. But no two forms of goods can be expected to maintain an absolutely constant price ratio towards each other. *There are, therefore, theoretically just as many rates of interest expressed in terms of goods as there are kinds of goods diverging from one another in value*" (1930, p. 42, emphasis in original).

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17 It was by following this line of reasoning that Fisher developed the concepts of zero-coupon rates as well as forward rates that have come to play such an important role in modern financial analysis.

18 Note the similarity with Keynes, who follows the definition of the rate of interest given above by noting, "It would seem, therefore, that for every kind of capital asset there must be an analogue of the rate of interest on money." He goes on to specify a wheat-rate of interest and a steel-plant rate of interest, finally referring the reader in a note to Sraffa's use of the concept in his debate with Hayek.
What is the relation between these different (in chapter 17 of the *General Theory*, Keynes called them "own-rates of own interest") interest rates? Fisher argues that market arbitrage should act to eliminate any changes in the relative values of the standards used to express the multiple possible rates of interest. For example, *if the forward price of wheat were perfectly known* to be at a 10 percent premium to spot, while the forward price of gold were known to be at a 4 percent premium, there would be a preference for wheat that would be expressed by using present stocks of gold (or borrowing gold at 4 percent) to buy wheat at the current spot price, lending the wheat against 1.10 bushels forward. The forward wheat received is then exchanged for 1.10 units of gold to replenish own stocks (or repay the gold loan) with an excess 0.04 units representing a positive carry of 6 percent. If the forward price ratio between gold and wheat is fixed at unity, this would drive up the current price of wheat until it stood at $1.1/1.04 = 1.057$ percent premium over gold (if the spot and forward price of wheat in terms of gold is 1:1, then the arbitrated forward price of wheat in money is $1.10/1.04$). 1.057 of gold invested at 4 percent just yields 1.10.\(^{19}\)

In Fisher’s approach to the theory of income, the rate of interest represents time preference, not liquidity preference, and its variation brings about the equality of present and future incomes, not of liquidity and illiquidity. Fisher extends the arbitrage process described above to "real income." This leads directly to the "Fisher relation" between monetary and real rates of interest that now underlies monetary policy and dominates the theoretical explanation of the shape of the yield curve.

As noted, there are three factors at work in the process, the appreciation or depreciation of one commodity standard in terms of the other, which we can clearly recognize as the rate of inflation, the rate of interest in

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\(^{19}\) It is easy to see that this is just Keynes' interest rate parity theorem which forms (see Kregel, 1996) the core of Keynes' analysis of interest rates and income determination. If we substitute dollars for gold and Deutsche marks for wheat, with the dollar interest rate 4 percent relative to the mark interest rate of 10 percent, the proportional difference between the spot and forward prices of the two currencies should be the spot rate times 1 + the dollar interest rate divided by 1 + the DM interest rate or $1 \times (1.04/1.10)$. In Fisher’s example, the forward dollar mark rate is fixed at 1:1, so we have to rearrange the formula to find the spot rate as the forward rate times 1 plus the mark interest rate divided by 1 plus the dollar rate or $1 \times (1.10/1.04)$. Thus, wheat sells at a spot premium or a forward discount. This means that wheat bought at 1.057 can only be sold at 1 at the end of the contract. It is clear that the arbitrage may occur via adjustment of either the spot or forward prices, that is, the rate of appreciation or depreciation of one standard in terms of the other, or in terms of the rates of interest in each standard, or in all three.
terms of the money standard, and the rate of interest in terms of the commodity (now the "real income") standard, representing individuals' time preference for present over future income. If we substitute "real income" for "wheat" and "money" for "gold" in the above example, then the arbitrage of competitive markets implies that it is only possible that the money rate of interest should be 4 percent when the (real) income rate of interest is 10 percent, if money is expected to exchange for 5.8 percent more income (i.e., purchasing power of money increases through a deflation) in the future than in the present so that $1.0578 \times 1.04 = 1.10$. The relation between the real and the money interest rates given by the rate of appreciation of the standard thus descends directly from the arbitrage relation that insures that the rate of interest is equal to the rate of return over costs (or from Keynes' interest rate parity theorem).\(^\text{20}\) The Fisher relation in which the monetary rate of interest is the real rate corrected for the rate of inflation, that is,

$$(1 + p)(1 + r) = (1 + i),$$

where $p$ is the rate of inflation, $r$ the rate of increase in real income, and $i$ the rate of interest on money, is just a different way of expressing the operation of this arbitrage relation.\(^\text{21}\) Fisher notes that the arbitrage process by itself cannot determine the rate of interest, but simply "enables us . . . to calculate the rates in other standards" on the assumption "that the rate in some one standard is already known." (Fisher, 1930, p. 45). Thus, one rate has to be given outside the system; for Fisher it is the real rate and for Keynes it is the money rate of interest. Given the money short rate, as set by the central bank or by the user cost of money, it is then possible to derive rates of interest, not only in terms of all commodities, but also for all future

\(^{20}\) Note the precise formal equivalence between Fisher and Keynes' analysis of the equality between rates of interest and rates of return. This is really not such a great discovery; anyone who has taught a course in international finance has drawn the four-corner equivalence diagram in which the two corners of one side (usually the top) represent Keynes' (covered) interest rate parity theorem and Fisher's real-nominal interest rate relation.

\(^{21}\) That this is formally equivalent to the interest rate parity theorem can be seen by rewriting the relation as $(1 + p) = (1 + i)/(1 + r)$, writing $S$ as the spot rate of exchange of gold for wheat and $F$ the forward rate of exchange of gold for wheat, then $F/S = 1 + p$ and we have $F = S[(1 + i)/(1 + r)] = 0.9455$, or given $F = 1$, $S = 1/0.945 = 1.057$, which is the price of wheat in terms of gold that eliminates arbitrage profit and $1.057 - 1 = 0.057$ is the rate of price deflation of wheat in money that brings the own rates of gold and wheat into equality.
periods, which allows the specification of the full yield curve.

Given these remarkable similarities in approach, why did Keynes object to Fisher's relation between the rate of interest and the rate of inflation? First, because it relied on the assumption of perfect foresight for the arbitrage process which establishes the equality of real and nominal rates (see Treatise on Money, vol. II, pp. 202–203, and General Theory, 1936, pp. 142–143). Second, because Fisher's argument that the money rate of interest should automatically reflect a perfectly foreseen rise in the rate of inflation overlooks the negative impact of a rise in interest rates on the prices of financial assets. While it is true that a perfectly foreseen rise in inflation for the coming year of 2 percent, producing a 2 percent rise in interest rates on one-year Treasury bills, would keep real returns constant, the same would not be true of a holder of a longer-term instrument if it were sold after one year (or even if it were held to maturity). Yet, market arbitrage should ensure that the return should be the same for any instrument (even thirty-year bonds sold one year after purchase) held for one year.

Keynes uses the example of a £100 par value British consol paying a £10 coupon that falls to £81.96 (a decline of 1.8 percent and a capital loss of over £18) when interest rates rise to 12.2 percent. While the "variations in the rate of interest earned during the year in question are too small to make much difference" (e.g., the extra 2.2 percent on the £10 coupon), the holder of fixed interest assets will have a substantial capital loss. The investor will have the benefit of being able to invest the future £10 interest coupon payments at the higher rate of 12.2 percent, but over the year this will not be sufficient to cover the £18 decline in the capital value of the bond, and thus by definition could not compensate for any loss in purchasing power resulting from a rise in the inflation rate equal to the increased rate of interest. Thus, Keynes argues that, for existing bond holders, Fisher's relation goes in the wrong direction since the higher yields required to preserve real yields causes capital losses that more than offset the increased interest earnings. Full inflation coverage would have to provide for an adjustment in capital value as well as to the income from the bond.

Thus, the discussion is led back to the concept of income. Keynes argues that, since the principal value of an existing bond is impaired when interest rates adjust to reflect anticipated inflation, an individual bond holder will have a lower total real income from the original investment. This is particularly easy to see in the case of the consol, for its price is permanently reduced. This provides the basis for Keynes'
basic criticism of Fisher’s relation, that the most important impact of inflation will be not on the interest rate, but on the prospective earnings from employing capital goods, the incentive to invest—the marginal efficiency of capital. Fisher’s account of the impact of a rise in the rate of inflation makes no mention of the impact either on long-term bond values or on the rate of return over costs, that is, on real returns, which Fisher thought remained unaffected. Keynes suggests that there is no reason for this to be the case if money is the “real” factor and real returns adjust to reflect changes in expectations of future conditions.

Keynes builds on this criticism of Fisher when he specifies the determinants of the speculative demand for money in the General Theory (Keynes, 1936, p. 202) in terms of the so-called “square rule.” Keynes argues that a “rational” investor deciding whether to hold money or a financial asset will always balance the increase in interest earned against the change in capital value when there is a change in the rate of interest. A rational investor chooses to hold money rather than assets when the potential for capital loss per annum on his or her assets exceeds the expected coupon or dividend yield per annum. The breakeven condition for a perpetual bond is thus \( \Delta P - C = 0 \), where \( \Delta P \) is the annual cumulative change in price, and \( C \) is its annual coupon interest. The price, or present value, of a perpetual bond is \( C/r \), where \( r \) is the current yield to maturity and \( C \) the coupon. The change in price may then be represented as the result of multiplying price times the change in the rate of interest, \( \Delta r \), times the modified duration of the bond. For a perpetual bond duration is given by \( D = (1 + r)/r \) and modified duration by \( D/(1 + r) \) which simplifies to \( 1/r \). Thus, \( \Delta P = P \Delta r * MD \), which can be rewritten as \( \Delta P = (C/r) \Delta r * (1/r) = \Delta r * (C/r^2) \). \( \Delta P - C = 0 \) can thus be expressed as \( \Delta r * (C/r^2) - C = 0 \) which simplifies to \( \Delta r = r^2 \) as the condition under which \( \Delta P = C \). This is simply Keynes’ square rule.\(^{22}\)

\(^{22}\) The duration of a par perpetual bond with a £4 coupon is 26 years. Modified duration, defined as \( D/(1 + r) \), which measures the volatility of bond prices, is 25 years. The change in the price of the 4 percent par consol is thus calculated by multiplying modified duration by the current price and the change in the bond’s yield to maturity. In the case of a 16 basis point (4 basis points squared) rise in the yield from 0.04 to 0.0416, the value of the bond will fall over the year by \( 25 \times 100 \times 0.0016 = £4 \), which is precisely the bond coupon. For any greater increase in interest rates, the fall in the bond’s value will exceed the current coupon of the bond, producing net losses for the holder. If an investor expects interest rates to rise by more than the square of the current rate, Keynes says the investor should prefer to hold cash rather than bonds. In such conditions, attempts to lower the rate of interest by increasing the purchase of bonds will find ready buyers at the prevailing interest rate, and the attempts of the monetary authority to lower rates will be prevented by a “liquidity trap.”
This point can also be described in terms of the breakeven point on the bond. Any change in a bond’s yield affects both its capital value and the income from reinvestment of the coupons, but in opposite directions. Duration gives the point at which the change in capital value is just offset by the opposite change in interest income from reinvesting coupon interest at the higher or lower interest rate over the remaining time to maturity of the bond. Thus, the lower the rate of interest, the higher the bond’s duration and the longer it takes to recover the fall in capital values from the increased reinvestment earnings. At 3 percent, the duration rises to 34.33 years and at 2 percent to 51 years. At 1 percent it is 101 years. Hence Keynes’ dictum that the lower the rate of interest, the more likely the liquidity trap. However, it should be clear that this does not rule out the existence of a liquidity trap at higher rates. At 8 percent, duration is 13.5 years and modified duration, 12.5 years. A rise in the rate of interest to 0.0864 would produce a fall in the price of a par 8 percent consol of 100*12.4*0.0064 = £8, which is exactly the coupon value. An expectation of a rise in interest rates of 8 percent then leads to the decision to remain liquid. The expected percentage rise in interest (or, equivalently, the expected percentage fall in the price of the bond) is, however, twice as high as in the case of 4 percent rates. However, these should be judged relative to recent changes in bond prices. If 8 percent lies within two standard deviations from the mean change in rates over the recent past, then it would be just as rational to remain liquid at 8 percent as it was at 4 percent in similar conditions of volatility.

However, as interest rates rise, *ceteris paribus*, duration falls. At a 20 percent yield to maturity, duration falls to six years and modified duration to five years. At 60 percent, as with interest rates paid in Mexico in the Tequila crisis period, duration is 2.67 years, so an investor can recover his or her lost capital value from the reinvested earnings on higher interest rates in a little over two and a half years. If there is any basis for the interest elasticity of the demand for money, this would appear to be it. However, it also suggests that the elasticity will be based on expectations of future bond prices, and that expectations will be based on recent volatility of rates. In a volatile rate environment, it will become more difficult to use changes in interest rates to influence the demand for money, since they will have to be larger in order to produce an impact.  

Here, all Keynes is doing is formalizing the relation between the user

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23 As rates rise, the square rule produces larger and larger absolute changes in the interest rate, and the use of modified duration to calculate the change in price becomes
cost of money and the rate of interest. Holding money gives a zero interest return, but holding a consol for one year when the rise in the interest rate is expected to exceed the square of itself will mean a return that is negative since the capital loss more than offsets the interest received, the user cost of money is negative, and money will dominate consols in portfolios. It is now possible to extend the reasoning to various holding periods (or to abandon the hypothesis of consols and allow bonds of different maturity) that will be associated with different values of duration. Bonds of longer duration will have a longer time to the breakeven point at which the increased reinvestment yield offsets the capital loss. This explains a positively sloped yield curve, since the risk of capital loss relative to coupon interest is higher, the higher the duration on a bond. Note that the shape of the yield curve then depends on the expectation of changes in prices of longer-term bonds, not the simple extrapolation of expected short yields, as in the traditional Hicksian expectations hypothesis. This does not mean that short rates will not have an impact on the yield curve, only that the traditional Hicksian explanation of the yield curve based on expected future short rates determined by expected future inflation rates leaves out a very important aspect of the expectations that are relevant to bondholders (and bond traders).

The shape and reaction of the yield curve will then be affected by the type of expectations (is the change in rates once over, or expected to continue?) and the holding period of the investor (an investor who holds until maturity will be unaffected by changes in capital value, while a short-term trader will be predominantly interested in capital values). Richard Kahn (1954) draws attention to this latter aspect by noting the importance of the difference between investors' sensitivity to income and capital risk. If all bond investors are widows and orphans who hold to maturity for income (as in Victorian novels), then short-term changes in capital value are unimportant. On the other hand, if markets are dominated by investment banks with leveraged bond portfolios managed to generate short-term proprietary trading gains, changes in capital values will be crucial. The Fisher relation is based on the dominance of widows and orphans, investing on the basis of confidently expected constant real returns on assets they expect to buy and hold. The Keynes-

less and less accurate. The full calculation of the change in the bond price will require the calculation of convexity. It is interesting that Hicks (1939, p. 261, n. 2) reproduces the square rule and notes that it is very likely that returns will be negative, since the fall in capital values will be even greater if changes in risk are taken into account.
Kahn approach, on the other hand, emphasizes the impact of interest rates on asset prices and of interest rates on the cost of carry of bond portfolios, and thus seems more appropriate to modern capital market conditions. Here, it is the expected future long rate that influences the demand for short-term funds, because the expected capital gains determine the size of the portfolio to be financed by borrowing short-term funds through repos of the bonds. The level of short rates, thus, influences the costs of accessing these capital gains through the costs of carry. The shape of the yield curve is determined by expectation of changes in long rates relative to the short borrowing rate. Monetary policy, which can only influence short rates, can influence the shape of the yield curve, and thus long rates, to the extent that it is capable of influencing expectations of changes in long rates. That is, by influencing the estimates of the future that determine present prices. This need have nothing to do with expectations of future inflation rates, unless the central bank reaction function suggests that changes in short rates are an indicator of future changes in inflation. Nor need it have anything to do with a constant, exogenously determined, expected real return. However, because changes in interest rates change the carry on levered bond positions, and thus the profitable arbitrage possibilities for market makers and speculators, they will also have an influence on long rates. Not through inflation premia, or short-term expectations, but by changing the cost of financing a levered portfolio. By reducing the spread between short and long rates, it reduces the running yield in the form of the positive carry, relative to the expected change in capital values. Which is simply an application of the two component elements of the square rule.

Conclusion

The combination of Keynes’ new method of analyzing expectations and the proper calculation of prices through the inclusion of user costs provides the basis for a monetary theory of production in which changing ideas about the future influence present production decisions. It also provides a theory of asset prices that is “linked up with our fundamental theory of value” and provides the basis for a Post Keynesian theory of finance.

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