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Asset Choice, Liquidity Preference, and Rationality under Uncertainty

David Dequech

The aim of this paper is to apply in the context of asset choice and liquidity preference some new ideas (developed elsewhere) about the determination of the state of expectation and about rationality under uncertainty. More specifically, the primary objective of the paper is to clarify the influence of confidence and animal spirits on asset choice and liquidity preference.

The paper begins with a discussion of the determinants of the state of expectation, which summarizes a more detailed treatment presented in Dequech [1999a]. The paper proceeds by developing a modified version of Keynes's model of asset choice (as found in Chapter 17 of *The General Theory*) and, in particular, by specifying variables that reflect the influence of animal spirits and confidence. This is followed by a more detailed examination of how confidence is related to different motives for liquidity preference. Here, I explain why confidence is the crucial factor behind the possibility of learning and precaution and show how speculation, while involving confidence, depends primarily on expectations of asset depreciation or appreciation. The influence of confidence and particularly of animal spirits on liquidity preference is clarified by treating liquidity preference as a preference for some assets relative to others, rather than a demand for a particular asset. Having clarified the relation among confidence, animal spirits, and liquidity preference, the paper closes by examining the rationality of the choice between more and less liquid assets. This choice is considered to be rational to the extent that it is based on knowl-

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edge and consistent with the end of pecuniary gain, but it is not dictated by rationality alone.

A preliminary discussion of the concept of uncertainty is necessary. Defined in a strong sense, uncertainty refers to the impossibility of forming fully reliable probabilistic estimates about the consequences of a decision [Dequech 1997]. Many important economic decisions involve fundamental uncertainty, in the sense that decision makers do not know the list of all possible relevant events.¹ However, even such uncertainty does not imply complete ignorance, because of stabilizing social practices. Thus, some (fallible) knowledge regarding at least some nominal values of important economic variables is possible. On the other hand, whatever knowledge decision makers have under uncertainty, this knowledge is necessarily incomplete to a substantial degree. Moreover, complete knowledge does not exist at the time of making the most relevant economic decisions.

The Determinants of the State of Expectation: A Brief Discussion

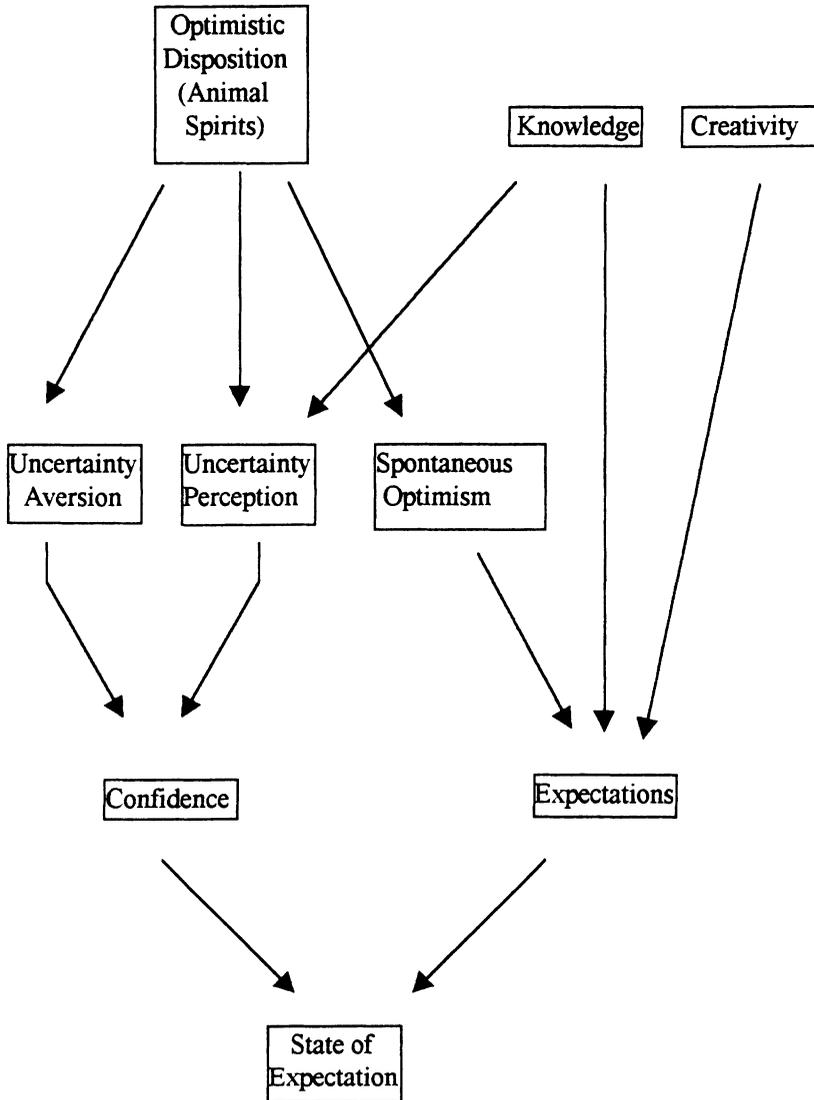
Based on Keynes [1936, 148], one may say that the state of expectation depends on expectations themselves and on the confidence in them. Expectations are the best estimates one can form about some events, while confidence refers to the consideration of the likelihood that things may turn out to be different from what one expects and to the disposition to behave according to expectations despite this possibility. Keynes's treatment of the state of expectation is not entirely satisfactory, though. This idea is developed here, in a way different from Keynes's, by distinguishing several determinants of the state of expectation and by establishing the relations among them.

Expectations and *confidence* may be called the *immediate* determinants of the state of expectation (see Figure 1). There are three *ultimate* determinants: *knowledge*, *creativity*, and the *optimistic disposition to face uncertainty*. Before continuing with the scheme depicted in Figure 1, let me clarify the meaning of these determinants.

What people know is based on the information available to them and/or learned through practice without necessarily being discursively dealt with (the latter case involves what Michael Polanyi termed "tacit knowledge"). Knowledge is fallible. It is also conditioned by the social context in which it is produced. This implies the possibility or even the necessity of different views on what is considered knowledge, which leads to different theories of economic reality. In the formation of the state of expectation, knowledge has to be supplemented by the optimistic disposition to face uncertainty and by creativity.

The optimistic disposition to face uncertainty (animal spirits redefined) is a broad notion encompassing different elements. In the case of product markets, this optimistic disposition is more clearly similar to what Keynes [1936, 161-62] called

Figure 1. The Determinants of the State of Expectation



"animal spirits," but it is not exactly the same. The expression "animal spirits," as redefined here, does not mean merely "a spontaneous urge to action rather than inaction" [Keynes 1936, 161]. Situations of fundamental uncertainty are not reduced to a simple dichotomy between action and inaction; rather, they refer also to *different types of action*, depending on the quality and intensity of the optimistic disposition to face uncertainty. The idea to be conveyed here is that of a disposition that comes in (ordinal) degrees and is combined with optimism or pessimism.²

Furthermore, animal spirits, as redefined here, are not the same as confidence. First, animal spirits should be associated not only with confidence, but also with the optimistic or pessimistic character of expectations themselves. As should become clearer below, animal spirits affect expectations themselves via what is termed *spontaneous optimism (or pessimism)*. By spontaneous optimism I mean optimism that is not based on any knowledge (in contrast, for example, if a person knows that the chance of winning a lottery is 90 percent, that person may be optimistic about winning, but this is not spontaneous). If animal spirits are strong, the estimates will be spontaneously optimistic, and the confidence in them will be high. The weakness of animal spirits leads to low confidence and to lack of spontaneous optimism or, in a more severe case, to spontaneous pessimism. Second, as argued below, confidence does not depend only on animal spirits.

Finally, animal spirits should not be seen as purely subjective or psychological. Animal spirits are influenced by the institutional environment in which an individual operates. At the same time, some degree of subjectivity is inevitable.

Creativity is interpreted here as an ability to see and do things in a novel way. As such, it is an important source of fundamental uncertainty. At least some individuals may be creative. Each person's creativity may be strong, weak, or even absent. As a determinant of expectations, creativity is forward-looking, but it is often associated with originality in interpreting the past and the present. Creativity in expectations is expressed as an innovative imagination, i.e., as the ability to imagine a future that is, at least in some aspects, radically different from the present (or, if creativity is weak, a future that is in all aspects essentially similar to the present). These aspects may be part of the individual's immediate environment or of society at large. As in the case of animal spirits, there are factors affecting creativity that are particular to a single individual, to his/her experiences, and to his/her personal reactions to those experiences. At the same time, creativity is also influenced by the institutional or cultural context.

After this initial explanation, the meaning of these determinants can be further clarified as we return to Figure 1. The role of each of the three ultimate determinants—knowledge, creativity, and the optimistic disposition—depends on which of the two immediate determinants, expectations and confidence, is considered.

Spontaneous optimism (or pessimism) is the factor through which the optimistic disposition indirectly influences expectations (as this optimistic disposition also af-

fects confidence, it should not be equated with spontaneous optimism). Expectations are directly determined by knowledge, spontaneous optimism, and creativity.

Creativity in this scheme affects expectations only, not confidence. Thus, confidence is ultimately determined by the optimistic disposition and knowledge, through their influence on the two factors on which confidence directly depends: how much uncertainty a person perceives and how willing the person is to face or to avoid this uncertainty. These two factors are termed, respectively, *uncertainty perception* and *uncertainty aversion* (or *willingness to face uncertainty*). Uncertainty aversion is solely a question of animal spirits, whereas part of the uncertainty perception may have a more concrete basis in knowledge and thus may be independent of animal spirits. The knowledge involved in this case is that of the existence of uncertainty itself and of factors that reduce or increase uncertainty, namely, social practices such as contracts, market-makers, conventions, etc.

Before moving on to the context of asset choice, it should be noted that in this case expectations and confidence are held with respect to asset prices and yields.

Initial Remarks on Asset Choice and Liquidity Preference

Different assets possess different attributes and provide their holders with different explicit and implicit yields. Like Chapter 17 of *The General Theory*, this paper adopts the distinction between expected quasi rents, carrying costs, liquidity premia, and appreciation. However, in contrast with that chapter and in order to avoid some difficulties in which Keynes was involved, the following discussion concentrates on the *ex ante* dimension of asset choice, referring to what goes on in people's minds before all the relevant *ex post* prices and results can be known. The analysis developed here applies to each single decision-making unit (allowing for differences among individuals). Each decision maker may have expectations about the asset prices that are going to prevail at the market level, but this paper is not intended to explain the determination of asset prices at the market level. It merely provides a foundation for the initial steps of such an explanation. Similarly, this paper does not discuss any supposed process of adjustment over time between the rates of return of the different assets.³ Moreover, the mathematical expressions presented below do not imply a maximization procedure. They are essentially a heuristic device that hopefully clarifies the specification of the factors involved in asset choice.⁴

The paper adopts a general perspective in which liquidity considerations are important for asset pricing and choice as a whole [Townshend 1937; Minsky 1975, chap. 4; Kregel 1982, 454; Wray 1990, 156-57; Carvalho 1992, 93, 97-99], thus avoiding the real/monetary dichotomy. There is a spectrum of assets in terms of liquidity. Money is the most liquid and thus the one with the largest liquidity premium.⁵ The decision as to the desired stock of capital goods (and therefore to invest) is seen then as only one among many asset choices. To invest is either to

part with liquidity directly or to accept liabilities that will later require liquidity [see also Wells 1983, 534]. The decision to invest must be made in conjunction with liquidity preference considerations.

The optimistic disposition to face uncertainty affects both the decision to invest and liquidity preference. Through spontaneous optimism, this disposition affects the estimate of return. It also affects confidence, and confidence—which depends also on how knowledge influences uncertainty perception—affects the liquidity premium of money and other assets.

In Chapter 17 of *The General Theory*, Keynes [1936, 240] established an inverse relation between the liquidity premium and confidence.⁶ This relation is even more explicit in the *QJE* article: "Our desire to hold money as a store of wealth is a barometer of the degree of our distrust of our own calculations and conventions concerning the future. . . . The possession of money lulls our disquietude; and the liquidity premium which we require to make us part with money [or which we implicitly attribute to money] is the measure of the degree of our disquietude" [Keynes 1973a, 116]. This should be generalized by including people's distrust of unconventional expectations, for these expectations also have a degree of confidence associated with them.

It is important to examine the relation between the liquidity premium and confidence in more detail. The liquidity premium mentally attributed to money and other liquid assets by the decision maker is inversely related to the confidence he/she has in his/her estimates of the total returns from *holding* less liquid assets (reference is made below to the returns from *waiting* to buy liquid assets). These expected returns include a flow of expected payments (quasi rents in the case of capital goods, dividends in the case of equity securities, interest payments in the case of bonds, etc.) minus carrying costs plus appreciation.

The liquidity premium of liquid assets reflects the decision maker's *general* confidence in his/her estimates of returns from other, less liquid assets. This confidence is general in the sense that it refers equally to the other assets. It is determined by the decision maker's uncertainty aversion and general uncertainty perception.

Beyond this basic, general confidence, the decision maker may have different *specific* degrees of confidence in his/her estimates of the return from different assets, because he/she may perceive some assets as involving more uncertainty than others. As there is no way in which the liquidity premium l of a liquid asset can reflect the diversity of his/her doubts regarding the return from many different assets, the proper way of representing this diversity seems to be by discounting the expected flow of payments of each asset at a rate of discount specific to that asset.⁷ In formal terms:

$$(1 + \delta_i) = (Q_i - C_i + L_i + A_i)/(1 + \alpha_{si})P_i \quad (1)$$

where: δ_i is the own-rate of interest of asset i ; Q_i , C_i , L_i and A_i represent quasi rents, carrying costs, liquidity premium, and appreciation *in nominal values*, respec-

tively; α_{si} is a rate of discount reflecting the degree of uncertainty specifically associated with asset i (beyond a general level of uncertainty that is common to all assets and that is one of the determinants of the liquidity premium attributed to liquid assets); and P_i is the asset market price. For n assets, $i = 1, 2, \dots, n$.

A_i is the expected appreciation (or depreciation, if negative) of asset i in terms of money. Thus, in the case of money, $A_i = 0$. L can be seen as a function of: an indicator of a general degree of perceived uncertainty, α_g ; an indicator of uncertainty aversion, β ; an indicator of the asset's degree of liquidity, γ ; and the expected appreciation (depreciation) of asset i in terms of the prices of other assets, A_j . Thus:

$$L_i = L_i(\alpha_g, \beta, \gamma, A_i, A_j) \tag{2}$$

$$\partial L_i / \partial \alpha_g > 0; \partial L_i / \partial \beta > 0; \partial L_i / \partial \gamma_i > 0; \partial L_i / \partial A_j < 0$$

A_j is relevant for speculation. Its influence on the liquidity premium depends on the degree of liquidity of the several assets. The less liquid the asset i is, the less its possessor can take advantage of the depreciation of other assets; the less liquid the asset j is, the less the expectation of its depreciation will attract speculators. If an asset is considered liquid enough to be used for speculative purposes, its liquidity premium may be seen as positively reflecting the possibility of taking advantage of the expected depreciation of other assets.

An asset may also be held for speculative purposes when there is an expected appreciation of that same asset (that is, when $A_i > 0$). This is reflected directly in the asset's rate of return through A_i , rather than through L_i .

Expressed as a rate, in contradistinction to a nominal sum, the liquidity premium is determined as follows (capital letters represent nominal sums and lower case letters represent rates⁸):

$$l_i = L_i / P_i \tag{3}$$

Confidence and Some Motives for Liquidity Preference

So far, confidence has been related to liquidity preference in an intentionally generic way. It is now necessary to specify this relation by considering how confidence is involved in some motives for liquidity preference under uncertainty. Three points are highlighted: (1) the possibility of learning, (2) precaution, and (3) speculation.⁹

Liquidity Preference and the Possibility of Learning

The argument of the possibility of learning as a reason for liquidity preference goes back to John Hicks, Robert Jones, and Joseph Ostroy and is resumed, in the context of a detailed discussion of probability and uncertainty, in recent contribu-

tions by Jochen Runde [1994] and Alessandro Vercelli [1996] (see their articles for other references; also Mario Amendola [1991]). According to this reasoning, the higher the uncertainty, the more there is to be learned in the future and the higher the liquidity preference. Liquidity provides the decision maker with flexibility to revise decisions, altering the composition of his/her portfolio in the future.

From the perspective defended in this paper, this argument can be accepted by saying that liquidity allows the decision maker to postpone action until (1) more information is obtained, and then the confidence in the forecasts may be high enough to justify action, or (2) an unforeseen profit opportunity appears, either in financial or in any other markets, and the decision maker feels sufficiently confident about it.

Perceived uncertainty may be reduced, and therefore confidence may be increased. People may be aware that uncertainty will never be completely eliminated *ex ante* and still wait until it is hopefully reduced to a level that they, given their uncertainty aversion, consider tolerable enough for them to sacrifice liquidity. A key issue here, then, is that accepting this depends on uncertainty being seen as coming in (ordinal) degrees.

It is interesting to briefly contrast my view on learning and liquidity preference with a few others. It is not the case that uncertainty will be eliminated, as in what Paul Davidson [1991, 50] describes as "the option to wait approach." No assumption is made in this paper that complete information exists at the time of decision, only that uncertainty can somehow be reduced. It is not the case that people could get more information and then form a reliable probability distribution.

Some critiques of standard Subjective Expected Utility (SEU) theory refer to people's refusal of bets that would allow the elicitation of their subjective probabilities [Dequech 1997]. In economic discussions, this refusal has sometimes been associated with liquidity preference. Although the association can be made, this paper differs from the discussions of people's refusal to bet under ambiguity [Frisch and Baron 1988; Camerer and Weber 1992]. Under ambiguity, people wait for the missing information and/or refuse to bet for fear of asymmetric information, that is, fear that someone else may have the missing information. Uncertainty in a fundamental sense can be reduced, but it cannot be completely eliminated before the time of decision. Therefore, if people wait at all, it cannot be for complete information (of the type that exists in situations of risk or even of ambiguity) to be obtained. Moreover, since some information does not exist at the time of decision, there is no asymmetry regarding such information: nobody has it (of course, asymmetry is possible regarding the information that does exist). Finally, if surprises—unimagined and unimaginable events—may occur, there are grounds for liquidity preference other than waiting.

In particular, there is a strictly precautionary motive that does not depend on learning, as discussed below. This contrasts with the opinion (shared by Runde

[1994] and Vercelli [1996], among others) that the possibility of learning is *the* reason for liquidity preference under uncertainty.¹⁰

A Strictly Precautionary Reason for Liquidity Preference under Uncertainty

Other authors have associated uncertainty with the precautionary preference for money and other liquid assets, with some [Davidson 1978, 191, 193; Asimakopulos 1991, 90; Carvalho 1992, 105-6] doing so more explicitly than others [Minsky 1975, 77; Wells 1983, 523-24]. In this section, a separate precautionary reason is contrasted with motives that depend on the possibility of learning, and this reason is related to confidence.

Apart from other reasons, the existence of uncertainty justifies liquidity preference on the grounds that (1) unexpected events may require sudden unforeseen expenses, and/or (2) the cash flows from less liquid assets may turn out to be less than expected. The balances held for this purpose defend the decision maker from not being able to meet his/her liabilities.

It might be argued that this problem may occur under risk, which justifies precautionary liquidity preference in that situation. It is true that undesired outcomes may also happen under risk, so that a person may keep liquid assets to avoid not being able to face liabilities. For example, if someone is risk averse, he/she does not bet all of his/her money on the roulette wheel. The same argument applies to the case of ambiguity.

However, there is an important difference among risk, ambiguity, and uncertainty in this regard. Under risk, people demand liquidity knowing with full confidence the chances of things going wrong, and under ambiguity they do it knowing the list of all possible events. Under uncertainty, in contrast, things may go wrong in an unpredictable way because an event may occur that is unimaginable *ex ante*; things may also go wrong for an individual because other people (on whose behavior the results of that individual's decisions depend) may unpredictably change their way of behaving—including their attitude regarding liquidity—in the face of their own ignorance. The possibility of such occurrences provides a reason for liquidity demand independent of risk aversion¹¹ and of ambiguity aversion. This reason depends on uncertainty perception and uncertainty aversion, the two determinants of confidence.

In cases of uncertainty, learning will only be complete when it is too late. It is impossible to have knowledge of all the relevant events at the moment of deciding, regardless of how long people wait before deciding.

Consider, for example, the case of investment. Capital goods are not liquid. People buy or construct them with some expectations regarding the cost of production and the sales of the final products. Contracts may reduce some of the uncertainty regarding these factors, but contracts do not normally refer to periods as long

as the entire lifetime of a capital good. Structural social change can alter the cost of labor or other inputs; a competitor may create a new process or a new product that renders existing capital goods obsolete; and so on. People need courage to face these possibilities. They may wait some time before buying capital goods and then perhaps get more information and become more confident. Nevertheless, uncertainty cannot be completely eliminated before a decision has to be made. Once people buy a capital good, they are stuck with it; they may simultaneously demand liquidity to protect themselves against unwanted circumstances that cannot be reliably anticipated. Or they may prefer not to buy the capital good for fear of those circumstances.¹²

Given uncertainty perception, the more uncertainty averse (the less courageous) a person is, the less capital goods he/she will buy and the more liquid assets he/she will want as a means of avoiding undesired unforeseen outcomes. Together, uncertainty perception and uncertainty aversion determine confidence, which in turn determines the precautionary demand for liquidity. When perceived uncertainty increases and confidence decreases, liquidity preference is reinforced not only because people realize that there is more to be learned, but also because they realize that their assessment of the likelihood of things going wrong has become even less reliable.¹³

The arguments presented in this section may also have some support as an interpretation of Keynes, although my primary concern is not with history of theory. Keynes [1936, 196] states that the precautionary motive is to provide not only for "unforeseen opportunities of advantageous purchase," but also for "contingencies requiring sudden expenditure." We can therefore divide the precautionary motive into a contingency motive and an opportunity motive. The argument in this section refers to the contingency motive, in a broader sense than Keynes's, for it includes the case in which returns from assets turn out to be less than expected. Keynes [1936, 144] refers to this case when he discusses the entrepreneur's doubts "as to the probability of actually earning the prospective yield for which he hopes," but there is in this passage no explicit connection with liquidity preference. Confidence may be related in Keynes's writings to the contingency motive, when, for example, he refers to "security" in his definition of the liquidity premium [1936, 226] and when he writes that "money lulls our disquietude" [1973a, 116].¹⁴

A Speculative Reason for Liquidity Preference under Uncertainty

The speculative demand for money may be understood as arising when the expected appreciation of another, less liquid (but not illiquid) asset is negative. In the case of bonds, this corresponds to an expected rise in the interest rate. If considerable inflation is anticipated, other liquid assets may be demanded for speculative purposes instead of money.

This speculative reason does not depend on waiting until getting more information, for it exists when the decision maker already believes that asset prices will move in a specific direction and has enough confidence to act upon this belief.

Keynes's references in both Chapter 17 and the *QJE* article to the link between liquidity premium and confidence might lead one to relate the liquidity premium only to the precautionary motive (including the opportunity motive) and not to the speculative motive. However, the liquidity premium seems to be the factor through which we should accommodate the fact that the expected depreciation of asset j does not make all the other assets equally more interesting to the decision maker. The attractiveness of liquid assets (whose major return is the liquidity premium) benefits relatively more from this expected depreciation than that of less liquid assets. Moreover, if the liquidity premium attributed to an asset is to reflect the decision maker's unwillingness to part with the liquidity provided by that asset, the liquidity premium must also reflect speculation.

As expressed in Equation (2), the liquidity premium attributed to an asset by a decision maker reflects in part the possibility of taking advantage of the expected depreciation of other assets—a possibility that illiquid assets such as capital goods do not allow (as noted above, speculation may also occur with an expectation of appreciation of asset i , but this affects that asset's rate of return directly through A_i and not via L_i).

Thus, confidence in the expected returns from *holding* other assets, discussed above, is not the only determinant of the liquidity premium. Other determinants, both with a positive influence on the liquidity premium, are the expected gains from *waiting* to buy other assets and the confidence the person has in these expected gains.

Confidence, Animal Spirits, and the Relative Character of Liquidity Preference

At this point, some clarification is necessary about the action range of animal spirits and the meaning of optimism in financial markets and liquidity preference.

Understood as an optimistic disposition to face uncertainty, animal spirits affect decisions regarding financial markets as long as these decisions involve uncertainty. Animal spirits have to be sufficiently strong, in whatever markets, if a decision maker is to buy assets less liquid than money (which also includes banks when lending money, as they buy assets of varying liquidity).

Optimism—or pessimism—may be partly spontaneous (motivated by animal spirits) and partly based on knowledge. Optimism in financial markets may refer, as in product markets, to the hope of making a profit, but, in the case of a person who demands money to hold for speculative purposes or sells an asset short in the futures market, this hope is not optimism in the sense of an expectation that prices will increase.

As to liquidity preference, although some passages of *The General Theory* associate it only with the demand for money, the general perspective defended earlier in this paper allows us to go beyond this association. From this perspective, while the liquidity premium is an attribute of an asset (that all assets have, in different degrees), liquidity preference can be seen as relative, as the preference for liquid assets *in comparison with* less liquid assets. This seems to be reflected in L. Randall Wray's [1990, 20, 163] definition of liquidity preference as "a preference to exchange illiquid items on a balance sheet for more liquid items."

The relation between liquidity preference, on the one hand, and confidence and optimism, on the other, depends on to what confidence and optimism refer. Thus, liquidity preference is negatively related both to confidence in the expected gains from holding less liquid assets and to optimism regarding these expected gains in product, financial, or any other markets. Strong optimism leads to high expected quasi rents of less liquid assets, while high confidence leads to a low liquidity premium of more liquid assets. Both factors reduce the preference for more liquid assets. In contrast, liquidity preference is positively related to confidence and optimism about the expected gains from holding liquid assets for speculative purposes. Both factors have a positive influence on the liquidity premium of more liquid assets and by extension on liquidity preference.

To the extent that animal spirits have a positive influence on both confidence and optimism about the gains from holding less liquid assets, liquidity preference and animal spirits are closely and inversely related.

Treating liquidity preference as relative helps us to understand why in product markets an increase in confidence may not stimulate investment. Suppose that some news appears (such as the announcement of a contractionist economic policy) that leads people to adopt pessimistic expectations regarding the prospective yield of capital goods with, because perceived uncertainty has been reduced, a higher confidence than before. Since the liquidity premium a decision maker attributes to liquid assets is inversely related to his/her confidence, this increase in confidence would have a negative impact on the liquidity premium. Nevertheless, even if other factors do not compensate for this impact so as to increase the liquidity premium, these liquid assets may still become more attractive *relative* to capital goods.¹⁵ The *Qs* that represent the prospective yields of capital goods would be lower for each given quantity of capital goods (in the terms of *The General Theory*, the "schedule of the marginal efficiency of capital" would shift inward).

In other cases, the news may increase perceived uncertainty and thereby reduce confidence (if there is a convention at work, it may break down). This increases the liquidity premium.

Rationality, Illiquidity, and Liquidity

Decision making under fundamental uncertainty is based on the state of expectation, the end(s) pursued, and the perception of constraints. Rationality of decision making requires, first of all, consistency within the state of expectation, within the ends pursued (if more than one), and within the perceived constraints, as well as consistency between the course of action taken, on the one hand, and the state of expectation, the end(s) pursued, and the perception of constraints, on the other. Rationality should require more than this. In particular, the state of expectation, the ends pursued, and the perception of constraints should be rational in a deeper sense than internal consistency. Since uncertainty by definition has to do with the lack or limitation of knowledge, the possibility of rationality under uncertainty in particular depends on how the relation between rationality in this deeper sense and knowledge is dealt with. In the light of the scheme presented earlier, this paper concentrates on knowledge as a factor underlying the state of expectation. Here, knowledge and the state of expectation enter into the definition of rationality as they are applied to the pursuit of an accepted end, within the perceived constraints. Knowledge will be used to establish an additional criterion of rationality to that of consistency.

This paper adopts a cognitive approach to the relation between rationality and knowledge (see Dequech [1998, 1999b] for further discussion). In this approach, *rationality* is defined as something that has to be based on knowledge. This criterion applies to the rationality of the state of expectation and by extension to the rationality of behavior based on this state of expectation.

At least for some purposes, when one can attribute a specific end to people in specific roles, the rationality of behavior in the pursuit of the specified end is determined by how much that behavior is known, by the acting individual, to be adequate for that end. Behavior may be rational even if it turns out to be unsuccessful *ex post*.

Irrationality is defined here as that which *contradicts* rationality. More specifically, the state of expectation is irrational—and so is the behavior based on it—to the extent that it is contrary to the knowledge that does exist under uncertainty. This definition implies rejecting a dichotomy between rationality and irrationality and introducing a third possibility: *arationality*. Some aspects of economic behavior under uncertainty should be considered arational, rather than irrational. They are the aspects in whose case the lack of knowledge prevents us from determining what is rational. Something cannot be said in this case to be irrational, since it cannot be said to contradict rational behavior (this triple differentiation is similar to that between moral, immoral, and amoral).

It seems legitimate to discuss the rationality of liquidity preference in connection with the end of pecuniary gain. The means to this end should not necessarily be taken as given, as people can be creative and devise new means.

Animal spirits should not be seen as involving irrationality. Rather, animal spirits, at least as redefined here, are essentially arational. They are not contrary to the knowledge that does exist; they are merely not based on knowledge. It is by understanding animal spirits as arational that we should defend Keynes's [1936, 162] statement that, when "animal spirits are dimmed and the spontaneous optimism falters . . . fears of loss may have a basis no more reasonable than hopes of profit had before." In my terms, these fears and hopes are arational.¹⁶

There is no completely rational way of deciding how much to invest, or, more generally, how much of the decision maker's portfolio should consist of capital goods in order to best pursue the end of pecuniary gain.

By the same token, and given the point made above that the optimistic disposition affects the portfolio choice as a whole (particularly investment and liquidity preference), the weakness of animal spirits that makes some people prefer more liquidity than otherwise should also be seen as arational.

Some authors argue for the rationality of liquidity preference [see Davidson 1982-83, 190; 1987, 150; O'Donnell 1989, 268-69; Asimakopulos 1991, 4].¹⁷ The view defended here is somewhat different. If the decision maker is aware of uncertainty, it is rational to have *some* positive degree of liquidity preference beyond that due to the transactions motive. It is irrational to have none (especially for precautionary reasons), which corresponds to suffering from *liquidity illusion*.¹⁸ Like the other alternatives, the option for liquidity is partly rational and partly arational. What makes it partly rational is the knowledge of: (1) uncertainty itself, (2) the institutions that make money and other assets liquid, and (3) other social practices that reduce uncertainty. The choice of a *specific* degree of liquidity involves arationality, as does the choice of a specific degree of illiquidity, typically represented by the purchase of capital goods. If someone accepts the idea of partial arationality of investment decisions, he/she should also, to be consistent, accept the same about liquidity preference.

The more the decision maker wants to play it safe, the larger the proportion of liquid assets he/she will want to have in his/her portfolio. In contrast, he/she may believe that the best way to pursue pecuniary gain is by holding illiquid assets. Arationality has to have its part in the decision of how safe or how bold to play. The knowledge on which to base this decision is incomplete and not fully reliable as a guide to action.

In conclusion, liquidity considerations are important for asset pricing and choice under fundamental uncertainty. As shown in the preceding sections, liquidity preference is closely related to animal spirits and confidence. Like confidence, liquidity preference is partly based on knowledge and therefore has partly rational grounds; but the quality and intensity of animal spirits are also determinants of confidence, as well as of spontaneous optimism, and this makes liquidity preference partly arational.

Notes

1. In contrast, the notion of ambiguity goes beyond the mainstream conception of uncertainty (or risk) but still falls short of fundamental uncertainty. Under ambiguity, people are uncertain about probabilities but know the list of all possible relevant events.
2. Except when referring to another author's use of the expression, this optimistic disposition to face uncertainty is what I mean by animal spirits here, and I use the two expressions interchangeably.
3. Therefore, if there is any equilibrium involved here at all, it is a peculiar one, taking place in the minds of people who may use the equimarginal principle to equalize the expected rates of return of different assets in order to maximize expected pecuniary gain in conditions of fundamental uncertainty (I am indebted to Mario Possas's view on this point). This seems to be the notion of equilibrium defended by Tonveronachi [1992].
4. However, these formulae are compatible with maximization, provided this is properly interpreted. Several differences should be pointed out between this and maximization as it is understood in neoclassical economics. First, the objective is pecuniary gain and not utility. The pursuit of money as an end in itself is a distinctive feature that Marx, Veblen, and Keynes identify in capitalism [Dillard 1987a, 1987b]. It is possible to conceive of pecuniary gain as an objective function and to interpret asset choice as the maximization of this objective. Second, expectations of pecuniary gain are formed under conditions of fundamental uncertainty, so that there is neither a presumption of completeness of the list of events nor of a probabilistic calculus. All that is needed is a bunch of numbers. Third, there is no implication here that people really do follow this formal procedure, or behave as if they did it, or, still, should do it. For people to use these formulae in practice, particularly in a maximizing procedure, they would have either to be unaware of fundamental uncertainty or to believe that it is worth going into this kind of mathematical detail when the numbers involved are influenced by very imprecise factors.
5. In periods of considerable inflation, money loses its attractiveness as a store of value [Davidson 1978, 233, 237] relative to other liquid assets that benefit from appreciation.
6. Keynes [1936, 240n, 148n] also relates the liquidity premium to the notion of weight he presented in *A Treatise on Probability*, which reinforces the connection established in Dequech [1999a] between confidence and weight. The link between liquidity premium and weight returns in a 1938 letter to Townshend [Keynes 1979, 293] (also O'Donnell [1989] and Runde [1994]). Cottrell [1993, 47-48] also notes this connection but doubts that weight is the appropriate notion to link with confidence. At least some of the problems he raises derive from the fact that Keynes was not always consistent in defining weight.
7. This discussion applies also to a bank's decision on lending. To lend is to buy an illiquid asset. A bank will lend money only if the expected return (interest) is high enough to compensate for the doubts regarding it. A bank may have specific degrees of confidence reflecting the perceived uncertainty regarding specific potential borrowers and their plans. When a bank is particularly uncertain about a specific potential borrower, it will apply a higher rate of discount to the flow of expected interest payments. In order for the returns from the loan to be more attractive than the liquidity premium attributed to money, a larger flow of interest has to be paid.
8. Davidson [1978, 64, 71] and Minsky [1975, 81] use lower-case for nominal sums. Although Davidson uses the symbols of *The General Theory* (Chapter 17), he notes that Keynes tended to refer to q , c , l , and a as rates, rather than as nominal sums (see also Carvalho [1992, 83]; contrast this with Minsky [1975, 94-95]).
9. This paper does not discuss in detail either what Keynes called the transactions motive or the finance motive, but it does acknowledge the importance of finance for asset choice and for investment in particular. Expectations of high profitability and strong confidence are not enough for investment to take place. Remarks on the availability of finance are made

indirectly in this paper, when the banks' decision to lend is related to their liquidity preference. Discussing what they call an institutional investment theory, Carrier and Marsh [1995] stress the importance of financial practices, but an institutional perspective on investment can be much broader than this. All the major determinants of the state of expectation have a strong institutional character. Institutions, in their informational role, contribute to reduce uncertainty, thereby affecting uncertainty perception. Moreover, institutions have a deeper cognitive function, through which they affect people's very understanding of reality [Hodgson 1988]. Their influence can be identified in knowledge, in the optimistic disposition to face uncertainty (as implicitly recognized by those who argue that animal spirits are affected by culture [Davidson 1991, 38; Matthews 1991, 110; Hargreaves Heap 1986-87, 272]) and in creativity.

10. Runde and Vercelli differ about how to relate this reason to Keynes's famous taxonomy of the motives for preferring liquidity. Vercelli [1996, 13] associates the possibility of learning with the speculative demand for money in Keynes. As the decision maker obtains more information, he/she may envisage profitable opportunities to buy financial assets which were not seen before, or at least not with a sufficiently low uncertainty. Runde [1994, 134] and Amendola [1991, 336] prefer to classify this in the precautionary motive, a procedure that seems closer to Keynes's [1936, 196] own inclusion of "yet unforeseen opportunities of advantageous purchases" among the things precautionary balances provide for. However, it is still the possibility of learning that attracts Runde's attention when interpreting the precautionary motive. This is clear in his discussion of Tobin's famous 1958 article. As is well known, Tobin's article depends on risk aversion to justify liquidity preference. Runde [1994, 137] argues that Keynes did not give most importance to risk aversion and that the crucial difference between Tobin and Keynes is that the former precludes the possibility of learning. Tobin uses standard subjective probability theory, in which the issue of the confidence in probabilities does not even appear, whereas for Runde the possibility of learning is closely related to what he calls extrinsic uncertainty, which is uncertainty about probabilities, due to low weight.
11. In contrast, Vercelli [1996, 13] argues that the precautionary demand for money exists only when the decision maker is risk averse and allows him/her to be prepared for unexpected events whose probability distribution is known.
12. Amendola [1991] points out the static, passive way in which learning and flexibility are often related to liquidity preference. He wants to consider the cases in which learning is a result of doing, not of waiting. "Learning of this kind is intrinsically connected with qualitative change: that is, with the construction of something new" [1991, 339]. He then mentions innovation as the typical example of qualitative change. Innovation does involve learning, and Amendola is right in relating the two. I have just pointed out that the possibility of innovation and of other types of unpredictable structural change implies that there are things about which we learn only *ex post*, when the decision has already been made. Amendola [1991, 339-41] argues that the consideration of innovation changes the nature of flexibility and of learning. For him, liquidity acquires a more transactional purpose than a precautionary one. I accept the need to finance the innovation-related expenditures, and I would translate Amendola's ideas in terms of a particular form of the finance motive, but I still maintain that the impossibility of learning everything *ex ante* justifies a precautionary motive for demanding liquidity.
13. Ferderer [1993] tries to show empirically that an increase in uncertainty does indeed have a negative impact on investment. This result may be interpreted in different ways. Ferderer [1993, 20] adopts the theoretical assumption that it is the desire to wait for more information that explains such a reduction, but the strictly precautionary reason discussed in this section may also be at work. Anderson and Goldsmith [1997] try to test Keynes's idea that investment depends on expectations and confidence. They equate confidence and weight, whereas I maintain that confidence depends not only on uncertainty perception

- (which is related to weight), but also on uncertainty aversion. In addition, as argued later on in this paper, an increase in confidence may not have a positive effect on investment. Ferderer [1993] and Anderson and Goldsmith [1997] use forecast surveys. For an attempt to empirically assess Keynes's theory of investment by a direct application of questionnaires, see Baddeley [1996].
14. In contrast, Runde [1994] tends to associate Keynes's references to confidence only with the demand for liquidity due to the possibility of learning. Be it for the contingency or the opportunity argument, Keynes did relate the precautionary motive to uncertainty in Chapter 17 and in the *QJE*, contrary to what he had done in Chapter 15, where the precautionary and transactions motives are lumped together.
 15. This would be compatible with Keynes's [1973a, 118] idea that "the same circumstances which lead to pessimistic views about future yields are apt to increase the propensity to hoard" [see also Keynes 1936, 316]. Keynes considered the marginal efficiency of capital and liquidity preference as independent variables as opposed to the dependent ones, but this does not mean that they are completely independent from one another. On the possibility of interaction between independent variables in Keynes, see also Asimakopulos [1991, 124, 136] and Davis [1994, 169].
 16. The same applies to "whim" and "sentiment" [Keynes 1936, 163], to "hope and fear" [Keynes 1973a 122], and to "emotion" [Davidson 1991, 38], contrary to the sense sometimes given to these terms, according to which they imply irrationality.
 17. See also Keynes [1973a, 115-16], who seems to refuse to consider liquidity preference as irrational when he asks: "Why should anyone outside a lunatic asylum wish to use money as a store of wealth?" He then refers, as quoted above, to our desire to hold money as reflecting confidence and argues that this desire is based "partly on reasonable and partly on instinctive grounds." However, see Winslow [1995] for an interpretation of these instinctive grounds as irrational.
 18. By liquidity illusion I mean an unfounded belief in one's ability to honor monetary commitments, even if unforeseen events occur. In contrast, much of what passes for money illusion is a rational concern with liquidity.

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