Weight of argument and liquidity preference: Keynes after Savage and Choquet.[1]

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Preliminary draft (25.10.13)

Abstract

In this paper we consider liquidity preference as a "rational" choice criterion within a general portfolio theory as sketched by Keynes in Chap.17th of the *General Theory*. The share of liquid assets in the agents' portfolio is increased or decreased according to their expected value as compared with that of less liquid assets. We distinguish four basic components of liquidity value related to (i) weak-uncertainty (or "risk") aversion and (ii) its intertemporal value (both of which may be formalized in terms of the Savage theory of decision), as well as (iii) to (strong) uncertainty aversion and (iv) to its intertemporal value (both of which may be formalized in terms of Choquet decision theory). Though each of these components has been often discussed as a specific, sometimes exclusive, theory of liquidity preference, we suggest that their analysis may be encompassed within a more general conceptual framework.

We emphasize that a full-fledged liquidity preference theory requires a thorough understanding of the crucial foundational role played by the Keynesian concept of weight of argument. In particular its variations along the business cycle alter the value, and relative weight, of each of the four components. In a period of financial tranquillity the weight of argument is believed to be fully reliable and this implies that the first two components play the crucial role consistently with the mainstream view of liquidity preference. On the other hand in a period of crisis the weight of argument is believed to be much less reliable and this implies that the crucial components become the third and fourth ones. In particular in a period of deep crisis, as in the Great Depression of the 1930s, in the Stagflation of the 1970s, or in the ongoing Great Recession, the weight of argument is believed to be so unreliable that the third and fourth components of liquidity preference lead to a persistent liquidity trap.

[1] This work amends, updates and develops a previous paper published in Italian by the author (Vercelli, 1996).

1. Introduction

The theory of liquidity preference is one of the most innovative contributions of Keynes in the *General Theory* (Keynes, 1936) and has continued to inspire, also recently, not only new interpretive insights but also original contributions aiming to extend and further develop the far-reaching Keynesian intuitions. The passages on liquidity preference scattered in the *General Theory*, as well as in preparatory and subsequent works, are stimulating but obscure. As in the cubist paintings that Keynes liked and collected, different viewpoints apparently contradictory are put together without an obvious unifying key. This paper aims to clarify the nexus between some of these viewpoints with the help of insights borrowed from the recent evolution of decision theory under uncertainty and the theory of option value. The target is a contribution to a rational reconstruction of liquidity preference theory in the dual sense of focusing on the rational aspects of Keynes' theory and of rationalising their nexus. This reconstruction aims to be consistent with the spirit of Keynes theory but it looks "forward" toward promising future developments of the approach rather than backward on what Keynes really meant to say.

The structure of the paper is as follows. In the second section we define the object of our analysis: liquidity as "positive" portfolio choice examined from the point of view of behavioural rationality. In section 3 we set the stage for the analysis of the "rational" determinants of liquidity preference by briefly introducing the relevant concepts of uncertainty and an operational version of Keynes' concept of "weight of argument". In section 4 we define the main "rational" components of liquidity preference suggesting a rigorous measure for each of them and their sum. In the light of the conceptual framework worked out in the preceding sections, in section 5 we revisit Keynes' theory of liquidity preference showing that conflicting interpretations do not need to exclude each other. We argue, however, that the relative importance of each component varies in different historical periods and cyclical circumstances. Section 6 concludes.

2. Liquidity as rational criterion of portfolio choice

Liquidity preference theory depends on a complex mix of rational and non-rational factors. Although factors that may look at first sight not-rational, or even irrational, may play occasionally a crucial role as Keynes has eloquently emphasized,[2] in this work I will focus exclusively on factors

[2] A significant example is the following assertion, often quoted, written in a letter after the publication of the *General Theory*: *'A liquidity premium… is a payment, not for the expectation of increased tangible income at the end of the period, but for an increased sense of comfort and confidence during the period' (CW XXIX: 293-4).* A thorough analysis of the non-rational factors in the liquidity preference theory may be found in Winslow (1995).

that may be interpreted as rational. Let me stress, however, that the notion of rationality to which I refer in this work is much broader than the traditional rationality of the *Homo economicus* christened by Simon "substantive rationality" (Simon, 1957). I adopt here a broader concept of rationality that I called elsewhere behavioural (or designing) rationality (see Vercelli, 1991, chap.6, 1994, 1996, 2002 and 2005). This concept does not focus on maximizing equilibria as the traditional concept associated to the *Homo economicus* of "substantive" (or "unbounded") rationality, and aims to go beyond Simon's procedural rationality as it includes within the scope of rationality not only the adaptation to a given environment but also the adaptation of the environment to human needs according to a given design. By assuming the broader view of behavioural rationality the boundary between rational and irrational behaviour shifts including within the scope of rationality also behaviours or decisions that would be considered as irrational according to substantive rationality and occasionally also to procedural rationality.

Liquidity preference may be affected by economic and non-economic factors. The only non-economic factor taken into account in this paper is risk and uncertainty aversion, psychological attitude that is fully consistent with, indeed a precondition of, agent's rationality in our sense as it reflects awareness of ignorance. As for the rational factors, liquidity preference may be seen as revealed by a "negative" decision ('non-decision' or postponement of a decision) or a 'positive' decision choosing the most reasonable option. An interesting 'negative' interpretation has been suggested by Runde (1994, p.142): 'Liquidity preference … is the economic analogue of the situation in which people reject the standard strictures for eliciting numerically definite probabilities by refusing to accept bets at all'. This point of view is not absent in the *General Theory*; in Chap.15 Keynes focuses on an extreme simplification of the more general portfolio approach set in chap.17 as a choice in a given moment between investing in rent-giving securities or postponing their choice to a more favourable moment by keeping liquid the available funds. This binary choice, however, is nothing but a special case of the approach of chap. 17 under the assumption that only two assets exist: cash and bonds where cash does not give an interest but is perfectly liquid and bonds give an interest but are less liquid. The more general point of view is discussed in chap. 17 as a choice between assets having different costs and benefits. The return R of any asset is given by:

$$R = q - c + l + a \qquad (1)$$

where q indicates the asset's expected return net of the risk premium, c indicates the costs of keeping the activity, while l indicates the liquidity premium and a the expected appreciation (or depreciation). The risk premium measures the risk of incurring in a loss to convert an asset in cash in case of unforeseen contingencies (ibidem, p.196). Within this view cash is one of the assets that can be chosen to be kept in the portfolio taking account of its comparative costs and benefits.

Precautionary liquidity preference depends on the fact that the more an activity is liquid the less is the risk premium (that is zero in the limit case of cash). The value of liquidity is in this case a lower notional cost, a sort of 'opportunity return'. In the case of speculative demand the 'liquidity premium' is instead a virtual return from the enlarged set of options offered by liquidity allowing a more efficient exploitation of new information before subsequent choices.
In both cases the choice of a more liquid asset is founded on expectations that may result to be wrong ex post: it may well be that new relevant information will not flow within the choice time horizon or that the speculation undertaken fails. In other words, also the decision of keeping part of the portfolio in cash for a precautionary or speculative motive is just a bet that may or may not succeed. If we interpret this decision as a negative decision it could be difficult to identify ex-post errors determined by this particular bet.

3. Uncertainty and weight of argument

As is well known, according to Keynes (1936), precautionary and speculative demands of liquidity depend both on uncertainty. In our understanding precautionary demand depends on a lower risk of loss for unexpected contingencies, while speculative demand depends on the liquidity premium, that is the potential strategic gain from the exploitation of new information made possible by liquidity. Keynes connects the risk premium to probability and the liquidity premium to the confidence of the decision maker in his own probabilistic beliefs: 'I am rather inclined to associate risk premium with probability strictly speaking, and liquidity premium with what in my *Treatise on Probability* I called "weight" (CW XXIX, pp.293-4). The difference between liquidity premium and risk premium corresponds "to the difference between the best estimates we can make of probabilities and the confidence with which we make them' (CW VII, p.240). The interpretation of these assertions, and other analogous scattered in his work has always been controversial. In particular it has been found unclear the distinction between risk and uncertainty, the concept of weight of argument, and their relation with liquidity preference. The recent advances in decision theory under uncertainty suggest a set of coordinated answers to these questions.
The concept of uncertainty is extremely complex, ambiguous and controversial notwithstanding its crucial role in contemporary economic theory (Dow, 1995). I have thus to clarify in what sense the term is used in this essay. By uncertainty in its broadest sense I mean the awareness of the decision maker of missing relevant knowledge for the decision to be taken. It is legitimate and useful in many contexts to distinguish between first-order uncertainty referring directly to the properties of observed event and second-order uncertainty that refers to the characteristics of probability distributions or alternative measures of first-order uncertainty. This distinction plays a crucial role

in the *Treatise on Probability* (Keynes, 1921) but its soundness has been denied by mainstream probability theory and theory of decision under uncertainty (TDU), in particular by the Bayesian approach. Traditional TDU postulated only one possible modality of uncertainty, that we may call weak, so that agent's beliefs could be exhaustively represented by a unique and fully reliable additive probability distribution complying with Kolmogorov's axioms. In this view the only alternative modality is "radical" uncertainty when the decision maker is unable to formulate any sort of probability distribution sufficiently reliable to be used.

The recent debate encouraged by the emergence of decision theories under strong uncertainty convinced many researchers to introduce a distinction between different modalities of probability when the uncertainty is not definable as radical. According to this new view, between the traditional case of 'weak" uncertainty and "radical " uncertainty we may identify a grey zone, henceforth called "strong" uncertainty in which suitable generalizations of probability, or alternative measures, can be applied with profit to economic problems.

Within the new analytic theory of decision theory under strong uncertainty we may distinguish two basic approaches. The first approach is based upon the assumption that the decision maker's beliefs can be correctly represented only through a set of probability distributions none of which may be considered as fully reliable. This approach has been developed within a research stream that started long ago (Makower and Marschak, 1938; Marschak, 1938, 1949; Hart, 1942; Ellsberg, 1961; Jones and Ostroy, 1984; and so on). The second approach is based on the concept of capacity, a generalization of the probability concept suggested by the eminent mathematician Choquet (1954); it is a measure of first-order uncertainty that, differently from traditional probability, is not additive. This approach is relatively recent, as the first applications to DT go back to the early 1980s and the first applications to economics started to emerge only in the 1990s, and permitted the elaboration of DTU not less analytically sophisticated than the traditional theories based on weak uncertainty. In addition the alternative theories of decision under strong uncertainty have been proved to be equivalent under quite general conditions (see, e.g., Vercelli, 1999). In CCT the degree of second-order uncertainty is given by the degree of non-additivity of the capacity distribution. The less the degree of non-additivity, the less is the degree of second-order uncertainty: in the extreme case of additivity the CCT reduces to the traditional TDU.

In order to connect the recent evolution of DTU with liquidity preference we have to introduce at this stage of our argument Keynes' concept of weight of argument. Given two sets of propositions, the set *h* of assumptions and the set *x* of conclusions, an argument *x/h* is according to Keynes a logical relation the knowledge of which permits to infer *x* from *h* with a certain degree of rational belief *p* that defines the probability of *x* given *h*. In his view, the epistemic and pragmatic relevance

of an argument depends not only from its probability but also from its 'weight' (TP, pp. 72-85 and 345-349; GT, pp. 148 and 240). The concept of 'weight of argument' (also called by Keynes 'weight of evidence') has been interpreted in different ways. We find in the TP different definitions that, at least at first sight, do not seem altogether congruent:

i) According to a first definition often repeated in chapter 6 of the TP headed 'The weight of argument', 'one argument has more *weight* than another if it is based upon a greater amount of relevant evidence' (TP, p.84).
ii) According to an alternative definition that may be found in the same chapter, the weight of argument 'turns upon a balance … between the *absolute* amounts of relevant knowledge and of relevant ignorance respectively' (TP, p.77).
iii) Finally, in chapter 26 the weight of argument is defined as 'the degree of completeness of the information upon which a probability is based' (TP, p.345).

Each of these three definitions aims to measure the degree of knowledge relevant for the probability; however, the first measure is presented as absolute, the second measure is relative to relevant knowledge, the third is relative to the complete relevant knowledge. In my opinion, contrary to the first-sight appearance the three definitions, correctly understood, are fairly consistent and may be represented by the same analytic measure (see Vercelli, 2010)

Most interpreters picked up the 'absolute' definition identifying the weight of argument simply with the amount of relevant knowledge *K*:

(1) $V(x/h) = K.$

The choice of this definition may depend on the fact that it appears at the very beginning of the chapter 6 on the weight of argument and on the frequency of its explicit and implicit references in the TP. This measure, however, is inconsistent with Keynes's crucial assertion that additional evidence may increase the relevant knowledge without increasing the weight of argument: 'the new datum strengthens or weakens the argument, although there is no basis for an estimate how much stronger or weaker the new argument is than the old.' (TP, p.34). This observation clarifies the *rationale* of the second definition. Unfortunately, this important clarification may be found not in chapter 6 on the weight of argument, but in chapter 3 on the fundamental ideas of the TP, before having explicitly introduced the concept of weight of argument, what may explain why the assertion of Keynes has been often neglected. We notice that, according to Keynes, the new evidence may reduce the weight of argument as it may alert the awareness of the agent that the gap between relevant knowledge and complete relevant knowledge is bigger than believed before.

Consistently with the preceding considerations and the second definition of weight of argument, Runde (1990) suggests the following measure:

(2) $V(x/h) = K/I.$

This simple ratio between relevant knowledge and relevant ignorance takes account of the exigency, emphasized by Keynes in his second definition, of taking in due account the relevant ignorance. This measure implies, differently from the first one, that the weight of argument increases only if the relevant knowledge increases more (decreases less) than the relevant ignorance. Also this measure, however, is not fully satisfactory because it is meaningless when the relevant ignorance is zero (complete relevant knowledge), and takes values tending towards infinite, absurd and hardly operational, for values of the relevant ignorance tending to zero.

We may overcome these shortcomings by introducing the following measure that descends from the third definition:

(3) $V(x/h) = K/(K + I)$

In this case the weight of argument increases only if the relevant ignorance *I* diminishes or increases less than the relevant knowledge *K*. This measure has the advantage of being clearly defined also in the extreme case of complete relevant knowledge ($V(x/h) = 1$). In addition, its range of values from zero to one is consistent with the usual measures of uncertainty, such as probability, and conforms to the range of values that also Keynes seems to have in mind (see TP, p.348).[3] Therefore I conclude that the third definition, as expressed in the relation (3), is the most general and satisfactory of the three definitions of weight of argument as it takes account explicitly of the relation between relevant knowledge and both relevant ignorance and complete knowledge. In what follows, thus, I will define and measure the weight of argument as in relation (3).

It is interesting to observe that this last definition may be interpreted as a second-order measure of uncertainty, since knowledge and ignorance refer to first-order measures of uncertainty (generally probability). It is thus possible, to fix the ideas, to interpret Keynes' measure of weight of argument as a measure of the degree of non-additivity of capacity distribution. A simple measure of this kind is the following (Dow and Werlang, 1992a and b):

(4) $c(P,A) = 1 - P(A) - P(Ac),$

where *A* is an event and *Ac* is its complement. According to Dow and Werlang the (4) defines a possible measure of (second order) uncertainty aversion but it may also be interpreted as awareness of (second order) uncertainty on the part of the decision maker. It is evident the strict analogy between (4) and (3). The unity stands for a complete second-order knowledge while $c(P,A)$ is an

[3] By introducing the usual criterion of normalization of probability measures $K+I = 1$ (criterion that has been utilized by Keynes himself in the TP, for example in p.348), this measure subsumes also the first definition.

index of second-order ignorance.[4] By applying to (4) the notation utilized in (3) and the normalization of note 3 we obtain that the weight of argument is the complement to one of *c(P,A)*, that we have interpreted as an index of ignorance awareness:

(5) $c(P,A) = 1 - P(A) - P(Ac) = 1 - K = I/(K + I) = 1 - V(x/h)$.

Therefore the higher the awareness of ignorance, the lower is the weight of argument.

4. Risk premium, liquidity premium and option values

As we have recalled before, Keynes defined liquidity as realizability at short notice without loss (CW VI, p.59). This definition immediately suggests that the liquidity of an asset depends on two magnitudes: the transaction costs connected to its transformation in cash (liquidation) and the time horizon within which the liquidation of the asset must be completed. A measure of liquidity must take account of both factors: given the deadline of liquidation, liquidity is inversely proportional to the expected costs of liquidation, while, given the latter, liquidity is inversely proportional to the expected times of liquidation. Only in the case of cash both the expected costs of liquidation and the time requested for it are in principle nil. For our purposes it is essential to notice that, within a certain liquidation deadline and given the maximum value of transaction costs, a more liquid asset may be exchanged with a wider set of assets. A given amount of cash may be virtually exchanged with any sort of assets non exceeding its value, while a very illiquid asset (say an industrial plant) may not be exchangeable with any other asset (including money). These observations suggest that the value of liquidity has in its essence the nature of an option value since an asset *x* is more liquid than an asset *y* if, given a time horizon and a balance sheet constraint, the asset *x* leaves open more exchange options than *y*. We may thus interpret liquidity as a special case of intertemporaral flexibility referred to market transactions (see Hicks, 1974; Jones and Ostroy, 1984; Vercelli, 1991, chap.5 and Appendix 5A).

The preceding observations suggest the idea of applying the theory of option values to the study of liquidity value not only to clarify its nature and sources but also to provide an operational measure. The traditional theory of option value postulates weak uncertainty and distinguishes between option value *tout court* and intertemporal option value, also called quasi-option value (see Basili and Vercelli, 1994). These two types of option value correspond to different aspects of liquidity preference theory, captured separately by different interpretations. It seems reasonable to refer the

[4] Unfortunately this measure of uncertainty aversion applies only as 'local' measure in relation to a given event. A more general measure has been suggested by Montesano (1999). Also in this case weak and strong uncertainty aversion are separable, since strong uncertainty aversion depends on the non-additivity of Choquet capacities while weak uncertainty aversion depends on the non-linearity of the utility function.

option value *tout court* to the precautionary demand of liquidity since it measures the "opportunity return" deriving from the lower risk premium. This value crucially depends on the degree of risk aversion on the part of the decision-maker. This aspect of liquidity value has been thoroughly investigated by Tobin in his famous article rightly called 'Liquidity Preference as Behaviour towards Risk' (Tobin, 1958). This work enjoyed a well-deserved success because it was the first that worked out liquidity preference theory in rigorous analytic terms. He succeeded in this task, however, only by restricting the analysis upon a particular aspect of the theory that, by the way, Keynes believed to play only a secondary role, if any. The limits of this approach have been emphasized several times. The impossibility of giving a role to learning makes Tobin's theory unable to explain the speculative demand of liquidity that plays a crucial role in Keynes' causal vision (Hicks, 1974, Makowski, 1988, p.330). In addition the assumption of weak uncertainty does not see that liquidity preference theory focuses mainly on "behaviour towards uncertainty", i.e. strong or second-order uncertainty (Chick, 1983, pp.214-16; Davidson, 1988, p.330). Finally, transaction costs are ignored questioning the fitness of Tobin theory to interpret liquidity preference theory though only in a very partial way (Jones and Ostroy, 1984).

The intertemporal option value may be referred instead to the speculative demand of liquidity and depends on the liquidity premium in the hypothesis that uncertainty is weak. This aspect of liquidity value that was not taken explicitly in consideration by Keynes has been recently analyzed by Makowsky (1989). In an intertemporal decision problem characterized by weak uncertainty, irreversibility (given in this case by transaction costs) and opportunity of learning, a more flexible position (because more liquid) has an intertemporal option value that is a growing function of the degree of liquidity and of potential learning depending on the degree of uncertainty perceived by the decision maker.[5] This component of option value (and thus also of liquidity value) has been recently further explored with the sophisticated instruments of the theory of stochastic systems that strengthened the operational content of the theory (Dixit and Pindyck, 1994).

The precautionary and speculative demand for liquidity have been analyzed so far only from the point of view of weak uncertainty. However the value of liquidity according to Keynes depends not so much on complex comparative calculations of future returns of assets made possible by the assumption of weak uncertainty but on the degree of confidence on these calculations, that is on second order uncertainty or strong uncertainty. We have thus to enter a territory much less explored but much more exciting.

[5] This point has been lucidly, but only verbally, clarified by Hicks (1974) and contemporaneously and independently proved in analytic terms, though in a different context, by Arrow and Fisher (1974) and Henry (1974a and b).

It is quite controversial whether the crucial role assigned by Keynes to strong uncertainty in liquidity preference theory is to be related more to the precautionary or speculative demand of money. The traditional point of view of post-Keynesian economists stressed the link between strong uncertainty and speculative demand (Chick, 1983). Runde (1994) maintained that strong uncertainty plays a crucial role mainly in the precautionary demand. Analogously, Winslow (1994) argued that the precautionary demand is affected by both risk and uncertainty while ignoring the possible influence of strong uncertainty on the speculative demand. In our opinion Keynes stresses the importance of strong uncertainty for both demand motives. This is altogether clear in a famous passage in which Keynes claims that an expansionary money policy may be useless since it could increase the uncertainty and thus liquidity preference. The argument is applied separately to both demand motives. As for precautionary demand, Keynes maintains that 'a large increase in the quantity of money may cause so much uncertainty about the future that liquidity-preferences due to the precautionary-motive may be strengthened' (Keynes, 1936, p.172). In this case the value of liquidity can be measured by the associated option value under strong uncertainty (henceforth s-option value to be distinguished from the usual option value, in our language w-option value) that depends on strong uncertainty aversion (to be distinguished from the usual risk-aversion, in our language weak-uncertainty aversion). The s-option value has the same underlying logic than w-option value and their effects add up: it is possible to show that the total uncertainty aversion may be decomposed in two additive components one for w-option value and one for s-option value (Montesano, 1991, 1993 and 1999). Summing up, the total precautionary value of liquidity is given by the sum of its w-option value that depends on risk (weak uncertainty aversion) and s-option value that depends on strong uncertainty aversion.

As for the speculative motive, the nexus between speculation and confidence expressed by the weight of argument is analyzed in chap. 12 and resumed in chap.15, where Keynes investigates why and to what extent 'changes in the liquidity function itself, due to news which cause a revision of expectations, will often be discontinuous, and will, therefore, give rise to a corresponding discontinuous change in the rate of interest.' (1936, p.198). The paradigmatic example is that of a bear speculator who forecasts a proximate increase in the rate of interest and thus a reduction in the price of bonds and keeps liquidity in his portfolio to be ready to exploit the opportunities offered by the increase in the rate of interest as soon the prediction will materialize. In this case the return may be sizeable while the cost (in the case the hypothesis happens to be wholly or partly falsified) is generally limited whenever the time horizon is short, as is typical of speculation. This cost is analogous to that of an option call on a security expected to depreciate. This paradigmatic case is nothing but a special case of the same more general conceptual structure: a more liquid portfolio

confers to the decision maker more freedom in the future allowing a more efficient exploitation of the information and a prompt change in decision strategy. The value of liquidity kept for speculative purposes can be measured through its intertemporal s-option value. The underlying logic of the intertemporal s-option value is altogether analogous to that of the intertemporal w-option value as it depends on the degree of liquidity of the asset and on potential learning; also in this case it can be made independent of second-order uncertainty aversion. Therefore the liquidity preference for speculative purposes may be decomposed in two additive components measured respectively by its intertemporal w-option value and intertemporal s-option value.

Summing up we can express the four components of liquidity preference and their nexus with uncertainty in a synoptic table where each components is characterized by a capital letter for the sake of clarity in the subsequent discussion.

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fig.1 about here

Each of these components has been discussed in the past as a specific view on liquidity preference. The view A has been investigated by Tobin (1958). The view B has been advanced, among others, by Hicks (1974) and Makowski (1989). The view C has been emphasized by Runde (1994) and Winslow (1995) though not in an exclusive form; the view D has been developed by Jones and Ostroy (1984) through an approach to strong uncertainty based on a multiple priors approach and, more recently, by Dow and Werlang (1992a and b) who have utilized an approach based upon Choquet capacity theory.

If the analysis developed in this paper is correct the four dimensions of liquidity preference do not exclude each other but may be seen as complementary. The views A and C do not exclude each other because the aversion to weak uncertainty and to strong uncertainty may be factorized in additive components (see retro note 2). The views B and D do not exclude each other since learning to reduce weak uncertainty is different from learning to reduce strong uncertainty. The views A and B are distinct since the intertemporal option value (quasi option value) is independent on risk aversion. The separation between the views C and D may at first sight seem more problematic because a convex capacity implies at the same time strong uncertainty and strong-uncertainty aversion. However Ghirardato (2001) has suggested an amendment to Choquet capacity theory that permits a sharp separation between s-uncertainty aversion underlying the view C from the awareness of s-uncertainty and the ensuing potential learning underlying the view D.

The views classified in table 1 do not offer a complete list of the causal factors impinging on liquidity preference according to the immense literature. As I clarified at the beginning of this paper

we ignored the non-rational factors that interact in a significant way with the "rational" ones considered here and we focused exclusively on those connected with uncertainty. The list of the latter is not exhaustive either. I have to mention at least a further view that claims to be the correct interpretation of Keynes's own view: liquidity preference is seen as behaviour against radical uncertainty (Davidson, 1988). There are good reasons to hold this point of view that finds support both in Keynes passages and in the real world. However in our opinion this view is not necessarily in conflict with the other views reviewed above. We can define radical-uncertainty aversion as an extreme case of strong uncertainty aversion postulating a substantial continuity in its measure from the case of a weight of argument just lower than 1 to a weight of argument about zero (radical uncertainty). Keynes, however, seems to relate radical uncertainty mainly to the non-rational determinants of liquidity preference (see note 2 above). As for the speculative motive, its role depends on what the decision maker believes about future uncertainty. If he believes that uncertainty on the relevant phenomena will continue to be radical in the foreseeable future, by definition there is no space for learning so that the speculative motive evaporates; however, if learning is not excluded we fall back in the case of strong uncertainty.

Going back to the interpretation of Keynes's own view in the *General Theory* in the light of table 1 we may say that the emphasis is no doubt mainly on views C and D but, as we have seen before, we may detect traces also of A and B. The concept of weight of argument plays a crucial role not only in explaining the component D but also in coordinating the different points of view. If we define the value of liquidity in additive terms as suggested above there is no reason to exclude A and B from the Keynesian theory although the principal components of the total value is given by C and D. In particular the component B, that has the same logical structure of component D, has in itself a very limited scope for the following reasons:

(i) weak uncertainty decision theories are based on the axiom of independence (or the equivalent axiom of the "sure thing" in the Bayesian approach) that guarantees the intertemporal coherence of tastes and beliefs of the decision maker, but this leaves a very limited scope for learning and thus for a genuine intertemporal flexibility preference that implies a likely change in tastes and beliefs.

(ii) even if one believes that the preceding problem may be circumvented through an apt generalization of the independence axiom (see, e.g., Machina, 1982 and 1987), the value of potential learning under weak uncertainty is very limited as it refers for each expected variable to a unique additive probability distribution assumed to be fully reliable.

On the contrary, under strong uncertainty genuine modifications in tastes and beliefs become possible, while the scope of potential learning greatly expands together with the awareness of ignorance. The correctness of Keynes' intuition that strong uncertainty plays a crucial role in the

explanation of the speculative demand of liquidity may be confirmed by a series of arguments and observations showing that the viewpoint D easily explains many phenomena observed in real financial markets that the point of view B is unable to explain. In particular:
i) the high volatility of securities prices that is puzzling under the assumption of weak uncertainty receives a simple explanation under strong uncertainty (Dow and Werlang, 1992a);
ii) an increase in the degree of strong uncertainty perceived by the decision maker implies, as argued in section 3, a reduction in the weight of argument and thus an increase in liquidity value (measurable as an increment of the intertemporal s-option value);
iii) the inertia observed in financial markets when the price of one or more assets changes may be easily explained as the consequence of rational behaviour under strong uncertainty without being compelled to introduce ad hoc assumptions on the elasticity of the liquidity preference curve as in Modigliani (1944), Tobin (1958) and the Keynesian textbooks (see in particular Simonsen e Werlang, 1991). In addition an increment of uncertainty increases the investors' inertia (Dow and Werlang, 1992b) explaining the so-called "liquidity trap" without ad hoc assumptions on the elasticity of liquidity preference curve. According to Keynes (1936) this phenomenon occurs when monetary policy authorities engineer a reduction in the rate of interest to boost the economic activity but this intervention is thwarted by the increase in the degree of strong uncertainty produced by this intervention when the latter encourages more pessimistic expectations. The recent policy of quantitative easing pursued in the US and in the Eurozone seems to be a case in point.

5. The evolution of liquidity preference theory

According to Sir John Hicks the concept of liquidity first appeared in the work of Keynes (Hicks, 1989, p.61, and 1962, pp. 238-47). In the *Treatise on money* Keynes gave a famous definition of liquidity that became the standard reference for the subsequent literature: a liquid asset is "…certainly realizable at short notice without loss" (Keynes, 1930, vol.2, p.67.). According to Hicks, the passage from which this definition is taken is "extremely important … because it is the first place where Keynes spoke of liquidity (and it may also be the first place where any economic and financial writer spoke of liquidity)" (Hicks, 1989, p.61). Liquidity continued to play a crucial role in Keynes' subsequent work. In the *General Theory* it is the polar star explaining the process of financialisation (chap. 12), the crucial determinant of the money rate of interest (chap. 13), a basic dimension of the generalized process of portfolio choice that manages a monetary economy (chap. 17). Keynes' priority may seem at first sight hardly credible although it is supported by such a reliable scholar as Sir John having a deep knowledge in the history of economic analysis. We may speculate that an accurate research would find a certain number of predecessors, as always happens

in similar cases: “nothing new under the sun”. For example Laidler (2005) maintains that we find a significant predecessor in Lavington (1921). Keynes himself maintains that “the concept of hoarding may be regarded as a first approximation to the concept of liquidity-preference” (Keynes, 1936, p.174). However, in a deeper sense, Hicks’ assertion seems to me substantially sound whether this depends on a different language used by previous economists to discuss similar problems (e.g. hoarding) or by their vaguer conceptualization: only with Keynes the concept of liquidity and the theory of liquidity preference enter in economics as crucial theoretical constructs deeply affecting economic theory and policy. This may be explained in historical terms. Keynes wrote at the end of a long period of progressive financialization of the economy that spread in the second half of the 19th century up to the WW1. Some historians called it “first financialization” to distinguish it from the “second financialization” of the last three decades or so. The driving force of the process, in the light of Keynes’ observations in the *General Theory*, was the progressive transformation of all the forms of capital in liquid assets (chap. 12). In particular, the generalization of joint-stock companies may be seen as a first formidable form of securitization as the very illiquid real capital of firms was transformed in relatively liquid shares. The process of financialization had conferred to liquidity a prominence and a role that was unknown in the earlier phases of capitalism. In the meantime the growing role of the state in the economy had increased the number and amount of sovereign bonds to finance public expenditure and debt. Therefore, in consequence of this dual process, private and public securitization, the quantity and variety of securities had greatly increased, giving a crucial role to portfolio choices (not by chance also portfolio theory emerged in the same period (Makower and Marshak, 1938). Finally the Great Depression had made evident the crucial role of liquidity in affecting the financial stability of economic units and of the whole system.

The concept of liquidity should not be confused with that of money. It is a property of assets in general as they may possess this quality in lower or higher degree. Only when the number of assets is sufficiently large and portfolio choices sufficiently systematic this property starts to play a crucial role as determinant of aggregate behaviour. Keynes understood the crucial role of liquidity and of the reasons for its preference in financialized capitalism, as made evident by the Great Depression, but he did not attempt to measure the value of liquidity to be compared in the portfolio formula (1) with that of the other assets taking into account the rate of interest, carrying costs and expected appreciation or depreciation of assets that are in principle measurable. The immediate followers of Keynes were deeply absorbed in the translation of the Keynesian theory in the operational language of econometrics and struggled to accommodate liquidity preference in their models. Crucial contributions in this direction came from Modigliani (1944) and Tobin (1958) who modelled liquidity preference as “behaviour against risk”. A formalization and a measure were obtained by

applying the emerging axiomatic theory of decision under uncertainty either in its objectivist version (von Neumann and Morgenstern, 1944) or in the Bayesian version (De Finetti 1937, and Savage, 1956). In this view the value of liquidity crucially depends on the so-called risk aversion of decision makers where by "risk" is meant what we have called weak uncertainty (view A in our table). This focus on weak uncertainty was fully consistent not only with the contemporaneous evolution of decision theory and its operational insights, but also with the remarkable financial and economic stability of the Bretton Woods period (1944-1971). Only in the 1970s a few forward looking scholars (Arrow and Kurz, 1970; Hicks, 1974; Goldman 1974 and 1978; Kreps, 1979) started to work out a more sophisticated theory of liquidity preference that relaxed some of the axioms of weak uncertainty decision theory (independence or "sure thing" axioms) to take account of time irreversibility and the opportunity of genuine learning (view B). This is consistent both with a more critical understanding of the limited scope of decision theory under weak uncertainty and with a more turbulent era characterized by unforeseeable structural changes and the need to adapt promptly to new circumstances through learning. The new economic environment was also conducive to the exploration of new approaches aiming to build a theory of decision under strong uncertainty as rigorous and operational as those under weak uncertainty. Three main approaches emerged: fuzzy sets (Zadeh, 1978; Billot, 1992), multiple priors (Hart, 1942), Choquet capacities (Schmeidler, 1982, 1989; Gilboa, 1987, 1989; Gilboa and Schmeidler, 1989, 1993), applied also to liquidity preference (Simonsen and Werlang, 1991). The growing financial instability contributed to attract a growing attention to strong uncertainty vindicating Keynes' insights.

We have emphasized in this paper that a full-fledged liquidity preference theory requires a thorough understanding of the crucial role played by the Keynesian concept of weight of argument. Not only a weak weight of argument underlies the third and fourth components of liquidity preference, but its variations along the business cycle alter the value, and relative weight, of each of the four components. In a period of financial tranquillity the weight of argument is believed to be fully reliable and this implies that the first two components play the crucial role consistently with the mainstream view of liquidity preference. On the other hand in a period of crisis the weight of argument is believed to be much less reliable and this implies that the crucial components become the third and fourth ones. In particular in a period of deep crisis, as in the Great Depression of the 1930s, in the Stagflation of the 1970s, or in the ongoing Great Depression, the weight of argument is believed to be so unreliable that the third and fourth components of liquidity preference lead to a persistent liquidity trap.

Summing up, the different dimensions of liquidity preference that may be detected in Keynes need not to be seen as contradictory while his emphasis on the dimensions related to hard uncertainty are

likely to play the crucial role as Keynes maintained, particularly in periods of severe financial instability such as the period in which Keynes wrote and the recent and current one.

6. Concluding remarks

In this work liquidity preference has been investigated as a positive portfolio choice based on rational principles. The approach here suggested permits in principle to measure the value of liquidity taking account of its main rational aspects. Profiting of the recent advances in the theory of decision under strong uncertainty and in option value theory we have suggested a conceptual framework that helps to co-ordinate different dimensions of liquidity preference under uncertainty, suggesting for each of them a method, in principle operational, to measure the value of liquidity. The sum of these measures defines for each asset the total value of liquidity, that contributes to explain, together with maintenance costs and expected returns or losses, the financial choices of a rational agent. The analysis has excluded non-rational factors and those unrelated to uncertainty focusing on the four main components of liquidity preference of rational decision makers under uncertainty. Although these components have been investigated in the past mainly as specific, often alternative, interpretations of the Keynesian theory we have claimed here that in principle they do not exclude each other and may be recomposed within a more general theory of liquidity preference. Keynes himself referred to at least three of the four components though he focused mainly on the two components depending on strong uncertainty. In the light of the analysis developed here, the coexistence in Keynes (and other authors) of different notions of liquidity preference does not need to be necessarily considered as a sign of incoherence or confusion. We have seen, however, that the relative importance of these components varies with the economic conditions. In particular during a serious crisis, as Keynes lucidly understood, liquidity preference depends mainly on strong uncertainty easily leading to a situation of liquidity trap.

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Weight of argument = x	Uncertainty aversion (Precautionary motive)	Potential learning (Speculative motive)
Weak uncertainty (x = 1)	***A: w-option value***	***B: intertemporal w-option value***
Strong uncertainty (0 < x < 1)	***C: s-option value***	***D: intertemporal s-option value***

Table 1: The main "rational" components of liquidity preference