THE FINANCIAL DIMENSION OF ECONOMIC DECISION-MAKING
(Towards an integrated theory of consumption demand, money and assets by households)

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"El Ensayo es la ciencia menos la prueba explícita"

Ortega y Gasset (1914) Meditaciones del Quijote

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Resumen

El principal defecto de la macroeconomía de hoy es que subestima la dimensión financiera de las decisiones económicas, que reduce el papel esencial del dinero en las economías avanzadas como se manifiesta en los procesos de préstamos y deudas. En consecuencia, para cubrir este vacío, proponemos un modelo que añade nuevas dimensiones al proceso de toma de decisiones de las familias, de manera que los hogares se caracterizan por decidir no sólo lo que tienen que consumir y ahorrar, sino también de realizar las funciones características de un *banquero privado* que se plantea como objetivo maximizar su riqueza – tanto la proveniente del pasado como la generada por el ahorro actual- bajo condiciones de incertidumbre. En este contexto los criterios de *rentabilidad, liquidez y solvencia*, características de la teoría bancaria, también constituyen los criterios que subyacen en el comportamiento optimista de los hogares, ofreciendo un marco unificado de elecciones, tanto aquellas que conciernen el consumo y a la distribución de la riqueza como las relativos a los préstamos y a la deuda, que de otra manera serian inconsistentes.

Las consecuencias que derivan de esta aproximación son tremendamente enriquecedoras. Desde un punto de vista teórico, nuestro modelo destaca la relevancia del concepto que hemos denominado como *capacidad financiera*, sugiere la necesidad de reconsiderar el papel de la riqueza humana en el hecho de dar forma a la riqueza global. Ello cuestiona el punto de vista clásico sobre los eventuales efectos expansionistas de la deflación en el consumo y alimenta las dudas que existen acerca del impacto de las variaciones en los intereses de los préstamos sobre el comportamiento de los hogares, mientras identifica un conjunto de efectos de riqueza que tiene un alcance mas amplio que el que se considera habitualmente.

Desde una perspectiva aplicada, nuestro modelo allana el camino para que los procesos de especulación financiera e inmobiliaria, de deuda y prestamos, el acelerador financiero y, hablando en términos generales, todos los fenómenos relacionados con la acumulación de la riqueza, puedan ser incorporados a nuestros modelos macroeconómicos y ofrecernos una representación mucho más fiel de lo que está pasando en el mundo real.

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Abstract

The main flaw of today's macroeconomics resides precisely in that it underestimates the financial dimension of economic decisions, which dilutes the essential role of money in advanced economies as it is manifested in the processes of borrowing and debt. Therefore, in order to cover this lacuna, we propose a model that adds new dimensions to the area of household decision-making, so that households are featured deciding not only what they ought to consume and save, but also performing the functions characteristic of a *private banker* that aims at maximizing his wealth—both that carried over from the past and that generated by current saving—under conditions of uncertainty. In this context, the criteria of *profitability, liquidity* and *solvency*, characteristic of banking theory, also constitute the criteria underlying the optimising behaviour of households, offering a unified framework to choices, such as those pertaining to consumption and wealth distribution as well as borrowing and debt, that would otherwise be inconsistent.

The consequences that derive from this approach are enormously enriching. From a theoretical standpoint, our model highlights the relevance of the concept that we have termed *financial capacity,* suggests the need to review the role played by human wealth in shaping the overall wealth, questions the classical view on the eventual expansionary effects of deflation on consumption, and feeds the doubts that exist as to the impact of variations in the lending interest rates on the behaviour of households, while it identifies a set of *wealth effects* that has a broader scope than the one that is usually considered. From an applied perspective, our model paves the way so that the processes of financial and real estate speculation, debt and borrowing, the financial accelerator and, broadly speaking, all phenomena related to wealth accumulation, can be incorporated to our macroeconomic models and offer us a much more faithful representation of what occurs in the real world.

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Contenido

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SECTION 1

INTRODUCTION

When getting up every morning, the head of the family unit is forced to make a number of decisions related with what we could call the ordinary affairs of economic life. In the most frequent case that he is an income-earning person, he will have to decide what proportion of his earnings he ought to set aside for purchasing various kinds of consumer goods and what proportion he believes necessary to save, whether as a safeguard to meet future needs or to leave his fortune to his heirs or to whomever or whatever he wants to. And while he decides what to do with his savings, he will also have to decide how to allocate his wealth among the various alternatives for value preservation, because we must assume that our man or woman will have some wealth that he or she has either inherited from his distant or recent ancestors, or that he will have had the fortune of generating through more or less speculative investments, or managed to accumulate through the effort of his saving over the course of time. In any of these events, and to mention only the most common options, he will have to choose what part of his wealth he will have to hold in the form of money, bonds, stocks or real state, with a view to maximizing his future wealth in function of the prospects for profitability offered by the alternative assets. Besides, most of these decisions, or at least the most transcendent ones, will have to be adopted under conditions of uncertainty, thus making things much more difficult for this *homo oeconomicus*, who not only acts as a conventional consumer but also behaves—and herein we begin to unveil the secrets of this article—as a *private banker* endowed with a greater or lesser aversion to risk, adopting decisions about his wealth by trying to find a suitable balance between the various banking categories of *solvency, profitability* and *liquidity*.

The decisions of various kinds that the head of the family unit will be forced to adopt, nevertheless share one common trait—all of them are necessarily interrelated. The decision to spend a greater proportion of our income means saving a lesser part of it. The decision to spend more than what we earn in consumer goods may only be carried out at the price of reducing our net worth, be it by selling assets, be it by getting ourselves into debt using them as collateral. The decision to save may only be undertaken by increasing the amount of our money or of our non monetary assets, whether financial or real assets. If we have decided to sell a residential property, that is because we want to increase our financial assets, to pay off a debt, to consume more, to buy company stocks or government bonds, to increase our holdings of money, or any combination of all these alternatives. And if we have decided to buy a residential property, it will be at the cost of saving more, consuming less, entering into debt, selling part of our property assets, reducing our holdings of money, or any combination of all these options. Whatever the reasons inducing the head of the family unit to take these decisions, there is a *golden rule* ensuring the interrelation we have referred to. And that golden rule is the following:

Any excess of family income on consumption spending must necessarily be equal to the sum of the net variation of their holding of money stocks, plus the net variation of their non-monetary assets, plus the net variation of their debts [1].

[1] That *golden rule* we have just referred to was already explained by Hicks in his celebrated essay "*A Suggestion for Simplifying the Theory of Money*," published in February 1935 in *Economica*, where he claimed that: "An individual´s decision to hold so mucho money means that he prefers to hold that money, rather than either less or more. Now what are the precise contents of these displaced alternatives? He could reduce his holding of money in three ways:1. By spending, i.e. buying something, it does not matter what; 2. By lending money to someone else; 3. By paying off debts which he owes to someone else. He can increase

Any theory attempting to provide a coherent explanation of the type of decisions we are considering, ought to take this restriction into account, which is tantamount to saying that the demand functions of goods and services, financial or real assets, loans and money, are necessarily interrelated.

Although all the above is obvious, the economic theory—both in its microeconomic and macroeconomic aspects—has, to date, proven unable to provide us with a theoretical framework from which we might derive, in an integrated and consistent way, the decisions we have just alluded to. We have a microeconomic theory of consumer behaviour that enables us to explain how to distribute consumer's monetary allowances among different goods. Notwithstanding that, this theory was not conceived to deal with decisions involving the demand for stocks, money and other assets. In the classic theory of consumer behaviour, these categories of demand simply did not exist, and the same applies to the microeconomic theory of intertemporal consumption [2]. We have a macroeconomic theory of aggregated consumption that started with Keynes and reached its point of perfection with Friedman, Modigliani, Miller, Brumberg and Ando. But in it, the demand for consumption is also independent from a demand for money and other assets and of decisions concerning indebtedness. Unquestionably, in those developments, wealth acquires a major role, but it does so as an explanatory variable *out of the blue*, and not as a central object of the process of decision making [3]. Corroborating this dichotomy, there is also a theory of the demand for money coming from the most primitive formulations of the quantitative theory whose highest points may be identified with Marshall, Keynes and Friedman, but the fact that the most relevant contributions in this field were simultaneously incubated with the demand for consumption in two of the most eminent and influential minds in the 20th century economy—Keynes and Friedman—has not served for the actual development of a unified theory of both behaviours. In this case, consumption is what is left outside the analysis, whilst wealth, although also appearing as a fundamental explanatory variable, is equally marginalised from the maximisation process carried out by the agents [4]. Finally,

his holding of money in three corresponding ways: 1. By selling something else which he owns; 2. By borrowing from someone else; 3. By demanding repayment of money which is owed by someone else". And he continues: "This classification is, I think, complete. All ways of changing one´s holding of money can be reduced to one of these classes or a combination of two of them – purchase or sale, the creation of new debts or the extinction of old". See Hicks, J.R.: "Suggestion for Simplifying the Theory of Money*"*. *Economica*, February 1935, Pags. 4–5. Reprinted in Hicks, J.R.: *Critical Essays in Monetary Theory*, Oxford University Press, 1967.

[2] The microeconomic theory of intertemporal consumption incorporates savings and loans into the analysis, while omitting money. The reason for this is very simple: in that theory, it is assumed that the decision agent always has the power to invest every period's savings at a given and known interest rate over a finite or infinite temporal horizon; subsequently, that agent will never deem it necessary to preserve all or part of his wealth in the form of money. Some modern authors, for instance Barro (Barro, R.J.: *Macroeconomics*, John Wiley and Sons., Inc., New York, 1984) introduces money into the intertemporal budget restriction; however, as money is absent from the objective function of the subjects, the final result is that money is just a means for exchange rather than a store of value. For money to be part of the representative agent's assets' portfolio, there must be some type of risk associated to the ownership of non-monetary assets. However, when this assumption of uncertainty is considered, the intertemporal model of consumption begins to lose its meaning.

[3] After the original Keynesian formulation of the consumption function in the General Theory (Keynes, J.M.: *The General Theory of Employment, Interest and Money,* Macmillan, London, 1936) the most significant progress in the field of macroeconomic theory of aggregated consumption have derived as is well known, in the contributions by Duesenberry (Duesenberry, J.S.: *Income, Saving and the Theory of the Consumer Behavior*, Harvard University Press, Cambridge, Mass., 1949) Modigliani, Brumberg and Ando (Modigliani, F., Brumberg, R.: "Utility Analysis and the Consumption Function: An Interpretation of the Cross-Section Data" in Kurihara, Ed: *Post Keynesian Economics*. Rutgers University Press, 1954; Ando, A., & Modigliani, F.: "The Life Cycle Hypothesis of Saving" in *American Economic Review*, 53, May, 1963); and Friedman (Friedman, M.: *The Theory of the Consumption Function*. Princeton University Press. Princeton, New Jersey, 1957).

[4] As far as demand for money is concerned, a very important part of research focused initially, as is also well known, on the support and rationalisation of the famous Keynesian *motives*. Demand for money by the *transaction motive* within the deterministic case was studied by Baumol and Tobin (Baumol, W.: "The Transaction Demand for Cash: An Inventory Theoretic Approach" in *Quarterly Journal of Economics*, 66, November 1952; Tobin, J.: "The Interest Elasticity of Transaction Demand for Cash" in *Review of Economics and Statistics*, 38, August 1956) and was later the object of many extensions. For an analysis

there is also a sophisticated theory of portfolio decision-making under conditions of uncertainty based on the concept of expected utility devised by Markowitz and Sharpe that emerged from the pioneering contributions of Von Neumann and Morgenstern. Nevertheless, these developments, together with the more modern ones of the new theory of financial behaviour grounded in Kahneman's works, have evolved, both conceptually and methodologically, entirely autonomously and disconnected from previous ones [5]. Thus, the representative agent of this compartmentalized economic theory is a rather limited character: when consuming, he does not administer assets, and when administering assets, he does not consume; and in either one of these two cases, he does not administer money.

The only serious and coherent way to face the problem we are dealing with here is to adopt integrated approaches of the sort developed initially by Tobin, Samuelson and Patinkin, followed by the *non-Walrasian* economic models developed by Benassy and Malinvaud, that flourished again more recently with the contributions of the New Keynesian Economic School, with authors such as Blanchard, Kiyotaki, Rotemberg and Ireland. These have recently been the object of a renovated impulse, in the wake of the devastating effects of the last financial crisis, in the work of Christiano, Motto and Rostagno [6]. Thanks to all these contributions, the path towards the integration of the

of the *precautionary motive*, we should cite Patinkin, Gray and Parkin (Patinkin, D.: *Dinero, Interés y Precios*. Aguilar, Madrid, 1959; Gray, M.R. & Parkin, J.M.: "Portfolio Diversification as Optimal Precautionary Behaviour" in Morishima et al.: *Theories of Demand, Real and Monetary*, Oxford University Press, London, 1973). The best known example of rationalisation of the *speculative motive* in the demand for money is that of Tobin (in Tobin, J.: "Liquidity Preference as Behaviour Toward Risk*"* in *The Review of Economic Studies*, February, 1958, reprinted in *Lecturas de Macroeconomía* compiled by G. Mueller. CECSA, Barcelona, 1971). The new emergence of the quantitative theory of money is due, above all, to Friedman (Friedman, M.: *A Theoretical Framework for Monetary Analysis*, National Bureau of Economic Research, New York, 1971).

[5] As is well known, in these models economic agents maximize an expected utility function taking into account the degree of risk associated with the different alternatives for investment offered to an investor who behaves exclusively as such. The origin of these developments can be found in the already classic work by Von Neumann, J. & Morgenstern, O.: *Theory of Games and Economic Behavior*. Princeton University Press, N.J., 1947 and their most relevant milestones are linked to the names of Markowitz – Markowitz, H.M. (1952): "Portfolio Selection" in *Journal of Finance,* Vol.7, Nº1, y Sharpe – Sharpe, W.F.(1963): "A Simplified Model for Portfolio Analysis", in *Management Science*, Vol.9, Nº2; Sharpe, W.F.(1964): "Capital Assets Prices: A Theory of Market Equilibrium under Conditions of Risk", in Journal of Finance, Vol.19, Nº3; and Sharpe, W.H.(1970): *Portfolio Theory and Capital Markets*, McGraw Hill, New York, (1970). The starting point of the new theory of Behavioral Finance can be found in Kahneman, D. & Tversky, A: "On the Psychology of Prediction" in *Psychological Review*, no. 80, 1973, pp. 263-291, and its main development in Kahneman, D., and Tversky, A. (1970): "Prospect Theory: An Analysis of Decision under Risk". *Econometrica*, Vol. 47, March, 1979. Pags. 263-291.

[6] The integrating approaches we are referring to, are basically defined by the inclusion of money into the utility function. Following Hicks' suggestion (Hicks, J.R.: *Op. Cit*.) that approach has been developed above all by Samuelson (Samuelson, P.A.: *Foundations of Economic Analysis*, Cambridge, Mass., 1947), by Patinkin (Patinkin, D.: *Op. Cit*.) and by Friedman himself (Friedman, M.: "The Optimum Quantity of Money" in *The Optimum Quantity of Money and Other Essays,* Aldine Publishing. Co., Chicago, 1969). Another line of research sharing an identical integrating intention, identified as the *general equilibrium approach* of monetary theory, has its origin in the works by Brainard and Tobin (Brainard, W.C., & Tobin, J.: "Pitfalls in financial model building*"*, in *American Economic Review*, 58, 1968, and Tobin, J.: "A General Equilibrium Approach to Monetary Theory" in *Journal of Money, Credit and Banking*, Vol. 1, No. 1, February, 1969). However, the studies that exhibit the most genuine integrated approaches are Benassy's models of non-Walrasian economics - Benassy, J.P.: *The Economics of Market Disequilibrium*, Academic Press. Inc. Orlando, Florida, 1982 - and Malinvaud - for example in Malinvaud: *The Theory of Unemployment Reconsidered.* Basil Blackwell, 1977. In these models, money, which in the French theoretical tradition is expected to provide indirect utility, appears simultaneously in the utility function and in the restriction that affects the constraint maximization process of economic agents. Along the same lines, Lastly, and while this list is far from being complete, the models of the New Keynesian School – see, for example, Blanchard, O.J. y Kiyotaki, N. (1987): "Monopolistic Competition and the Effects of Aggregate Demand", *The American Economic Review*, Vol.77, Sept.1987; Poterba, J.M. y Rotemberg, J. (1987): "Money in the Utility Function: An Empirical Implementation", in *New Approaches to Monetary Economics*, Ed. by Barnett, W.A., and Singleton, K.J., Cambridge University Press, Cambridge 1987; Rotemberg, J. (1987): "The New Keynesian Microfoundations". Macroeconomic Annual. NBER, 1987; and Ireland, P.N. (2000): "Sticky-Price Models of the Business Cycle: Specification and Stability". NBER. Working Paper 7511, Cambridge, Mass. 2000 – tie in with Sidrauski's model – Sidrauski, M. (1967): "Rational Choice and Patterns of Growth in a Monetary Economy", *The American Economic Review*, 57, 1967 – and present in most cases the following common characteristics: i) Money enters the utility function in the form of real

demand for consumption and the demand for money and other assets is clearly outlined, although the limitations still affecting these developments is the cause of their inability to win over the post-Keynesian theories of aggregated consumption, the *new vision* of money emerging from the *General Theory*, or the traditional *quantitative approach* to monetary problems later revived by monetarism. As a result, the processes of decision-making we are referring to here, instead of being conceived as the *two sides of the one coin*—as recommended by Morishima [7]—still basically model themselves, as we have already pointed out, as independent processes within the framework of theories which are most often autonomous though sometimes even contradictory.

Naturally, the survival of a state of affairs so opposed to common sense requires the existence of some justification, and a justification that should have some weight. Should that not be the case, why should the dichotomy between the decision of wealth consumption, accumulation and distribution infringing the most elementary logic be maintained as an almost natural rule? Or, would monetary stocks—and therefore the demand for them—not be a feasible alternative for saving? How come we have been able to live with *The Theory of the Consumption Function* and the *Framework* by Friedman without judging them as contradictory? Would the above-mentioned integrated attempts perhaps not be more reasonable? In that case, why has there not been a more complete integration of the theory of demand for money and other assets into the general theory of value?

Leaving aside the consideration of money as a factor of production for firms and restricting the diagnosis only to the field of individual decisions, there are at least three reasons to explain—albeit not to justify—the prevalent state of affairs.

The first reason should be looked for in the intellectual influence of the *General Theory,* and has its origin in the separable nature attributed by Keynes to decisions on consumption and saving, on one hand, and decisions on wealth accumulation and distribution on the other [8]. From that moment onwards, the variation of monetary stocks disappears as the necessary nexus linking saving flow and the desired wealth stock, a *de facto* path for a return to the classic theory of saving is re-established, and a breakthrough acting as an incentive for the autonomous development of the theories of demand for consumption, money and other assets conceived as independent bodies of theory.

The second reason also stems from the *General Theory*, and emerges from the Keynesian affirmation—on the other hand fully justified—that the *uncertainty* about the future behaviour of interest rates is the necessary condition for the existence of a positive demand for money as a store of value [9]. Progressing towards a purely probabilistic treatment of the concept of uncertainty

balances assets; ii) Money is incorporated into the budget constraint along with other assets; and iii) The prospective calculations are done taking into account expectations generated under conditions of perfect forecasts or rational expectations. Lastly, and while this list is far from being complete, the contributions of Christiano, Motto and Rostagno – especially Christiano, L., Motto, R. and Rostagno, M. (2010): "Financial Factors in Economic Fluctuations", *European Central Bank*, Working Paper Series, Nº 1192, May 2010 – provide, from this perspective, new conceptual elements which support the point of view previously expressed in the works of Blanco Losada which are the basis for this paper. All These latter models incorporate most of the necessary ingredients to elaborate an integrated theory of the decisions to be adopted by the subject we referred to at the beginning of this sección, by which it is possible to obtain, as recommended by scientific good practice, interrelated functions of demand for consumption and money that respond to a common optimization scheme.

[7] Morishima, M.: *Teoría Económica de la Sociedad Moderna*. Bosch, Barcelona, 1981, p. 158.

[8] The already classic reference appears in Chapter 13 of the *General Theory*: "The psychological time-preferences of an individual require two distinct sets of decisions to carry them out completely. The first is concerned with that aspect of time-preference which I have called the *propensity to consume*, which, operating under the influence of the various motives set forth in Book III, determines for each individual how much of his income he will consume and how much he will reserve in *some* form of command over future consumption. But this decision having been made, there is a further decision which awaits him, namely, in *what form* he will hold the command over future consumption which he has reserved, whether out of his current income or from previous savings." Keynes, J.M.: *Op. Cit.* p.166.

[9] Keynes, J.M.: *Op. Cit*. p. 68

increasingly removed from the true Keynesian spirit [10], although initially underlying the *preference for liquidity* theory, the theory of demand for assets has evolved towards alternative approaches, both conceptually and methodologically, increasingly distancing themselves from the platform that should have acted as a shared stem for the decisions to be adopted by the representative agent [11].

The third and perhaps most important reason resides in the very simplicity of the integrated approaches we have alluded to, and particularly in the difficulties met by the more commonly used models when it comes to including the categories of profitability, liquidity and solvency in a differentiated and coherent manner in the framework of the theory of choice in which decisions regarding consumption, saving and debt should also be integrated. Certainly, the preference for liquidity has always been present, in a more or less explicit fashion, in all the integrated approaches we have commented here. However, as Hicks already pointed out, the alternative between money and goods merely represents a far more complex part of a problem of choice that should be dealt with in greater detail than that reflected in the mere and unilateral inclusion of money within the utility function.

Notwithstanding, the fact that there are reasons supporting the possibility of explaining the course of events in the field of monetary theory should not be used as justification for a situation that, due to its contribution to a consolidation of the dichotomy between the theories of demand for consumption and assets, must therefore be regarded as unsatisfactory. On the contrary, what remains for us to do is to rethink those reasons, to assess their true weight and to place the problem within a more favourable framework for its solution. And it is then when a quite elementary question arises: if the essence of the Keynesian monetary theory lies in the consideration of money as a store of value, and if the integrated approaches are incomplete because they omit other components of wealth that compete with money, would it not be therefore convenient to fill this gap? Does the analytical apparatus of marginal utility not perhaps provide for a criterion for decision based on the motivations for consumption, liquidity, profitability and solvency, and in their complementary ones of saving and indebtedness? Would we be eventually able to resort to the paradigm of marginal utility to

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[10] Keynes' scepticism concerning the possibility to deal in a probabilistic way with the problem of uncertainty, is clearly expressed in the following quote: "Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral, hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of *animal spirits*—of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities." Keynes, J.M.: *Op. Cit*. p.161. The quote refers to the attitude of entrepreneurs vis-à-vis the decision to invest in physical capital, but I see it as equally applicable in the sphere of the decisions to be adopted by the head of the family unit.

[11] The evolution of the theory of demand for assets, while extraordinarily worthwhile in and of itself, has failed to provide this much needed integration. In this sense, notwithstanding Hicks' unifying attempts, modern financial theory, built out of the already cited pioneering works by von Neumann and Morgenstern, took the principle of *expected utility* as a core reference which, although opening up the door to new and promising analytic developments, also built at the same time a methodological frontier between the theories of demand for consumption and money on one hand, and the portfolio selection theory on the other. Meanwhile, the attempts to solve Allais' paradox without renouncing the analytical approach of expected utility gave rise to new theories of financial behaviour, of which Kahneman is one of the most qualified representatives. However, those theories, although having the virtue of placing the problem of maximisation of wealth at the core of the analysis, do not integrate, within their conceptual apparatus, decisions concerning consumption, savings and demand for money. To find a theoretical approach that may simultaneously cover such a varied range of decisions, we should formulate the problem in terms of the utility of expectations associated with the various forms of wealth, and not, as happens in those latter developments, in terms of the expected utility associated with those alternatives. See in this regard, Hicks, J.R.: *Op. Cit*.; Allais, M.: "Le Comportement de l´Homme Rationnel Devant le Risque: Critique des Postulates el Axioms de L´Ecole Americaine" in *Econometrica*, 21, 1953; and Kahneman, D & Tversky, A. (1979): *Op. cit*. For a very clear presentation of classical financial theory, of the implications of Allais' critical arguments, and of the new theories of financial behaviour, see Villalba, D. (2003): "¿Son los inversores racionales?". Bolsa de Madrid, Abril 2003.

integrate the theory of money and other assets into the theory of value in a more complete way than the one used to date?

This article attempts to make progress in the above-mentioned integrating direction mentioned earlier. To achieve that, we start out from two basic premises: i) firstly, that the theory of marginal utility is powerful and flexible enough as to provide the appropriate support for the complex decisions we listed at the beginning of this introductory chapter. We know that the fathers of the theory of marginal utility did not have any doubts regarding this; however it is up to us to give content to that possibility [12]. The second, that the best approach to suitably modelling those decisions consists, as Hicks once suggested [13], of *regarding the representative agent as a small scale bank*. In that way, the concepts of *liquidity, profitability and solvency*, essential to understand the current crises suffered by western economies, acquire a truly crucial relevance as criteria inspiring the agents' behaviour, complementing those established by the conventional monetary theory as a reference for demand for money and other assets. Taking those premises as a starting point, we shall reformulate the classical problem of the choice of the representative agent through a function of utility that may allow us to tackle variables including consumption, money and non-monetary assets, as well as loans and debts, within a prospective context of utility maximisation, and will as well specify a *liquidity constraint* —as an alternative to the usual constraints of income or wealth—establishing the existing interrelations between stocks and the flows associated with those variables. Ratifying the importance of the last challenges launched by Stiglitz, the changes introduced in both sides of the problem reveal new dimensions of the monetary theory [14], and introduce elements that are crucial to explaining the processes of decision-making observed in the real world. They guarantee that the demand functions for consumption, money, and assets, as well as loans and debt, are seen for what they truly are: as the by-product of a simultaneous choice conferring an essentially interdependent nature to the functions that are representative of the behaviour of those variables. From this analytical viewpoint, central to which are the very precise contributions of Blanco Losada on which this paper is based [15], the post-Keynesian developments in the fields of the demand for consumption and

[12] The scope of utility is indeed very wide in Bentham: "By utility is meant that property in any object, whereby it tends to produce *benefit*, *advantage* [our italics], pleasure, good or happiness or (what comes again to the same thing) to prevent the happening of mischief, pain, evil, or unhappiness to the party whose interest is considered." Bentham: *Introduction to the Principles of Morals and Legislation,* p. 3. Similarly, Jevons expresses himself in the following terms: "I hesitate to say that men will ever have the means of measuring directly the feelings of the human heart. A unit of pleasure or of pain is difficult even to conceive; but it is the amount of these feelings which is continually prompting us to buying and selling, *borrowing and lending, labouring and resting* [our italics] producing and consuming." And, quoting Marshall, he concludes: "It is from the quantitative effects of the feelings that we must estimate their comparative amounts." Jevons, W.S.: *The Theory of Political Economy*, reedited in 1970 by Penguin Books, UK, p. 83.

[13] As Hicks said, it is possible to express his suggestion by saying that we must consider each individual as a small scale bank. Monetary theory would then be transformed into something like a generalization of banking theory. See Hicks, J.R.: *Op. Cit*. p.96.

[14] During the last twenty five years, Stiglitz as well as other authors such as Weis and Greenwald, have highlighted the crucial role of loans and constraints on loans in the transmission of the effects of the monetary policy enforced by Central Banks. The fact that loans, debt, and solvency are in the heart of the decision-making model that we have developed, confirms Stiglitz's perception regarding the true determinants of a monetary economy, as well as the relevance of financial institutions' behaviour related to the supply of loans. For a general panoramic presentation of these contributions see Stiglitz, J.E. and Greenwald, B. (2003): *Towards a New Paradigm in Monetary Economics.* Cambridge University Press. Cambridge, United Kingdom, 2003.

[15] See Blanco Losada, M.A. (1989): *Consumo, Dinero y Riqueza: Un Ensayo sobre la Integración de la Teoría del Dinero en la Teoría del Valor*. McGraw-Hill, Madrid, 1989, y Blanco Losada, M.A. (2008): *Consumo, Dinero y Riqueza: Ensayos sobre el Ahorro y la Acumulación de Activos en Sociedades Avanzadas*. McGraw-Hill, Madrid, 2008. This article, largely a summary of previous works, has incorporated three important innovations. The first is a definition of the profitability demanded from stocks that is more respectful with the original concept. This generates results which are closer to the facts of the real world in regard to substitutability between bonds and stocks. The second is that the simulation models on which the results of these experiments

money, while individually worthy of very positive consideration, appear as unconnected developments in immediate need of unification and revision, in order to be able to give an appropiate answer to the new challenges to economic theory brought about by the economic crisis during the early years of the twenty first century [16].

are based, are presented explicitly here, a gesture that will allow the scientific community to replicate them. The third is that the interpretation of the results has improved considerably, which will enhance their credibility. Furthermore, this article makes an effort to highlight those features which are especially relevant to the present economic crisis.

[16] Leijonhufvud has told us, and it is undoubtedly true, what the modern theories of the consumption function, by demonstrating the decisive influence of capital and wealth on behaviour, have proved to be one of the most promising advances in economic theory in the second half of the 20th century. We hope that this recognition serves to locate in its rightful terms the question raised in the text in regard to the internal coherence of some of these contributions. See in this respect, Leijonhufvud, A.: *On Keynesian Economics and the Economic of Keynes*. Oxford University Press, New York, 1968. pp. 188.

SECTION 2

THE THREE TRIADS

As we have noted already, Keynes established in his *General Theory* that the manifestation of the psychological time-preferences of economic agents in regards to the desired levels of consumption and wealth accumulation can be modelled through a double process of decision-making that can be described in a sequential manner. First of all, and before any other decisions can be made, the agent has to choose what part of his income he wants to consume and what part to save. Secondly, having resolved this first question, the agent has to choose how to allocate his wealth—both from current income and previous savings—among the different alternatives available for value preservation [1]. Within this conceptual framework, the desired relative flows of the target variables in the first decision stage—consumption and saving—could be derived through the maximization of a utility function under the conditions imposed by the income constraint, while the desired levels of the target variables in the second stage—the stock demand for money and securities—could be reached through a process of prospective calculation in which considerations relative to the future behaviour of interest rates, in that they would induce capital gains or losses through the ownership of securities, played an essential role [2]. The Keynesian dichotomy was thus established, and the conceptual separation of the determinants of the demand for consumption and for money was further reinforced, from the methodological point of view, in postulating the presence of uncertainty as a necessary condition for the emergence of a positive demand for money as a store of value [3].

The challenges involved in founding a convincing theory of the utility of money in combination with too strict an interpretation of the Keynesian concept of uncertainty, opened a seemingly unbridgeable gap between the new developments in the field of monetary theory and what seemed to be the technical capabilities of the analytical apparatus of marginal utility theory. This is why

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[1] Keynes, J.M. (1936): Op.cit., p.166

[2] This is certainly the most frequent interpretation in explaining the relative distribution of wealth between money and securities, although Hicks finds a valid justification in terms of income alone. “It was easy to show, granted this simplification, that occasions would arise when it would be (or would seem) more profitable to hold money than to hold bonds, in spite of the fact that the bonds carried a positive rate of interest, while the money carried none at all. It could happen if the interest on the bonds was expected to rise. For a rise in interest is equivalent to a fall in the price of bonds; an expected fall in price, in the near future, would cancel out the nominal yield. It is not the case, as often supposed, that this speculation implies that the operator is looking at the capital value of his portfolio, not at the income he is to derive from it. He will get a larger income, over any but the shortest period, if he is correct in his expectation, by postponing purchase. Suppose that he expects the rate of interest on the bond to rise, from 4 to 5 per cent, within a year. Pounds 100 invested now will yield pounds 4 per annum; if invested later, it looks like yielding pounds 5 per annum; Thus by delay there is a gain of pound 1 per annum, in perpetuity, against a loss of pounds 4 (at the most) in the period of delay. Considered in income terms, this is quite a profitable investment”. (Hicks, J.R., 1974: *The Crisis in Keynesian Economics*. Basil Blackwell, Oxford, 1974, pp. 35-36).

[3] To illustrate this statement we can take the example of the reasoning, now classic, of J. Tobin (1958) in regard to *certain interest rate expectations.* Under such circumstances, a *critical level* of the current interest rate r_c could be defined such that if $r > r_c$, the agent will put his whole investment balance in *consols*. However, it is evident that such an *all or nothing* decision is only admissible in the context of a theory in which the demand for money is a function of its expected return relative to the return of securities, when the latter yield capital gains or losses under conditions of absolute certainty. If we could attribute to money any utility in addition to the yield factor—in terms of the security provided by liquidity when the expectations on future interest rates are subject to a degree of uncertainty, for instance—then it would be clear that there could be a positive demand for money greater than the amount needed for habitual transaction needs, even if $r > r_c$. The optimization model that is developed in section 3 of this article allows the formal deduction of this result.

Patinkin, trying to close this gap, focused all his efforts in justifying a *security motive* that would ensure the deduction of a positive demand for money even in the event that holding bonds guaranteed a certain yield—taking into account capital gains—under the choice criteria characteristic of marginal utility theory. This is, in fact, the true significance underlying the theory of money's marginal utility contained in his book *Money, Interest and Prices,* and therefore the *real liquidity effect,* inexorably tied to the name of Patinkin, is considered one of his most important contributions. At this point, money enters the game of utility analysis as a function of the security it provides to its holder, and, thanks to this simple subterfuge, we find a first pillar on which to found a monetary theory that appears compatible with the theory of value.

There is a problem, however; money is not a commodity like all others, and therefore we cannot be satisfied in assuming—as Patinkin suggested -"that it is not necessary to specify of the money commodity any more than is specified of any other commodity" [4]. To be sure, it seems irrelevant to dwell on the subjective quantification of the utility derived by a subject from pears or apples, for after all we all know what they are and the reason they are in demand: They are demanded simply because they satisfy an objective need in a pleasurable manner. In contrast, it is obvious that this is not the case with money, since its functions are manifold, its properties diverse, and the reasons why it is demanded are equally varied [5]. If we are to provide a proper foundation to a function of money demand, we have no choice but to delve into these aspects, as Hicks did in his time.

In theory there is something that we all agree on, which is the functions that are usually attributed to money. Money is, or serves as, a *unit of account*, a *medium of payment*, and a *store of value*. There may be ideal or material tools that allow the fulfilment of some of these functions, but it is only money that can carry out all three at once. But the consensus comes to an end when the different functions of money are associated to the Keynesian motives (*transactions*, *precautionary* and *speculative*) for which money is demanded. For Keynes, the transactions and precautionary motives are associated to the function of money as a medium of payment, while the speculative demand of money was associated to its function as a store of value. Hicks, however, thinks otherwise: There is a transactions motive associated to the function of money as a medium of payment, but we could not speak of a demand for money due to the transactions motive as a fully voluntary act. Free will would only apply to the precautionary and speculative motives, and those are based on the function of money as a store of value. To complicate matters further, as we mentioned above, Patinkin postulates a security motive—encompassing the Keynesian transactions and precautionary motives—which leads to a demand of liquidity, but does not fully explain the role of money as a store of value in the decisions of the individual.

Making an objective analysis of these findings, if only from a purely semantic perspective, one cannot but feel dissatisfied. If there is a demand for money due to the precautionary motive or the demand for security, what do we mean by that? That whoever holds his wealth in the form of bonds is not cautious? That we should only feel safe if we held our wealth as money? And if there was indeed a demand for money as a medium of payment as a result of the transactions motive, what would that mean? That the notion of money as a store of value is superfluous? What is, then, the essential characteristic of money? That it does not yield interest, as Hick says that Keynes states?

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[4] Patinkin, D. (1959): *Op. cit.*, p. 71.

[5] From this perspective, it is unquestionable that the mere and unqualified inclusion of money in the utility function is perceived as an overly simplistic and largely contrived option. This approach has been criticised recently by Stiglitz and Greenwald, who state in this regard: "Current dicta require that macroeconomics (treating here monetary economics as a branch of macroeconomics) be based on microeconomics principles. Some economists, who, in other respects, seem to insist that models should not be *ad hoc*, that they should be based on principles of maximization, took the low road around the difficulties posed by these strictures, putting money into the utility function or the production function—a trick, which repeated often enough, took a semblance of respectability". Stiglitz, J.E. & Greenwald, B. (2003): *Op. cit*. p.8.

That it can provide a *certain yield,* as Hicks argues in Lecture II of *The Two Triads*? That it is *liquid,* as Patinkin believes? That it gives the individual *time to think,* as Hicks speculates in *The Crisis in Keynesian Economics?* When such brilliant minds think so differently, could we not be facing a *mission impossible* in our attempts at clarification? This could be so, yet we have no option but to continue taking risks. And since we are taking risks, we might as well entertain ourselves by making a few speculations under the direction of common sense.

It is clear that money is a store of value, as is a bond. Therefore, both assets are a means of wealth accumulation in the sense that they grant their owner a generic purchasing power susceptible of being used or preserved, and in the latter case, of doing so on a temporary or a perpetual basis. However, money is a medium of payment while bonds are not, which leads us to another question: What is, then, a medium of payment? Or, in other words, which is the property or characteristic of money that makes it into a medium of payment?

As is generally agreed upon, the essential feature of a medium of payment is that it grants its owner a general purchasing power that is also able to preserve its value without time constraint. This would be the reason why money is a medium of payment—in the absence of inflation, a euro will always be a euro, and it can be used in any way desired today as well as tomorrow—and would also be the reason why a bond is not, since, in fact, a bond is nothing but the formal expression of its owner's relinquishment of employing his immediate purchasing power in exchange for employing it—when it eventually increases—in a more or less distant future. To be sure, the holder of a bond—whether it is an old one or one newly issued—always has the option of converting bonds into money by reselling the bonds to other consumers, but it is obvious that bonds will never appear as perfect substitutes of money when it comes to formulating the demand for means of payment. First, because from the point of view of its owner, there would never be any guarantee that the reselling of the bonds would not result in capital losses if he had an unexpected need to sell them. And second, and more importantly, because the sellers of goods and services will always prefer to be paid with a means of exchange that will leave open to them every available option when it comes to the *direct* exercise of a given purchasing power. If we truly believe in the superiority of a monetary economy over a barter economy, we must associate the demand for liquidity to the demand for money, something that we learned from Keynes but may nevertheless need to be reminded of [6].

Building our arguments upon the above speculations, we can establish some correspondences between the properties or functions of money and the motives that are generally agreed upon as the determinants of its demand. To do this, let us consider a specific time period—a year, for example—with its beginning and its end. In this period, the representative agent has to decide how to allocate his *financial resources*—constituted in theory by his existing stock of money and other assets, and by the money earnings obtained through wages and investment returns in that period—into consumption expenditures, on one hand, and wealth accumulation in its various forms, on the other. We are not concerned at all with the ultimate cause that motivates or induces this accumulative process: It may be that present savings are only motivated by the desire for deferred consumption in the mind of the individual, but it may also be that the individual simply wants to be wealthier for its own sake. What truly matters is that in any time period, the representative agent is subject to the *eternal conflict* described by Fisher: the conflict between the impulse to spend and the impulse to accumulate wealth [7]. From the short-term point of view, the desires of consumption and wealth accumulation thus emerge, quite naturally, like basic drives that shape the behaviour of the individual.

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[6] From the point of view of the *Treatise*, the only fully liquid store of value is money, which makes it the means of payment par excellence. See Keynes, J.M. (1930): *A Treatise on Money*. Macmillan, London, V. II, p. 67.

[7] Fisher, I. (1930): *The Theory of Interest*. Augustus M. Kelley. Publishers. Clifton New Jersey, 1974, p. 29.

To be sure, a maximization intent underlies this motive for wealth accumulation, and it is here that we start to get a glimpse of a new conflict between the desire to accumulate for its own sake, and the desire for liquidity. On one hand, it seems clear that at any given time individuals need to be in command of a purchasing power that can be exercised immediately, both to carry out expected and routine transactions—involving either goods or securities—and to cover, with no danger of capital loss, any unforeseen contingency requiring immediate action. Thus, a stock demand of immediate purchasing power will exist and be sustained to the end of the period and this demand, the result of an ongoing optimization process throughout the period, is essentially a *liquidity* demand that satisfies an objective need of the agents, even if the underlying factors that support it are difficult to identify. From this perspective, money is the only store of value that allows for the response to contingencies derived from immediacy and emergency without threatening the wealth status of the agents, and for that reason everything Patinkin has stated about the advantages of liquidity is, in our opinion, albeit with the noted qualifications, fully justified.

But needless to say, the money *stock* held to satisfy the liquidity-preference, in its function as an intertemporal store of value, is also a component of the total wealth of individuals. Thus, in theory, the liquidity-preference and the general demand of wealth would not be conflicting, but rather complementary determinants of the demand for money. Still, the conflict arises when we take into account that the desire for liquidity, which can also be satisfied by the possession of a given amount of money holdings, restricts the opportunity of investing in income-generating securities, which could in turn restrict the potential for future increases in net worth. Thus, we see that two opposing forces are at work behind one of the most characteristic decisions made by the representative agent: On one hand, a desire for *liquidity* that is satisfied by continuing to hold on to a purchasing power that can be utilised immediately and that takes the form of money holdings; on the other, a desire to accumulate purchasing power for the future, also covered by money holdings, but which could be increased over time, "sacrificing" liquidity to some degree, insofar as the financial assets in excess of the consumption expenses could yield *profits* to their owner if they were invested in income-generating assets. Evidently, the crucial element in such "conflict of interests" is the *uncertainty* of the future yields of assets other than money, for it is clear that if such uncertainty did not exist, nobody would choose to hold money as a store of value.

As we can see, the concepts of *profitability* and *liquidity*, characteristic of theories of banking, appear to have a strong interrelation with the optimizing behaviour of the individual, but this relationship is even stronger when we take into account decisions involving debt. Up to this point we have assumed that individuals do not have standing debt or get in debt, but this is an obvious simplification. It would make sense for our representative agent to resort to debt not only to satisfy his immediate consumption needs, but also, based on his expectations for investment returns, in the hopes of increasing his future wealth. In addition to resolving the usual conflicts to which we have referred—the conflict between consumption and accumulation, on one hand, and the conflict between allocating wealth to money or other assets, on the other—the representative agent must make a choice in regards to what we could term a *reasonable* level of debt. Naturally, the greater the debt incurred by the representative agent, the greater his short-term purchasing power and his possibilities of increasing his wealth, but in exchange, his decisions about consumption and accumulation become much more complex and risky. And it is precisely in this context—in the decision of incurring debt under conditions of uncertainty—where the concept of *solvency,* understood as the ability of the representative agent to face his debts with those of his resources that are available to him becomes truly relevant: This man or woman can no longer just consume goods and administer his or her wealth, but must do so in the knowledge that it is his or her own worth that is at risk. Therefore, from the perspective of monetary theory, *profitability, liquidity* and *solvency* emerge as a *triad* as relevant as the preceding two.

Having reached this point, we can now summarise the reflection that we have conducted in this chapter by regrouping some of the previous concepts in three—once again, a triad—analytical categories: *primary impulses*, *attitudes toward risk* and *optimization criteria.* The *primary impulses* are the desires to consume and to accumulate that exist naturally in every individual; in the long run these impulses may or may not converge toward the impulse to consume, but in the short run they are evidently opposites. The *attitudes toward risk* define the propensities of individuals when it comes to making decisions under conditions of uncertainty; in this sense, we could speak of cautious or prudent behaviours—with a higher aversion to risk—or of speculative behaviours—more inclined to risk-taking. Finally, we would have the three *optimization criteria* that we have referred to—profitability, liquidity and solvency—which act as a brake on the primary impulses and influence the attitudes toward risk. Our opinion is that the analytic apparatus of marginal utility theory can be used to build an appropriate model of such basic impulses, primary behaviours and behavioural criteria, which allow for the deduction of the decisions of the representative agent pertaining debt, consumption, and the different means of wealth accumulation in a coherent and comprehensive approach. In this context, money functions as a medium of payment in the liquidity holdings reserved for the transactions carried out by the individual, as a store of value that satisfies the liquidity demand of the representative agent, and as a store of value that is part of the wealth of households in speculative competition with other assets, so that the functions generally attributed to money and the motives for which it is demanded are integrated in an optimization program that combines the basic drives with primary behaviours and the behavioural criteria that we have referred to.

SECTION 3

WEALTH AND THE MAXIMIZATION OF UTILITY

In what is the dominating line of enquiry, economists have treated consumption as if it were truly, as Keynes suggested, *"the sole end and object of all economic activity"* [1]. By and large, this has led—and textbooks are a good demonstration of this—to typify the problem of the consumer's choices in terms of the maximization of an intertemporal consumption flow—over a usually infinite time horizon—subject to an also intertemporal constraint of income or wealth [2]. Within this analytical framework, wealth—that is, the object of accumulation—is just a means to attain an end, and the concept of holding money as a feasible alternative for wealth preservation simply does not exist [3].

One could nevertheless question whether this approach best clarifies the problem at hand. First, because the collection of assumptions and hypotheses that would have to be developed to delimit the problem is of such magnitude that in practise it does not offer any advantages over the view of the phenomenon that we can acquire through a simpler and more direct approach [4]. And, second, because after all, accumulating "*wealth for the sake of wealth*", which is acknowledged in the economic tradition by renowned economists like Pareto, Knight or Pigou, should not ever be dismissed as an objective motivation of economic agents. Consequently, and in the manner suggested by Patinkin [5], Samuelson and Sato [6], Chase [7], Johnson [8], Clower and Johnson [9] or Benassy [10],

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[1] Keynes, J.M. (1936): Op. cit., p.104.

[2] Leijonhufvud has characterised these models as featuring three fundamental postulates: a) The postulate that *consumption is the ultimate purpose of economic activity*; b) the postulate that the relevant preference function is to be specified over consumption of all consumer goods at all dates up to an *infinitely distant horizon*; c) the *certainty* postulate. More recently, this last postulate has led to the appearance of different operators with expectations which are influenced by the information available at the moment in which the decision-making agent makes the prospective calculation. On this matter, see Leijonhufvud, A. (1968): *Op. cit*., p. 227 and onward.

[3] This type of model usually assumes that the income that is not spent on consumption goods in each period can always be invested in assets that generate a fixed interest in subsequent periods, a hypothesis that is evidently too simplistic. To be sure, a few more modern approaches, for instance that of Barro, do include money in the consumer's budget constraint, seemingly providing a solution to the problem. However, money does not play any role as a store of value in such models, and thus the corresponding demand function only addresses the consideration of money as a medium of exchange. On this matter, see Barro, R.J. (1984): *Macroeconomics*. John Wiley and Sons, Inc. New York,1984.

[4] Morishima gives a detailed account of the requisites that ought to be fulfilled by an integrated theory of consumption and asset selection developed from an intertemporal perspective. Morishima states that it "would first require the preparation of a multi-period theory of consumption; secondly it would necessitate consideration of consumer durables, second-hand goods markets and futures markets; thirdly, account would have to be taken not only of uncertainty regarding prices, interest and selling costs, but even of uncertainty regarding utility functions; fourthly, it would have to deal with the difficult problems of short-selling, hedging by buying and selling, speculation and bankruptcy". Morishima, M. (1981): *Op. cit.,* p.159 [*The Economic Theory of Modern Society*, London, Cambridge University Press 1976, p. 144]. Although our proposal is much more simplified, it develops along the same lines.

[5] Patinkin, D. (1959): *Op. cit.*

[6] Samuelson, P.A. and Sato, R. (1984): "Unattainability of Integrability and Definiteness Conditions in the General Case of Demand for Money and Goods", in *The American Economic Review,* September, 1984, p. 601.

[7] Chase, S.B. (1963): *Asset Prices in Economic Analysis*. Berkeley, 1963.

[8] Johnson, M.B. (1971): *Household Behaviour*. Penguin Books Ltd., London, 1971.

we will reduce the problem, as Leijonhufvud succinctly expressed it [11], *"to the inmediate choice between consumption goods and assets in the current period cross-section of the time-commodity space"*, although this in no way means, as we will see further down, that the inclusion of money in the utility function will not be carried out in as simple a way as the one contemplated in the aforementioned references. This course of action entails an obvious simplification, but in any case, it does not seem that we need reject a priori the possibility that in actuality the intertemporal preference function of individuals may show a high degree of complementarity [12].

After this brief preamble, the problem whose solution we attempt to draw in this article could be approached through the following formal terms:

Let c_t^i be the amount of consumer goods demanded by a consumer i in the period t, and let p_t be the price level of those goods in that period. We could assume that c_t represents the consumption of nondurable goods that can provide satisfaction during the current period, while durable consumer goods would be included in the assets category as part of the nonfinancial wealth of households. Since in due time we will expand our model to take into account the wealth held in the form of physical assets, the methodological simplification that we adopt in this paper, which does not allow the intertemporal substitutability of consumption, would not only be supported in practise, but also enjoy a solid theoretical support.

Let M_{t-1}^i be the amount of nominal money held by a household i at the end of period $t–1$; let M_t^i be the amount of nominal money that the household holds at the end of the period t; and let $m_t^i = M_t^i / p_t$ be the amount of money in real terms—at the price level of period t—that the household unit has in its portfolio at the end of that period.

Obviously, the variable c_t^i must be an argument of the utility function that the household decision-maker tries to maximize in the t period, for the drive to consume is one of the basic drives we have identified on typifying the behaviour of economic agents. Furthermore, the variable m_t^i fulfils all the prerequisites to satisfy the *liquidity* criterion in its strictest sense, and therefore must also be introduced as an independent argument in the preference function of the subjects. Up to this point everything is clear, and there would be little to add to what Keynes and Patinkin have said about a decision model limited to the alternatives of money and goods.

Still, the characterisation of the variables that must be part of the utility function as representative components of wealth calls for a small detour and for the introduction of a few simplifications. The

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[9] Clower, R.W., and Johnson, M.B. (1968): "Income, Wealth, and the Theory of Consumption", in *Value, Capital and Growth. Papers in Honour of Sir John Hicks.* Edinburgh University Press, Edinburgh, 1968.

[10] Benassy, J.P. (1986): "Macroeconomics: An Introduction to the Non-Walrasian Approach". Academic Press. London, 1986.

[11] Leijonhufvud, A. (1968): Op. cit., p. 198.

[12] Whatever may happen in reality, it seems that the hypothesis of the intertemporal complementarity of the system of preferences is not as restrictive as it may appear from a strictly theoretical standpoint. As Samuelson and Sato note: "But, as an ultimate *desideratum*, money is no more in the utility function than is penicillin or any other intermediate good. We must, therefore, regard our U [M, X; P] function as already the result of some behind-the-scenes optimizing and time-averaging. With this understanding and caveat, we can regard the present model as a useful scaffolding of analysis even if it is not itself at the deepest level". Samuelson, P.A., and Sato, R (1984): *Op. cit*. Another reference along these lines can be found, for instance, in Benassy: *"We shall now see how such a utility function*" (referring to one in which money is directly involved as an argument of the function) *"can be constructed from an intertemporal optimization program, taking into account expectations of future prices and quantities, and where only current and future consumptions yield direct utility".* Benassy, J.P. (1986). *Op. cit.* The economists of the Non-Walrasian school consider that money does not have an intrinsic utility, and that its utility consequently can only be of an *indirect* nature, so they are interested in demonstrating the instrumental character of its inclusion in the *transversal* preference function. However, it is obvious that in a world characterised by uncertainty, money renders numerous services that provide *direct* utility to the individuals, and that its inclusion in the individual's utility function is fully justified as long as it is carried out in a rigorous manner.

reason for this is that decisions about wealth composition are based by necessity on expectations regarding returns formulated in a framework of *uncertainty,* which complicates matters to a degree.

Our first consideration must be that the decisions made by households regarding the amount of goods that they wish to consume depend on values of variables that are perfectly known, while decisions pertaining to the level and composition of their wealth must be, by necessity, anticipated or predicted. Indeed, the decision on the level and optimal wealth structure, insofar as it entails consequences that will only manifest in the future, must be based on a forecast in which expectations about the predictable behaviour of the yields of different types of assets must play a key role.

Let us start, first of all, with the money component of wealth. Under some circumstances, money can be the most profitable store of value, and thus we must contemplate the possibility that it will *compete* with other assets in shaping the wealth expectations of households. But this does not pose any difficulties, since if by W_{t+1}^{Mi} we refer to the monetary value of the wealth that the household holds in the form of money at the beginning of *t+1*, and by p_{t+1} to the price level expected for the *t+1* period, the real value of the money component of the initial wealth at *t+1*, which we will refer to as w_{t+1}^{Mi}, will be,

$$[3.1] \qquad w_{t+1}^{Mi} = \frac{1}{1+\pi} \cdot m_t^i$$

where π is the expected inflation rate [13].

Now let us consider the non-monetary component of wealth, assuming that it can take the form of two representative types of assets—bonds and stocks —which we will use as imperfect substitutes.

Let us assume that at the beginning of a period *t* the consumer holds bonds and stocks that carry over from the past for a nominal value that we will denote respectively by B_{t-1} and A_{t-1}. Naturally, the representative agent can behave in two ways to configure the holdings of bonds and stocks that he wants to possess at the end of the current period, which we will also denote by B_t and A_t: On one hand, he can buy or sell, or simultaneously buy and sell, all or part of the securities that have carried over from the past to other—or from other—consumers. On the other, he can increase his holdings of securities by acquiring securities newly issued by corporations or the government. We will denote respectively by b_{t-1}^{ji}, b_{t-1}^{ij} and b_t^i the nominal value of the sale of old bonds by consumer *i* to the remainder of consumers *j*, the nominal value of the purchase of old bonds by consumer *i* from the remaining consumers *j*, and the nominal value of the purchase of newly issued bonds by consumer *i*. Similarly, we will denote by a_{t-1}^{ji}, a_{t-1}^{ij} and a_t^i the nominal value of the sale of old stocks by consumer *i* to the remainder of consumers *j*, the nominal value of the purchase of old stocks by consumer *i* from the remaining consumers *j*, and the nominal value of the purchase of newly issued stocks by consumer *i*.

If we let r_{t-1} be the nominal interest rate on the old bonds [14], while letting r_t be the nominal interest rate on the bonds issued during *t*, and lastly denoting by W_t^{Bi} the nominal value of the wealth

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[13] Indeed, w_{t+1}^{Mi} is defined as $w_{t+1}^{Mi} = \frac{W_{t+1}^{Mi}}{p_{t+1}}$, that is, $w_{t+1}^{Mi} = \frac{M_t^i}{p_{t+1}}$

Now, considering the definition given for m_t^i, the above expression turns into $w_{t+1}^{Mi} = \left(\frac{p_t}{p_{t+1}}\right) \cdot m_t^i$

or also, given that $\pi = \frac{p_{t+1} - p_t}{p_t}$, in $w_{t+1}^{Mi} = \frac{1}{1+\pi} \cdot m_t^i$

[14] Needless to say, the nominal interest rate of old bonds here is a weighted average of all the interest rates associated to the different types of bonds issued in the past.

held in the form of bonds by consumer *i* at the end of period *t*, then the real value of the wealth held in the form of this asset class by the end of period *t*, which we will call w_t^{Bi}, will be:

$$[3.2] \qquad w_t^{B_i} = \frac{W_t^{Bi}}{p_t} = \frac{1}{p_t}\left\{\frac{r_{t-1}}{r_t} \cdot B_{t-1}^i + \frac{r_{t-1}}{r_t} \cdot \left(b_{t-1}^{ij} - b_{t-1}^{ji}\right) + b_t^i\right\}$$

where we will assume, for the sake of simplicity, that all bonds are perpetual bonds.

Having made these clarifications, we can now define the value of the expected wealth in real terms in the form of bonds anticipated by the household at period *t* for period *t+1*. It is this expectation that will ultimately determine, in competition with the household consumption needs and the expected profitability associated to the possession of alternative assets, the decision as to what part of its wealth the household will wish to keep in the form of bonds at the end of period *t.*

Therefore, if we have r_{t+1} be the interest rate for bonds expected by consumer *i* for the period *t+1*, and W_{t+1}^{Bi} be the monetary value of the expected wealth in the form of bonds considered for *t+1* by our representative household, then the real value of the expected wealth held as assets of this class, which we will denote by w_{t+1}^{Bi}, will be:

$$[3.3] \qquad w_{t+1}^{Bi} = \frac{W_{t+1}^{Bi}}{p_{t+1}} = \frac{1}{p_{t+1}} \cdot \left\{r_{t-1} \cdot B_{t-1}^i + r_{t-1} \cdot \left(b_{t-1}^{ij} - b_{t-1}^{ji}\right) + r_t \cdot b_t^i + \right.$$

$$\left. + \frac{r_{t-1}}{r_{t+1}} \cdot B_{t-1}^i + \frac{r_{t-1}}{r_{t+1}} \cdot \left(b_{t-1}^{ij} - b_{t-1}^{ji}\right) + \frac{r_t}{r_{t+1}} \cdot b_t^i\right\}$$

or, to put it more succinctly,

$$[3.4] \qquad w_{t+1}^{Bi} = \frac{1}{p_{t+1}} \cdot \frac{1+r_{t+1}}{r_{t+1}} \cdot \left\{r_{t-1} \cdot B_{t-1}^i + r_{t-1} \cdot \left(b_{t-1}^{ij} - b_{t-1}^{ji}\right) + r_t \cdot b_t^i\right\}$$

Now, dividing this expression by $p_t \cdot r_t$, we get,

$$[3.5] \qquad \frac{w_{t+1}^{Bi}}{p_t \cdot r_t} = \frac{1}{p_{t+1}} \cdot \frac{1+r_{t+1}}{r_{t+1}} \cdot \frac{1}{p_t} \cdot \left\{\frac{r_{t-1}}{r_t} \cdot B_{t-1}^i + \frac{r_{t-1}}{r_t} \cdot \left(b_{t-1}^{ij} - b_{t-1}^{ji}\right) + b_t^i\right\}$$

and also, considering [3.2]

$$[3.6] \qquad \frac{w_{t+1}^{Bi}}{p_t \cdot r_t} = \frac{1}{p_{t+1}} \cdot \frac{\left(1+r_{t+1}\right)}{r_{t+1}} \cdot w_t^{Bi}$$

from which we can deduce, recalling the definition given for π

$$[3.7] \qquad w_{t+1}^{Bi} = \frac{1}{1+\pi} \cdot r \cdot w_t^{Bi}$$

where *r*, which is expressed by $[3.8] \qquad r = \frac{r_t \cdot \left(1+r_{t+1}\right)}{r_{t+1}}$

is defined as the expected monetary value at *t+1* of one euro invested in bonds at *t* [15].

Likewise, if by d_t we denote the dividend per share [16] and by a the *arithmetic equity risk premium*—defined as a differential on the interest rate of long term government bonds [17]—and denote by W_t^{Ai} the monetary value of the wealth held in the form of stocks at the end of period t, then the real value of the wealth that the representative household will be holding in the form of stocks at the end of that period, which we will express as w_t^{Ai}, will be, applying the well-known Gordon-Shapiro formula [18],

$$[3.9] \qquad w_t^{Ai} = \frac{W_t^{Ai}}{p_t} = \frac{1}{p_t} \cdot \left\{ \frac{d_t}{r_t + a} \cdot A_{t-1}^i + \frac{d_t}{r_t + a} \cdot \left(a_{t-1}^{ij} - a_{t-1}^{ji} \right) + \frac{d_t}{r_t + a} \cdot a_t^i \right\}$$

Therefore, if W_{t+1}^{Ai} is the expected monetary value for the period $t+1$ of the wealth held as stocks during t, the corresponding expected real value, which we will call w_{t+1}^{Ai}, will be

$$[3.10] \quad w_{t+1}^{Ai} = \frac{W_{t+1}^{Ai}}{p_{t+1}} = \frac{1}{p_{t+1}} \cdot \left\{ d_t \cdot A_{t-1}^i + d_t \cdot \left(a_{t-1}^{ij} - a_{t-1}^{ji} \right) + d_t \cdot a_t^i + \right.$$
$$\left. + \frac{d_t}{r_{t+1} + a} \cdot A_{t-1}^i + \frac{d_t}{r_{t+1} + a} \cdot \left(a_{t-1}^{ij} - a_{t-1}^{ji} \right) + \frac{d_t}{r_{t+1} + a} \cdot a_t^i \right\}$$

Or also, to put it more concisely,

$$[3.11] \qquad w_{t+1}^{Ai} = \frac{1}{p_{t+1}} \cdot \frac{1 + r_{t+1} + a}{r_{t+1} + a} \cdot \left\{ d_t \cdot A_{t-1}^i + d_t \cdot \left(a_{t-1}^{ij} - a_{t-1}^{ji} \right) + d_t \cdot a_t^i \right\}$$

Now, dividing [3.11] by $p_t \cdot (r_t + a)$, and considering that [3.9], we get

$$[3.12] \qquad \frac{w_{t+1}^{Ai}}{p_t \cdot \left(r_t + a \right)} = \frac{1}{p_{t+1}} \cdot \frac{1 + r_{t+1} + a}{r_{t+1} + a} \cdot w_t^{Ai} ,$$

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[15] Let us assume that a consumer invests one euro in newly issued bonds at t hoping to sell the same bonds for a higher amount at $t+1$. If the interest rate is r_t, and the interest rate at $t+1$ is r_{t+1}, the value at $t+1$ of each euro invested at t in this type of bonds—the result of accounting for accrued interest and capital gains—will be, adjusting for arbitrage,

$$r_t + \frac{r_t}{r_{t+1}} = \frac{r_t \cdot \left(1 + r_{t+1} \right)}{r_{t+1}}$$

An expression that corresponds to the definition we have given for r.

[16] It is assumed that at t the investor perceives the dividends generated during $t-1$—which we will call d_{t-1}—and that he also will estimate then the dividend that will be generated in this period, denoted by d_t, to be perceived by him in $t+1$.

[17] Usually, *risk-free* interest rates have been identified with the return on safe bonds, especially long-term government bonds. However, this view must take on a much more restrictive character, given the sovereign debt crisis suffered by various peripheral European countries, including our own to some degree.

[18] Let d_t be the dividend per share to be perceived during $t+1$, and let r_t^a be the *required rate of return* of the stocks. The share price during the period t, assuming the dividend yield remains stationary, will be:

$$p_t^a = \frac{d_t}{r_t^a} ,$$

where p_t^a is the share price and where $r_t^a = r_t + a$; the latter two variables having the meaning attributed to them in the text. On this topic, see Gordon, M. and Shapiro, S. (1956): "*Capital Equipment Analysis: The Required Rate of Profit". Management Science,* 3. October 1956, pp.102-110.

from which it follows that

$$[3.13] \qquad w_{t+1}^{Ai} = \frac{1}{1+\pi} \cdot q \cdot w_t^{Ai}$$

where q, which is expressed by

$$[3.14] \qquad q = \frac{\left(r_t + a\right) \cdot \left(1 + r_{t+1} + a\right)}{r_{t+1} + a}$$

is defined, by analogy with [3.8], as the expected monetary value at $t+1$ of one euro invested in stocks at t.

Consequently, if we let W_{t+1}^{Ii} be the monetary value of the expected total wealth in $t+1$, the corresponding real value of that expectation, which we will denote by w_{t+1}^{Ii}, will have to be

$$[3.15] \qquad w_{t+1}^{Ii} = \frac{1}{1+\pi} \left(m_t^i + r \cdot w_t^{Bi} + q \cdot w_t^{Ai}\right),$$

which expresses the expected real value at $t+1$ of an investment portfolio constructed at t with M_t^i euro invested in money, W_t^{Bi} euro invested in bonds, and W_t^{Ai} euro invested in stocks.

Going back to the root of our problem, we will assume that the preference structure of the consumer can be represented by means of the utility function

$$[3.16] \qquad U^i = U^i\left(c_t^i ;\ m_t^i ;\ w_t^{Bi} ;\ w_t^{Ai} ;\ w_{t+1}^{Ii}\right),$$

that is assumed to be concave ($U''i < 0$) to reflect that the decision-making agent is averse to risk, and which contains as arguments the consumption in the period t, the real value of wealth held as money, bonds and stocks at the end of that period, and the expected real value at $t+1$ of the investment portfolio selected at t with the composition noted above.

The expression [3.16] constitutes a first approximation to the type of reasoning that we have carried out in Section 2 about the dilemma faced by the representative agent when it comes to choosing, on one hand, between consuming and saving, and on the other, to selecting his investment portfolio—which, of course, contains money among other assets—under conditions of uncertainty. Consuming gives satisfaction to our agent, as does accumulating wealth. And the decision to accumulate wealth in its various forms, which overlaps with the decision of distributing wealth that carries over from the past among the different alternatives for value preservation, is introduced in the utility function by means of a prospective concept—the *expected wealth*—which fulfils the *profitability criterion* and plays a crucial role when it comes to determining the optimal portfolio of this household decision maker, who has now morphed into an archetypal *private banker*. Granted, if there were no uncertainty about the future, there would also be no hesitation when configuring the optimal portfolio with the resources available from current saving and past wealth accumulation: In such case, the totality of available resources would be invested in whichever asset guaranteed the highest profit, and the demand for money would be limited to the absolute minimum amount needed to carry out any planned transactions, concerning either goods or securities, taking into account the adjustment costs. But the presence of uncertainty makes our agent question his own expectations to a degree, so he does not put all his eggs in one basket. It is this context that provides meaning to the subjective assessment that the agent makes as to the degree of confidence he feels toward the profitability expectations associated to the different asset classes, which circumstance justifies that the amounts invested in each of them appear as arguments belonging to the utility function in addition to appearing as elements of the expected wealth. The drive to maximize the expected real wealth by putting all the resources into the most profitable asset or set of assets is thus adjusted and balanced

by the subjective assessment that the individual, drawing from personal experience, makes in regard to the likelihood of the expected profitability of the different types of assets. As we have pointed out in the Introduction to this article, it is *the utility of expectation,* and not the *expected utility,* that is relevant to our analysis, and within this framework, money, bonds and stocks, as well as any other assets that we could introduce in the household portfolio, are configured as stores of value that only differ from each other in the degree of uncertainty attributed to the profitability that they afford. It is clear that our approach to the problem we have presented departs from the conceptualisation that characterises expected utility theory, a theory whose internal consistency has been challenged in the work we previously mentioned by Allais, and whose practical relevance is also being questioned as a result of the empirical studies carried out by Kahneman and Tversky, to which we have referred as well [19]. The inclusion of these assets as distinct arguments in the utility function of our representative household, acting as a weighting mechanism in the configuration of the optimal portfolio, thus assists in the conformation of what we could call a *liquidity spectrum* in the purest Hicksian sense, which allows the individual to fine-tune his decisions pertaining to prospective profitability according to the *liquidity criterion* that we have been discussing.

Needless to say, in this formulation we assume that the agent has defined expectations about the future returns on his assets and eventual capital gains, although by this we are referring to purely subjective expectations that will not usually coincide with the so-called objective or standard expectations of probability theory [20]. We will simply acknowledge that such expectations do exist and are taken into account by the agents in relation to the decisions that they need to make in the current period, which is not to say, as we noted before, that those agents do not have doubts about the fulfilment of those expectations. In fact, such doubts may induce the representative agent to keep a certain asset in his portfolio even if its expected return is negative for a while, because there is always the possibility, however remote, that a mistaken forecast will prevent him from obtaining a very substantial gain.

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[19] Among the arguments wielded to account for the Allais paradox and explain certain behaviours that are observed in the real world are, for example, the *certainty effect,* and on the other, the fact that subjects may give low-probability events more weight than they deserve according to their objective probabilities, and vice versa. In fact, this is tantamount to admitting that the *expected utility,* as defined by expected utility theory, is not the same as the *utility of expectation*, a conclusion that is implicit throughout this book.

[20] It is well known that the identification of the criteria that shapes the formation of expectations by the agents was a major research topic in the field of economic analysis during the last third of the XX century. As Argandoña, Gámez and Mochón pointed out—Argandoña, A., Gámez, C., and Mochón, F. (1996): *Macroeconomía Avanzada, I.* Mc.Graw Hill, 1996, —up to that point it was assumed that the future is basically determined by the past, which would give rise to what came to be known as *adaptive* or *extrapolative expectations.* The foremost proponent of this approach may be Cagan—Cagan, P. (1956)—who used them as a basis to explain the behaviour of hyperinflations. Later on, the school of *rational expectations*, developed by Muth in the early 1960s—Muth, J.F. (1960,1961)—had an extraordinary impact as a result of what is known as the "Lucas critique"—Lucas, R.E. (1972)—which underscored the implications of the new theory of expectation formation both for economic analysis in general and for econometrics in particular.

Since then, there has been no shortage of criticism toward the rational expectations theory, both from in and outside the field of economic analysis. Chief among the earliest are the works of Grossman – Grossman, S.J. (1976,1978)—Grossman and Stiglitz – Grossman, S.J. and Stiglitz, J. (1980)— who analyse the role played by information costs in expectation formation. There is a vast amount of literature from the field of applied psychology including the relevant contributions of Kahneman and Tversky, of which an excellent selection can be found in Kahneman, D., Slovic, P and Tversky, A.: (1982): "*Judgment under Uncertainty: Heuristics and Biases"*. Cambridge University Press. Cambridge, New York, 1982. As it is known, the most relevant aspect of this literature is the confirmation that objective probabilities have little relevance in real life. As Kahneman and Tversky remark: "Although no systematic theory about the psychology of uncertainty has emerged from this literature, several empirical generalizations have been established. Perhaps the most general conclusion, obtained from numerous investigations, *is that people do not follow the principles of probability theory in judging the likelihood of uncertain events"* (italics are ours). More recently, the studies on the *momentum effect* carried out by Dimson, Marsh and Staunton—Dimson, E., Marsh, P., and Staunton, M. (2010): "Credit Suisse Global Investment Returns Sourcebook". London Business School, 2010—also bring to question the fundamental tenets of rational expectations, as they have detected cumulative trends in share prices that are incompatible with the efficient-market hypothesis.

But our analysis of household behaviour within the framework of marginal utility theory now demands, on a second approximation, that we devote some time to specifying the relevant constraint to the maximization problem that we have presented so that it can be resolved. At first, this issue may seem secondary, but there is no question that a great part of the difficulties that have impeded an adequate integration of monetary theory and aggregate consumption theory are precisely the result of the inadequate description of the constraint that acts as the limiting boundary of the decisions of economic agents in general and consumers in particular. The emphasis that the field of monetary theory has been giving of late to this subject can be interpreted as a confirmation of this statement.

Referring to the "modern" consumption functions of Modigliani-Brumberg-Ando and Friedman, who continue to dominate the contemporary empirical practice, Leijonhufvud has pointed out that the fundamental breakthrough of these authors was their introduction of a new variable, the *perceived wealth*, as a relevant construct in defining the constraint that operates on the optimisation decisions of consumers in real life. Thus, in this theoretical approach, "wealth"—which Leijonhufvud sees as standing "*as a proxy for what the households, taking the long view, subjectively perceive themselves as being able to afford in terms of current consumption"* [21]—takes on the role that *current income* used to play in the Keynesian consumption function.

It is beyond question that the most updated interpretations of the *permanent income* hypothesis of Friedman, or the *life-cycle* hypothesis of Modigliani-Brumberg-Ando, test out better, when considering the vast amount of available empiric data, than any other variation on the original Keynesian hypothesis. But these advances must not be interpreted as definitive. After all, as the latest crisis has evinced, our optimistic view of the future may not be in tune with the forecasts of bankers, and it is hard to understand how a subjective concept of wealth inserted in the framework of a monetary economy—which, precisely for being such, ought to fit Clower's postulate according to which *"money buys goods and goods buy money, but goods do not buy goods,"* [22]—can be relevant to the constraint that is actually perceived by the consumer. In such an economy, the decisions of the agents will always be subject to *liquidity constraints*, and therefore the only efficient wealth assets will be those which provide a real possibility of liquidity out of the expected income, given the prevailing conditions and circumstances of the financial markets [23]. This is also the direction suggested by the theoreticians of Non-Walrasian economics, but by now we are ready to apply the postulate with the necessary scope.

Fortunately, the way in which we have defined the components of non-monetary wealth when typifying our wealth variable, referring at all times to values associated to the prices resulting from market transactions, allows for the immediate establishment of the liquidity constraint relevant to the maximization problem under study in [3.16]. This liquidity constraint, which is equivalent to Clower's *expenditure constraint*, has the property of including all the transaction records that

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[21] Leijonhufvud, A. (1981): *Information and Coordination*. Oxford University Press, Nueva York, 1981. Pag.76.

[22] Clower, R.W. (1967): "A Reconsideration of the Microfoundations of Monetary Theory", in Western Economic Journal, Vol.6, 1967, reprinted in *Monetary Theory,* edited by R.W. Clower, Penguin Books Ltd. Great Britain, 1971; pp. 207–208.

[23] This is the conclusion that can be deduced from the following excerpt from Leijonhufvud, which we support fully in its formulation and spirit: "Keynes' own conception of it was definitely tied to the idea that you *have to have* cash to exercise effective demand. What needs to be added to the permanent income conception to get to Keynes' multiplier is a *cash constraint* –which in the *cushioned* model is seen, less rigidly, as initially a matter of *liquidity.* In their version, it is implicit that the sources, human or non-human, of the household's permanent income are *illiquid*. They cannot readily be turned into current purchasing power—except at prices (or interest rates) which the household, for one reason or another, is unwilling to accept". We will return to this later on, when we tackle the topic of debt. Leijonhufvud, A. (1981): *Op. cit*., p. 225.

determine the fluctuation in the stock of money held by the representative household, and is obviously [24],

$$[3.17] \quad M^i_{t-1} + T^i_t + r_{t-1} \cdot B^i_{t-1} + d_{t-1} \cdot A^i_{t-1} =$$
$$= p_t \cdot c^i_t + \frac{r_{t-1}}{r_t} \cdot \left(b^{ij}_{t-1} - b^{ji}_{t-1}\right) + b^i_t +$$
$$+ \frac{d_t}{r_t + a} \cdot \left(a^{ij}_{t-1} - a^{ji}_{t-1}\right) + \frac{d_t}{r_t + a} \cdot a^i_t + M^i_t$$

which expresses that the difference between the *disposable funds* of period *t* and the stock of money at the end of period *t* has been used to finance the purchase of consumer goods, the net purchases of old bonds and stocks, and the purchases of newly issued bonds and stocks, which purchases are valued at the going price in the bond and stock markets, respectively [25]. In this expression, d_{t-1} represents the dividends generated during *t–1* that are assumed to be perceived in *t*, T^i_t represents the wages perceived during the current period, and the remaining variables have the meaning already noted above.

The relationship between the variables featured in the objective function [3.16] and those that appear in the constraint [3.17] can be obtained immediately now.

Indeed, [3.17] can also be expressed in the following manner:

$$[3.18] \quad M^i_{t-1} + T^i_t + r_{t-1} \cdot B^i_{t-1} + \frac{r_{t-1}}{r_t} \cdot B^i_{t-1} + \frac{d_t}{r_t + a} \cdot A^i_{t-1} + d_{t-1} \cdot A^i_{t-1} =$$
$$= p_t \cdot c^i_t + \frac{r_{t-1}}{r_t} \cdot B^i_{t-1} + \frac{r_{t-1}}{r_t} \cdot \left(b^{ij}_{t-1} - b^{ji}_{t-1}\right) + b^i_t +$$
$$+ \frac{d_t}{r_t + a} \cdot A^i_{t-1} + \frac{d_t}{r_t + a} \cdot \left(a^{ij}_{t-1} - a^{ji}_{t-1}\right) + \frac{d_t}{r_t + a} \cdot a^i_t + M^i_t$$

or also by dividing [3.18] by p_t and keeping in mind [3.2] and [3.9],

$$[3.19] \quad f^{Ii}_t = c^i_t + w^{Bi}_t + w^{Ai}_t + m^i_t$$

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[24] As was only to be expected, this constraint evinces the fact that money not only operates as a medium of exchange in the transactions that take place in the goods or services markets, but that its role also extends to, in what is certainly more relevant, transactions carried out in the securities markets. Stiglitz and Greenwald have highlighted this fact in criticism of those who defend the stability of the money-income relationship and support their claims on a conventional demand-for-money function, which is based on a transactions motive limited to the exchanges that take place in goods markets. "Indeed", note Stiglitz and Greenwald, "it is surprising that the LM curve has remained such a focal point of macro-economic analysis for so long. As we noted, if money were required to engage in transactions, then the relationship between money and output would necessarily be unstable, since only a small fraction of all transactions are those directly related to income generation: most transactions are exchanges of assets and these exchanges can exhibit great volatility, much greater volatility than is exhibited by national income, or the interest rate, or any other macro-economic variable". Stiglitz, J.E. and Greenwald, B. (2003). Op. cit., p. 294.

[25] From this point on we will use the term "*liquidity constraint*" to express that our representative agent needs to hold enough monetary resources to carry out his purchase of consumer goods or assets of various kinds; monetary resources which consist, as we noted above in this text, of pre-existing money holdings, or the income from labour and capital perceived in the current period, or the money obtained through the sale of previously owned assets, or, as we will see in Chapter 8, of the resources obtained by means of incurring debt. In contrast, we will reserve the expression *credit crunch* to refer to those situations in which the amount of the loans demanded by our representative agent is greater than the amount that that the lender is willing to grant the borrower.

where $f_t^{Ii} = F_t^{Ii}/p_t$, and where F_t^{Ii}, given by the expression,

$$[3.20] \qquad F_t^{Ii} = M_{t-1}^i + T_t^i + r_{t-1} \cdot B_{t-1}^i + \frac{r_{t-1}}{r_t} \cdot B_t^i + d_{t-1} \cdot A_{t-1}^i + \frac{d_t}{r_t + a} \cdot A_{t-1}^i$$

stands for what we will call the *"financial capacity"* of individual *i* during period *t*.

As we can see, the concept of *"financial capacity"* in our analysis has a specific content that contrasts with the high degree of subjectivity inherent in concepts such as the *"available resources"* in the Modigliani-Brumberg "Life cycle hypothesis" or Friedman's *"permanent income hypothesis"*. The term encompasses both the income perceived as money by individuals during the period—wages and capital income—as well as the sum of their initial holdings in the form of money and the money value of their initial holdings of bonds and stocks calculated at the going prices in the securities market, the latter sum corresponding to what Chase calls *cashable wealth* [26], which we will refer to as *"gross financial capacity"*.

Consequently, our problem is reduced, as is usually the case, to maximizing [3.16] under the conditions [3.15] and [3.19]. Formulating the corresponding Lagrangian and setting the partial derivatives of the resulting expression equal to zero, the equilibrium values of c_t^i, m_t^i, w_t^{Bi}, w_t^{Ai}, and w_{t+1}^{Ii}, assuming they could be obtained explicitly, would be given, considering [3.8] and [3.14], by the expressions

$$[3.21.a] \qquad c_t^{i^*} = c^i \left(F_t^{Ii}; p_t; \pi; d_t; r_t; r_{t+1}; a\right)$$

$$[3.21.b] \qquad m_t^{i^*} = m^i \left(F_t^{Ii}; p_t; \pi; d_t; r_t; r_{t+1}; a\right)$$

$$[3.21.c] \qquad w_t^{Bi^*} = w^{Bi} \left(F_t^{Ii}; p_t; \pi; d_t; r_t; r_{t+1}; a\right)$$

$$[3.21.d] \qquad w_t^{Ai^*} = w^{Ai} \left(F_t^{Ii}; p_t; \pi; d_t; r_t; r_{t+1}; a\right)$$

$$[3.21.e] \qquad w_{t+1}^{Ii^*} = w^{Ii} \left(F_t^{Ii}; p_t; \pi; d_t; r_t; r_{t+1}; a\right)$$

Which, as we have pointed out at the beginning of this essay, highlight the interrelated character of the functions of the individual demand for consumption, money and securities.

[26] Chase, J.B. (1963): *Op. cit*. p.5

SECTION 4

THE PROPERTIES OF THE FUNCTIONS OF DEMAND FOR CONSUMPTION, MONEY AND SECURITIES: A PRELIMINARY APPROXIMATION

In the previous section we assumed that it was possible to obtain the functions of the aggregate demand for consumption, securities and money that constitute the explicit solutions of the microeconomic maximisation problem that we have proposed, and that this should allow us to evaluate directly the sign of the effects of the exogenous variables that are involved in our model on the equilibrium state. However, obtaining these solutions can be quite a daunting task, if not impossible, in the framework of increasing complexity that we will continue to elaborate for the decision model that we have proposed, which is why we have preferred to assess the properties of the reference functions through a fully specified model, one that will allow us to apply numerical calculus procedures. This may detract from the generalisability of our conclusions, but in compensation it sets the tone for an experimental programme that may prove to be very enriching.

Specifically, the problem posed in Section 3 is now reformulated in the following terms:

Calculating the maximum of

$$[4.1] \qquad u^i = A \cdot \left(c_t^i\right)^{\alpha} \cdot \left(m_t^i\right)^{\beta} \cdot \left(w_t^{Bi}\right)^{\delta} \cdot \left(w_t^{Ai}\right)^{\xi} \cdot \left(w_{t+1}^i\right)^{\Omega}$$

subject to

$$[4.2] \qquad w_{t+1}^i = \frac{1}{1+\pi}\left(m_t^i + r \cdot w_t^{Bi} + q \cdot w_t^{Ai}\right) \text{ and}$$

$$[4.3] \qquad \frac{1}{p_t} \cdot F_t^{1i} = c_t^i + m_t^i + w_t^{Bi} + w_t^{Ai}$$

where all the variables have the meaning already noted in Section 3.

For values of the parameters $\alpha, \beta, \delta, \xi$ and Ω that guarantee the strict concavity of the household utility function [4.1], it is easy to see that the solution of the problem under consideration must meet the equilibrium conditions:

$$[4.4.a] \qquad \frac{\beta}{m_t^i} + \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^i} = \frac{\alpha}{c_t^i}$$

$$[4.4.b] \qquad \frac{\delta}{w_t^{Bi}} + \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^i} \cdot r = \frac{\alpha}{c_t^i}$$

$$[4.4.c] \qquad \frac{\xi}{w_t^{Ai}} + \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^i} \cdot q = \frac{\alpha}{c_t^i}$$

[4.4.d] $$w_{t+1}^{li} = \frac{1}{1+\pi} \cdot \left(m_t^i + r \cdot w_t^{Bi} + q \cdot w_t^{Ai}\right)$$

[4.4.e] $$\frac{1}{p_t} \cdot F_t^{li} = c_t^i + m_t^i + w_t^{Bi} + w_t^{Ai}$$

Entering the pertinent values for the parameters α, β, δ, ξ and Ω, as well as for p_t, π and the rest of the exogenous variables that are part of the definitions given for F_t^{li}, r and q, we could proceed to doing the simulation we have proposed, but a subtle transformation of the former system would allow us to introduce a few concepts of interest that will make the interpretation of the results easier later on.

Indeed, subtracting [4.4.a] from [4.4.b], [4.4.a] from [4.4.c], and [4.4.b] from [4.4.c], the previous system becomes:

[4.5.a] $$(r - 1) \cdot \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^{li}} = \frac{\beta}{m_t^i} - \frac{\delta}{w_t^{Bi}}$$

[4.5.b] $$(q - 1) \cdot \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^{li}} = \frac{\beta}{m_t^i} - \frac{\xi}{w_t^{Ai}}$$

[4.5.c] $$(q - r) \cdot \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^{li}} = \frac{\delta}{w_t^{Bi}} - \frac{\xi}{w_t^{Ai}}$$

[4.5.d] $$w_{t+1}^{li} = \frac{1}{1+\pi} \cdot \left(m_t^i + r \cdot w_t^{Bi} + q \cdot w_t^{Ai}\right)$$

[4.5.e] $$\frac{1}{p_t} \cdot F_t^{li} = c_t^i + m_t^i + w_t^{Bi} + w_t^{Ai}$$

which certainly introduces a few instrumental concepts that we will proceed to discuss.

Let us remember that in Section 3, r was defined as the expected value at $t+1$ of one euro invested in bonds at t—see the expression [3.8]. Therefore, $r-1$ is simply the *opportunity cost* of holding money instead of bonds as a form of wealth preservation. This opportunity cost will be positive if,

[4.6] $$\frac{r_t\left(1 + r_{t+1}\right)}{r_{t+1}} > 1$$

that is, if

[4.7] $$r_t > \frac{r_{t+1}}{1 + r_{t+1}},$$

and will be negative otherwise.

Now, deriving r with respect to r_t and r_{t+1} en [3.8], we get:

[4.8] $$\frac{dr}{dr_t} = \frac{1 + r_{t+1}}{r_{t+1}} > 0 \quad \text{and,}$$

[4.9] $$\frac{\delta r}{\delta r_{t+1}} = -\frac{r_t}{r_{t+1}^2} < 0$$

Therefore, an increase in the current interest rate of bonds increases the opportunity cost of holding money rather than bonds, while a reduction in this rate would result in a reduction of the opportunity cost. On the other hand, an increase in the expected interest rate of bonds decreases the opportunity cost of holding money instead of bonds, while a reduction will result in an increase of the opportunity cost.

Let us also remember that q was defined in Section 3—see the expression [3.14]—as the expected value at $t+1$ of one euro invested in stocks at t, so $q–1$ now represents the opportunity cost of holding money rather than stocks as a form of wealth preservation. This opportunity cost will be positive if

[4.10] $$\frac{\left(r_t + a\right) \cdot \left(1 + r_{t+1} + a\right)}{r_{t+1} + a} > 1 \quad \text{that is, if}$$

[4.11] $$r_t + a > \frac{r_{t+1} + a}{1 + r_{t+1} + a}$$

and it will be negative otherwise.

If we go on to derive q with respect to r_t and r_{t+1}, we obtain:

[4.12] $$\frac{\partial q}{\partial r_t} = \frac{1 + r_{t+1} + a}{r_{t+1} + a} > 0$$

[4.13] $$\frac{\partial q}{\partial r_{t+1}} = -\frac{r_t + a}{\left(r_{t+1} + a\right)^2} < 0$$

and finally, if we derive q with respect to the equity risk premium it is easy to verify that the resulting expression will be positive if

[4.14] $$r_t - r_{t+1} < \left(r_{t+1} + a\right)^2$$

This expression is satisfied for any value of the equity risk premium, as long as $r_t \leq r_{t+1}$, or, if $r_t > r_{t+1}$, when the difference between the interest rates is sufficiently small [1].

We can reach the following conclusions based on what has been discussed this far: i) An increase in the current interest rate of bonds raises the opportunity cost of holding money instead of stocks as a form of value preservation, while a decrease in the current interest rate results in a reduction of the opportunity cost; ii) an increase in the expected interest rate of bonds reduces the opportunity cost of holding money instead of stocks as a form of value preservation, while a reduction of the expected interest rate raises the opportunity cost; and iii) for the range of values which satisfies [4.14], an increase in the equity risk premium increases, as happens with the current interest rate, the opportunity cost of holding money rather than stocks, and the opposite is true if the risk premium decreases [2].

Finally, and by analogy with the preceding concepts, $(q - r)$ is identified as the opportunity cost of holding bonds as opposed to stocks as a form of value preservation, an expression that will be positive if

$$[4.15] \qquad \frac{\left(r_t + a\right) \cdot \left(1 + r_{t+1} + a\right)}{r_{t+1} + a} > \frac{r_t \cdot \left(1 + r_{t+1}\right)}{r_{t+1}}$$

and will be negative otherwise.

On the other hand, now by deriving $(q - r)$ with respect to r_t, r_{t+1} and a, we obtain the following conclusions:

a) The sign of the derivative of $(q - r)$ with respect to r_t is unequivocally negative, since

$$[4.16] \qquad \frac{\partial\left(q - r\right)}{\partial r_t} = - \frac{a}{r_{t+1} \cdot \left(r_{t+1} + a\right)} < 0$$

b) The sign of the derivative of $(q - r)$ with respect to r_{t+1} will be positive if

$$[4.17] \qquad r_t > \frac{r_{t+1}^{\,2}}{2r_{t+1} + a}$$

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[1] In order to meet the condition noted in the text, the difference between both interest rates has to be, in this last case, greater the higher the risk premium of the stocks, and the greater the expected interest rate of the bonds. For a reasonable value of *a*—for example, 3,9%—the positive difference between the current interest rate and the expected rate ought to be around 50 basis points when the current interest rate is 5%; 150 basis points if the interest rate is 10%; and approximately 250 basis points if the current interest rate is about 15%.

[2] It is however important to realize that the limitations outlined in Note 1 regarding the range of values for which this conclusion is valid, do only play a role when the equity risk premium takes on an additive form, in the sense that, as explained in the text, it is added to the current or future interest rate in order to determine the required rate of return for stocks. If the equity risk premium had adopted a multiplicative form, that is, if the required rate of return of stocks was multiplying the interest rate, then the corresponding derivative would always be positive, indicating that an increase in the value of the equity risk premium would unquestionably yield an increase in the opportunity cost of maintaining money as opposed to stocks, and vice versa. Therefore, in order to determine the true impact of changes in the value of the equity risk premium on the relative distribution of the portfolio between money and stocks, what is relevant is whether or not in the real world the risk premium changes with the interest rates. See in this regard Blanco Losada, M.A. (2008): *Op. Cít*. Pág. 70.

which is also satisfied, given the generally accepted values for *a,* for the value pairs of r_t and r_{t+1} whose differences between the two fall below a level that may be considered normal in practise [3].

c) Last of all, we can verify that the sign of the derivative of $(q - r)$ with respect to the equity risk premium will also be positive as long as expression [4.14] is fulfilled, which will be the case under the conditions we have been referring to [4].

Consequently, we can express these results in the following terms: a) The opportunity cost of holding bonds rather than stocks will be greater the lower the current interest rate, and lower the greater the same rate [5]; b) The opportunity cost of holding bonds instead of stocks will be, in practise, greater the higher the expected interest rate, and lower the lower that interest rate; and c) within the range of values that satisfy [4.14], the opportunity cost of holding bonds instead of stocks will be greater the greater the equity risk premium, and lower the lower that premium.

Under these conditions, and taking as a reference the *basic solution* [6] of the system formed by the equilibrium conditions [4.5.a] – [4.5.c], along with the restrictions [4.5.d] and [4.5.e] we can analyse the results of the simulations that we have carried out by giving alternative values to the exogenous variables and/or parameters that are involved in the solution of the system, and these results indicate the following:

i) An increase in the wages perceived during the current period while the general price level remains constant, results in an equivalent increase of the real value of household financial capacity which leads to an increase of the real demand for consumption and of the *stock* of bonds, shares, and money in real terms in an amount equivalent to the increase experienced by that income. Following this increase, the distribution of the financial capacity between consumption expenditures, on one hand, and the accumulation of wealth in its different forms, on the other, is the same it was before the change, since, as far as wealth preservation is concerned, the variation produced in the financial capacity does not alter the opportunity cost of holding money rather than bonds or stocks, or of holding bonds rather than stocks. These results can be extrapolated to any changes produced in the financial capacity as a result of variations in its components as long as the opportunity cost of holding one asset as opposed to another remains the same, as is the case, for example, of a change in the initial value the stock of money. Analogously, a fall in wages or any other component of the

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[3] In this case, the degree of freedom enjoyed by the values of r_t and r_{t+1} which satisfy [4.17] is considerably higher than the one attributed to those which satisfy [4.14]. For a prime risk value of 3,9% and even more so if this is higher, condition [4.17] is satisfied, as a practical rule, for every value of r_{t+1} which is not more than two times larger than r_t.

[4] See in this regard the comment in note 2 above.

[5] The fact that the opportunity cost of holding bonds rather than stocks is greater the lower the current interest rate of bonds is consistent with the judgment formulated by many financial analysts in underscoring that the policy of *quantitative easing*, put into practise in 2010 by the United States Federal Reserve, intended, among other objectives, to stimulate share prices. The underlying idea is that when the interest rates on bonds are exceptionally low, investors find the stock market more attractive even if it involves taking higher risks. Nevertheless, and as one can anticipate from previous comments, this conclusion is only valid if the value of the equity risk premium is *independent* of the value of the interest rates. If, as mentioned above, the required rate of return of stocks was a multiple of the current interest rate—for example, a multiple *a*, for $a>1$—then the opportunity cost of keeping bonds as opposed to stocks, would be greater the greater the current interest rate. Under this assumption, any increase in the current interest rate of bonds would be shifted in an amplified fashion to the required rate of return of stocks, increasing the opportunity cost of keeping wealth in the form of bonds as opposed to stocks. For more on this, see Blanco Losada, M.A.(2008): *Op. Cit*. Págs.70 y 71.

[6] Since the models that we are referring to in this section and the next are simple *submodels* of the model that will be presented comprehensively in *Section 6,* we do not think it necessary at this point to give the specific values of the parameters and the exogenous variables that we have used as a basis for our simulations in these cases. In fact, the results obtained through these submodels are reproduced with absolute fidelity, but with a broader validity, in the framework of the complete model that we present in that section, which is why we refer to what is said there on the foundation of the numerical specification presented in detail in *Appendix II*.

financial capacity to which we have referred would lead, if the price level were to remain unchanged, to the opposite change in the demand values, while the relative proportions between them remain the same.

ii) A rise in the general price level that is not counteracted by a compensating variation in the incomes perceived in the current period decreases the household financial capacity in the same proportion that the price level has risen, which causes a decline in the real demand for consumption and in the real demand for different types of assets. Similar to what happened in the case of a drop in wages, the reduction of the financial capacity in real terms as a consequence of the rise in the general price level produces a proportional reduction in the real demand for consumption, on one hand, and in the real demand for different types of assets, in the other, so that the distribution of the financial capacity between the former and the latter is not altered for this reason, either. Naturally, a decrease in the general price level that is not accompanied by a compensating variation in the components of the financial capacity produces the opposite results, as in this case the change has an expansive effect both on the demand for consumption and the demand for assets, while the distribution of the financial capacity between both remains unchanged. This last result obviously happens because variations in the general price level alter neither the opportunity costs of consuming as opposed to accumulating wealth, nor the opportunity costs of each of the different alternatives available for value preservation.

iii) A rise in the current interest rate of bonds produces three types of effects: first of all, it reduces the household financial capacity to a degree that is greater the greater the proportion of the initial financial capacity that was held in the form of securities, which has a contractive effect on the real demand for consumption and on the real demand for money and securities during the current period that must be interpreted as a negative *wealth effect.* Secondly, the rise in the current interest rate of bonds increases the *proportion* of the financial capacity invested in securities relative to the part held in the form of money; this result is consistent with expressions [4.8] and [4.12], which highlight the fact that an increase in the current interest rate of bonds raises the opportunity cost of holding money as opposed to securities as a form of wealth preservation. Thirdly, the rise in the current interest rate of bonds induces a proportionally greater increase in the portion of the financial capacity that will be held in the form of bonds in relation to the portion that is held in the form of stocks; and this is the case because, as can be seen in expression [4.16], the rise in the current interest rate of bonds increases the opportunity cost of holding stocks as opposed to bonds as a form of wealth preservation. Granted, a fall in the current interest rate of bonds gives rise to a positive wealth effect and substitution effects in reverse of those that would happen given a rise in the interest rate. In either case, there is no change in the distribution of the financial capacity between consumption, on one hand, and the collection of different types of assets, on the other.

iv) An increase in the equity risk premium produces similar effects to those caused by a rise in the current interest rate of bonds, although in this instance the factor that triggers the changes resides in the initial wealth held in securities of this type. First of all, an increase in the equity risk premium reduces the financial capacity of households to a degree that will be greater the greater the proportion of the initial financial capacity was held in the form of stocks, which translates into a decline in the real demand for consumption and the real demand for money and securities in the new equilibrium situation, which must be also interpreted as a negative *wealth effect.* Secondly, it causes an increase in the proportion of the financial capacity that will be held in the form of stocks in relation to the amount that will be held as money. This outcome is consistent with expression [4.14], since if this condition is fulfilled the increase in the equity risk premium would raise the opportunity cost of holding money instead of stocks as a form of wealth preservation. Last of all, the increase in the equity risk premium causes an increase in the proportion of the financial capacity that will be held as stocks, as the amount invested in bonds shrinks proportionally in the new equilibrium configuration. This is so because, in agreement with what can be deduced from the fulfilment of

[4.14], the increase of the equity risk premium raises the opportunity cost of holding bonds as opposed to stocks in the household portfolio. A decrease in the equity risk premium would produce, needless to say, the opposite effects to those we have noted.

v) An increase in the current interest rate of bonds or in the equity risk premium compensated by a variation in one or more of the autonomous elements of the financial capacity, so that the value of the latter remains unchanged, can compensate for the wealth effect and allows us to value in isolation the impact of the *substitution effects* produced by the original changes. In the case of a rise in the current interest rate of bonds compensated in the way mentioned above, what occurs is a fall of the real demand for money and an increase in the real demand for bonds and stocks, although the distribution of the financial capacity between bonds, stocks and money is not altered in relation to what we have already specified in our simulation of the effect of an increase of the interest rate of bonds in the absence of this compensating variation in the financial capacity. If it is the equity risk premium that rises, the result is a fall of the real demand for money and bonds, and an increase of the real demand for stocks, while the distribution of the real financial capacity between money, bonds and stocks remains at the same relative levels determined by the change of the risk premium for stocks in the absence of the noted compensating variation.

vi) An increase in the expected rate of bonds does not cause a wealth effect, since the latter has no influence on the household's financial capacity. However, it *does* produce substitution effects between the demands for money and securities in real terms within the asset portfolio of the household, since, on one hand, changes in the expected interest rate of bonds alter the opportunity cost of holding wealth as money relative to the alternative of holding it in the form of securities, and on the other, they modify the opportunity costs of holding bonds as opposed to stocks in the financial asset portfolio. In particular, a) a rise in the expected interest rate of bonds, to the extent that it reduces the expected profitability of both bonds and stocks, induces—let us recall expressions [4.9] and [4.13]—a substitution effect involving the change of securities for money; and, b), to the extent that at the same time the opportunity cost of holding bonds instead of stocks increases, it causes—let us remember what we noted in regard to expression [4.17]—a steeper decrease in the proportion of the financial capacity held as bonds. In the simulations we have done, the decline in the demand for wealth held in the form of securities, associated to the specified increase in the expected interest rate of bonds, is accompanied by a parallel decline in the proportion of the financial capacity held as securities that compensates exactly for the increase in the proportion of the financial capacity that will be held in the form of money in the new equilibrium situation.

vii) An increase in the expected rate of inflation does not modify the financial capacity in real terms, and furthermore it does not lead to changes in the demands for consumption, money and securities in real terms, and among the latter it does not change the amounts demanded of stocks and bonds. At first glance this result may seem odd, but it is consistent with the restrictions that, *for the time being,* we have imposed on the behaviour of households in the context of our model. Indeed, as can be deduced from the system [4.5.a] – [4.5.e] once we replace w^{li}_{t+1} for its value in [4.5.d], the inflation rate does not take part in any of the equations that conform the system, and consequently it does not play any active role in its solution. The reason for this is very simple: In the framework on the present model, the households have *yet* to contemplate the possibility of incurring in capital gains or losses as a consequence of possible changes in the rate of inflation, since this would require the introduction of physical assets whose profitability is related precisely to the changes in their prices. When this possibility is taken into account, as we contemplate in Section 5, the variations in the inflation rate of real estate assets alter the opportunity costs of holding money and securities rather than physical assets, thus having a decisive influence on the wealth composition of the equilibrium solution that is more in line—if only on the foundation of a different theoretical justification—with the conclusions obtained through more conventional specifications of the demand for money and other assets.

viii) Under the assumptions contemplated in our model, the demand for money in real terms is positive even when the opportunity cost of holding money instead of bonds or stocks is zero. From a Keynesian perspective, which postulates the existence of a perfectly elastic demand for money when the opportunity cost is zero, this result may seem contradictory, but it is also consistent with the perspective on the issue of uncertainty that we have suggested at the beginning of this section. The head of household may reach the conclusion that, given the current and expected interest rates, he would not incur an opportunity cost if he were to decide to hold only money and no securities in the household investment portfolio, but this does not allow us to infer that this would be the only reasonable behaviour. If he were *absolutely certain* of his forecast, the choice of holding money alone in his portfolio would be unquestionably the correct one. But if he were only *relatively sure* of his forecast, as Keynes himself assumed and as is the norm in practice, then it would also be rational for him to hold both money and securities in his wealth preservation portfolio in proportions that would depend on the level of his financial capacity, of the respective expectations of profitability, and of his aversion to risk [7]. In fact, the Keynesian demand for money function can be conceived as a special case of the function contemplated here, as we show in *Appendix I.*

[7] We may find elements within the financial world which sustain the rationality of this behaviour. For example, the ESN Recommendation System of Bloomberg, which offers advice (or ratings) regarding firms within the stock market, only recommends holders to *reduce*—and not to *sell*—when a stock is expected to generate a total return of 0 to -10% during the following 12-months period. Such an approach suggests that it is better to keep a portion of stock within the portfolio even when it is expected to register a loss. The system recommends selling only when the shares are expected to generate a total return of under minus 10% during the following one-year period.

SECTION 5

HOUSING WEALTH

The approach that we have been developing in the previous sections of this article can easily be adapted to include in its analysis the handling of physical assets [1], and of housing wealth in particular. This is in no way a secondary matter, since housing wealth, which as we know is the main means of value preservation in advanced societies [2], has been largely neglected by the theoretical approaches that try to explain macroeconomic behaviours from an integral perspective. Its inclusion will allow us to take into account the wealth effects associated to changes in house prices, which are by far the most relevant when it comes to household economies [3].

Since our main objective is to analyse the behaviour of economic agents as income perceivers and holders of wealth, we are going to assume that housing is simply an asset that the representative family acquires for the purposes of earning rental income and profit from speculative capital gains if the conditions of the real estate market allow it. The dimension of housing as an earning asset thus prevails over its dimension as a consumer good that can provide direct utility to its owner, a simplification that fits our purpose perfectly [4].

Having made this clarification, let H^{i}_{t-1} be the stock of pre-owned homes held by household *i* at the end of period *t-1*; let H^{ij}_{t-1} and H^{ji}_{t-1} be, respectively, the number of pre-owned homes purchased by household *i* from the remaining households *j* in the period *t* and the number of pre-owned homes sold by household *i* to the rest of the consumers *j* in the same period; lastly, let h^{i}_{t} be the number of new homes purchased by household *i* during the period *t.* If by p^{h}_{t} we denote the house price level

[1] As we have noted in Section 3, the category of physical assets should include durable consumer goods, which in addition to providing a flow of consumption services to their owners constitute a significant part of their wealth. In this section we will only take into account real estate, but our analysis could be generalised easily to include other assets such as those noted.

[2] According to the OECD, in 2007, shortly before the *real estate bubble* burst, non-financial wealth accounted for 62% of the net wealth of households in Canada, 68% in Germany, 47% in Japan, 66% in the United Kingdom, and 44% in the United States. The significance of these figures is compounded by the fact that most of the household borrowing in these economies is collateralised primarily by housing wealth. On this issue, see OECD (2010): *OECD Economic Outlook,* N. 88. OECD. November 2010. Annex Table 58.

[3] At the time of this writing, the effects on the financial system that derived from the bust of the so-called *real estate bubble*, which brought to an end the extraordinary appreciation of house prices for most of the last decade, continue to be a significant concern for economic authorities and to hamper the economic recovery of several Western countries. This is the reason why we have incorporated to our model a specification of the demand for real estate that takes directly into consideration its speculative component—represented by the expected inflation rate—instead of using alternative formulations that are more attuned to their economic *foundations*. Among the latter we would like to highlight that of Poterba - Poterba, J. (1.992): "Taxation and Housing: Old Questions, New Answers", *American Economic Review*, Vol. 82, n. 2—which has served as a reference for the OECD (2006) – see OECD: "Recent House Price Developments: The Role of Fundamentals". *OECD Economic Outlook* n. 78, December 2006, for an estimate of the overvaluation of real estate assets in the major economies of the region.

[4] A more comprehensive consideration of the decisions pertaining to the demand for housing would call for attending to the dual nature of the demanded good itself—a consumption good, on one hand, and an investment good, on the other—the triple dimension of the demanders—lessors, investor-owners, and owners that just enjoy the purchased property—as well as the circumstances surrounding the decision to invest, with especial emphasis on those that affect debt. The latter will be subjected to analysis in Section 6 of this text, from which we will infer the consequences that will be addressed in Section 9. For an approach that undertakes a thorough analysis of the ramifications of the above, see the work of Arce and López-Salido in Arce, O.J. and López-Salido, J.D.(2006): "House Prices, Rents and Interest Rates under Collateral Constraints". Working Paper No. 0610. *Banco de España,* 2006.

that prevailed during period *t,* then the value of the housing wealth at the end of period *t,* which we will denote by W_t^{Hi}, will be,

$$[5.1] \qquad W_t^{Hi} = p_t^h \cdot H_{t-1}^i + p_t^h \cdot \left(h_{t-1}^{ij} - h_{t-1}^{ji}\right) + p_t^h \cdot h_t^i$$

and its corresponding value in real terms at the prices of period *t,* which we will denote by w_t^{Hi}, will be, needless to say,

$$[5.2] \qquad w_t^{Hi} = \frac{1}{p_t} \cdot \left\{p_t^h \cdot H_{t-1}^i + p_t^h \cdot \left(h_{t-1}^{ij} - h_{t-1}^{ji}\right) + p_t^h \cdot h_t^i\right\}$$

where $w_t^{Hi} = W_t^{Hi}/p_t$.

If now we denote by e_t the value of the income generated by housing, defined as a percentage of the market value of the latter, the expected value at *t+1* of the housing owned by household *i* at the end of period *t,* which we will label W_{t+1}^{Hi}, will be,

$$\begin{aligned}[5.3] \qquad W_{t+1}^{Hi} &= e_t \cdot p_t^h \cdot \left(1 + \pi^h\right) \cdot H_{t-1}^i + e_t \cdot p_t^h \cdot \left(1 + \pi^h\right) \cdot \left(h_{t-1}^{ij} - h_{t-1}^{ji}\right) + \\ &+ e_t \cdot p_t^h \cdot \left(1 + \pi^h\right) \cdot h_t^i + p_t^h \cdot \left(1 + \pi^h\right) \cdot H_{t-1}^i + \\ &+ p_t^h \cdot \left(1 + \pi^h\right) \cdot \left(h_{t-1}^{ij} - h_{t-1}^{ji}\right) + p_t^h \cdot \left(1 + \pi^h\right) \cdot h_t^i\end{aligned}$$

where π^h represents the expected variation of house prices.

Consequently, the expected real value of the housing wealth at *t+1* at the prices of *t+1*, which we will denote by w_{t+1}^{Hi}, will obviously be,

$$\begin{aligned}[5.4] \qquad w_{t+1}^{Hi} &= \frac{1}{p_t\left(1+\pi\right)} \cdot \left(1 + e\right) \cdot \left\{p_t^h \cdot \left(1 + \pi^h\right) \cdot H_{t-1}^i + \right. \\ &\left. + p_t^h \cdot \left(1 + \pi^h\right) \cdot \left(h_{t-1}^{ij} - h_{t-1}^{ji}\right) + p_t^h \cdot \left(1 + \pi^h\right) \cdot h_t^i\right\}\end{aligned}$$

where $w_{t+1}^{Hi} = W_{t+1}^{Hi}/p_t\,(1+\pi)$ and from which it follows, keeping in mind that [5.2],

$$[5.5] \qquad w_{t+1}^{Hi} = \frac{1}{1+\pi} \cdot g \cdot w_t^{Hi}$$

where $g = (1+ e_t) \cdot (1+\pi^h)$

Now, considering [3.15], the total expected *real* wealth for household *i* in the period *t+1*, which we will denote by w_{t+1}^{2i}, will be,

$$[5.6] \qquad w_t^{2i} = \frac{1}{1+\pi} \cdot \left\{m_t^i + r \cdot w_t^{Bi} + q \cdot w_t^{Ai} + g \cdot w_t^{Hi}\right\}$$

and therefore the new objective function of the maximization process carried out by the head of household, by analogy with what we have been expounding in the previous chapters, comes to be

$$[5.7] \qquad U^i = A \cdot \left(c_t^i\right)^{\alpha} \cdot \left(m_t^i\right)^{\beta} \cdot \left(w_t^{Bi}\right)^{\delta} \cdot \left(w_t^{Hi}\right)^{\xi} \cdot \left(w_t^{Hi}\right)^{\mu} \cdot \left(w_{t+1}^{2i}\right)^{\Omega}$$

Parallel to this, the maximization of the new objective function corresponds to a new liquidity constraint that takes the following form:

$$[5.8]\quad M^i_{t-1} + T^i_t + r_{t-1} \cdot B^i_{t-1} + d_{t-1} \cdot A^i_{t-1} + e_{t-1} \cdot p^h_{t-1} \cdot H^i_{t-1} =$$
$$= p_t \cdot c^i_t + \frac{r_{t-1}}{r_t} \cdot \left(b^{ij}_{t-1} - b^{ji}_{t-1}\right) + b^i_t +$$
$$+ \frac{d_t}{r_t + a} \cdot \left(a^{ij}_{t-1} - a^{ji}_{t-1}\right) + \frac{d_t}{r_t + a} \cdot a^i_t +$$
$$+ p^h_t \cdot \left(h^{ij}_{t-1} - h^{ji}_{t-1}\right) + p^h_t \cdot h^i_t + M^i_t$$

Where the new variables, e_{t-1} and p^h_{t-1}, denote respectively the values taken at *t–1* by the percentage of rents over property value and the house price level. As we can see, and by analogy with expression [3.17], the difference between the disposable funds of period *t* and the stock of money at the end of period *t* has been used by household *i* to finance the purchase of consumption goods, the net purchases of old bonds and stocks and pre-owned homes, and the purchase of newly issued bonds and stocks and new housing, which purchases were valued at the going prices in the respective goods and securities markets, and where the rents received are yet another component of said disposable funds.

Replicating the transformation already applied to [3.18], it is easy to see that the constraint that fits the maximization problem we have posed is now given by the expression,

$$[5.9]\quad M^i_{t-1} + T^i_t + r_{t-1} \cdot B^i_{t-1} + d_{t-1}\, A^i_{t-1} + e_{t-1} \cdot p^h_{t-1} \cdot H^i_{t-1} +$$
$$+ \frac{r_{t-1}}{r_t} \cdot B^i_{t-1} + \frac{d_t}{r_t + a} \cdot A^i_{t-1} + p^h_t \cdot H^i_{t-1} =$$
$$= p_t \cdot c^i_t + \frac{r_{t-1}}{r_t} \cdot B^i_{t-1} + \frac{r_{t-1}}{r_t} \cdot \left(b^{ij}_{t-1} - b^{ji}_{t-1}\right) + b^i_t +$$
$$+ \frac{d_t}{r_t + a} \cdot A^i_{t-1} + \frac{d_t}{r_t + a} \cdot \left(a^{ij}_{t-1} - a^{ji}_{t-1}\right) + \frac{d_t}{r_t + a} \cdot a^i_t +$$
$$+ p^h_t \cdot H^i_{t-1} + p^h_t \cdot \left(h^{ij}_{t-1} - h^{ji}_{t-1}\right) + p^h_t \cdot h^i_t + M^i_t$$

That is, dividing by p_t and taking into consideration [3.2], [3,9] and [5.2],

$$[5.10]\quad f^{2i}_t = c^i_t + w^{Bi}_t + w^{Ai}_t + w^{Hi}_t + m^i_t$$

where $f^{2i}_t = F^{2i}_t / p_t$ and where F^{2i}_t, defined as

$$[5.11]\quad F^{2i}_t = M^i_{t-1} + T^i_t + r_{t-1} \cdot B^i_{t-1} + d_{t-1} \cdot A^i_{t-1} + e_{t-1} \cdot p^h_{t-1} \cdot H^i_{t-1} +$$
$$+ \frac{r_{t-1}}{r_t} \cdot B^i_{t-1} + \frac{d_t}{r_t + a} \cdot A^i_{t-1} + p^h_t \cdot H^i_{t-1}$$

denotes the financial capacity of household *i* when we include housing wealth in its asset portfolio and its monetary transactions.

The simulations carried out on the equation system that results from calculating the maximum of [5.7] under the constraints [5.6] and [5.10] ratify, as expected, the *qualitative effects* on the basic solution of the changes that could take place in wage income, the general price level, the current

interest rate of bonds, the expected interest rate of bonds, and the equity risk premium, so that all the conclusions we reached in that regard in Section 4 remain perfectly valid. Specifically: a) An increase in wage income leads to an increase in the financial capacity of the household and generates a *parallel* move in the demand for consumption and the demand for assets, which in this case also includes the stock of housing wealth; b) Any increase in the general price level causes a proportional decrease in the financial capacity of the household and in the demand for consumption and the demand for different types of assets; c) Increases in the current interest rate of bonds decrease the financial capacity of the household to an extent that will be the greater the higher the value of the initial wealth held in this form, which causes a proportional drop in the overall demand for consumption and assets accompanied by a process in which money and real estate assets are replaced by bonds and stocks; d) Increases in the equity risk premium produce similar results, although in this case the proportion of wealth held in the form of money, bonds and real estate decreases and only the proportion of wealth held in the form of shares increases; and, e) Increases in the expected rate of return of bonds do not change the financial capacity of the household, but they raise the opportunity cost of holding wealth in the form of bonds and stocks, which generates a tendency to replace these assets with money and real estate.

However, the inclusion of housing wealth in our model introduces new effects associated to it, and additional effects on the demand for consumption, bonds, stocks and money. Resorting to concepts analogous to those defined in Section 4, these effects are of the following nature: a) While in our model an increase in the rate of return of rents does not change the household's financial capacity in the current period, it does increase the opportunity cost of holding wealth in the form of money and securities as opposed to real estate; this leads to a process by which some types of assets are replaced by others in the new equilibrium configuration, so that housing wealth will have greater weight in it. b) A rise in house prices will increase the financial capacity in real terms, generating an expansive effect on the demand for consumption and the demand for different types of assets; c) A rise in the expected inflation rate of house prices does not alter the real financial capacity of the current period, but it does increase the opportunity cost of holding money, bonds and stocks as opposed to real estate, since the real value of the former is independent from that rate whereas the real value of the latter increases along with it. Thus, as one would expect, this leads to a process by which money and financial assets are replaced by real estate investments in the optimal portfolio, while the result is the opposite if the expected inflation rate for real estate drops.

SECTION 6

DEBT AND SOLVENCY

Until this point we have assumed that the representative household has sufficient financial resources to carry out its purchases of consumer goods and different types of assets without resorting to debt. However, the norm is for the representative household to incur in debts to maximise its structure of preferences, for a variety of reasons that are not mutually exclusive. For instance, it may be that a household cannot but ask for a loan to face an unexpected misfortune or contingency. It may also be that the household resorts to borrowing to avail itself ahead of time of certain durable consumer goods whose enjoyment it would have to defer otherwise; the purchase of a home or a vehicle are the most common examples in this regard. And it may also be that it resorts to debt for the purposes of speculation if it considers that the expected appreciation of the assets that it would acquire with the borrowed resources are attractive enough to make a net gain after paying the principal and interests of the loan to the lender. In real life, every household goes through some of these circumstances at one time or another, and it is common for all of them to occur simultaneously [1].

From the perspective of the decision models that we have formulated in the preceding sections, debt plays a double role: On one hand, it provides additional resources to those contemplated this far in the liquidity constraint of households, which allows these households to expand the choices available to them in terms of purchasing consumer goods and financial and physical assets, and their need for liquidity. However, as we already noted in Section 2, the impact of debt is not limited to increasing the flexibility of the liquidity constraint of households, but also complicates the optimisation problem by adding to the complexity and uncertainty of the decisions that the head of household needs to make. And the reason for this is evident: borrowing increases the risk of capital losses if the expectations that have been the basis of the decision-making of the head of household were not met, which requires that we incorporate a new variable—*solvency*—in the optimisation program so as to take into account the new dimensions that have emerged in the problem. Indeed, solvency and debt are intimately associated concepts, since the urge to safeguard at all times the integrity of the household's assets to prevent risky situations from bringing it to bankruptcy gives pause to the behaviour of the agents, with more prudent behaviours prevailing over more risky or irresponsible ones. Thus, to the criteria of *profitability* and *liquidity* that we have addressed in prior sections we now add a new behavioural criterion, that of *solvency,* which completes the triad that we have referred to in Section 2 of this text.

With the object of incorporating these new elements of analysis to our optimisation problem, we will start by assuming that inter-household loans are negligible, so that household debt is manifested exclusively in long-term bonds issued by households and underwritten by financial institutions. The bonds that stand for these loans are granted at the interest rate that applies to the

[1] In the opinion of Stiglitz and Greenwald, the creation of credit by the banking system is precisely what constitutes the distinctive characteristic of a monetary economy as opposed to a barter economy. "The essential difference between a corn economy and a monetary economy" the authors note, "is that in a monetary economy, banks do not actually have to give out seed to borrowers. They lend, creating a *deposit* which the borrower can use to obtain seed on the market. The deposit is, en effect, a *certification of credit worthiness*. The bank bears the risk of the borrower not repaying. Anyone who supplies seeds to farmers will be more willing to accept these certifications than to provide credit directly to the farmer himself. It is this certification which facilitates the transaction between the borrowing farmer and seed supplier". Stiglitz, J.E. and Greenwald, B. (2003): *Op. cit*. p. 17.

current period in this market, which will be fixed for the duration of the loan. We will also assume that in each time period the borrowers will pay back a fraction ρ of the total amount of the loan according to the agreed payment plan, whose term we consider to be in all instances long enough that the loans could be included in the perpetual bond category due to their characteristics. To be sure, this is a simplification of reality, but it preserves all the essential properties of debt and also allows us to formalise the optimisation problem along with it, which makes it easier to interpret, as we have done before with stocks and bonds issued by corporations and the government.

Having clarified this, let us denote by r^l_{t-1} the average interest rate of the loans approved until *t–1* for a nominal value of L^i_{t-1}. Then let r^l_t be the interest rate of the *new loans* contracted in *t,* and let l^i_t be the nominal value of the latter. Since we assume that there are no inter-household loans, the value of the debt incurred by the latter by the end of period *t,* which we will call W^{Li}_t, will be:

$$[6.1] \qquad W^{Li}_t = \frac{r^l_{t-1}}{r^l_t} \cdot (1-\rho) \cdot L^i_{t-1} + l^i_t$$

and its corresponding real value at the prices of period *t,* which we will call w^{Li}_t, will be, evidently,

$$[6.2] \qquad w^{Li}_t = \frac{1}{p_t} \cdot \left\{ \frac{r^l_{t-1}}{r^l_t} \cdot (1-\rho) \cdot L^i_{t-1} + l^i_t \right\}$$

If we now denote by r^l_{t+1} the interest rate of the loans that is expected to prevail in *t+1*, the value in *t+1* of the debt incurred in *t*, which we will call W^{Li}_{t+1}, will be,

$$[6.3] \qquad W^{Li}_{t+1} = r^l_{t-1} \cdot (1-\rho) \cdot L^i_{t-1} + r^l_t \cdot l^i_t + \\ + \frac{r^l_{t-1}}{r^l_{t+1}} \cdot (1-\rho) \cdot L^i_{t-1} + \frac{r^l_t}{r^l_{t+1}} \cdot l^i_t$$

That is,

$$[6.4] \qquad W^{Li}_{t+1} = \frac{1+r^l_{t+1}}{r^l_{t+1}} \cdot \left\{ r^l_{t-1} (1-\rho) \cdot L^i_{t-1} + r^l_t \cdot l^i_t \right\}$$

where said value includes both the cost of the interest generated by the loan during the current period and the value that the principal of the loan will have in *t+1*, whether the borrower decides to keep it active or he chooses to redeem the loan early.

Now, dividing [6.4] by r^l_t, and performing some operations, we get

$$[6.5] \qquad W^{Li}_{t+1} = r^l \cdot W^{Li}_t$$

where r^l, which is expressed by

$$[6.6] \qquad r^l = \frac{r^l_t \cdot \left(1+r^l_{t+1}\right)}{r^l_{t+1}}$$

is defined, by analogy with the meaning that we attributed to *r* and *q* in the previous chapters, as the expected value at *t+1* of each euro borrowed in period *t*.

If we proceed to divide the expression [6.5] by p_{t+1}, and if by w^{Li}_{t+1} we denote the quotient of W^{Li}_{t+1} and p_{t+1}, we finally get, performing a few operations,

$$[6.7] \qquad w^{Li}_{t+1} = \frac{1}{1+\pi} \cdot r^l \cdot w^{Li}_t$$

Where we know that w_t^{Li} is the real value in t of the debt incurred up to t and where w_{t+1}^{Li} is the expected real value at the beginning of $t+1$ of the debt incurred through t.

It follows that the expected total wealth in real terms contemplated by the head of household for $t+1$, which we will call w_{t+1}^i, is now

$$[6.8] \qquad w_{t+1}^i = \frac{1}{1+\pi} \cdot \left(m_t^i + r \cdot w_t^{Bi} + q \cdot w_t^{Ai} + g \cdot w_t^{Hi} - r^l \cdot w_t^{Li} \right)$$

where all the variables and/or parameters featured have the meaning already assigned to them.

Having reached this point, we now have to redefine the liquidity constraint anew to take into account the repercussions of debt. This constraint takes the following form,

$$\begin{aligned} [6.9] \qquad & M_{t-1}^i + T_t^i + r_{t-1} \cdot B_{t-1}^i + d_{t-1} \cdot A_{t-1}^i + e_{t-1} \cdot p_{t-1}^h \cdot H_{t-1}^i + l_t^i = \\ & = p_t \cdot c_t^i + \frac{r_{t-1}}{r_t} \cdot \left(b_{t-1}^{ij} - b_{t-1}^{ji} \right) + b_t^i + \\ & + \frac{d_t}{r_t + a} \cdot \left(a_{t-1}^{ij} - a_{t-1}^{ji} \right) + \frac{d_t}{r_t + a} \cdot a_t^i + p_t^h \left(h_{t-1}^{ij} - h_{t-1}^{ji} \right) + \\ & + p_t^h \cdot h_t^i + r_{t-1}^l \cdot L_{t-1}^i + \frac{r_{t-1}^l}{r_t^l} \cdot \rho \cdot L_{t-1}^i + M_t^i \end{aligned}$$

where, as we can see, the disposable funds of households are now augmented by the amount of the newly received loans, and where on the uses side we include, along with those contemplated in the previous equivalent expressions, the repayments and interests associated to loans contracted prior to the period to which the restriction applies.

From this, and performing a transformation similar to the one employed to the same end in previous chapters, it is easy to see that the liquidity constraint finally takes in the following form,

$$[6.10] \qquad f_t^i = c_t^i + w_t^{Bi} + w_t^{Ai} + w_t^{Hi} + m_t^i - w_t^{Li}$$

where $f_t^i = F_t^i / p_t$ and where F_t^i, which now denotes the *net financial capacity at the beginning of the period*, corresponds to the expression,

$$\begin{aligned} [6.11] \qquad & F_t^i = M_{t-1}^i + T_t^i + r_{t-1} \cdot B_{t-1}^i + d_{t-1} \cdot A_{t-1}^i + e_{t-1} \cdot p_{t-1}^h \cdot H_{t-1}^i - \\ & - r_{t-1}^l \cdot L_{t-1}^i - \frac{r_{t-1}^l}{r_t^l} \cdot L_{t-1}^i + \frac{r_{t-1}}{r_t} \cdot B_{t-1}^i + \\ & + \frac{d_t}{r_t + a} \cdot A_{t-1}^i + p_t^h \cdot H_{t-1}^i \end{aligned}$$

If we proceed to add the argument w_t^{Li} with a negative sign to the objective function [5.7], and if we replaced the constraints [5.6] and [5.10] by [6.8] and [6.10], it would appear that we could tackle the problem of the maximization of utility in households that have debts, but this approximation would be necessarily incomplete for at least two reasons. First of all, because the lender is not always willing to grant the borrower whatever amount the latter requests, but will demand of him, in turn, some kind of guarantee. And second, and this is what truly makes a difference for our purposes, because the head of household, who we assume acts responsibly, will never incur in a level of debt such that it jeopardises the integrity of the assets that he has been set to manage. At any rate, whether the borrowed funds are intended for purchasing consumer goods or acquiring assets of the types we have contemplated this far, the borrower assumes a risk to his assets given

that his forecasts may be wrong, so he will try not to endanger his assets beyond what his prudence and good judgment dictate, as determined by his greater or lesser aversion to risk [2].

To take these aspects into account, we will assume that the head of household not only maximizes his consumption and wealth or minimizes his debt in the context of expectations given under the aforementioned conditions of uncertainty, but that his optimisation programme also contemplates the convenience or need of preserving or if possible increasing the solvency of his assets under any circumstances.

The way in which we can account for this new aspect of the optimisation behaviour is very simple. Indeed, the *solvency level in real terms* of household *i,* which we will denote by j_t^i, can be defined as follows,

$$[6.12] \qquad j_t^i = \frac{1}{p_t} \cdot \left\{ v \cdot \frac{T_t^i}{r_t^l} + F_t^i + \frac{r_{t-1}^l}{r_t^l} \cdot L_{t-1}^i \right\} - w_t^{Li}$$

where the term $v.T_t^i / r_t^l$, in which v is a parameter that takes on values between zero and one depending on the *working life expectancy,* represents the *personal debt capacity* in nominal terms for period t, associated to the wage income perceived during this period by the household [3], and where the sum of the two last terms within the brackets in [6.12] equates the *gross financial capacity.* As we see, the real solvency level of household i at the end of period t can be defined as the difference of its *potential financial capacity* in real terms, which we will denote by o_t, and the real value of its debts *at the end of that period,* where the potential financial capacity equals, as can be inferred from the preceding formulations, the sum of its personal debt capacity and its gross financial capacity [4].

Now, defining the objective function in the following manner:

$$[6.13] \qquad U^i = A \cdot \left(c_t^i\right)^{\alpha} \cdot \left(m_t^i\right)^{\beta} \cdot \left(w_t^{Bi}\right)^{\delta} \cdot \left(w_t^{Ai}\right)^{\xi} \cdot \left(w_t^{Hi}\right)^{\mu} \cdot \left(j_t^i\right)^{\varepsilon} \cdot \left(w_{t+1}^i\right)^{\Omega}$$

the new optimisation problem faced by the head of household consists in calculating the maximum of [6.13] under the constraints [6.8], [6.10] and [6.12], which leads to the equation system presented in *Appendix II* and through which we could eventually determine the optimal values of real consumption, of money in real terms, and of real wealth held in the form of bonds, stocks and physical assets, as well as the expected wealth for the immediate future, the level of debt in real terms, and the level of solvency in the same terms.

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[2] Granted, in real life there is no shortage of examples of extremely imprudent behaviours in individuals that seem to love risk or who risk their wealth on an "all or nothing" basis under desperate circumstances. And such imprudence can also become the norm in certain collective behaviours, such as those that gave rise, along with other concomitant factors, to the housing crisis experienced by many advanced economies at the end of the previous decade. However, it seems that such atypical behaviours do not invalidate the fully representative character of the general case contemplated in this text.

[3] The debt capacity will obviously depend on the working life expectancy of the members of the household, both from the perspective of the borrower, which is the one we are interested in, and from that of the lender. For the purposes of simplicity, we will assume that this working life expectancy is large enough on average that the formula used in this text for the calculation of the current value of the wage income is reasonably fitting.

[4] It is clear that the concept of solvency that we use in this text is somewhat similar to that used in accounting analysis, and can be considered a stand-in for what is usually known as *debt ratio*, except that in this case it is expressed in terms of the difference between wealth components. However, this is not the only possibility, since solvency could just as well be defined, as is also customary in banking, in terms of the capacity of the household to service its debt with its current income. This would give a prominent role in our analysis to the average term of mortgages, which is not the case now. Either way, it is clear that here we are just considering solvency as a reference for the behaviour of the borrower, and we choose to disregard the possibility that the level of debt that he seeks is beyond the maximum that the lender is willing to grant him.

Applying a numerical simulation process similar to those used in previous chapters, and backing our analysis on a few of the concepts derived from the proposed system of equations, which could be easily interpreted by analogy with those preceding them, we can now analyse the effects on the equilibrium state of the changes that may affect the variables and/or parameters that shape the behaviour of the head of household in the most general case contemplated in this section. In such case, the results that can be obtained through the specification of the full model presented in *Appendix II* are the following:

i) An increase in wage income that is not accompanied by a compensating variation in the general price level now triggers two types of effects: On one hand, it increases the net financial capacity in real terms in the same amount in which the income has risen. On the other, it raises the potential financial capacity in real terms by increasing the personal debt capacity, and therefore the gross financial capacity in real terms, which induces an increase in the real solvency level that in turn allows for an increase in the real household debt level, both in absolute terms and in relation to the net financial capacity. Since they reinforce each other, these two effects have an expansionary impact both on the real demand for consumption and on the real demand for assets of various types. Since a higher debt level increases the disposable funds for consumption and investment relative to the net financial capacity, consumption expenditures and financial and physical wealth also experience an increase in proportion to it, although the allocation of the *total financial resources* [5] into consumption and assets as well as into the different types of assets does not experience any changes, since there have not been any changes in their relative opportunity costs either. Qualitative effects of a similar nature—both on consumption and on the different types of assets—also extend, on the other hand, to other possible changes in the net financial capacity without affecting the relevant opportunity costs, as happens, for example, if there is an increase in the initial stock of money. Naturally, a drop in wage income in real terms produces the opposite effects to those noted above, both through their direct impact on the net financial capacity and through the indirect effect of this decline on the demand for consumption and assets through the level of solvency.

ii) An increase in the general price level that is not accompanied by a compensating variation in the wage income and the remaining components of the net financial capacity in monetary terms also produces two different types of effects: First of all, it reduces the net financial capacity in real terms in a proportion that is greater the more the general price level rises. Secondly, it reduces to the same extent the potential financial capacity in real terms because both the personal debt capacity and the gross financial capacity in real terms decrease, which causes a proportional drop in the real solvency level that in turn brings an equally proportional reduction in the household debt level in real terms. Both effects exert a contractionary impact in the demand for consumption and the demand for assets, while the distribution of the new total financial resources into consumption and assets, and into the different types of assets, remains the same given that there has not been a variation in their relative opportunity costs. Needless to say, a reduction in the general price level that is not accompanied by a proportional reduction in wage income and the remaining components of the net financial capacity will have the opposite effect, leading to an increase in real terms of the demands for consumption and assets, and of debt, while the relative distribution of the total financial resources between real consumption and the real demand for different types of assets will remain the same. Nevertheless, it should be noted that in such case, variations in the general rate of inflation also have

[5] The *total financial resources* during period *t* correspond to the sum of the net financial capacity of the period and the amount of debt accumulated through the end of period *t,* all of which magnitudes are measured in real terms. They correspond to the resources that are effectively available to the household, whether it is for the purchase of consumption goods or to acquire assets of different types. The fact that households can expand their financial resources for consumption and investment by means of borrowing constitutes, as we can see, a fundamental change that has far-reaching consequences in the macroeconomic environment.

no effect on the equilibrium state, since the solution of the system of equations derived from the optimisation problem posed in this section is, for the reasons already presented in previous sections, independent from it.

iii) An increase in the current interest rate of bonds, however, produces various types of effects of the opposite sign, part of which have been analysed in the earlier contexts. Firstly, this increase reduces the net financial capacity to an extent that is the greater the higher the proportion of wealth held in the form of bonds and stocks at the outset, resulting in a *negative wealth effect*; this should have a contractionary impact both on the real consumption and on the real demand for the different types of assets. Second of all, and as a result of the reduction of the net financial capacity, the increase in the current interest rate of bonds induces a reduction of the potential financial capacity and a deterioration of the initial solvency level that should lead to a decrease in borrowing and an additional reduction of the demand for consumption and for assets. However, the increase in the current interest rate of bonds, by raising the expected wealth for the immediate future, increases the attractiveness of resorting to debt to a greater extent the higher the proportion of wealth held in the form of bonds and stocks; this third effect, whose sign is opposite to that of the others, stimulates the demand for consumption and for all assets, and makes more appealing the option of resorting to debt to finance new acquisitions for both components of the financial capacity. Last of all, the increase in the current interest rate of bonds raises the opportunity cost of holding wealth in the form of money or physical assets relative to the alternative of holding it in the form of bonds or stocks, which induces a process of substituting the latter for the former, as well as, for the reasons already noted, a redistribution of the resources invested in securities that favours bonds in the new equilibrium configuration. The performed simulations corroborate the unequivocal negative impact of increases in the current interest rate of bonds both on the net financial capacity and on the potential financial capacity, and in the case of the latter, the consequent drop in real consumption and in the demand for assets in real terms, as well as confirm the expected substitution effects on asset structure, but they leave open the possibility, given the opposed signs of the different effects, of a final expansionary effect on borrowing and on real consumption fostered by expectations of a higher future wealth.

iv) An increase in the expected interest rate of bonds does not modify the net financial capacity, since it does not depend on the former. It also does not change the potential financial capacity, which is not affected by changes in the expected interest rate of bonds. However, such an increase causes, as we could see before, three types of effects. First of all, it reduces the opportunity cost of forgoing borrowing, since increases in the future interest rate of bonds will reduce the future net value of the wealth held in the form of bonds and stocks; *ceteris paribus,* a drop in the expected future wealth causes a reduction of the desired level of debt, which exerts a negative impact both on real consumption and in the demand for securities in real terms. Secondly, an increase in the expected yield of bonds increases the opportunity cost of holding wealth in the form of bonds and stocks relative to the alternative of holding it in the form of money or physical assets, leading to a higher proportion allocated to the latter, and thus a smaller proportion invested in securities, in the asset portfolio of the representative household. Third, the increase in the expected interest rate of bonds penalizes to a greater degree the real value of bond holdings than that of stocks, inducing a proportionally larger drop in the demand of the former. Having said that, the simulations we carried out confirm the configuration of a new equilibrium state characterized by: a) Sustained levels of net financial wealth and of potential financial wealth in real terms; b) a drop in real consumption and real debt, both in absolute terms and relative to the net financial capacity; c) money and real estate tend to displace bonds and stocks in the optimal portfolio; and, d) within the total financial assets, the drop in bonds is greater relative to the drop in stocks.

v) An increase in the equity risk premium produces, on one hand, qualitative effects analogous to those caused by an increase in the current interest rate of bonds. Thus, it reduces the net financial capacity to an extent that in this case will be greater the higher the proportion of the financial capacity

held in the form of stocks. It also reduces the potential financial capacity in a proportion that will be the greater the larger the net financial capacity held initially in this form. Both effects induce a drop both in real consumption and in the real demand for securities of different types. Meanwhile, an increase in the equity risk premium increases the opportunity cost of holding wealth in the form of money, bonds and real estate relative to holding it as stocks, inducing a process by which all of the former types of assets are replaced by the latter in the household portfolio. Yet, the increase in the equity risk premium also increases the opportunity cost of forgoing borrowing, leading to an expansionary effect on both debt and on real consumption and the demand for assets that counteracts to some extent the contractionary effects noted above. The performed simulations corroborate the forecasts of the behaviour of the model that could be established by analogy with the results obtained through the evaluation of the effects of an increase in the current interest rate of bonds, which are of an inverse sign when the simulation addresses a decrease in the aforementioned risk premium. As for possible changes in the dividends, the performed simulations show that their increase has a global expansionary effect on consumption and the demand for assets through their positive effect on the net financial capacity and the potential debt capacity, while the distribution of the total financial resources into consumption and the different types of assets remains unchanged because there has been no variation in their relative opportunity costs.

vi) The effects caused by changes in the parameters that affect housing wealth are of various kinds, depending on the nature of the parameters. Under the simplifying assumptions of our model, an increase in the rate of return of rents does not alter either the net financial capacity or the potential financial capacity, for it is the rates of return set during the previous period, as opposed to the current one, that affect these magnitudes in the current period. However, an increase in the rate of return of rents increases the expected future wealth of the household in an amount that is larger the greater the proportion of the financial capacity that the household chooses to hold in the form of real estate, which would have an expansionary effect on the real demand for consumption as well as cause a reallocation of the total financial resources that would favour those assets. An increase in the house price level, on the other hand, produces two other types of effects. First, it increases the current worth of the housing wealth that carries over from the past in proportion to the rise in the corresponding price level, which in turn increases the real value of the net financial wealth. Second, it increases the value of the potential financial capacity in real terms, since the net financial capacity is a component of the potential one; consequently, in the new equilibrium state there will also be an upward trend in the debt level. Both effects reinforce one another, and have an expansionary effect both on consumption and on the different types of assets. These results seem to be broadly corroborated in the performed simulations, and the opposite effects occur when the opposite changes are simulated.

vii) Since for our purposes housing wealth is the only type of physical asset in which wealth accumulation can materialise, this model gives the expected price changes in real property all the relevance that other theoretical approaches attribute, with less backing in our opinion, to the general price level. An increase in the inflation rate of real estate certainly does not change the net financial wealth, since the former plays no part in any of the components of the latter. It does not change the potential financial capacity either, which for the same reason experiences no alteration. However, it causes other effects of the following nature: i) First of all, it makes the expected future wealth be, at the new housing price level and with everything else remaining equal, higher than it was in the previous equilibrium state. If the size and composition of the portfolio were to remain unchanged, the wealth expectation for the immediate future would now be greater than it used to be, which leads the behaviour of the household toward a rebalancing process characterised by an increase in debt, an increase in consumption, and an increase in the *total demand* for different types of assets. ii) Second of all, and as happened in the case of variations in the current interest rate of bonds, an increase in the inflation rate of real estate also increases the opportunity cost of holding wealth in the form of money or financial assets as opposed to real estate, inducing a substitution process by

which the former are replaced by the latter that will be the more thorough the larger the change in the aforementioned opportunity cost. Needless to say, a drop in the expected appreciation of real estate, or a shift in expectations forecasting an eventual decline in property prices, will have a contractionary impact on the magnitudes that we have been referring to, and the size of this effect obviously depends on the greater or lesser weight of real estate in the household portfolio. Thus, despite having a merely potential character, changes in the expected real estate prices have a significant impact both on the demand for consumption and for assets other than real estate, as well as on the demand for borrowing, an effect that adds to those pertaining real estate that we have just described in point vi) [6].

viii) By necessity, changes in the parameters that affect the current or future costs of household debt also exert a decisive influence on the behaviour of households. In the framework of our model, an increase in the current interest rate of loans has the initial effect of reducing the real value of the debt carried over from previous periods, which has an expansionary effect on consumption and on the demand for assets as the net financial capacity increases in real terms. However, and in contrast to this, such an increase lessens the expectation of future wealth and reduces the opportunity cost of forgoing borrowing, leading to a drop in borrowing and consumption as well as to a reduction in the level of asset accumulation relative to that which occurred in the previous equilibrium state. In the case we present here, the contractionary effects prevail over the expansionary ones, although in general the end result will depend on the specific combination of initial values. In opposition to this, an increase in the expected loan interest rates, in reducing the expected real value of the debt burden, exerts an expansionary effect on borrowing, consumption and the demand for assets, while the distribution of the total financial resources among the different types of assets shows no variation given that there has been no change in their relative opportunity costs. Decreases in the current and expected loan interest rates will have effects of opposite sign, a presumably expansionary one in the case of the former, and an unequivocally contractionary effect in the case of the latter. In any event, it is important to underscore that the somewhat uncertain nature of the effects derived from a variation in current loan interest rate is circumscribed to the case of fixed interest rate loans, since in the case of variable interest rates, as we point out in Section 9, their increase generates unequivocally contractionary effects and their decrease brings about unequivocally expansionary effects.

[6] As is well known, the impact of house price appreciation in relation to consumption, both due to its direct influence through the wealth effect and to the fact that it facilitates higher levels of household debt, is sufficiently corroborated by modern empirical research. Among the studies that support this conclusion we would like to mention, for instance, that of Case, Quigley and Shiller – Case, K., Quigley, J. and Shiller, R. (2001): "Comparing Wealth Effects: The Stock Market versus the Housing Market". *NBER.* Working Paper 8606. Cambridge. Mass. 2001 – and the one by Campbell and Cocco in Campbell, J.Y. and Cocco, J. (2005): "How do House Prices Affect Consumption? Evidence from Micro Data". Working Paper 11534. *NBER.* Cambridge, Mass. 2005.

SECTION 7

AGGREGATION AND SAVING

Despite not having obtained the explicit solutions of the system that results from calculating the maximum of [6.13] under the constraints [6.8], [6.10] and [6.12], the simulations we have performed in Section 6 on the equilibrium conditions that derive from it underscore that the optimal values of the real demands for consumption, money, bonds, stocks and physical assets, as well as those of debt, solvency and the expected wealth, can be represented in the general case as functions of the explanatory variables that we have been referring to by means of the expressions [1]:

[7.1.a] $$c_t^{i*} = c^i \left(F_t^i ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi_t^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.1.b] $$m_t^{i*} = m^i \left(F_t^i ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi_t^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.1.c] $$w_t^{Bi*} = w^{Bi} \left(F_t^i ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi_t^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.1.d] $$w_t^{Ai*} = w^{Ai} \left(F_t^i ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi_t^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.1.e] $$w_t^{Hi*} = w^{Hi} \left(F_t^i ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi_t^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.1.f] $$w_t^{Li*} = w^{Li} \left(F_t^i ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi_t^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.1.g] $$j_t^{i*} = j^i \left(F_t^i ; p_t ; p_t^h ; r_{t+1} ; a ; d_t ; \pi_t^h ; e_t ; r_l ; r_{t+1}^l\right)$$

[7.1.h] $$w_{t+1}^{i*} = w^i \left(F_t^i ; p_t ; p_t^h ; r_{t+1} ; a ; d_t ; \pi_t^h ; e_t ; r_l ; r_{t+1}^l\right)$$

Now, assuming that all households share the same estimates in regard to the evolution of rents, dividends and the risk premium, that they hold uniform expectations in regards to the future behaviour of the interest rate of bonds, loans and the rate of inflation of real estate assets, and that there is a reasonable stability in the distribution of the net financial capacity among households in the economy under consideration, the functions of aggregate demand of the magnitudes to which we have been referring would be given by the expressions [2]:

[7.2.a] $$c_t^* = c \left(F_t ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.2.b] $$m_t^* = m \left(F_t ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[1] In the terminology of Non-Walrasian economics, these would be the *Keynesian forms* of the functions of consumption, money and securities, physical assets and debt, since the labour supply is taken for granted. On this point, see Benassy, J.P. (1982): *Op. cit.* Chapter 4.

[2] Were it possible to obtain the explicit solutions to the optimisation problem that gives rise to the expressions [7.2.a] – [7.2.h], the corresponding aggregate functions would result from weighting the marginal propensities of the respective individual functions by their representative percentage of the total distribution of the net financial capacity of the economy under consideration. In this regard, see Blanco Losada, M.A. (1.989): *Op. cit*. p. 65.

[7.2.c] $$w_t^{B*} = w^B \left(F_t ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.2.d] $$w_t^{A*} = w^A \left(F_t ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.2.e] $$w_t^{H*} = w^H \left(F_t ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.2.f] $$w_t^{L*} = w^L \left(F_t ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.2.g] $$j_t^* = j \left(F_t ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

[7.2.h] $$w_{t+1}^* = w_{t+1} \left(F_t ; p_t ; p_t^h ; r_t ; r_{t+1} ; a ; d_t ; \pi^h ; e_t ; r_t^l ; r_{t+1}^l\right)$$

Where the new variables, both in real terms and in monetary terms, have the following meaning:

– F_t is the aggregate net financial capacity of household economies in monetary terms, and is given by the expression:

[7.3] $$F_t = M_{t-1} + T_t + r_{t-1} \cdot B_{t-1} + d_{t-1} \cdot A_{t-1} - r_{t-1}^l \cdot L_{t-1} - \\ - \frac{r_{t-1}^l}{r_t^l} \cdot L_{t-1} + \frac{r_t}{r_{t-1}} \cdot B_{t-1} + \frac{d_t}{r_t + a} \cdot A_{t-1} + p_t^h \cdot H_{t-1}$$

where,

$$M_{t-1} = \sum_{i=1}^{n} M_{t-1}^i \ ;$$

$$T_t = \sum_{i=1}^{n} T_t^i \ ;$$

$$B_{t-1} = \sum_{i=1}^{n} B_{t-1}^i \ ;$$

$$A_{t-1} = \sum_{i=1}^{n} A_{t-1}^i \ ;$$

$$H_{t-1} = \sum_{i=1}^{n} H_{t-1}^i \ ;$$

$$L_{t-1} = \sum_{i=1}^{n} L_{t-1}^i \ ;$$

It becomes apparent that the aggregate version of the household financial capacity does not correspond exactly to the mere aggregation of [6.11], since we have assumed that rental agreements are made exclusively between households and therefore the net rents cancel out at the aggregate level.

– Analogously, we could define f_t as the aggregate financial capacity of household economies in real terms, while $f_t = F_t / p_t$.

– c_t is the aggregate demand for consumption in real terms in period *t,* and it is defined as follows,

$$c_t = \sum_{i=1}^{n} c_t^i \ ;$$

M_t and m_t denote the aggregate demands for money in real and nominal terms at the end of period *t,* with,

$$M_t = \sum_{i=1}^{n} M_t^i \quad \text{and with} \quad m_t = \frac{M_t}{p_t}$$

W_t^B and w_t^B represent the aggregate demands of bonds in monetary and real terms at the end of period *t*. These variables are defined as,

$$W_t^B = \sum_{i=1}^{n} W_t^{Bi} \quad \text{and} \quad w_t^B = \frac{W_t^B}{p_t}$$

making it necessary in this case, given that the net purchases of old bonds must cancel out in the aggregate version of [3.2], that w_t^B now be defined as [3],

$$[7.4] \qquad w_t^B = \frac{1}{p_t} \cdot \left(\frac{r_{t-1}}{r_t} \cdot B_{t-1} + b_t \right)$$

where b_t now represents the aggregate demand of newly issued bonds in nominal terms, which we will define as

$$b_t = \sum_{i-1}^{n} b_t^i$$

W_t^A and w_t^A correspond to the aggregate demands for stocks in monetary and real terms at the end of period *t,* with

$$W_t^A = \sum_{i=1}^{n} W_t^{Ai} \quad \text{and} \quad w_t^A = \frac{W_t^A}{p_t}$$

As happened in the previous case, the net purchases of old stocks should cancel out in the aggregate version of [3.9], and therefore w_t^A should be defined as,

$$[7.5] \qquad w_t^A = \frac{1}{p_t} \cdot \left(\frac{d_t}{r_t + a} \cdot A_{t-1} + \frac{d_t}{r_t + a} \cdot a_t \right)$$

where a_t, defined in the following manner,

$$a_t = \sum_{i=1}^{n} a_t^i$$

now stands for the aggregate demand in terms of the nominal value of the stocks newly issued in period *t.*

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[3] The household, which makes its decisions based on specific expectations, is in fact subject to no restriction—other than the one derived from its own liquidity-constraint–when it comes to configuring its stock of securities at the end of period *t,* since it will always have the option of investing its financial resources, save those destined to the purchase of consumer goods, in the acquisition of old securities owned by other households or in the purchase of securities newly issued by corporations or the government. However, this will not happen at the aggregate level, since the set of households will only be able to increase its stock of securities, in this case of government-issued bonds, by subscribing newly issued securities. This qualification also applies, needless to say, to the purchase of physical assets.

W_t^H and w_t^H denote the aggregate demands for real estate in monetary and real terms, respectively, and it is obvious that

$$W_t^H = \sum_{i=1}^{n} W_t^{Hi} \quad \text{and} \quad w_t^H = \frac{W_t^H}{p_t}$$

Since the net purchases of pre-owned housing should cancel out in the aggregate version of [5.2], w_t^H now corresponds to the expression

$$[7.6] \qquad w_t^H = \frac{1}{p_t} \cdot \left(p_t^h \cdot H_{t-1} + p_t^h \cdot h_t \right)$$

where h_t, defined as

$$h_t = \sum_{i=1}^{n} h_t^i$$

is the aggregate demand for new housing during period *t*.

Analogously, W_t^L, w_t^L, j_t, W_{t+1} and w_{t+1} have the following meaning:

W_t^L and w_t^L respectively denote the aggregate demand for loans in monetary and real terms at the end of period *t,* and evidently

$$W_t^L = \sum_{i=1}^{n} W_t^{Li} \quad \text{and} \quad w_t^L = \frac{W_t^L}{p_t}$$

Since in this case we have considered inter-household loans to be negligible, the aggregate version of [6.2], w_t^L is simply

$$[7.7] \qquad w_t^L = \frac{1}{p_t} \cdot \left\{ \frac{r_{t-1}^l}{r_t^l} \cdot (1-\rho) \cdot L_{t-1} + l_t \right\}$$

where the term l_t, defined as

$$l_t = \sum_{i=1}^{n} l_t^i$$

is the nominal value of the new loans requested by households in period *t.*

Last of all, j_t denotes the aggregate value of solvency measured in real terms, and w_{t+1} the aggregate expected wealth in those terms as well, with

$$[7.8] \qquad j_t = \frac{1}{p_t} \cdot \left\{ \frac{T_t}{r_t^l} + F_t + \frac{r_{t-1}^l}{r_t^l} \cdot L_{t-1} \right\} - w_t^L$$

$$[7.9] \qquad w_{t+1} = \frac{1}{1+\pi} \cdot \left\{ m_t + r \cdot w_t^B + q \cdot w_t^A + g \cdot w_t^H - r^l \cdot w_t^L \right\}$$

and where, needless to say,

$$j_t = \sum_{i=1}^{n} j_t^i \quad \text{and} \quad w_{t+1} = \sum_{i=1}^{n} w_{t+1}^i$$

The expressions [7.4], [7.5], [7.6] and [7.7] could be used eventually to derive the aggregate demands for newly issued bonds and stocks and for newly constructed housing, which would refer to the investment that households wish to make in these types of assets during period *t,* as well as the demand for new loans requested during the same period. To do so, it would suffice to solve for b_t in [7.4], a_t in [7.5], h_t in [7.6] and l_t in [7.7], and then replace w_t^B, w_t^A, w_t^H and w_t^L with their corresponding equilibrium values, assuming that they could be obtained explicitly. Alternatively, the effects of the changes in the exogenous variables we have referred to on the equilibrium values of b_t, a_t, h_t and l_t could be identified using numerical simulation procedures on the system that results from applying the proposed optimisation scheme at the aggregate level, since, as we have noted before, the purchase of old bonds and stocks and pre-owned housing cancel out at this level. In any case, the expressions [7.4], [7.5], [7.6] and [7.7] show indirectly that the equilibrium values of the flows of assets and loans depend not only on the equilibrium values of the corresponding *stocks* at the end of the period, but also on the levels of those *stocks* at the beginning of the period. The difference between the desired values of the *stocks* at the end of the period under consideration and their corresponding levels at the beginning of the period is what determines the desired or optimal flows, so that the latter cannot be modelled independent of the former.

Now, taking into account the preceding expressions, we can obtain the function for the aggregate demand for saving almost immediately. Indeed, the aggregate version of the constraint [6.9] is:

$$[7.10] \qquad \begin{aligned} & M_{t-1} + T_t + r_{t-1} \cdot B_{t-1} + d_{t-1} \cdot A_{t-1} + l_t = \\ & = p_t \cdot c_t + b_t + \frac{d_t}{r_t + a} \cdot a_t + p_t^h \cdot h_t + r_{t-1}^l \cdot L_{t-1} + \frac{r_{t-1}^l}{r_t^l} \cdot \rho \cdot L_{t-1} + M_t \end{aligned}$$

Moving $p_t \cdot c_t$ and $r_{t-1}^l \cdot L_{t-1}$ to the first member and M_{t-1} and l_t to the second, and having S_t denote the resulting difference in the first member, we get

$$[7.11] \qquad S_t = b_t + \frac{d_t}{r_t + a} \cdot a_t + p_t^h \cdot h_t + \left(M_t - M_{t-1} \right) + \frac{r_{t-1}^l}{r_t^l} \cdot \rho \cdot L_{t-1} - l_t$$

An expression that indicates that the aggregate saving of period t, S_t, takes the form of either an increase in the stock of money, or the acquisition of newly issued bonds and stocks, or the purchase of newly constructed housing, or the payment of debts, or else—which will be the usual case—a combination of all of those alternatives, while its net value will be the result of subtracting from the addition of all these amounts the value of the newly borrowed funds [4].

Meanwhile, if we replace in [7.11] b_t, a_t, h_t and l_t by the expressions that result from solving for their respective values in [7.4], [7.5], [7.6] and [7.7], the equilibrium aggregate saving could be defined, alternatively, by the expression

$$[7.12] \qquad \begin{aligned} S_t^* = & \left(W_t^{B*} - \frac{r_{t-1}}{r_t} \cdot B_{t-1} \right) + \left(W_t^{A*} - \frac{d_t}{r_t + a} \cdot A_{t-1} \right) + \\ & + \left(W_t^{H*} - p_t^h \cdot H_{t-1} \right) + \left(M_t^* - M_{t-1} \right) - \left(W_t^{L*} - \frac{r_{t-1}^l}{r_t^l} \cdot L_{t-1} \right) \end{aligned}$$

[4] It is important for us to mention that the definition of savings given in [7.13] is based on the assumption that it is the income that is actually perceived, and not the income that is just generated, that is relevant to the analysis. This is perfectly consistent with the principles that inspire this text and particularly with the formulation of the monetary economy that we have presented.

or also, dividing both members of [7.12] by p_t and rearranging the terms,

$$[7.13] \quad s_t^* = w_t^{B*} + w_t^{A*} + w_t^{H*} + m_t^* - w_t^{L*} - \\ - \frac{1}{p_t}\left(\frac{r_{t-1}}{r_t} \cdot B_{t-1} + \frac{d_t}{r_t + a} \cdot A_{t-1} + p_t^h \cdot H_{t-1} + M_{t-1} - \frac{r_{t-1}^l}{r_t^l} \cdot L_{t-1}\right)$$

Where the asterisks on the relevant variables indicate optimal values and where s_t^* is the equilibrium value of aggregate saving in real terms [5].

The last two expressions show that the aggregate flow of net saving at equilibrium depends on two opposing forces: on one hand, on the desired or equilibrium levels of the *stocks* of assets in which aggregate saving materialises, with the desired level of debt acting as a negative asset; on the other, of the levels reached in the current period by the values of the assets accumulated until the period immediately preceding the one under consideration, both of which are used, with a negative sign, to compute the current value of the level of debt incurred in the past [6]. In each period, the aggregate saving flow will be higher the greater the desired stock of net wealth at the end of that period, and will be lesser the greater the value of the existing stock of net wealth at the beginning of the period, while its internal composition will depend, at each moment of time and for each type of asset, on the degree of discrepancy between the current value of its holdings and the desired value in the equilibrium state.

The aggregate versions of the functions that we have referred to in this and previous chapters of this book certainly introduce, from a theoretical as well as an empirical perspective, significant changes in relation to the conventional approaches to these topics that have been developed since the *Keynesian Revolution*. These changes mark a very clear break with the prevailing theoretical constructs and empirical practise in regards to what we know as the basic aggregate functions of consumption, saving and the demand for money and other assets, which manifests itself in the following aspects:

a) The functions of aggregate demand for consumption, money and securities, as well as their complementary functions pertaining to physical assets, saving and debt are, to underscore what should be obvious already, interdependent functions insofar as each of them needs to satisfy the aggregate liquidity constraint [7.10] or, to put it more precisely, the constraint that would result from the aggregation of the transform of [6.9]. From this perspective, the main theoretical developments of the second half of the past century in the field of the demand for consumption and for money undoubtedly suffer from the basic flaw of having overlooked the essential requisite of interdependence. The lack of a suitable integration of the theory of consumption, money and the demand for assets within the framework of the general theory of value constitutes, in our opinion, the main cause of the dissatisfying dichotomy that prevails today.

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[5] In Section 8, where we establish the relationship that exists between saving and the increase of wealth in the context of what we call the *consistency rule*, we will elaborate on additional details regarding the scope of this concept.

[6] The dependence of aggregate saving on the current value of the assets held by households at the end of the period prior to the one under consideration is surprisingly overlooked by some of the most renowned figures of Non-Walrasian economics, such as Benassy. Referring to the demand functions for consumption and bonds that derive from his model, Benassy notes: "These functions, of course, also depend on the initial holdings of money and bonds of the household, but we shall omit them since they are given in the period considered". The problem lies, as can be seen in [7.11] or [7.12], that changes in the current interest rate, in the equity risk premium, in the dividends yielded by the latter, or in the current prices of real estate, as well as in the current interest rate of loans, also affect the value of the financial and physical assets carried over from the past, and therefore influence the decisions that households make in this regard during the current period. On this point, see Benassy, J.P. (1986): *Op. cit.,* p.107.

b) As has become apparent in the present chapter, *saving* ought to be seen as the consequence, and not the cause, of a basic drive to accumulate wealth that can be satisfied by means other than what we could call the mere *abstinence* of the period [7]. This is to say that the most conventional theoretical approach, which consists in modelling the consumption and saving decisions first and then modelling the decisions pertaining to wealth allocation, falls in a serious specification error that precludes a correct understanding of the phenomenon of saving [8]. This aspect, which is of utmost importance, is analysed within the framework of the relationships studied up to this point in the following section of this text.

[7] This idea was already expressed by Friedman, who in referring to the *General Theory* noted that "Keynes's error consisted in neglecting the role of wealth in the consumption function – or, stated differently, *in neglecting the existence of a desired stock of wealth as a goal motivating savings"* (Italics added by the author of the present text). However, the first part of this statement—that is, that Keynes neglected the influence of wealth on consumption—seems exaggerated, and the second part, while hinting at a consistent theory of saving based on a theory of the maximization of utility, is nevertheless not supported formally in Friedman's contribution. In this regard, see Friedman, M. (1971): *A Theoretical Framework for Monetary Analysis*. National Bureau of Economic Research, Nueva York, 1971, p. 16.

[8] The fundamental flaw of the conventional theory of saving is that it assumes that saving always yields an interest regardless of investment choices. Hicks already considered that this was a complication, yet the issue has only been the object of marginal attention in the literature. On this point, see Hicks, J.R. (1945): *Valor y Capital*. Fondo de Cultura Económica. Mexico, 1945. Chapter 19.

SECTION 8

THE RULE OF CONSISTENCY

While the aggregate demand for consumption and the aggregate demands for money, securities, physical assets and debt appear in [7.2.a] – [7.2.f] as functions of the net financial capacity and the general price level, of the current and expected interest rate on bonds, of the dividend of stocks and their risk premium, of the profitability of real estate and of its current and expected prices, as well as of the current and expected interest rate on loans, the aggregate demand for saving cannot be formulated—see expressions [7.12] and [7.13]—as a functional relationship with a structure analogous to those already described. Although aggregate saving depends just as much on the aforementioned variables, its equilibrium level will also be lower the greater the initial holdings of money, securities and physical assets, and greater the greater the debt level previously reached by the set of households, which is a singular characteristic that sets saving apart from the previously mentioned functions.

The fact that saving has a fundamentally residual character in the mind of individuals is certainly surprising when we consider it from the perspective of a long theoretical tradition that historically treats saving as an end in itself. Indeed, the drive to save has been approached as being as basic as the drive to consume, for in this framework *saving and wealth growth* are treated in effect as synonymous concepts [1]. This view of things is the one that has become most widespread, and the very acceptance met by a practise as unorthodox as one detaching saving-related decisions from wealth distribution-related decisions is a powerful corroboration of this appraisal.

However, this paradox is dispelled when we notice that saving and wealth growth would only be equivalent terms in the very special and unlikely case that the rate of appreciation of non-monetary assets were zero, since, as can be inferred from [7.13] we have chosen to subscribe to the conventional definition of saving [2]. In the normal case, saving will present itself, however, as a non-exclusionary means to satisfy the basic drive to accumulate wealth, which is the reason why the formulation of an objective function of economic agent behaviour circumscribed to the traditional variables—that is, consumption and saving—would entail falling into a serious specification error.

To clarify the concepts under discussion, we ought to take into account that the aggregate net wealth of the consumers in monetary terms at the end of period *t,* which we will call W_t, will be, evidently,

$$[8.1] \qquad W_t = M_t + W_t^B + W_t^A + W_t^H - W_t^L$$

[1] For example, we can still find proof of the tendency to identify saving and wealth growth in Modigliani, F. (1986): "Life Cycle, Individual Thrift, and the Wealth of Nations", in *The American Economic Review*, June 1986.

[2] For a general and comprehensive explanation of the relationships between saving and wealth, see, for instance, the pioneering treatise of Maurice Allais (Allais, M., 1954) on *Les Fondements Comptables de la Macroéconomique.* Presses Universitaires de France, Paris, 1954.

That is, recalling [7.4], [7.5], [7.6] and [7.7],

$$[8.2] \quad W_t = M_t + \frac{r_{t-1}}{r_t} \cdot B_{t-1} + b_t + \frac{d_t}{r_t+a} A_{t-1} + \frac{d_t}{r_t+a} \cdot a_t + \\ + p_t^h \cdot H_{t-1} + p_t^h \cdot h_t - \frac{r_{t-1}^l}{r_t^l} \cdot (1-\rho) \cdot L_{t-1} - l_t$$

Let us continue by defining W_{t-1} as follows:

$$[8.3] \quad W_{t-1} = M_{t-1} + p_{t-1}^b \cdot B_{t-1} + p_{t-1}^a \cdot A_{t-1} + p_{t-1}^h \cdot H_{t-1} - p_{t-1}^L \cdot L_{t-1}$$

where p_{t-1}^b, p_{t-1}^a, and p_{t-1}^l denote, respectively, the prices of bonds, of stocks, and of the loans held by the household in *t–1*, and where p_{t-1}^h has the meaning already specified.

The desired increase in the aggregate wealth of households between *t* and *t–1* will be given, therefore, by the expression:

$$[8.4] \quad W_t - W_{t-1} = \left(M_t - M_{t-1}\right) + b_t + \frac{d_t}{r_t+a} \cdot a_t + p_t^h \cdot h_t - l_t + \\ + \left(\frac{r_{t-1}}{r_t} - p_{t-1}^b\right) \cdot B_{t-1} + \left(\frac{d_t}{r_t+a} - p_{t-1}^a\right) \cdot A_{t-1} + \\ + \left(p_t^h - p_{t-1}^h\right) \cdot H_{t-1} - \frac{r_{t-1}^l}{r_t^l} \cdot (1-\rho) \cdot L_{t-1} + p_{t-1}^L \cdot L_{t-1}$$

Or also, recalling the definition of saving given in [7.11], by the expression:

$$[8.5] \quad W_t - W_{t-1} = S_t + \left(\frac{r_{t-1}}{r_t} - p_{t-1}^b\right) \cdot B_{t-1} + \\ + \left(\frac{d_t}{r_t+a} - p_{t-1}^a\right) \cdot A_{t-1} + \left(p_t^h - p_{t-1}^h\right) \cdot H_{t-1} - \left(\frac{r_{t-1}^l}{r_t^l} - p_{t-1}^l\right) \cdot L_{t-1}$$

Which tells us that the increase in wealth between *t* and *t–1* originates both from saving in the current period and from the eventual *net* appreciations—*capital gains,* to use the words of Allais and Malinvaud—registered during period *t* by bonds, stocks and physical assets held by households in *t–1*.

The expression [8.5] thus satisfies what Malinvaud termed the *rule of consistency,* whose importance resides in that it guarantees a consistent link between the income and capital transactions made by the household. This consistent link between the income and capital accounts is important for two reasons:

On one hand, we ratify that saving and wealth growth are not synonymous terms, and that increases in wealth generated by an appreciation of non-monetary assets—as a consequence, for example, of a decline in the current interest rate—ought to be considered as real or tangible, given a certain state of the expectations regarding the probable returns, as those generated by *abstinence* or *sacrifice* in that period.

On the other, we observe that the appreciation of non-monetary assets constitutes as valid a source as the resources originating in current saving when it comes to configuring consumption and saving decisions, which means that, as demonstrated by empirical experience, the simple association of consumption-income or saving-income will never suffice to explain with the necessary rigour

all the circumstances that surround the spending and accumulation decisions made by economic agents [3].

To be sure, these considerations are not innovative in the light of modern macroeconomic analysis, but the formal framework that we have established here to frame the capital account and the income account in the context of the decisions made by individuals confers greater explanatory power to the accounting relationships than that which can be obtained in the absence of a theoretical foundation such as the one presented here.

[3] These aspects have been highlighted by Tobin in the contexts of a very revealing critique on the flaws in the formulation of the IS-LM model. "To put the same point another way," Tobin notes, "desired accumulation of a single asset, or of all assets together, refers to the differences between end-of-period real value and beginning-of-period real value. One component of this difference is capital gain or loss, the change in the value of the initial holding because of rise or fall in real asset price. The remainder is saving, the asset purchases households must make to meet their goals of accumulation". Tobin, J., 1980: *Asset Accumulation and Economic Activity*. Basil Blackwell, Oxford, 1980, p. 88.

SECTION 9

WEALTH EFFECTS

To the extent that the basic hypothesis of the intertemporal complementarity of the preference structure that we have adopted oversimplifies the options available to consumers in the real world, the demand functions for consumption, money, securities and physical assets that have been obtained in the previous sections, as well as the one pertaining to debt, would certainly not be the most competitive when it came to assessing the empirical merits of the theoretical system developed in this text against other alternatives. If this happened to be the challenge before us, introducing a higher degree of intertemporal substitutability in the preference structure, taking adjustment costs into consideration, using functional forms of greater complexity than those employed here, as well as including additional forms of wealth preservation by households—for instance, mutual funds—would give rise to specifications that, in being more comprehensive, could be subjected to empirical tests on a more equal footing.

Nevertheless, the fact that the functions we have obtained do not exhaust all the possibilities of the proposed theoretical framework does not mean that we should underrate its relevance. On one hand, there is a broad variety of consumer goods—for instance, all those pertaining to health or simply the subsistence of individuals—for which the potential for intertemporal substitution is very limited, and at least in this case the proposed preference function is unquestionably the one that best reflects the real ability to choose of individuals. On the other, the consumer goods that can be subject to a greater intertemporal substitutability are precisely durable goods, whose characteristics are very similar to those of physical assets, and which can therefore be included within the latter. Finally, we should not rule out that the assumption of intertemporal substitutability of the preference structure, while theoretically brilliant, may have a limited significance in practise, in which case the behavioural patterns of the agents should not diverge much from those described here.

Which are, then, the consequences that we can gather from our analysis? To what extent do they modify our current view of the determining factors of the demands for consumption, saving, assets and money? To what extent do they confirm it? Our conclusions on these aspects, which we put forth as suggestions for empirical research both in the field of econometric practise at the aggregate level and in that of applied psychology, can be summarised in the following points:

1.- In a monetary economy *strictu sensu,* with the properties that we have referred to in previous sections of this text, real consumption is presented, to mention the factors that seem most relevant in principle, as a defined function of the aggregate net financial capacity in real terms, of the current and future lending and borrowing interest rates, and of the equity risk premium, as well as of the current and expected prices of real estate. The net financial capacity plays a key role in the decision to consume—as well as the decision to save—but the balance of the lending and borrowing interest rates, to the extent that it affects the desired debt level, also exerts a decisive influence on consumption and therefore on saving. On the other hand, the fact that in our case the scale variable is the net financial capacity in real terms, which comprehends both the real income of the period and the real value of the financial and housing wealth after deducting liabilities, has two significant implications: a) First of all, it does not seem justified to attribute different marginal propensities to consume in relation to each of the components that integrate the net financial capacity, and in particular in relation to income on one hand and wealth on the other; the decisions to consume and save are configured by means of a fairly complex process of prospective maximization under the constraints set by the net financial capacity, with the latter magnitude being, consequently, the only

one that is relevant in this regard. b) Secondly, as we have already noted, concepts such as that of the Modigliani-Brumberg-Ando *available resources*, Friedman's *permanent income*, or the more generic concept of *total wealth*, commonly used in econometric works on the demand for consumption, are unlikely to be efficient when it comes to modelling consumer behaviour in a monetary economy in which the agents are subjected, by definition, to liquidity constraints. This conclusion supports our intuition that *wealth* as such cannot act as a relevant constraint on spending in real life, a suspicion that, furthermore seems to be ratified by more recent studies as far as financial and housing wealth are concerned [1]. In our model, wealth, considered prospectively, is the object of maximization, and not the constraint that conditions the spending and investment decisions of individuals as it appears in other theoretical approaches that we have already mentioned. In the case we propose, this role is played by financial capacity with the meaning we have ascribed to it, and is a revamping of the Keynesian line of thought as reinterpreted in the second half of the past century by Clower [2] and Leijonhufvud [3]. Obviously, all the changes that could happen in the variables that affect the net financial capacity in real terms—the price level, the interest rate on bonds, the dividend and equity risk premium, the interest rate on loans, etc—will also affect consumption, but it is clear that in this case we are referring exclusively to income or wealth effects, and not to intertemporal substitution effects, which we rule out by hypothesis.

2.- The preceding reflections are particularly applicable to the case of *human wealth,* which in modern research on the consumption function, inspired in the pioneering works of Modigliani and Friedman, is not only considered one of the components of total wealth but is also one of the most important from a quantitative standpoint. According to the prevailing interpretation, human wealth can be understood as the current value, capitalised at the appropriate interest rate, of the labour income flow that the economic agent expects to perceive through his working life, which determines, along with his current income and financial and housing wealth, his available resources. However, it is obvious, or it ought to be, that the household worker cannot purchase goods or acquire assets charging against the current value of his future income, but rather against the financial resources that he has been granted in the form of a loan with his future wage income as collateral. As we have seen in Section 6, the wage income that the representative agent expects to perceive in the future has an

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[1] A recent study of the OECD, which reviews the results of research studies aimed at assessing the impact of stock market fluctuations on consumption, underscores the importance of liquidity constraints in this type of behaviours. The study mentions expressly the contribution of Zeldes on the importance of these constraints. On this point, see Boone, L., Giorno, C. and Richardson, P. (1998): "*Stock market fluctuations and consumption behaviour: Some recent evidence*" Economics Department Working Papers Nº208. OECD. Paris, 1998. Also see Zeldes, S.P. (1989): "Consumption and Liquidity Constraints: An Empirical Investigation". *The Journal of Political Economy*, volume 97, issue 2, April 1989.

Another study of the OECD devoted to assessing the impact of changes in housing wealth on consumption also highlights the significant regulatory role played by liquidity constraints in the transmission of shocks that originate in the housing market. "Feed-through from house prices to activity" the study notes, "occurs largely through wealth channels affecting personal consumption; there are important differences in the strength of such wealth influences on consumption buoyancy, depending of the facility to take on mortgage debt and the extent of housing equity withdrawal". And further down, along the same lines, it adds: "The size of the long-run marginal propensity to consume out of housing wealth appears to be positively correlated with mortgage debt ratios across countries, suggesting that the mortgage market is pivotal in translating house price shocks into spending responses". For more on this issue, see: OECD: *Economic Outlook.* Volume 2004/1, No. 75. OECD. Paris, June 2004, pp. 128 and 134.

[2] The fact that consumers are subject to liquidity restrictions is, in fact, what is most consistent with the well-known characterisation of Keynesian economics: "An essential formal difference between Keynesian and orthodox economics" Clower states, "is that market excess demands are in general assumed to depend on current market transactions in the former, to be independent of current market transactions in the latter. This difference depends, in turn, on Keynes' tacit use of a dual-decision theory of household behaviour and his consequent rejection of Walras´ law as a relevant principle of economic analysis". Clower, R.W. (1965: *The Keynesian Counter-Revolution: A Theoretical Appraisal.* Reprinted in *Monetary Theory*, edited by R.W. Clower. Penguin Books Ltd. Great Britain, 1971, p. 294

[3] For more on this issue, see Leijonhufvud, A. (1981): *op. cit*., chapters 6 and 8 in particular.

indirect influence on consumption, since it constitutes one of the determining components of the solvency level, but human wealth, understood in the sense noted above, is only one referent to the *potential* spending power that will only turn into effective purchasing power to the extent that the financial markets make it possible. Thus, for example, and to recall what we saw in Section 6, an increase in the current interest rate on loans will reduce the current value of the wage income that the representative agent expects to perceive through his working life, even if the expectations regarding its evolution have not changed, which, *ceteris paribus,* will reduce his solvency level, discourage his propensity to borrow, and will ultimately curb either his acquisition of consumer goods or his purchase of assets of different types. Thus, a single expected future income can have different effects on consumption, which depend on the conditions that prevail at each time in the loan market [4].

3.- These reflections become especially significant when one considers the high level of debt incurred by households in many Western economies, and particularly in some peripheral European economies, as a consequence, among other reasons, of the hike in house prices [5]. This fact continues to be a source of great concern for the central banks and governments of these countries, which at the time of this writing fear the negative wealth effects associated to an eventual increase in the interest rates of loans in the context of a potential tightening of the monetary policy. In this regard, and as we have anticipated, our analysis shows that in the framework of our model, changes in the interest rate on loans produce three different types of effects that we ought to keep in mind: i) First of all, an increase in the interest rate on loans will reduce the current value of the debt that the borrower carries over from the past, which increases the aggregate financial capacity and causes an expansionary impact on consumption and on the different types of assets; naturally, a decrease in the interest rate on loans would cause the opposite effect, since in this case the value of debt contracted in the past—which we would assume was contracted at a fixed rate—would rise both for the borrower and the lender. ii) Second of all, an increase in the interest rate on loans will decrease the current value of the wage income flow that the household borrower expects to perceive through his working life, which lessens his solvency level, discourages his propensity to borrow, and has a negative impact both on aggregate consumption and on the aggregate demand for assets of different classes. Naturally, a drop in the interest rates on loans will produce the opposite result, and its net impact will depend, as happened in the previous case, on the initial financial position of the borrower as it concerns his expected income and his debt level. iii) Last of all, an increase in the interest rate on loans reduces the opportunity cost of forgoing borrowing since it diminishes the net expected profit of alternative allocations, which will have a contractionary impact both on the demand for consumption and on the demand for assets on which the resources derived from them could be invested. As can be seen, this is a chain of effects that are quantitatively different and that are not always of the same sign, although under normal circumstances we could assume that an increase in the interest rate on loans will have an overall contractionary impact on the propensity to borrow and on consumption and the demand for assets.

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[4] Another excerpt of the work of Zeldes, from the *Summary* of the article previously cited, seems fitting here: "Several recent studies" Zeldes notes, "have suggested that empirical rejections of the permanent income/life cycle model might be due to the existence of liquidity constraints… *The results generally support the hypothesis than an inability to borrow against future labor income affects the consumption of a significant portion of the population".* (Text italicised by the authors of the current text.) Zeldes, S.P. (1989): Op. cit. p. 305.

[5] According to the OECD, in 2008 the financial liabilities of households amounted to 97.5% of their disposable income in Germany, 127.2% in Japan, 177.6% in the United Kingdom, and 130.3% in the United States. In Spain, our country, according to estimates made by Funcas, in 2007 financial liabilities amounted to 139.9% of household disposable incomes. In almost all of the above countries, the financial liabilities to gross disposable income *ratio* has reached exorbitant levels in the past decade, although of late these levels are adjusting downwards. For more on this issue, see OECD (2010): *Economic Outlook*. No. 88, November 2010. Fundación Española de Cajas de Ahorro (2008): *Ensayos*: "Patrimonio Inmobiliario y Balance nacional de la Economía Española. (1995-2007)". Madrid, 2008, p. 138.

4.- The questions that arise from the effects mentioned in the previous point in regard to the assessment of the ultimate impact of an increase or decrease in the interest rate on loans vanish entirely when the loans are contracted at a variable interest rate rather than a fixed one. In this case, which at the time of this writing is the most common in our country [6], the most comprehensive version of the model we have developed in previous chapters changes in at least two significant aspects: a) First of all, the current interest rate ceases to be relevant when it comes to the calculation of the expected future value of debts, since once variable interest rates apply the only relevant interest rate is the variable interest rate expected for the immediate future; with variable interest rates, the expected value in $t+1$ of one euro borrowed in t will be simply—see expression [6.6]—$(1+ r_{t+1})$. b) Second, the definition of the aggregate net financial capacity given in [7.3] also experiences a change, since on one hand the payment of interests in the current period results from applying the new going variable rate to the carryover debt, and on the other, the value of the carryover debt is no longer affected by changes in the interest rate. To put it another way: The value of the principal of the debt carried from the past is simply L_{t-1}, and the interest generated by this debt amounts to $r_t^l \cdot L_{t-1}$. Under these new circumstances, the effects of the variations of the current—and variable—interest rate on loans are of the following nature: i) As happened before, an increase in the interest rate on loans will decrease the current value of the wage income flow that the household borrower expects to perceive during his working life, which leads to, as we already noted, a contractionary impact both on aggregate consumption and on the demand for assets, and an expansionary impact on both in the opposite case; ii) Also as happened before, an increase—or decrease—in the current interest rate on loans lessens—or increases—the opportunity cost of forgoing a higher debt level, which will have a contractionary—or expansionary—impact both on the demand for consumption and on the demand for assets; iii) However, and unlike what happened in the previous case, the variations in the variable interest rate on loans do not alter the value of the carryover debt, so the contractionary or expansionary impacts caused by an increase or decrease of these rates on the demand for consumption and for assets prevail without question through the effects described in the preceding points i) and ii). With variable interest rates, the expansionary—or contractionary—effects on consumption and the demand for assets generated from a decrease—or increase—of the former always move in the same direction, so presumably they are of a greater intensity than in the previous case.

5.- The considerations we just presented in the two previous points bring to light an aspect of extraordinary significance in the behaviour of advanced economies: That is, the amplifying effect, in either direction, that changes in the interest rate on loans have on the overall demand through their influence on the financial capacity, solvency, and debt. Indeed, the influence of the variations in the interest rate on loans is not limited to their direct impact on the financial capacity, but is also manifested through their indirect impact on the relative level of the lending and borrowing interest rates, on the solvency level, on the debt level, and ultimately on the overall financial resources. This *accordion effect* on the overall demand— a more than proportional increase of consumption relative to the increase in the net financial capacity caused by a fall in the interest rate of loans, and a more

[6] At present, more than 90% of the mortgage debt incurred by Spanish households—which, as we have pointed out, are among the most indebted in the world—is contracted at variable interest rates, and we assume that a similar situation would appear in other countries under the same circumstances. Although the economic authorities of our country find this behaviour worrisome, we cannot but state that the financing option chosen by Spanish households is logically consistent, since the expected increases in the interest rates that are being conveyed to the public by the financial authorities and the financial institutions themselves fall below the rates at which the latter are willing to grant long-term loans. Naturally, the asymmetrical character that fixed rates have for financial institutions—with comparatively low transaction costs, the borrowing household can get *entrenched* with its original financial entity in regard to the agreed-upon fixed rate when rates continue to be higher on a long-term basis, yet it always has the option to contract a lower rate with the competition when the rates have dropped—justifies that they try to *cover themselves* with rates higher than they would be otherwise, but the households understandably resist going along with this.

than proportional drop of consumption relative to the decrease of the net financial capacity induced by an increase in the aforementioned rate—works on the households as what has been termed a *financial accelerator,* a concept that fits into the *Fisherian* tradition, according to which financial factors—such as increases in the financial debt of households or variations in asset prices—play a crucial role in the generation of economic fluctuations. Iacoviello—Iacoviello, M. (2005)— describes the mechanism by which demand *shocks* are transmitted to economic activity in a way that fits to perfection the argument we discussed in Section 6 when we analysed the effects of the changes that may occur in the household lending and borrowing interest rates on the equilibrium of our model."The model transmission mechanism", Iacoviello notes, "works as follows. Consider, for the sake of argument, a positive demand shock. When demand rises, consumer and asset prices increase: the rise in asset prices increases the borrowing capacity of the debtors, allowing them to spend and invest more. The rise in consumer prices reduces the real value of their outstanding debt obligations, positively affecting their net worth. Given that borrowers have a higher propensity to spend than lenders, the net effect on demand is positive, and acts as a powerful amplification mechanism" [7]. Even if we were to disregard this last aspect, our interpretation of the adjustment process of households to changes in financial conditions—as it pertains to both consumption and to the reallocation of financial and physical assets—while restricted in our case to household behaviour, fits perfectly in the credit view of economic crises, which posits that financial conditions play an essential role in the generation of such crises.

6.- The relevance we attribute to the conditions of credit and debt as amplifying factors of economic fluctuations happens to provide additional support to the series of modern contributions, such as those by Stiglitz, Bernanke, Kiyotaki, Zeldes, Campbell and Mankiw among many others, that ascribe a determining role in the configuration and propagation of economic cycles to financial frictions, even if for the time being we attribute this relevance based on different grounds [8]. In our case, the fluctuations would not be caused, as would follow from the model of Stiglitz and Weiss, to put an example–Stiglitz, J. and Weiss, A. (1981)–by the existence of credit rationing under *equilibrium* conditions in the loan market, but rather by the responsible behaviour of those who could be called *good borrowers*, to use the terminology of the cited authors. In each of the scenarios contemplated in the preceding points 3), 4) and 5), we have been referring exclusively to the effects of changes in the demand for loans on the part of the borrowers, which involves an implicit acceptance of the hypothesis that this demand *could* be satisfied in full by the lenders, at least in theory, at the going interest rates. Consequently, we would find ourselves in the situation that modern research in the field of housing demand defines as *Low Valuation Equilibrium* (LVE), in which, as noted by Arce and López-Salido [9], wealth owners do not exhaust their borrowing limits. However, we could also find ourselves in a situation that the works we just referred to would term as *High Valuation Equilibrium* (HVE), characterised by a demand for credit at the going interest rate by the borrowers exceeding the limits that the lenders are willing to accept. This leads to a mismatch between the desired demand for credit and the available supply of loans that gives rise to *borrowing*

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[7] Iacoviello, M. (2005): "House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycles". *American Economic Review*, 95, 3 June 2005, p. 740.

[8] On this issue, see Bernanke, B.S., and Gertler, M. (1989): "Agency Costs, Net Worth, and Business Fluctuations". *American Economic Review*, 1989, 79 (1); Kiyotaki, N. and Moore, J. (1997): "Credit Cycles". Journal of Political Economy, 105, (2), 1997; Bernanke, B.S., Gertler, M. and Gilchrist, S. (1999): "The Financial Accelerator in a Quantitative Business Cycle Framework", in Taylor, J.B., and Woodford, M. Eds: *Handbooks in Macroeconomics*, North Holland, Amsterdam, 1999; Zeldes, S.P. (1989): *Op. cit*.; and Campbell, J.Y. and Mankiw, G. (1989): "Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence", in Blanchard, O.J. and Fisher, S. Eds. *NBER Macroeconomic Annual*. Volume 4. Cambridge Mass. MIT Press, 1989.

[9] Arce, O.J. and López-Salido, D.J. (2006): *Op. cit.*

constraints [10]. In this case, the upper bound of the financial resources that households can generate by means of borrowing is limited on the supply side, and the equilibrium levels for borrowing, consumption and the demand for assets are lower than they would be otherwise. On the other hand, the emergence of credit constraints may be unavoidable in those cases in which there has been a process of excessive borrowing, a circumstance that can be advanced by the fact that the collateral for mortgage loans consists of real estate assets whose *ex-ante* appraisal may be inflated. In our model, financial resources always have a finite value on the demand side, since the potential financial capacity only includes the current value of wealth accumulated in past periods and thus excludes the value of assets newly acquired in the current period. But if the latter were to be included in the solvency constraint, it could be that the demand for borrowing by our representative agent would tend to infinity, which could happen as long as the cost of loans was inferior to the expected profitability of the different types of assets. In fact, the model developed in Section 6 does not seem to generate any solutions for certain values of the parameters and of the relative opportunity costs when the purchases of assets made in the current period are included in the computation of the financial capacity of the same period, suggesting that our decision-making agent, in the throes of an episode of *irrational exuberance*, could be assessing as optimal a behaviour consisting in *becoming infinitely indebted to become infinitely wealthy* [11]. In this last case, a new definition of solvency based in the ability of the representative agent to pay the interest and principal of his debts would probably prevent the emergence of situations that could be described as *moral hazards.*

7.- According to the content that we have assigned to the concept of aggregate net financial capacity, the income of the period—understood in terms of the liquid resources obtained from wages and the financial and physical capital perceived in that time after deducting the interests on liabilities—is only one element, which is smaller the greater the aggregate net financial capacity of the economy, among the many that determine consumption in the period. The by now age-old intuition that the income variable does not suffice to explain consumption behaviour—a conclusion that has been established robustly by modern macroeconomic analysis—is thus justified, with no less backing, by the results of our analysis. From our point of view, the old challenge of reconciling the long-term and short-term consumption functions, which was quite in vogue in the second post-war period, would not be, as has been suggested by recent investigations, more than an artificial problem derived from a clearly unsatisfactory specification of the function of aggregate consumption that did not take into account the increasing influence of wealth. The income of the period can have a determining impact on the evolution of aggregate consumption whenever the wealth levels are low,

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[10] The influence of credit constraints on the demand for borrowing, and consequently on the demand for assets and the overall demand, is now the object of widespread attention in relation to the determining factors of the demand for housing. In addition to the studies of the OECD and Zeldes already cited, as well as that by Arce and López-Salido, see, for example, significant references such as Haurin, D.R., Hendershott, P.H. and Wachter, S.M. (1997): "Borrowing Constraints and the Tenure Choice of Young Households". *Journal of Housing Research*, 8, 1997; Iacovello, M. (2005): "Housed Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle". *American Economic Review*, 93, (3), 2005; and Yao, R. and Zhang, H.H.: "Optimal Consumption and Portfolio Choices with Risky and Borrowing Constraints". *Review of Financial Studies*, 18 (1), 2005.

[11] Although the vast majority of loan seekers act prudently to limit the risk involved in excessive borrowing, the experience of the last crisis demonstrates that irresponsible behaviours, both at the individual and the collective levels, cannot ever be overruled. Spain is still ailing from the effects of the period of *irrational exuberance* experienced in the domestic housing market from the beginning of the previous decade up to the 2008 financial crisis, during which house prices reached extraordinary levels—to the point that they amounted to almost thirteen times the average yearly wages—as a result of the speculative fever that seized real estate buyers and developers with the fraudulent collusion of financial institutions and their subsidiary valuation companies, the opportunistic complacency of national, regional and local authorities, and the indolent tolerance of the Bank of Spain. For years, hundreds of thousands of Spanish households became excessively indebted to benefit from the miraculous effects of housing appreciation, although the happy ending that these households had been dreaming of has turned for many into a real nightmare.

but it stands to reason that its influence weakens as wealth increases [12]. In retrospect—and not only from the specific perspective of the functions of aggregate consumption or money, but from the perspective of economic theory in general—it would seem as if our theoretical frameworks were designed to reflect the economic behaviours in economies with relatively modest levels of wealth, but which have been decreasingly representative as Western economies became wealthier and more lavish. According to the last *Economic Outlook* published by the OECD, which we have referred to already in our discussion of borrowing, in year 2008 the net wealth was 4.7 times the disposable income of North American households, 5.5 that of Canadian households, 6.1 that of German households, 7.0 that of Japanese households, 7.5 that of households in the United Kingdom, and according to Funcas—Funcas (2009)—it amounted to almost twelve times the disposable income of Spanish households. As much as these figures may be influenced to a great degree by prices of real estate that are largely overrated, which is particularly true in the case of Spain, it is clear that wealth must have quite a decisive influence on consumption levels.

8.- Although there were already clear hints as to the influence of wealth on consumption in the *General Theory* [13], the truth is that our analysis, in agreement with what seems to be the most recent empirical practise, leads to a considerable expansion of the theoretical framework that is more likely to give rise to *wealth effects* than alternative formulations. In contrast to stricter versions—in which the wealth effects derived from a general deflation of wages and prices would be confined to their impact on the real value of the *stock* of *outside money* held by households and to the real value of the government bonds in their command [14]—the scope of the concept of aggregate *net financial*

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[12] With the aim of refuting the prescriptions of the Barro-Ramsey – Barro, R. (1974) – and Diamond-Samuelson – Diamond, P. (1965) – models regarding the neutral effects of fiscal policy, there has recently appeared, following the line drawn by Mankiw – Mankiw, N.G. (2000) - various models of a dual nature which hold that an important portion of consumers follow a *rule-of-thumb* behavior, in the sense that they neither save nor borrow loans, and thus spend all of their income. Based on empirical data on the distribution of wealth, Wolf – Wolf, E.N. (1998) - Galí et al – Galí, J., López Salido, J.D. y Vallés, J. (2007) – Bosca, Domenech and Ferri – Bosca, J.E., Domenech, R. and Ferri, J. (2009) - and more recently Ståler and Thomas – Ståler, N. and Thomas, C. (2011) – have insisted, although not always to the same purpose, on the importance of this *rule-of-thumb* behavior. Nevertheless, and while recognizing that even in advanced societies there are substantial sectors of the population which barely reach subsistence levels, this does not seem to be the general rule, as is recognized in the works cited above. On average, as the text shows, in advanced societies the value of the financial capacity far exceeds the value of the disposable income of families, and in our view the existence of sectors of the population who are poorly-off does not invalidate both the general character of the model presented here and the conclusions derived from it. Moreover, it is important to emphasize that our model does not resemble those presented as an alternative - the RBC models, which postule infinitely-lived Ricardian households - by the defenders of *rule-of-thumb* behavior. Even if it does not have an all-determining character, we support that each period's income will have an impact on consumption that is greater the smaller the non-wage related component of the financial capacity, and that its degree of influence will be larger – as Mankiw himself noted in the article cited – if there are restrictions on liquidity and credit.

[13] In response to the criticism of Harry Johnson, who had accused Keynes of failing to account for the influence of capital on behaviour, Leijonhufvud has proven, conclusively in our opinion, that this was certainly not a flaw that could be attributed to the *General Theory*. The references on which Leijonhufvud bases his rebuttal of Johnson's critique, which confirm the existence of a Second Psychological Law of Consumption within the framework of the General Theory, are (see Leijonhufvud, A., 1976: *Op. cit*., pp.165 and following) the following statements by Keynes:

"The consumption of the wealth-owning class may be extremely susceptible to unforeseen changes in the money value of its wealth. This should be classified amongst the major factors capable of causing short-period changes in the propensity to consume". (Keynes, J.M., 1936: *Op. cit*., pp. 92-93.

"Unfortunately a serious fall in the marginal efficiency of capital also tends to affect adversely the propensity to consume. For it involves *a severe decline in the market value of Stock Exchange equities*. Now, on the class who take an active interest in their Stock Exchange investments, e*specially if they are employing borrowed funds*, this naturally exerts a very depressing influence. These people are, perhaps, even more influenced in their readiness to spend by rises and falls in the value of their investments than by the state of their income". Italics added by the authors of the current text. (Keynes, J.M., 1936: *Op. cit*., p. 319).

[14] The existence of a wealth effect on consumption associated to an increase in the real value of money holdings as a consequence of deflation—*Pigou effect*—is not usually put into question, although the foundations that support this effect have come to be limited, after Kalecki's critique of Pigou's original formulation, to outside money. The second of these aspects—

capacity comprehends, on one hand, the extension of wealth effects to the real value of capital income and the real value of the *stock* of securities and real estate commanded by the household, and on the other the recognition of their influence on the real value of the capitalisation of wage income and the real value of debts. Therefore, leaving aside the *real income effect* that refers to the increase in the real value of the capital income generated and perceived by the current period due to deflation, our analysis reveals five different types of *wealth effects*: i) The *Pigou effect*, which in this case is understood as the impact on consumption that derives from an increase in the real value of the *total* money balances held by households due to deflation, since the impact of this increase on debt is taken into account separately [15]; ii) the *real financial effect*—to use the terminology of Patinkin—which in our case refers to the positive impact of deflation not only on the real value of the initial *stock* of bonds, but also on the real value of the *stock* of shares held by households [16]; iii) The *real physical asset effect*, which in this case refers to the positive effects that derive from the increase in the real value of housing as a consequence of deflation; iv) The *real solvency effect*, defined as the increase in the current real value of the wage income flow that the household expects to perceive through its working life; and v) Lastly, the *real debt effect,* understood as the increase that would take place in the real value of household debts as a result of deflation. Therefore, the theoretical foundation for the generation of wealth effects associated to deflation is, according to our analysis, of a vastly greater scope than it has been previously deemed in more traditional approaches, since it also applies to the real financial effect on shares of stock, to the effect that we have labelled real physical asset effect, and to a real debt effect that is now explicitly identified.

9.- The recognition of significant wealth effects associated to the deflation of wages and prices—Pigou effect, real financial effect, real physical asset effect, real solvency effect, and real debt effect—should guarantee, as shown by the simulations that we have discussed in Section 6, an overall positive effect of deflation on the demand for consumption in particular and on the overall demand for goods and services in general. However, recognising these effects does not mean that an overall deflation of wages and prices could be considered, unless we were referring to an open economy in which external competition were a determining factor, an overly advisable option to revive the demand for consumption and stimulate economic activity, let alone on a general basis. The fact that

that is, the one that derives from an increase in the real value of the nonfinancial government debt as a consequence of deflation—has been the object of greater controversy, with the response depending, as Ricardo already suggested, on the degree to which consumers anticipate an increase in taxes set by the government to meet the increased real burden of servicing its debt. The basic references to analyse these issues are, fundamentally, Pigou, A.C. (1943): "The Classical Stationary State", in *Economic Journal,* December 1943; Kalecki, M. (1944): "Professor Pigou on the Stationary State. A comment", in *Economic Journal*, April 1944; Pigou, A.C. (1947): "Economic Progress in a Stable Environment" in *Economica*, August 1947; Ricardo, D. (1817): *The Principles of Political Economy and Taxation*; Barro, R. (1974): "Are Government Bonds Net Wealth?", in *Journal of Political Economy*, November-December 1974.

[15] In relation to the comment that we made at the beginning of this section about the *General Theory* it is worth mentioning, to bring up a contradictory piece of evidence, that Keynes has not recognised, contrary to what can be inferred from our analysis, any direct effect on consumption when the real value of the initial money balances increases as a result of deflation. In the *General Theory,* as is well known, the wage and price deflation acts on the aggregate demand for goods and services through the *Keynes effect.*

[16] Taking into account a wealth effect associated to an increase in the real value of stocks held by households as a consequence of deflation could eventually incite, as was the case with bonds, a criticism along *Ricardian* lines adapted to this circumstance. For instance, it would be possible that an increase in the real value of the debt burden of corporations could force them to raise sale prices, which would set off the positive impact of the initial deflation. It would also be possible that the increase in the real value of debt would make the prices of corporate stocks fall if the firms failed to raise their prices, which would also counteract the favourable initial impact of deflation. In our opinion, any of these arguments might even have a stronger foundation than the one habitually used to refute the existence of a wealth effect on bonds. But it is one thing for what we could call *second round* effects to exist, and quite another for households to be capable, in either of these cases, of anticipating the sequence of effects that could be triggered by deflation.

income from wages plays a part as an explicit component of the net financial capacity, as well as the fact that such income still constitutes the most significant income source for households and thus the main guarantee of their solvency in most economies, evinces the need to consider different types of arguments before policy recommendations can be formulated which would not be free from risks if they were to be implemented. From a strictly theoretical standpoint, the answer will depend for the most part on the degree to which we are willing to accept the existence of instantaneous processes of adjustment between wages and prices in the real world, for in the absence of mechanisms of this nature, drops in wages could lead to a drastic fall in the purchasing power of workers, and eventually to a total or partial offsetting of the positive impact on consumption associated to the increases in the real value of the remaining components of the financial capacity in the economy under consideration. From this last perspective, our model would offer additional support, albeit circumscribed to the behaviour of households, to the theoretical developments of New Keynesian economics, which, as is well known, attribute real effects—explicitly upward ones, but therefore downward ones too—to the changes that may take place in monetary conditions precisely as a consequence of the price rigidity caused by imperfect competition, by the existence of adjustment costs associated to price changes, or other reasons [17]. Granted, we could assert that the stimulating impact of wage and price deflation will always be greater the smaller the proportion of the financial capacity is comprehended by wages in the economy under consideration, but in any case, it is not possible to predict a certain answer for a problem that could only be debated with any sense in the framework of a much more complex macroeconomic model than the one contemplated here [18].

10.- The wealth effects mentioned above could also serve to contrast the forecasts on the foreseeable impact of deflation on saving that are deduced from the most representative versions of classical theory, which were developed in the first half of the past century by Scitovszky [19], Haberler [20], and Pigou [21] precisely to include the connection between saving and wealth. As is well known, these versions establish that real saving tends to be lower, and therefore real consumption higher, the greater the real value of private wealth, which will obviously increase with deflation. However, our simulations refute the existence of a negative correlation between deflation and real saving, both in the case contemplated by the classical theorists and in the case that debt occurs. Whether we take as a reference the basic model whose properties were analysed in Section 4 or the comprehensive

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[17] For a thorough and rigorous exposition of the models of the new Keynesian economics, in which price rigidity issues play a decisive role, see, apart form the already mentioned references, the internal document of the UNED drawn by professors Barreiro and López-Salido with the reference Barreiro, F. and López-Salido, J.D. (2006): *Fundamentos Microeconómicos de la Macroeconomía*. Department of Economic Analysis. UNED. Madrid, 2006.

[18] As is well known, Keynes denied that a reduction in wages could have a direct impact on employment, since the effective demand in terms of wage units would not be altered by this fact. At most, and as long as the *liquidity trap* did not come into effect, one could expect a mild positive impact through the *Keynes effect,* although he never considered that this possibility could be relevant in practise. The later reformulation of the classical saving function carried out by Haberler and Pigou made it possible to rebut the Keynesian scepticism within the framework of static analysis, but, as Patinkin already settled in his day and was later demonstrated by Friedman and Phelps in their relevant contributions about the validity of the *Phillips curve*, this is an issue that can only be elucidated, given the decisive role played by expectations, by resorting to considerations of an essentially dynamic bent. This is the reason why we hold a cautious attitude toward the real effects of deflation despite the results offered by the model we have developed in this text. As basic references for our commentary, see, above all, Keynes, J.M. (1936): *Op. cit.,* Chapter 19; Patinkin, D (1948): "Price flexibility and full employment", in *American Economic Review*, September 1948; Friedman, M. (1968): "The Role of Monetary Policy", in *American Economic Review*, Vol. 58 No. 1, 1968; and Phelps, E. (1968): "Money-Wage Dynamics and Labor Market Equilibrium", *Journal of Political Economy*, August 1968.

[19] Scitovszky, T. (1941): "Capital Accumulation, Employment and Price Rigidities", en *Review of Economic Studies*, February 1941.

[20] Haberler, G. (1941): *Prosperity and Depression*. League of Nations, Geneva, 1941.

[21] Pigou, A.C. (1943): *Op. cit.*

model that includes debt presented in Section 6, the simulations confirm that the drop in the general price level increases real consumption and real saving to the same degree, while the propensity to consume in relation to both the real disposable income of the period and net financial capacity of the period in real terms does not change as a result of it. To be sure, and as reflected in expression [7.13], the decrease in prices increases the real value of the wealth carried over from the past, leading, *in principle,* to a drop in real saving that would be consistent with what the classical tradition propounds, but this is not the whole story. As that expression [7.13] shows, the equilibrium level of real saving *also* depends on the equilibrium values of the *stocks* of assets in real terms held by households at the end of the current period, which also will be greater the lower the price level. In the end, what happens is that deflation stimulates both real consumption and real saving, and its expansionary effects, which should be approached with the same cautious regard for the dynamics that may emerge already indicated in point 9 above, should not be attributed to a process of substituting consumption for saving, but rather, and in a line of argumentation that is revealed as typically Keynesian, to the expansionary impact of the drop of prices on the real financial capacity, on the real solvency level, and therefore on consumption, saving and the overall demand.

11.- The discrepancies that emerge with the classical model when assessing the impact of deflation on consumption and saving also surface when it comes to assessing the impact of changes in the current interest rate on bonds on the same variables. At first glance, these discrepancies are not addressed in the framework of the basic model we have analysed in Section 4, since in this case an increase in the current interest rate on bonds has a contractionary impact both on real consumption and on the propensity to consume out of the disposable income, and therefore an expansionary impact both on real saving and on the propensity to save from that disposable income, both effects that in principle would be consistent with what we could call the *classical tradition* on this issue. Still, we have to take into account that in our case the decline in consumption and in the propensity to consume on one hand, and the increase in saving and in the propensity to save, on the other, are not consequences of a substitution effect of saving for consumption induced by a rise in the interest rate, but both effects are due to the simple fact that increases in the current interest rate reduce the financial capacity while leaving the disposable income unchanged. It is a different matter, however, when we study what happens to consumption and saving as a result of the changes that may take place in the current interest rate on bonds in the framework of the comprehensive model we have presented in Section 6, for in this case debt plays a crucial role. In this model, as we can remember, several elements come into play. On one hand, households are aware that the market value of old bonds and stocks experiences a decrease if the interest rate on newly issued bonds increases; this reduces their financial capacity to an extent that is greater the higher the proportion of wealth carried over from the past held in the form of securities, so that real consumption should consequently drop. On the other, the level of debt incurred in the past seems increasingly worrisome after the rise in the interest rate on bonds as the solvency level has declined in relation to the initial equilibrium state, which should lead to a decrease in borrowing and therefore discourage consumption. However, from this point on it is the expectations of future wealth that come into play, and these are greater, for the given current interest rate on loans and the expected interest rate on bonds, the higher the current interest rate on the latter. The manager of the household finances thus finds himself in a situation in which the expected overall return of bonds, which from his perspective is a *lending* rate, widens the gap in regards to the *borrowing* rates represented by the interest rate on loans; and this, to the extent that it leads to anticipating a higher level of future wealth, may induce an expansionary effect on borrowing and consumption and a contractionary effect on saving that could offset, partially or in full, the expansionary impacts of the latter that we have just discussed. Although overall expansionary effects on saving derived from an increase in the current interest rate on bonds prevail in the model simulations that we present in *Appendix II*, we cannot rule out the possibility that the opposite may occur.

12.- Whatever the effects of deflation or of interest rates on saving may be, which at any rate we consider to be sufficiently bounded, the expressions [7.4], [7.5] and [7.6], as well as [7.7], show that choosing the optimal values of the net wealth holdings in their different forms—that is, w_t^B, w_t^A, w_t^H and w_t^L—necessary involve choosing the optimal flows of *net investment* in real terms of the assets that integrate it—that is, $(1/p_t)\cdot b_t$, $(1/p_t)\cdot(d_t/r_t+a)\cdot a_t$, $(1/p_t)\cdot p_t^h\cdot h_t$ and $(1/p_t).l_t$—since the real value of the wealth accumulated in the past is determined exogenously. To put it in other words: in our case, the *net investment* in assets is precisely the *residual* consequence of a *trade-off* between the real wealth level that the household wishes to maintain at the end of the period, and the current real value of the wealth of the household at the beginning of the same period. This result seems to contradict the findings of the *Behavioural Finance* school obtained through the already cited works of Kahneman and Tversky [22], according to which investors do not maximize the expected final wealth but the change in wealth expected in relation to a given reference point. Nevertheless, Kahneman and Tversky do not seem to rule out this dependence entirely. As the authors note in the article we have just referred to: *"The emphasis on changes as the carriers of value should not be taken to imply that the value of a particular change is independent of initial position. Strictly speaking, value should be treated as a function in two arguments: the asset position that serves as a reference point, and the magnitude of the change (positive or negative) from that reference point"*. On the other hand, there are significant conceptual differences in the methodologies to which we are referring, since the *phenomena* drawn by Kahneman and Tversky to establish the cited conclusion do not intend to represent in their full complexity the situations in which households find themselves in the real world. For our conclusions on this matter to be refuted—that is, that the decisions made in regard to the *increases* and *levels* of wealth are in fact two sides of the same coin—it would be necessary to design experiments that reproduced the initial conditions and the constraints that we contemplate in our analysis, a task which, by the way, would not fail to be of interest. On the other hand, there are also differences as to the purpose of the experiments: The conclusions of Kahneman and Tversky derive from the contradictions that arise from contrasting decisions based in the theory of expected utility, an appraisal that we agree with but which does not concern us. In fact, the solution of the optimisation programmes developed in the previous chapters does not correspond with the maximum value of the expected wealth, since this maximum is modulated by the degree of *subjective confidence* that the decision-making agent feels toward the expected returns associated to the different types of assets in which he can materialise his wealth. In reality, the model that we have developed throughout this text would aspire to be no more than a sort of formal frame, and a relatively simple one at that, for the mental processes, with all their complex psychological underpinnings, described by Kahneman and Tversky in their pioneering work about decision making under conditions of uncertainty [23].

13.- Meanwhile, the analysis of the demand for money function given in [7.1.b] or [7.2.b], developed from the simulations which we have referred to reveals the following basic properties: i) The demand for money in real terms depends, as far as the scale variable is concerned, on the aggregate net financial capacity in real terms, which means that the demand for nominal money balances by the ultimate owners of wealth is proportional to the general price level; ii) The demand for money in real terms will be positive, even if the opportunity cost of holding money is positive as well, with said opportunity cost equating the forgone overall earnings—rents, interests, and capital gains—associated to the possession of different types of assets after deducting from it the cost of

[22] Kahneman, D. and Tversky, A. (1979): *Op. cit*.

[23] On this issue, see, Kahneman, D., Slovic, P. and Tversky, A. (1982): *Op. cit*.

loans; the uncertainty associated to the returns on non-monetary assets is, as Keynes noted [24], at the source of this result. iii) The real demand for money will be lower the higher the current interest rate of bonds, the equity risk premium, the appreciation of house prices, and the interest rate on loans, and greater the lower these are; this is so because these changes will increase the opportunity cost of holding money as opposed to other, non-monetary assets as a given proportion of the aggregate net financial capacity of households in real terms. iv) On the contrary, the demand for money in real terms will be greater the higher the expected return rate on bonds and on loans, and lower the lower these rates; and this is so because both shifts will reduce the opportunity cost of holding money rather than securities in the household portfolio. v) In general, the demand for money in real terms will not be infinitely elastic even if the opportunity cost of holding money were to be zero, since this would only happen if the only possible choices were money and bonds and no intrinsic utility—not even as a factor to reduce uncertainty—could be attributed to holding money; the Keynesian demand for money function is thus configured, as we highlighted in Section 4, as a special case of the more general one we have presented here. Many of these properties ratify crucial aspects that have been present at all times in the theoretical debates around the demand for money function, from Keynes to Friedman, but some others, which appear to be more novel, are more discernible within the theoretical framework that we have developed in this text.

14.- Continuing with the demand for money function, at first glance there is a remarkable similarity between the one we have obtained and the one proposed by Friedman in his *Framework.* The similarities are mostly noticeable in a few aspects, especially in the inclusion in the function of non-human wealth and the expected return on the different types of explanatory assets in the corresponding demand function, as well as in the relevance attributed in the latter to the *expected inflation rate,* which has a similar meaning to the one we attributed to it [25]. However, there are also very significant differences between our function and Friedman's that we ought to highlight. The first one, which may be the most important, is that we have obtained the demand for money function of households through a scheme of prospective wealth maximization under the liquidity constraints that characterise a monetary economy, while Friedman proposes his through a more *ad hoc* approach. The second difference resides in the matter of content, since the way Friedman conceived of wealth had little to do, especially once it is replaced by as subjective a concept as that of *permanent income,*

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[24] "The possession of actual money lulls our disquietude; and the premium which we require to make us part with money is the measure of the degree of our disquietude". Keynes, J.M. (1937): "The General Theory of employment". *Quarterly Journal of Economics*. Vol. 51, 1937. Reprinted in *Monetary Theory*, edited by R.W. Clower. Penguin Books Ltd. Great Britain, 1971, p. 219.

[25] Friedman expressly states that "(1/P)(dP/dt) is the expected rate of change of prices of goods and hence *the expected nominal rate of return on real assets"* (Italics added by authors of current text). Friedman, M. (1971): *Op. cit*., p. 13. This is precisely the role that we have attributed in this text to the inflation rate, since the *real* demand for money as a store of value does not compete with goods in general, but with those financial assets that yield returns to their owners and with physical assets whose profitability is identified to a large degree with their intrinsic inflation rate.

However, our interpretation differs from that of other authors such as Laidler, who in referring to Friedman's demand for money function states:

"If the rate of return on holding money were constant, we could leave matters here, but if the price level can vary, this is not the case. If the price level rises, the real value of money holdings, denominated as they are in nominal terms, falls, and vice versa. Rising or falling price levels provide a return to money holding, which in the former case is negative and in the latter case positive. The expected percentage rate of change of the price level must then be interpreted as an expected own rate of return to money holdings. Other things being equal, the higher expected rate to holding money, the more of it will be held, and the lower it is, the less will be held. Thus the expected rate of inflation is a potentially important variable in the demand-for-money function".

Laidler, D.E.W. (1985): *Op. cit.,* p. 57. But this is obviously a biased interpretation, since according to our line of argument the inflation rate is a measure of the positive or negative return of real assets not so much in relation to money—which does not yield any interest—as in relation to other financial assets that do yield interest.

with our concept of the *net financial capacity* [26]: i) On one hand, our definition of financial capacity comprehends in a compact form concepts of income and wealth that can only intervene in an independent manner in Friedman's demand for money function; ii) On the other, the components of wealth that are part of our definition of the financial capacity refer at all times to the *initial holdings* of money, securities and physical assets—even if it is not uncommon for the last two to experience appreciations or depreciations in the period under analysis—while Friedman chooses as the explanatory variable of the demand for money a final value of wealth that we have to assume is not affected by its internal distribution into money and financial and physical assets. The third difference, of a much more substantial nature, involves the very essence of the optimisation process, since Friedman interprets one of the variables that we consider crucial in the decision-making process as a constraint [27]. And, last of all, a crucial issue that affects the functions of both the demand for consumption and the demand for money, and which is usually overlooked: Whether we speak of wealth in the conventional sense or of the financial capacity with the meaning we have attributed to it, it is obvious that the relevant magnitudes must be posited in *net* terms and not in *gross* terms. To be sure, by now the concept of net wealth is a habitual feature of modern approaches to the issue at hand, but it is still surprising that in the matter of the demands for consumption and for money, Friedman as well as other authors have used in many instances a concept of wealth or of permanent income that does not explicitly account for debt.

15.- Needless to say, the fact that the demand for money in real terms depends on the aggregate net financial capacity in real terms implies attributing to the demand for money the same wealth effects—associated to the variations that may occur in the general price level, the current interest rate on bonds, the equity risk premium, or house prices—that we have postulated already for the demand for consumption. However, the demand for money function given in [7.2.b] also reflects the presence of substitution effects in relation to the variations of the current and future interest rate on bonds, the equity risk premium, and the returns on real estate, which, as we can recall, are of the following nature: i) Increases or decreases in the current interest rate on bonds will stimulate the substitution of bonds and stocks for money and real estate, or vice versa, as a form of wealth preservation; this is so because the increases—decreases—in the current interest rate on bonds will increase—decrease—the opportunity cost of holding money or real estate rather than bonds and stocks in the household portfolio. ii) Increases or decreases in the equity risk premium will produce effects similar to the ones mentioned before, in this case circumscribed to the substitution of stocks for money, bonds and real estate, or vice versa. iii) Increases or decreases in the expected interest rate on bonds will produce, however, the opposite effect to those mentioned above, since its increases will induce a substitution process of money and real estate for bonds and stocks, and its decreases the opposite process; this is so because the increases—decreases—in the expected interest rate on bonds will decrease—increase—the opportunity cost of holding wealth in the form of bonds and stocks as opposed to holding it in the form of money and real estate; iv) The expected appreciation

[26] In relation to this point, we ought to remember that our definition of the net financial capacity leaves no room to include what Friedman calls *human wealth.* In our model, as we already noted, human wealth does not intervene directly in the behaviours that we are analysing, but their influence manifests indirectly, through the level of solvency, in a higher or lower propensity to borrow. To put it more precisely: future wealth does not buy goods or financial or physical assets; future wealth will only have economic effects once it is transformed into a loan that avails the borrower of the necessary monetary resources to exercise a purchasing power today that he would otherwise have to defer to a later time.

[27] As is well known, Friedman considers that the demand for money is formally identical to the demand for consumption services, and in this context wealth plays a part that is analogous to that of budget constraints in the traditional demand theory. The differences with our perspective are, therefore, quite significant. For more on these aspects, see Friedman, M. (1956): *The Quantity Theory of Money: A Restatement.* Reprinted in *Monetary Theory*, edited by R.W. Clower. Penguin Books, 1971, pp. 94 and onward.

or depreciation of housing will induce a substitution process of real estate for money, bonds and stocks, or vice versa, as a form of wealth preservation; obviously, this will be due to the fact that the appreciation—depreciation—of real estate will increase—decrease—the opportunity cost of holding wealth in the form of any of its alternatives. v) Finally, the increases—decreases—in the current interest rate on loans will reduce—increase—the demand for money, while the increases—decreases—in the expected interest rate on loans will produce, for reasons similar to those already explained, the opposite results to those just described.

16.- The intimate association that exists between the value of the aggregate net financial capacity of an economy and the amount of effectively existing money is manifested, furthermore, when the demand for money function [7.2.b] is transformed into the corresponding monetary equilibrium state. Under given expectations in regard to the expected interest rates on bonds and loans, and in the absence of mechanisms guaranteeing a short-term compensating response in wages and prices, the adjustment between the demand and the supply of money, which would result from the variations that may take place in the latter, must be realised by necessity through changes in the current interest rate of both bonds and loans, which in turn will induce the corresponding adjustments in the valuation of the non-monetary components of the net financial capacity carried out respectively in the securities and loan markets. Thus, expansions or contractions in the amount of money that are not accompanied by equivalent compensating variations in wages and prices will have a very direct effect on consumption and investment, and consequently on the overall demand, with the securities and loan markets, which are the mechanisms that allow economic agents to adjust their *stocks* of money, securities and physical assets to the desired levels, acting as the channelling instruments for such impulses. Naturally, the *real* effects of these monetary impulses will be lower the greater the degree of the response of the price and wage system to the requirements of monetary policy, so that the price stability objectives set by the central banks can be reached with a minimal cost in terms of growth and employment. However, the fact that such adjustments do not happen instantaneously in the real world forces monetary policy to take into account these costs, especially in those economies that have incurred in a high level of debt. In the latter case, the effects of the credit crunch compound the losses produced in the securities markets, and eventually in the housing market, which is why contractionary monetary policies must be implemented with utmost caution.

17.- The preceding considerations certainly open up interesting alternatives for empirical research, whether to reinforce lines of analysis that are already established or to create new ones. Thus, the hypothesis that both consumption and the demand for money depend on the net financial capacity in real terms fits in to a great degree with the central result of the modern theories of individual and aggregate consumption, although in our case we have found criteria for the valuation of non-monetary wealth that, in making the value of its different components directly observable, facilitate a rigorous assessment of the predictive relevance of the net financial capacity in relation to other alternative scale variables. On the other hand, and this may be the most important point, our analysis confirms the need, which has already been considered in different empirical works [28], of developing integrated estimates of the functions of consumption, money and assets of different types, which would probably lead us to the discovery of highly direct connections between monetary and real variables whose evolution could not be explained in what would otherwise be a disjointed and isolated manner. This course of action, which involves an integrated treatment of the functions that are deduced through a common process of optimisation, has been habitual for decades in works about derived demand for factors obtained through a process of maximizing corporate profits having

[28] For a reference for these works, see Laidler, D.E. (1985): "*The Demand for Money: Theories, Evidence and Problems*". Harper and Row, New York, 1985. See also Owen, D. (1986): *"Money, Wealth and Expenditure".* Cambridge University Press. Great Britain, 1986.

a specific production function as a reference; this in turn allows for the imposition of constraints on its parameters that give a higher degree of consistency to the resulting estimates from a theoretical standpoint. Last of all, which is not to say that the list is complete, our model can also serve as support for psychology research in the field of microeconomics, an approach with enormous potential to contribute to the progress of our science and which could complement the advances made in the field of traditional econometrics research.

SECTION 10

A FINAL REFLECTION

The modern contributions on the demand functions for consumption and assets generally assume that the wealth held by consumers constitutes the relevant constraint when it comes to the decisions that the households make in this regard. But this is clearly a vicious cycle, since the stock of wealth that the households wish to hold in its different forms at the end of each period—including, of course, the desired level of monetary holdings—is precisely, along with the volume of consumption, what they have to determine given their financial capacity and their expectations about the future [1]. Since this fact was overlooked, we came to face three different theories—one on the demand for consumption, one on the demand for money, and one on the demand for non-monetary assets—which approach in a separate and disconnected manner what in fact constitutes a joint decision process. To be sure, assets certainly play some sort of role, but as Tobin already noted in his day, they are only modelled on the supply side, and the households find it in the constraint as if it had appeared out of the blue [2].

By including the expected wealth in the utility function of the subjects, inverting the terms in which the standard optimisation programme is generally approached, the vicious cycle is broken and the role played by liquidity and borrowing constraints in limiting the choices of the household unit is manifested clearly. Now, households appear in each period of time choosing their level of debt and distributing their financial resources between consumption flows, on one hand, and asset accumulation flows in different forms, on the other, with the purpose of maximising a utility function in which both consumption and the expected wealth configure the conflicting arguments at work in its preference structure. In this new conceptual framework, households are not mere consumers of

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[1] A year after the introduction of the *General Theory*, Keynes pointed out that the process of wealth accumulation was precisely one of the most important characteristics that set his work apart from the classical tradition, although this detail has been overlooked by and large by Keynesian economists. "Now of all human activities which are affected by this remoter preoccupation", Keynes writes, "it happens that one of the most important is economic in character, namely, wealth. The whole object of the accumulation of wealth is to produce results, or potential results, at a comparatively distant, and sometimes at an *indefinitely*", the italics here are by Keynes, "distant, date. Thus the fact that our knowledge of the future is fluctuating, vague and uncertain, renders wealth a peculiarly unsuitable subject for the methods of the classical economic theory. This theory might work very well in a world in which economic goods were necessarily consumed within a short interval of their being produced. But it requires, I suggest, considerable amendment if it is to applied to a world in which the accumulation of wealth for an indefinitely postponed future is an important factor; and the greater the proportionate part played by such wealth-accumulation the more essential does such amendment become". This quote is taken from Keynes, J.M. (1937): "The General Theory of Employment", in *Quarterly Journal of Economics*, Vol. II, 1937. Reprinted in *Monetary Theory*, edited by R.W. Clower. Penguin Books Ltd. Great Britain, 1971.

[2] Referring to the specification errors of IS-LM based models, which still hold a central position in macroeconomics texts, and in regard to this issue, Tobin expresses himself in the following terms: "A second objection concerns the disparity in the model between saving and the specific components of saving. The saving function—or consumption function—tells at what rate households wish to be adding to their wealth. In the solution, it tells how fast they actually are adding to their wealth. However, the model does not tell at what rate they desire to add to their wealth in a any specific form, money or bonds or capital or foreign assets. Rather the model contains equations, or in simplest version the single LM equation, one side of which describes how households wish to allocate their existing stock of wealth. Household portfolio preferences are specified with respect to stocks but not with respect to flows. Now the flows, the rates at which stocks are increasing, are of course modelled. They are modelled on the supply side, and only there". Tobin, J. (1980): *Op. cit.* p. 81.

goods and services, but also demanders of loans that must see to their payment, and owners of wealth accumulated in the past whose suitable management, based on a *trade-off* between profitability, liquidity and solvency under fundamentally uncertain conditions, constitutes one of their most important and risky tasks.

The teachings that can be gleaned from this new approach for the reformulation of the aggregate demand functions for consumption, money and financial and physical assets have been analysed in the preceding sections of this text, and thus it is unnecessary to repeat them here. But the preponderant role played by the concept of *net financial capacity,* with the precise meaning we have assigned to it, underscores an obvious conclusion: That money is, in fact, important when the rules of the game of a monetary economy are specified in a rigorous manner, and that the connection between consumption, money and wealth is then revealed to be much more clear and intimate than is suggested by the more conventional views of the macroeconomic process. Whether we like it or not, the variations in the money stock or the interest rate, insofar as they allow the setting of the discount rate which the conversion of non-monetary wealth to money is by necessity subject to, are what ultimately determines the financial capacity in advanced economies, which means that the wealth or poverty of nations, and thus prosperity or depression, are not phenomena that can be considered independent from the successes—and of course, from the failures—of the Central Banks.

As far as theory is concerned, we believe that these ideas could help reinforce new lines of inquiry in the issues we have discussed, both from an econometric perspective and from the perspective of experimental psychology, which seems quite promising at present. Indeed, our analysis reveals that the processes of consumption and wealth accumulation unfold through complex stock-and-flow links, in which expectations regarding the probable returns and the liquidity and borrowing constraints, as well as the solvency level, certainly play a crucial role, with these decisions being all the more transcendental and dramatic, as would be expected, in economies with higher levels of debt. On the other hand, our analysis also shows that the effects of the increases or decreases in the interest rates that affect consumption and saving are much more complex than is habitually thought, and that their ultimate impact will vary according to their being lending or borrowing rates, and will depend, at the end of the day, on the initial net financial position of the households and the relative strength of the propensity to consume or accumulate that constitute their preference structures. From an applied standpoint, our approach attributes to the financial dimension of the economic decisions of households the relevance that it deserves, as the so-called *Great Recession*, which still holds many advanced economies in its throes, has come to remind us. The concepts of profitability, liquidity, solvency and debt, which constitute the core of our model, have and do play a central role in all the debates that have been triggered by the latest financial and economic crisis, but these concepts are all but missing, with few exceptions, in our macroeconomic treatises and in the vast majority of the conventional econometric models [3]. This is certainly puzzling, yet its explanation is as simple as it

[3] The absence in our models of behavioural equations referring to these concepts—as criteria that motivate the decisions not only of households, but also of corporations and, needless to say, financial institutions—is all but absolute, and it is even more conspicuous in the case of the econometric models of the Central Banks. Certainly some of the most representative models of these institutions take into account the effects of both the liquidity constraints and of the increase in the value of assets on consumer behaviour. They also take into account the impact of cash flow and of credit restrictions on firms' investment decisions. But it should be clear that profitability, liquidity, solvency, and the level of indebtedness play only a very small role in these developments. In recent decades, the models of the Central Banks have devoted most of their efforts to improving the understanding of the process through which expectations are generated and to incorporating the dynamic adjustment mechanisms through which variables reach their long-run equilibrium values. But the fact that these models do not even consider the existence of banks as an independent sector, clearly shows their limitations and helps explain the difficulties monetary authorities experience in anticipating and then countering the devastating consequences of a financial crisis. From our point of view, the

is paradoxical: The Keynesian-inspired models, which dominate macroeconomic theory and practise in an overwhelming manner, give no importance to the *cash flow*—with all that it entails—when it comes to modelling the behaviour of households and firms, which leaves an enormous gap through which many of the clues escape that would allow for the understanding and explanation of a good part of the most characteristic economic events of today's world.

only studies that properly address these difficulties are those which, following the lead of Chari, Christiano y Eichenabum - Chari, V.V., Christiano, L.J. and Eichenbaum, M. (1995): "Inside Money, Outside Money and Short Term Interest Rates". *Journal of Money, Credit and Banking*, 27, 1995 –, as well as Bernanke, Gertler y Gilchrist – Bernanke, B., Gertler, M. and Gilchrist, S. (1999): *Op. Cit*. – are being put into practice by Christiano himself, together with Motto y Rostagno – Christiano, L., Motto, R. and Rostagno, M. (2010): *Op. Cit* - within the European Central Bank. For a panoramic view of the Federal Reserve models, see Brayton, F., Levin, A., Tryon, R. and Williams (1997): "The Evolution of Macro-Models at the Federal Reserve Board", *Federal Reserve Board*, Washington, February, 1997. For an analysis of their tendencies from the point of view of the Bank of England, see *Bank of England* (2000): "Economic Models at the Bank of England", London, 2000. Regarding the models of the European Central Bank can be consulted, in addition to the previously cited work: Dieppe, A., González, P., Hall, S. and Willman, A. (2011): "The ECB´S New Multi-Country Model for the Euro Area". Working Paper Series, Nº 1316, *European Central Bank*, 2011, and Moutot, P. (2011): "Systemic Risk and Financial Development in a Monetary Model". Working Paper Series, Nº 1352, *European Central Bank*, 2011. On this Spanish situation in this context, see Ortega, E., Burriel, P., Fernández, J.L., Ferraz, E. y Hurtado, S. (2007): "Actualización del Modelo Trimestral del Banco de España". Documento de Trabajo Nº 0717, *Banco de España*, 2007.

APPENDIX I

THE KEYNESIAN DEMAND FOR MONEY AS A SPECIAL CASE

As we also know, in the *General Theory* Keynes established that the demand for money could become infinitely elastic for a positive interest rate, a situation that would eventually come to pass if the interest rate on bonds were low enough to justify generalising the expectation that future rates would by necessity tend to increase from that level. Under such circumstances, Keynes asserts, all subjects would prefer to hold money alone in their investment portfolio, as opposed to securities, since the probability of incurring in capital losses as a consequence of holding securities would be at a maximum in this case. Indeed, referring to the speculative component of the demand for money, Keynes wrote:

> "We have seen in Chapter 13 that *uncertainty* as to the future course of the rate of interest is the sole intelligible explanation of the type of liquidity-preference L_2 which leads to the holding of cash M_2. It follows that a given M_2 will not have a definite quantitative relation to a given rate of interest of r; - what matters is not the *absolute* level of r but the degree of its divergence from what is considered a fairly *safe* level of r, having regard to those calculations of probability which are being relied on. Nevertheless, there are two reasons for expecting that, in any given state of expectation, a fall in r will be associated with an increase in M_2. In the first place, if the general view as to what is a safe level of r is unchanged, every fall in r reduces the market rate relatively to the safe rate and therefore increases the risk of illiquidity; and, in the second place, every fall in r reduces the current earnings from illiquidity, which are available as a sort of insurance premium to offset the risk of loss on capital account, by an amount equal to the difference between the *squares* of the old rate of interest and the new. For example, if the rate of interest on a long-term debt is 4 per cent, it is preferable to sacrifice liquidity unless on a balance of probabilities it is feared that the long- term rate of interest may rise faster than 4 per cent of itself per annum, i.e. by an amount greater than 0.16 per cent. per annum. If, however, the rate of interest is already as low as 2 per cent., the running yield will only offset a rise in it of as little as 0,04 per cent. per annum. This, indeed, is perhaps the chief obstacle to a fall in the rate of interest to a very low level. Unless reasons are believed to exist why future experience will be very different from past experience, a long-term rate of interest of (say) 2 per cent. leaves more to fear than to hope, and offers, al the same time, a running yield which is only sufficient to offset a very small measure of fear" [1].

This situation, known as the *liquidity trap,* was highly relevant from a theoretical standpoint, since under those circumstances a general deflation of wages and prices would not allow, contrary to what neoclassical economists asserted, to reduce the interest rate to the level needed to ensure full employment of the productive resources.

The concept of the liquidity trap remained dormant for over a half century, but in the late 1990s it attracted some attention when the massive monetary stimulus policy implemented by the Japanese government to revive its ailing economy failed repeatedly in a markedly deflationary context. Although the situation in Japan at the time did not strictly fit the concept of the liquidity trap—in fact, in the early 1990s the long-term interest rates in Japan dropped to nearly zero—it may be worth

[1] Keynes, J.M. (1936): *Op. cit*., pp. 201-202. Italics by the original author.

analysing the particular circumstances under which our model is susceptible of generating a result like the one we are discussing, for in such instance Keynesian monetary theory would appear as a special case of the much broader theory that we have presented in the previous sections.

To do so, let us assume that the preferences of the head of household can be represented by means of the following utility function,

$$[\text{I.1}] \qquad U^i = A \cdot \left(c_t^i\right)^{\alpha} \cdot \left(m_t^i\right)^{\beta} \cdot \left\{\frac{1}{1+\pi} \cdot \left(m_t^i + r \cdot w_t^{Bi}\right)\right\}^{\Omega}$$

where all the variables and/or parameters have the meaning already assigned to them.

The utility function [I.1] also constitutes a fully specified version of [3.16], but it differs from it in that the head of household does not ascribe any direct utility to holding securities—which, to position ourselves in the Keynesian sphere, we restrict to the possession of bonds—beyond that which he derives from holding them as a component of his expected wealth. It does, however, attribute a direct utility to holding money that is justified by the total liquidity that this asset offers under conditions of uncertainty, but it does not contemplate the possibility that coverage under such conditions could be obtained, in the context of given expectations, through a range of assets comprehending instruments with a variety of expected returns and different degrees of risk.

Having made these simplifications, our problem is reduced to finding the maximum of [I.1] subject to the constraint

$$[\text{I.2}] \qquad \frac{1}{p_t} \cdot F_t^{1i} = c_t^i + m_t^i + w_t^{Bi}$$

where F1i,t is defined, for the purposes of this section, in the following manner,

$$[\text{I.3}] \qquad F_t^{1i} = M_{t-1}^i + T_t^i + r_{t-1} \cdot B_{t-1}^i + \frac{r_{t-1}}{r_t} \cdot B_{t-1}^i$$

Contrary to what happens in Section 4, in this case it is possible to obtain the explicit solutions to the posed problem for c_t^i, m_t^i and w_t^{Bi}, which are given by expressions

$$[\text{I.4.a}] \qquad c_t^{i^*} = \frac{\alpha}{\alpha+\beta+\Omega} \cdot \frac{1}{p_t} \cdot F_t^{1i}$$

$$[\text{I.4.b}] \qquad m_t^{i^*} = \frac{\beta}{\alpha+\beta+\Omega} \cdot \frac{r}{r-1} \cdot \frac{1}{p_t} \cdot F_t^{1i}$$

$$[\text{I.4.c}] \qquad w_t^{Bi^*} = \frac{\Omega(r-1)-\beta}{(\alpha+\beta+\Omega)\cdot(r-1)} \cdot \frac{1}{p_t} \cdot F_t^{1i}$$

where the asterisk on the endogenous variables denotes the equilibrium values.

As can be observed in [I.4.b], the demand for money now becomes infinitely elastic as the opportunity cost of holding money becomes zero, which happens, as is the case of the Keynesian instance, when $r_t = r_{t+1}/(1+r_{t+1})$. The infinity property of the demand for money when the cost of holding money as opposed to bonds is zero thus depends on the special assumption that no direct utility is attributed to the possession of the latter—other than that attributed to it as a component of

the expected wealth—in the objective function of households. This seems to be in agreement with the Keynesian view of the *intrinsic advantages of liquidity* under the described circumstances, but in that case the property under discussion would be no more than the consequence of introducing an *ad hoc* hypothesis when it is judged from the broader perspective of the model that we are developing here. We do not know whether this conclusion has any real significance in practise—after all, the demand for money tends to be quite elastic if not infinitely elastic—but from a theoretical perspective, it is certainly of interest [2].

[2] This opinion had been expressed by Blanco Losada before in the talk he gave at the University of Malaga on the occasion of the conference series on Keynesian economics organised by Professor Mochón Morcillo. On this subject, see Blanco Losada, M.A. (1990): "Especulación y demanda de dinero", in *Vigencia de las ideas keynesianas,* Edited by F. Mochón Morcillo. Málaga, 1990.

APPENDIX II

BASE MODEL FOR THE SIMULATIONS

The model that results from calculating the maximum of [6.13] under the constraints [6.8], [6.10] y [6.12] is reduced, after performing the appropriate operations, to a system of nine equations that allow us to determine the values of the nine unknowns c_t, m_t, w_t^b, w_t^a, w_t^h, w_{t+1}^h, w_t^l, o_t, and f_t for specific values of the exogenous variables and the remaining parameters that are part of the model to which we have been referring in the text. This equations are enumerated below, and all of their parameters as well as their endogenous and exogenous variables have the meaning already given.

[II.1] $$\frac{\beta}{m_t^i} + \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^i} = \frac{\alpha}{c_t^i}$$

[II.2] $$\frac{\delta}{w_t^{Bi}} + \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^i} \cdot r = \frac{\alpha}{c_t^i}$$

[II.3] $$\frac{\xi}{w_t^{Ai}} + \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^i} \cdot q = \frac{\alpha}{c_t^i}$$

[II.4] $$\frac{\mu}{w_t^{Hi}} + \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^i} \cdot g = \frac{\alpha}{c_t^i}$$

[II.5] $$\frac{\varepsilon}{o_t^i - w_t^{Li}} + \frac{1}{1+\pi} \cdot \frac{\Omega}{w_{t+1}^i} \cdot r^l = \frac{\alpha}{c_t^i}$$

[II.6] $$w_{t+1}^i = \frac{1}{1+\pi} \cdot \left(m_t^i + r \cdot w_t^{Bi} + q \cdot w_t^{Ai} + g \cdot w_t^{Hi} - r^l \cdot w_t^{Li}\right)$$

[II.7] $$\frac{F_t^i}{p_t} = c_t^i + w_t^{Bi} + w_t^{Ai} + w_t^{Hi} + m_t^i - w_t^{Li}$$

[II.8] $$o_t^i = \frac{1}{p_t} \cdot \left\{ v \cdot \frac{T_t^i}{r_t^l} + F_t^i + \frac{r_{t-1}^l}{r_t^l} \cdot L_{t-1}^i \right\}$$

[II.9] $$F_t^i = M_{t-1}^i + T_t^i + r_{t-1} \cdot B_{t-1}^i + d_{t-1} \cdot A_{t-1}^i + e_{t-1} \cdot p_{t-1}^h \cdot H_{t-1}^i -$$
$$- r_{t-1}^l \cdot L_{t-1}^i - \frac{r_{t-1}^l}{r_t^l} \cdot L_{t-1}^i + \frac{r_{t-1}}{r_t} \cdot B_{t-1}^i +$$
$$+ \frac{d_t}{r_t + a} \cdot A_{t-1}^i + p_t^h \cdot H_{t-1}^i$$

For the purposes of providing the model with a certain empirical content, and although the pertinent elasticity values have not been subject to any econometric estimations, the latter have been selected so that in combination with the values of the remaining relevant exogenous variables—the initial income and debt levels, the initial holdings of assets, past, current and "future" lending and borrowing interest rates, the equity risk premium, the inflation rate on real estate, etc.—they determine a *base solution* that allows us to approach within the same order of magnitude the results of the entries in the Spanish Household Balance Sheet of 2007 (SHBS07), the last one published by FUNCAS, the Spanish Savings Banks Foundation [1]. Specifically, the values of each and every one of the parameters and exogenous variables that intervene in the model are listed below followed by the specification of their respective statistical sources:

- The elasticity values, selected through a process of trial and error, were the following: α = 0.028; β = 0.05; δ = 0.05; ξ = 0.05; μ = 0.25; ε = 0.52; Ω = 0.05.
- M_{t-1} = 730; corresponds to the Cash and Deposits figure of the Spanish Household Balance Sheet of 2007, which we will refer to as SHBS07 from now on.
- T_t = 644; corresponds approximately to the Gross Disposable Income figure in the SHBS07.
- B_{t-1} = 363; corresponds to an estimation made using the figure of Securities other than Stocks in the SHBS07.
- A_{t-1} = 616; corresponds to the value for Stocks and Other Shares in the SHBS07.
- H_{t-1} = 6,981; corresponds to the estimated value of the Total Housing Wealth of Households according to the SHBS07.
- L_{t-1} = 933; corresponds to the figure for Household Liabilities—most of them Loans—in the SHBS07.
- r_{t-1} = 0.03; r_t = 0.04; r_{t+1} = 0.05; they correspond, approximately, to the Average Returns on Ten-Year Government Debt of years 2006, 2007 and 2008, respectively. See the Statistical Bulletin of the Bank of Spain.
- a = 0.039 corresponds to an estimate of the equity risk premium in Spain done by Gómez Montejo. On this issue, see Gómez Montejo, I. (2010): *Bolsa.* No. 185, pp. 38-46. Madrid, 2010. This estimate does not differ in essence from the one done for the main stock markets by Dimson, Marsh and Staunton, who put it, depending on the computation criterion used, at 3% or 5%. On this regard, see Dimson, E., Marsh, P., and Staunton, M., (2003): "Global Evidence on the Equity Risk Premium". *The Journal of Applied Corporate Finance.* Vol. 15. No. 4, Summer 2003.
- r^l_{t-1} = 0.05; r^l_t = 0.06; r^l_{t+1} = 0.07 correspond to the average interest rate on loans to Households and Non Profit Organisations by the financial system in years 2006, 2007 and 2008, respectively. See Bank of Spain, Statistical Bulletin.
- d_t = 0.07, e_t = 0.06 and π^h_t = 0.08 correspond respectively to particular estimations of the dividend yield of stocks, the yield of property rentals, and the appreciation rate of house prices in the years contemplated in the simulation.
- P^h_t and pt take on the value of 1 in both cases.
- Finally, the correcting coefficient for the calculation of the current value of wage income that appears in the solvency constraint takes on a value of 0.5, since on average the employed population of Spain is halfway through their working life.

[1] *Patrimonio Inmobiliario y Balance Nacional de la Economía Española (1995-2007)*. Fundación de las Cajas de Ahorro Españolas. Madrid, 2008. See Table II.1.3.1. Patrimonio Total de los Hogares Españoles (1995-2007) in millions of euro, pp. 138 and 139.

The aggregate magnitudes of the Spanish Household Balance Sheet from 2007 that have been used as *inputs* for the base solution are reproduced in column A of Table No. 1, while column B presents along with them the results of the simulation that we call BASE and which are obtained by giving the exogenous variables and parameters of the model the values that we have mentioned.

Table No.1
(Figures in millions of euro)

	Column A	Column B
1.- Cash and Deposits	730 (M_{t-1})	1.217 (m_t)
2.- Securities other than stocks	363 (B_{t-1})	1.190 (w_t^b)
3.- Stocks and other shares	616 (A_{t-1})	1.211 (w_t^a)
4.- Housing Wealth	6.981 (H_{t-1})	6.124 (w_t^h)
5.- Loans	–933 (L_{t-1})	–2.029 (w_t^l)
6.- Gross Disposable Income	667	651
7.- Net Worth: 1 + 2 + 3 + 4 – 5	7.757	7.713
8.- Financial Capacity: 6 + 7	8.424	8.364

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