

**Liquidity preference, capital accumulation and investment financing:  
Fernando Cardim de Carvalho's contributions to the Post-Keynesian paradigm<sup>+</sup>**

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**Abstract:** This paper assesses the main theoretical contributions by Fernando Cardim de Carvalho to the Post-Keynesian Economics Paradigm: his elucidation of the fundamental principles that define the concept of a monetary production economy; his analysis of decision-making under non-probabilistic uncertainty; his development of a portfolio choice theory in which the decision to invest is regarded as one of possible wealth accumulation strategies; his liquidity preference theory, including its application to banks' portfolio allocations under uncertainty; and finally his analysis of the finance-funding circuit and its implications for the functioning of monetary economies.

**Key-words:** Post-Keynesian theory; Keynes; monetary economics

**JEL Classification:** B59; E12; E44

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<sup>+</sup> Published in *Review of Political Economy* 32(1): 121-139, 2020.

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## 1. Introduction

Keynes' point of departure for defining the properties of the modern monetary economy is the finding that production is organised by firms that are entities with objectives of their own, particularly to properly gain control of wealth<sup>1</sup>. In a monetary economy, the different decision makers (firms, families or government) operate in a context of uncertainty. This is different from risk, for which the universe of future events and its probabilities are known. Uncertainty, meanwhile, is a situation where the decision maker knows only that unforeseen and unpredictable events may occur. In such situations, it becomes rational for individuals to engage in defensive behaviour that would be irrational in a risk environment.

Analysis of decision-making in conditions of uncertainty and their effects on the functioning of monetary economies form the core of the Post-Keynesian Paradigm<sup>2</sup>. Fernando Cardim de Carvalho played a fundamental role both in reformulating and clarifying that paradigm as well as being a major academic influence in Brazil and worldwide<sup>3</sup>.

This paper aims to make a systematic analysis of Carvalho's main contributions to the development and refinement of the Post-Keynesian school's paradigm<sup>4</sup>. As will be seen, Carvalho systematised the concept of monetary production economy, making fundamental contributions, in his writings, on the subjects of portfolio choice, liquidity preference, banks and investment finance.

Fernando Cardim de Carvalho developed his PhD thesis in Rutgers University under the guidance as thesis advisor of Paul Davidson, from whom he was very influenced in his theoretical works. However, in this paper we pointed out some theoretical difference between Carvalho and Davidson: (i) definition of the principles of Post-Keynesian economics; (ii) alternative explanation of the determinants of investment,

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<sup>1</sup> One of the few favorable references to Marx in his writings is made in that connection. When Keynes endeavors to clarify the nature and role of firms in a business economy, he mentions the famous Marxist concept of commodity circulation (CWJMK, Vol. XXIX, p. 81), that is, the M-C-M' arrangement, where M is the amount of money applied in purchasing labor and means of production at the start of the production cycle, C represents the commodities produced during the cycle and M' is the amount of money obtained at the close of the process ( $M' > M$ ). Money is thus the beginning and end of all production activity.

<sup>2</sup> See section 2 of this paper for a description of the Paradigm.

<sup>3</sup> Fernando Cardim de Carvalho passed away in May 16, 2018.

<sup>4</sup> This paper differs from the brief survey done by Ferrari-Filho (2018) that focused mostly in Carvalho (1992). Although we analyze other Carvalho's works, we do not intend to exhaust his contributions, but rather to focus in some his most important theoretical contributions.

since Davidson works with the theory of two prices<sup>5</sup> (demand and supply of capital goods) while Carvalho developed a theory of asset-pricing inspired directly from the chapter 17 of the Keynes' General Theory; (iii) Carvalho developed a more deep and comprehensive analysis of the functionality and importance of the financial system and banks in a monetary economy, resuming the discussion of the finance-funding circuit that was introduced initially by Keynes (1937c).

For this purpose, the paper is divided in eight sections, besides this introduction. In section 2 it is developed the Post-Keynesian approach in the work of Fernando Cardim de Carvalho. Section 3 focuses on the relationship between uncertainty and liquidity preference, while section 4 is analysed the relationship between own-rate of interest, liquidity preference and capital accumulation based in Carvalho (1992). Section 5 focuses on the view of Carvalho over the debate related to the endogeneity of money supply. Section 6 and 7 analyse finance issues in a Post Keynesian view: bank's liquidity preference and finance-investment-saving circuit, respectively. Finally, section 8 concludes the paper.

## **2. The (Post) Keynesian approach in the work of Fernando Cardim de Carvalho**

In the early 1930s it was clear to Keynes that he had to look for new ways of understanding capitalist economies. That meant addressing the properties of money in modern economies. In *A Treatise on Money* (Keynes, 1930), he reached an impasse: there, he proposed that monetary factors affect the volume of investments (which affects the system's long-term equilibrium), but still argued based on the *Quantity Theory of Money* framework, in which money is held to be neutral, at least in the long run.

The problem with accepted theories at the time was that they were based on a Robinson-Crusoe economy (RC from here on) in which the individual chooses between hunting or fishing, subject to the constraints on his efforts that these activities entail, and is able to devote part of his time to developing tools, which forces him to delay his consumption. Although it was recognised that modern economies are more complex than an RC-type economy, they were not regarded as *essentially* different from that stylised idealisation (Carvalho, 2005, p. 2). RC-type economies are essentially non-monetary

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<sup>5</sup> See Davidson (2011, ch.4).

economies, because there is no other individual with whom RC can perform transactions. Accordingly, for such economy, money cannot be considered as essential.

In 1933 Keynes began to develop a new theoretical framework, called the *monetary production economy*, for which money could not simply be *added in* to the complete structure of a “real” model, but it had to be *essential* to it, which means that the “fundamental theorems” as to how the economy functions could not be expressed in terms of an economy without money. This new framework was presented and codified in *The General Theory* (GT) and later writings.

To some Post-Keynesians, such as Carvalho, the concept of *monetary production economy* defines this school of thought’s paradigm. For Thomas Kuhn (1962), scientific activity is not only the accumulation of facts and discoveries, but also by what he considers as “normal science” that is defined within the context of a paradigm. The latter is defined as: “universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners.” (p. x). Therefore, the goal of normal science is defined “by extending the knowledge of those facts that the paradigm displays as particularly revealing, by increasing the extent of the match between those facts and the paradigm's predictions, and by further articulation of the paradigm itself.” (p. 24). Then, normal science takes its course through three subsets of activities:

- i) The determination of the significant fact defined by the paradigm.
- ii) The manipulation of the paradigm for its applicability to new cases to test it empirically.
- iii) The reformulation of the paradigm itself with the intent of clarification of its significance.

Carvalho, in his 1992 book, sought reformulate the paradigm by clarifying what Keynes meant by a “monetary production economy”. But before discussing this book itself, it is necessary to make some observations on the state of the Post-Keynesian school by the time of the early 1980s and Carvalho’s views on the subject. As a matter of fact, what is written in the book is the result of a series of articles written by the author on the 1980s in which he analysed the state of Post-Keynesian theory.

In 1979, Robert Solow states that the so-called Post-Keynesian economists have a problem of unity. In his words: “the school has provided no systematic description or example of what it conceives to be the right way to do macroeconomic theory. Thus far so-called post-Keynesianism seems to be more a state of mind than a theory.” (Solow,

1979, p. 344). Also: “The difficulty I experienced in trying to find a representative work in this tradition made me realize how little unity and structure it has. (Idem, p. 344)”. Kregel (1985) also makes some critical observations on the English branch of the school for not incorporating money and uncertainty on the growth models of income and distribution.

With this lack of unification in mind, Carvalho (1983) differentiates the concepts of time of Shackle and Sraffa, with the former highlighting the nature of historical time, in which events that are non-repeatable gain importance, and the latter having a more mechanistic view.

In this mechanistic view, time only provides a mapping of all the states of a given economy, not being able to alter these states. But, for Shackle, “the past is immutable, and the future is to be created, as a result of the choices done in the present” (Idem, p. 268). These decisions are made in a context of non-probabilistic uncertainty and, therefore, have a certain aspect of “creativity” involving them. Therefore, for Carvalho, the problem with Shackle’s theory, because of being “radically individualistic and subjectivistic” (Idem, p. 270) is that it is not capable to explain regularities and economic events are then seen as entirely unpredictable. With this lack of viewing any “orderliness”, Carvalho (Idem, p. 270) states that Shackle’s approach:

“overemphasizes the freedom of the agent and underestimates the influence of conditions other than his own imagination. In this context, orderliness becomes an external necessity or constraint, something that cannot be explained...”

With this approach, economic events are seen more as coincidences rather than the functioning of a system that can be objectively studied.

On the other hand, “Sraffa is concerned with the logical requirements for the determination of production prices. He does not commit himself with any description of actual processes that would lead to equilibrium.” (Idem, p. 273). These determinants are the technical coefficients and income distribution. Therefore, the statement that certain set of prices is a gravitational centre around which the market prices fluctuate is dependent upon the assumption that these coefficients are fixed and independent of the equilibrating process. Beyond that, the equalization of the profit rates is obtained by capital being invested where there is a higher than equilibrium rate. Therefore, the equilibrating process itself is dependent upon a theory of investment, but, on this scheme,

this activity is determined only by the difference between profit rates, that is, prevalent present conditions with no regards to uncertainty. The Sraffian approach, Carvalho (1983, p. 275) states:

“In sum, in order to conceive of prices of production as a long-run gravity center we have to accept that the technique adopted, and the income distribution profile and composition of demand are invariant to investment, realization, and price movements. Unexpected changes and uncertainty cannot be introduced in this scheme.”

Then, none of these approaches can be an alternative to neoclassical economics. Each by its own limitations and both simultaneously for their mutual incompatibility. It is interesting here to point out that Carvalho’s analysis is similar to the analysis that Chick (2004) and Chick and Dow (2005) develop in favour of the Open Systems approach<sup>6</sup>. For the latter, the problem with mainstream economics is its instrumental approach regarding the formulation of models. That is, from a certain set of axioms, a model (practically considered to be the same as theory) is built. Therefore, only through the previsions of the model economic that reality is to be approached. Carvalho makes a similar case when he criticizes the IS/LM diagram for its lack of substantial and unrealistic understanding of economic processes in favour of a device for making forecasts. Also, Chick and Dow (2005) criticize Critical Realism for its rejection of the use of models and scepticism on the possibility of having knowledge of observable economic regularities.

Therefore, Carvalho’s view is close to the Chick and Dow’s Open Systems view: both have problems with the lack of realism of mainstream economics; such as Chick and Dow disagree with the radical claim that economic systems are absent of event regularities, Carvalho rejects Shackle approach on the similar ground that, for the latter, there is no regularity to be objectively studied. Also, as important as the assumptions about time and its consequences for the nature of economic events, is the treatment given for the relation between the long and the short run. Carvalho (1984) presents different views given by Post-Keynesian economists on the matter. The main trends are (Idem, p. 217):

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<sup>6</sup> Open systems are those which may not be possible, in a complex system, that all relevant variables are identified; there may be interrelationships between agents and/or these may change (for example agents may learn); there is imperfect knowledge of the relations between variables, which relationships may change along time; connections between structures may be imperfectly known and/or may change, so that structure and agency are typically interdependent (Chick, 2004, p.6).

“(1) the Garegnani/Eatwell approach, concerned exclusively with long run equilibrium positions of prices and output, identified as static gravity centers; (2) the Kaldor/Pasinetti model of determination of long run growth rate usually seen as dynamic (moving) gravity centers; (3) the Kaleckian alternative, which combines both long and short run models, displacing the emphasis, however, to cyclical movements as the major phenomenon to be explained; (4) the Davidson/Kregel/Minsky approach, where uncertainty undermines the usefulness of gravity center models and the necessity for historical models is posed; (5) the Shackle alternative, which concentrates attention in the study of expectations and the nature of imagination in the moment of decision making.”

The first group resolves the question by stating that short run events are not systematic and, therefore, not subject to objective analysis (being, then, ignored). The second one ascertains the possibility to study short run behaviour, but these are seen “as temporary maladjustments that do not prevent long run trends to affirm themselves” (p. 221). Both these positions describe long run equilibrium without any possibility for short run events influencing the capacity for such equilibrium being reached.

For the third one, long run factors are those that exercise a durable influence on the economy, instead of being some center of gravity. Therefore, for Kalecki, long run positions are not independent from short run processes.

The fourth group focus on the operations of a monetary economy stressed by Keynes and the role of expectations under the condition of uncertainty in determining the position of the economy on the short run. According to Carvalho, the position of this group is the same as Keynes’s, which states that long run positions cannot be considered as gravity centers to which certain economy tends to if enough time is given for the process to be completed. Therefore, according to Carvalho (1984, p. 224):

“This approach is essentially dynamic in the sense that motion, not states, is the subject. Moreover, it is historic because it refers to economies with past and future. The present inherits material conditions, in a specific shape, institutions, and contractual commitments from a past that cannot be undone. The future will inherit the results of decisions, actions and commitments made in the present”.

This last position is the one that Carvalho sustains later when he reformulates, on his terms, the “Monetary Economy” paradigm. On this paper (Carvalho, 1984), the author describes, again, the approach of Shackle on economics, as seen above. Yet, what is important from these former two papers, is to note that, by the 1980s, Carvalho was searching for a way to better present the meaning and significance of Post-Keynesian economics, to make it a viable alternative to neoclassical economics.

Beyond those, Carvalho (1988) shows how some themes studied by Keynes on the *Treatise on Probability* (1923) regarding decision making were later retrieved and employed on the General Theory, while Carvalho (1990) shows the relation between the Marshallian treatment of time and Keynes’ views on the possibility a long run position being a gravity center.

In his book *Mr. Keynes and the Post Keynesians*, published in 1992, starts from the problems studied in the previous articles and makes his reformulation of the *Monetary Economy* paradigm. In the first chapter of his book, Carvalho reviews the reception of The General Theory by the time of its publication and states that the impact of Hicks’ 1937 article was to undermine the revolution in the economic science sought by Keynes.

In the second chapter of the book, Carvalho reviews some of the contributions given by Marshall (1890) and analyses what kind of influence those had on the work of Keynes. Indeed, the author shows that, for Marshall, the distinction between classical economics and those of the marginalist revolution as one of emphasis, not of substance. Along with the classical economists, Marshall thought that the study of economics was meant to discover regularities in the social productive activity applicable to the long run. Yet, he did not see this as independent of studying individual behaviour. To reconcile orderliness with individual freedom, Marshall proposes the concept of “normality” as a substitute for the laws sought by classical economics. Therefore, as Carvalho states (Idem, p. 18): “If men have similar motives and face similar conditions, one may expect they will have similar behaviours...”. With this concept of normality in mind, the author then states that, on the problem between orderliness and individual freedom/creativity, the Keynesian position is that:

“Order and social organization are essential elements of Keynes’s vision, as much as uncertainty and individual freedom. To a large extent one can see Keynes’s economics as the attempt to reconcile these two elements, order and freedom, without surrendering to either one of them...”



Therefore, one of the innovations proposed by Keynes, taking Marshall as a starting point, was to discuss how the long run state expectations can affect the equilibrium of a given economy on the short run and if it is possible for such an economy to achieve this equilibrium. For Keynes, a long run position can be referred to, but, as such position is dependent upon expectations made on a context of uncertainty (which renders them to being volatile), it is not possible to refer to such a position as a gravitational centre. Therefore, the problem in question is how production takes place and what determines its level.

With this in mind, Carvalho criticizes the proposal made by Davidson (1984) to resume the fundamentals of Post-Keynesian economics as a refusal and substitution of certain neoclassical axioms. For Carvalho (idem, p. 42), the axioms postulated by Davidson “...certainly summarize the core of Keynes’s proposed revolution. They have one limitation, however, if one thinks of a system of axioms – that of not being intuitive enough and therefore perhaps not ‘originative’ enough.” In an interview given for the Brazilian Keynesian Association in 2011 [See Oreiro, 2019], authors’ translation) states:

“...the three axioms scheme, proposed by Davidson, served more to the purpose of criticizing the conventional approach than to serve as basis for an alternative theory. Therefore, the negation of the axiom of the gross substitution, for example, was important only because Davidson was going against the idea present in the conditions for stability of general equilibrium models... while the relation proposed by Keynes between money and output... was much more complex. This is an important argument for critique but does not posit the fundamentals for an alternative.”

“...o esquema de três axiomas, proposto por Davidson, serviam mais ao propósito de criticar a abordagem convencional do que para servir de base a uma teoria alternativa. Assim, o axioma na não validade do axioma da substituição bruta, por exemplo só era importante porque Davidson estava combatendo a ideia (que estava presente na condição de estabilidade de modelos de equilíbrio geral) ... quando a relação proposta por Keynes entre moeda e produto...era bem mais complexa. Essa é um importante argumento de crítica, mas não de fundamentação de uma alternativa.” (original em português)

Therefore, it is evident Carvalho's motivations to reformulate the paradigm initiated by Keynes were:

i) First, his view of the inadequacy between Hicks interpretation of the General Theory and Keynes' Marshallian upbringing. Because this interpretation undermines the discussion made by Keynes on the nature of economic activity and causality relations to a special case of certain parameters values.

ii) The failure to build an alternative economic approach, with the Post-Keynesian economists, as he saw, being more united by the arguments they tried to refute than the positive tenets of the theory under construction.

In that light, the Post-Keynesian paradigm consists in *analytically* developing the vision proposed by Keynes in the course of his GT and other academic writings. In Carvalho's (1992, p.37-38) words:

“(...) Post Keynesians have as their programme precisely to develop the new vision, that of a monetary economy. This is the unifying concept that organizes the Post Keynesian paradigm and that makes it possible to overcome the very common impression (...) that this school is united more by the arguments they refute than by positive tenets of theory under reconstruction.”

Then, Fernando Carvalho set out what he considered to be Keynes' worldview on the basis of six fundamental theoretical principles<sup>7</sup>, which define the concept of *monetary production economy*. More specifically, the principles that Carvalho (1992, Chapter 3) proposed are as follows:

(i) ***Principle of the Temporality of Economic Processes***, according to which production is a process that takes time, so that the decision to purchase inputs and factors of production must take place before the sale of the finished output on the market. It follows that production- and employment-related decisions must be taken based on expectations regarding future demand for the firm's products;

(ii) ***Principle of the Non-ergodicity of Economic Processes***, according to which economic processes are non-ergodic, i.e., the sampling distribution of economic variables does not converge with the population distribution (Davidson, 1988). In economic terms, this means that economic decisions are crucial in Shackle's sense, i.e., they are decisions

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<sup>7</sup> Davidson (1984) offered a different codification that included the principle of the non-neutrality of money, the non-ergodicity principle and the money contract principle.

which change the initial conditions in which they were implemented, causing the economic environment to be non-stationary. Then, non-ergodicity means that agents cannot eliminate the uncertainty surrounding the decision-making process by “trial and error” in order to arrive at “knowledge of how the world works”;

(iii) ***Principle of Coordination***, according to which capitalist economies do not have central planning mechanisms by means of which economic agents’ plans can be coordinated in advance (as in Walrasian general equilibrium models, with the *tâtonnement* hypothesis). It follows that transactions generally occur at “false prices”, i.e., at other than equilibrium prices. Transactions at other than equilibrium prices entail losses for one part of the agents involved, thus, producing strong *income effects*. In that context, decision makers’ behaviour and institutions will be developed to reduce uncertainty and the effects of such errors. Prominent among these institutions is the system of *money contracts*;

(iv) ***Principle of Production***, according to which firms engage in production aiming to gain profits defined in monetary terms. In other words, a firm exists not in order to generate utility for its shareholders, but solely to accumulate money. The driver of production is the power to command social wealth, which means that a firm seeks wealth at its most general, which is obtained in monetary form;

(v) ***Principle of Dominant Strategy***, according to which there is an asymmetry among economic agents in their decision-making power. To Keynes (and post-Keynesians) it is firms that take the fundamental decisions in a capitalist economy. Indeed, levels of employment and savings depend on firms’ decisions to produce and to invest;

(vi) ***Principle of the Properties of Money***, which is directly related to the *principle of coordination* in that Keynes asserted that, for a complex system of money contracts to be feasible, money would need to have certain properties. These relate essentially to restrictions on it being supplied by agents. To Keynes, in a monetary production economy, money is characterised by zero or negligible elasticities of production and substitution<sup>8</sup>. These properties sustain money’s liquidity, i.e., its ability to liquidate debts.

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<sup>8</sup> On the relationship between the essential properties of money and its liquidity, Keynes (1936, p.241) states that: “The attribute of liquidity is by no means independent of these two characteristics [the negligible elasticities of production and substitution]. For it is unlikely that an asset, of which the supply can be easily increased or the desire for which can be easily diverted by a change in relative prices, will possess the attribute of liquidity in the mind of owners of wealth. Money itself loses the attribute of liquidity if its future supply is expected to undergo sharp changes.”

Money's properties ensure that, in an entrepreneurial economy, money will never lose its liquidity attribute.

With these principles, Carvalho states (*idem*, p. 49):

“A model of an economy built on the above six principles will present the results Keynes expected: the long-period non-neutrality of money, the full realization of the meaning of the concept, created in the *Treatise on Money*, and the principle of effective demand. *The General Theory* can be seen as the analytical development of the concept of monetary economy, where those principles are translated into analytical propositions that allow a rigorous description of its dynamics.”

In Keynes' work, the definition of money and its role in the economic system are intimately related to the *system of money contracts*, which are the basis on which production is organised in modern monetary economies. Any transaction in a market economy can be seen as a contract between two parties: one party undertakes to deliver a good or service now or in the future; and another party undertakes to make a payment for that good or service now or in the future (Carvalho, 1992, p. 100). The contracts, in turn, can be of two types: (i) *spot or implicit contracts*, in which both parties to the transaction undertake *informally* to deliver a product or service and to make the corresponding payment in the act of performing the transaction; and (ii) *future or explicit contracts* in which one of the parties to the transaction undertakes *formally* (in writing, by signing documents) to deliver a good or service in the future in exchange for payment to be made now or in the future. Spot contracts reduce uncertainty by specifying the flow of real or financial resources, their delivery dates and their terms (prices). In this way, such contracts assure producers that inputs will be available and at what the prices they can be purchased. In addition, contracts also function as a cost control mechanism for producers, allowing them to calculate the relative profitability of their various production options (Carvalho, 1992, p. 48).

### **3. Uncertainty and liquidity preference**

After its publication, Keynes (1937a) stated that one of the key theoretical innovations of the GT was that it examined the relationship of uncertainty with wealth accumulation and,

especially, demand for money (Carvalho, 2015, p. 18). Although uncertainty was central to the argument, the fact is that Keynes offered no precise definition of the concept:

“By uncertain knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of the roulette is not subject, in this sense, to uncertainty; nor is the prospect of a Victory bond being drawn. Or, again, the expectation of life is only slightly uncertain. Even the weather is only moderately uncertain. The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculus of probability whatever. We simply do not know”. (CWJMK, VOL XIII, p. 113-114).

Carvalho (1990 and 1992, p. 56-62), however, found that a more precise notion of uncertainty in Keynes’ work can be obtained by examining the “weight of arguments” concept presented in the *Treatise on Probability*, published in 1923. There, Keynes was concerned with understanding to what extent it is rational to accept as true a proposition obtained by argument based on another proposition. In that connection, Keynes defined “rational belief” as the logical plausibility of a proposition derived from some starting proposition. Assuming the starting point is correct, then probability theory is no more than the application of logic to an initial set of propositions in order to obtain another set of propositions. However, if the assumptions on which the argument rests are sound, and the arguments are derived logically, why then are the conclusions merely *probable* rather than certain? The answer to that question is that the set of propositions on which the argument is based may be incomplete, making it impossible to obtain conclusions that are certain, but permitting only conclusions about which it is possible to hold some degree of rational belief.

The relations of probability between the initial set of assumptions and the propositions that can be logically derived from them takes a new direction when one considers the possibility that *the initial assumptions may be wrong* if not based on sound evidence, but constructed out of individuals’ imaginations (Carvalho, 1992, p. 61). In such cases, in addition to relations of probability, one must consider what Keynes called

the “weight of arguments”, which is determined by comparing not “between the favourable and unfavourable evidence, but between the absolute amounts of relevant knowledge and of relevant ignorance respectively” (Keynes, 1923, in Carvalho, 1992, p. 58). Evidence of this kind reveals no new logical link between propositions, nor does it negate or invalidate any proposition; it only corroborates, positively or negatively, certain already known arguments. In such conditions, Carvalho argued, the new evidence may not affect the probability relationship between two propositions, but merely the “degree of confidence” held in it.

Carvalho (1992, p. 62-63) draws attention to the fact that uncertainty does not reflect defective methods in obtaining and processing information, but results from the very nature of social and economic processes. If these were ergodic<sup>9</sup>, then a process of trial and error could lead decision makers eventually to obtain all the information necessary to guide their actions. Ergodicity, however, demands replicability, requiring that social processes be invariable over time, which precludes what Shackle called *crucial decisions*, i.e., decisions which, once taken, inexorably change the initial conditions in which the decision-making process was conducted (Carvalho, 1992, p. 65).

The existence of uncertainty, which cannot be reduced to probability calculations, is fundamentally important to understanding the functioning of modern economies, because it changes agents’ behaviour as compared with situations where future outcomes of any course of action can be forecast on the basis of probability calculations (Carvalho, 1992, Ch. 4). If the future is uncertain, then decision makers need protection against unspecified, unforeseeable events that may occur in the future and which have the potential to affect their economic and financial situation adversely (Carvalho, 2015, p. 20). As money is the instrument in which all contractual obligations are expressed and settled, then it constitutes purchasing power in its most general form, thus becoming a universal insurance against adverse events, particularly in cases where decision makers’ doubts force them to make contractual payments now and in the future. In such contexts, possession of money functions as a “tranquiliser” against the limitations of any forecast regarding future outcomes of decisions taken in the present.

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<sup>9</sup> A stochastic process is said to be ergodic when, if performed in infinite repetitions, its temporal and spatial means converge (Davidson, 1988, p. 331). In that context, the probability distributions of relevant variables obtained from any past repetition of the stochastic process will converge to the probability distribution governing present and future values of those variables.

Demand for protection against unspecified, unforeseen events can be met by money and other assets that can be quickly and easily converted into means of payment. In other words, that demand for protection is, in fact, a demand for liquidity. As Carvalho notes (1992, p. 83), liquidity is the ability to convert an asset into means of payment and hence into anything that can be acquired with money. Accordingly, liquidity is a two-dimensional concept, because it relates both to the time interval required to realise an asset (i.e., the time lapse between the decision to sell the asset and the materialisation of that decision) and, simultaneously, to that asset's ability to maintain its value over time (Carvalho, 1992, p. 85).

It was shown above that the existence of uncertainty prompts demand for protection against unspecified, unforeseen events and that such demand can be met directly by the possession of money or of assets that can be converted quickly and readily into money. Accordingly, in a context of uncertainty, it is important to decision makers to hold liquid assets in their portfolio, meaning that they are willing to forego the possibility of higher monetary returns in order to own liquid assets. The return that decision makers are willing to sacrifice in return for liquidity is known as the *liquidity premium*, defined as the implicit (subjective) return that individuals attribute to their ownership of liquid assets. The greater the uncertainty perceived by decision makers, the greater that implicit return will be.

However, liquidity preference cannot be reduced to demand for money in the more general context, where there exists a *liquidity spectrum* extending from illiquid assets at one extreme to perfectly liquid assets at the other. In that framework, liquidity preference will determine not the interest rate, but the prices and rates of return of all assets in the economy. This is because liquidity preference will mean that, at equilibrium, less liquid assets will yield higher rates of return to their owners than more liquid assets, in compensation for their lesser liquidity. Understood in this way, liquidity preference theory is, in fact, an asset pricing theory, not a theory of demand for money (Carvalho, 1992, p. 98).

#### **4. Own-rate of interest, liquidity preference and capital accumulation**

In Chapter 17 of the GT, Keynes presents the liquidity preference theory as an asset-pricing theory (Carvalho, 1992, p. 81). In that chapter, Keynes describes how spot and forward prices are set for the various assets existing in a monetary economy. The

relationship between these prices will induce changes in asset supply flows, thus allowing amounts supplied to be adjusted to the amounts demanded.

Keynes regarded all assets as having certain attributes to a greater or lesser extent. The first attribute is *quasi-rents* ( $q$ ), i.e., money revenues that the owner of wealth expects to obtain by using the asset in the production process (profits) or simply by owning it (interest). These expectations are formed in a context of non-probabilistic uncertainty in which individuals know that unexpected events can occur. Their expectations thus involve two components: the best forecast that agents can formulate regarding *quasi-rents* and the degree of confidence they have in their own expectations. A reduction in that degree of confidence will thus lead to a reduction in the quasi-rents expected. The second attribute is *carrying cost* ( $c$ ), which consists in the negative returns associated with maintaining an asset in the portfolio of the owner of wealth. These costs can involve storage and insurance costs, or interest payments if the asset purchase has been financed by loans. The third attribute is expected capital gains or losses ( $a$ ), given by the difference between the purchase price and expected sale price of the asset in question. Lastly, the final attribute is *liquidity premium* ( $l$ ), defined as the implicit return attributed by the individual to ownership of liquid assets in his portfolio.

From these attributes it is possible to define the concept of *own-rate of interest in money terms*, which is a measurement of an asset's total yield, including not only its explicit monetary return, but also the implicit return that the asset's greater or lesser liquidity affords its owner. In this way, individuals will choose those assets that offer the highest possible own-rate of interest in money terms. Competition among economic agents to obtain the best assets will produce a variation in the prices of these assets until the own-rates of interest of all of them are equal. This process will determine the spot price of the various assets in the economy. If an asset's spot price is greater than its forward price, then it will be possible for the producers of those assets to increase production profitably. The amount of this asset available on the market will gradually increase, thus reducing its spot price until it equals the forward price. At the point where the asset's spot price equals its forward price, there will then be no additional production of the asset, so that the economy will be in long-term equilibrium.

The model of *own-rate of interest in money terms* developed in Chapter 17 of the GT rests on certain assumptions (Carvalho, 1992, p. 81-90). In the first place, the time horizon for portfolio choice is a period of only one year. Thus, all assets existing in the economy will have the same retention period and are necessarily to be realised at the end



of the period. That expedient avoids the need to calculate the present value, which would require using an exogenous rate of interest in order to determine the spot prices of the different assets. Secondly, the time dimension of the various assets is not ignored, but embedded in another variable, viz., the liquidity premium. Accordingly, the greater the asset's liquidity, the greater will be its owner's ability to sell it in advance, at no loss, within the retention period. Lastly, all an asset's attributes are measured using a unit that is proportional to the asset's spot market price. In that way, the sum of the value of all the asset's attributes gives the total rate of return on it, i.e., the own-rate of interest in money terms.

Given these assumptions, we shall consider an economy in which there are only three asset types: money, securities and capital. Money is the means of payment and unit of account used in the economy, in such a way that its liquidity premium ( $l_m$ ) is at a maximum, while the expected quasi-rents, carrying cost and expected capital gain are all equal to zero, i.e.,  $q_m = c_m = a_m = 0$ . Securities are assets traded on well-organised secondary markets so that their liquidity premium ( $l_b$ ) is positive, although smaller than the liquidity premium of money. Let us suppose that the sum of the expected capital gains and expected quasi-rents ( $a_b + q_b$ ) from ownership of such assets is greater than their carrying cost ( $c_b$ ). Capital, meanwhile, is an asset that is not traded on secondary markets and is thus illiquid. In other words, the liquidity premium of capital assets is equal to zero, in the same way as the expected capital gains, i.e.,  $l_k = a_k = 0$ . Lastly, the expected quasi-rents from the use of capital in the production process are greater than the carrying cost of that asset, i.e.,  $q_k > c_k > 0$ .

The portfolio equilibrium situation exists when the own-rates of interest in money terms of all assets in the economy are equal, which for the case in question is given by:

$$l_m = l_b + a_b + q_b - c_b = q_k - c_k \quad (1)$$

This equality is assured continuously in the short-term by the variation in the asset's spot price (the asset's secondary market spot price) as compared with the asset's expected price for future delivery, thus closing any gaps between own-rates of interest in money terms.

By way of example, let us suppose that an improved state of confidence among entrepreneurs raises the own-rate of interest on capital in money terms. In that case, an initial situation of portfolio disequilibrium is produced where:

$$l_m = l_b + a_b + q_b - c_b < q_k - c_k \quad (2)$$

In view of this disequilibrium between the various assets' own-interest rates in money terms, owners of wealth will review the composition of their portfolios and reduce the proportion of money and securities in their stocks of wealth, in order to increase the proportion of capital. In that process of portfolio adjustment, the price of securities on the spot market will fall, while the demand price of capital assets will rise<sup>10</sup>, restoring equality among own-interest rates in money terms.

An increase in a capital asset's demand price will, in turn, create a gap between the asset's demand price and supply price. More specifically, the maximum price that entrepreneurs are willing to pay for an additional unit of capital will be greater than the unit's future price (for new capital goods orders placed with the asset's manufacturers). In this way, there will be a clear signal from the market for entrepreneurs to order new capital units from the manufacturers of such assets, thus producing a stimulus to investment (Carvalho, 1992, p. 92).

How would heightened perceptions of uncertainty among owners of wealth affect asset prices and investment? In such a case, the liquidity premium of money would rise, producing an imbalance among the various assets' own-interest rates in money terms. That disequilibrium would induce a change in portfolio composition, increasing the proportion of money and reducing the proportion of securities and capital. That movement, in turn, would leave to a fall in both security prices and the demand price of capital goods, re-establishing equality among the own-interest rates in money terms of all assets. However, the fall in the capital goods demand price would result in a situation where the maximum price that entrepreneurs were willing to pay for an additional unit of capital would be less than the future price of that asset, thus discouraging investment in fixed capital and producing negative effects on levels of production and employment in the economy.

## 5. The debate over the endogeneity of money supply

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<sup>10</sup> Because it cannot be traded on secondary markets, capital is an illiquid asset and accordingly has no corresponding cash or spot price. Thus, the expected quasi-rent of capital is given by the ratio between a capital asset's expected monetary return (Q) and demand price ( $P_k^D$ ), i.e., the maximum price that entrepreneurs are willing to pay for one additional unit of the asset.

One natural development from the theoretical approach to liquidity preference constructed by Fernando Cardim de Carvalho is his analysis of banks' liquidity preference, drawing particularly on his reading of the *Treatise on Money*. However, the embryo of his theory of the banking firm had already appeared in his debate with Nogueira da Costa (1993) on the horizontalist approach to the endogeneity of money supply. Counter to that approach, he posed precisely the approach based on banks' liquidity preference, which – he claimed – offered a different explanation for the endogeneity of money.

On the *horizontalist view* developed by Kaldor (1982) and Moore (1985), the money supply curve is horizontal in interest-money stock space, because the suppliers of money always fully accommodate demand for money to a given interest rate. In a credit-money economy, money is created as a result of firms, families and governments needing to finance their expenditures, and of banks' portfolio decisions. In that respect, money supply and demand are interdependent. The Central Bank (CB), as lender of last resort, sets only the base interest rate and provides banks with unlimited amounts of funds at that rate, thus playing an accommodative role. Banks, meanwhile, lend on request at approximately constant cost (given the mark-up determined by their degree of monopoly) and never experience constraints on their reserves, given that they can access CB lines of financing at any time<sup>11</sup>.

Carvalho's main criticisms (1993a, 2015) of the horizontalist view are that:

(i) the CB does not necessarily play a passive role in providing bank reserves, because even though it may not be able to refuse to support their reserves, it can do so in punitive conditions (by setting a higher or lower bank loan rate to suit its wish to swell or shrink the volume of reserves offered to banks), which may compel banks to scale back new lending. The validity of this argument is restricted to the very shortest term;

(ii) the horizontalists exaggerate the CB's role as lender of last resort, in that it is unreasonable to assume that all and any liquidity squeeze should be seen as a threat to the

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<sup>11</sup> This is not to say, however, that this view is incompatible with the phenomenon of credit rationing. As emphasised by Hein (2008, p. 44), banks set the bank loan interest rate on the basis of a mark-up on the short-term interest rate set by the central bank, offering all credit that is demanded at this rate by those borrowers assessed as "creditworthy". Banks are thus price setters and quantity takers, within limits given by their creditworthiness appraisals of borrowers. For an analysis of the theory of the endogenous money in an "accommodationist" view, see Lavoie (2006), and in a "structuralist" view, see Dow (2006).

stability of the financial system. Strictly, while the CB cannot intervene in available reserves, as the horizontalist view assumes, nor can it do so with regard to interest rates;

(iii) commercial banks are not a “black box” that accommodates all credit demand from non-financial agents, because – as with any agent operating under non-probabilistic uncertainty – they display liquidity preference, which can lead them to ration the supply of credit, while their capacity for innovation allows them, during boom cycles, to expand the supply of credit beyond the CB’s reserve requirements and regulatory parameters.

The Post-Keynesian alternative advanced by Carvalho (1993a, p. 119) starts by assuming that “the authorities do not wield absolute control of the money supply, as the verticalists suppose, not only because the money demand function may be volatile, but also because the central bank has to operate through the commercial banks. For the authorities to achieve their intended goals depends on the banks’ reaction and their policy”. On the other hand, on the basis of the two money circuits developed originally by Keynes in the *Treatise on Money* (*industrial circulation*, where real revenue is expressed in means of payment in a given period, and *financial circulation*, where money serves as a form of wealth), Carvalho (1993a, p. 119) argues that “in the financial circuit, money can be altered by the ‘portfolio adjustment’ method, by which the central bank, through the open market, replaces money by securities, or vice versa, in private agents’ (including banks’) portfolios”; the monetary authority can thus influence the demand for money by altering the interest rate, thus altering the desired relationship between securities and money that the public wishes to hold.

Carvalho pointed out that, in the *Treatise on Money*, Keynes had developed a much richer and more detailed conception of how money is created in the economy and had maintained that, in their balance-sheet strategies, banks seek to reconcile return and liquidity in their applications, which are crucial to creating deposits and thus to expanding supply of means of payment (Keynes, 2011, Ch. 25). On this perspective, argues Carvalho (2015, p. 54), banks “don’t react mechanically either to changes in their reserves initiated by the central bank or the changes in the demand for loans coming from firms or private consumers. Their actions depend on how they balance their simultaneous desires for profitability and liquidity”. Thus, the endogeneity of money in Keynes considered that monetary policy can be confirmed, attenuated or offset by banks’ strategies.

To conclude, Carvalho (1993a) attributed the endogeneity of money supply to the banking sector’s ability to increase the volume of loans and to permit means of payment to expand beyond growth in bank reserves, as a result of the sector’s ability to innovate

in such a way as to expand credit supply in relation to CB bank reserve requirements and regulatory parameters.

## 6. Banks' liquidity preference

In Keynes' *Treatise on Money*, Carvalho<sup>12</sup> found inspiration to build a theory of bank liquidity preference as a natural development from his analysis of liquidity preference in the context of an *asset pricing theory* or *asset choice theory*, without a doubt one of his most original contributions to theory. Banks, just like any agent whose activity is speculative, operate under conditions of fundamental uncertainty and seek to design their balance-sheet strategies with a view to reconciling profitability with their scale of liquidity preference. The liquidity preference approach, Carvalho argued (1999, p. 123), "suggests that banks pursue active balance sheet policies instead of passively accommodating the demand for credit", seeking to compare the expected returns and liquidity premiums of all assets available for purchase.

Accordingly, *banks' portfolio choices* are particularly sensitive to perceived uncertainties: if uncertainty increases (and confidence in expectations wanes), liquidity preference will tend to increase and, consequently, demand will be channelled towards assets that are more liquid, although less profitable. Meanwhile, if perceived uncertainty diminishes, liquidity preference will tend to decline and banks will seek assets that are more profitable, although less liquid, i.e., profitability will predominate over liquidity. In this way, in any given state of expectations, "banks' liquidity preferences will determine the desired profile of the assets they purchase and at their prices, that is, the rate of returns each type of asset must offer to compensate for their degree of illiquidity" (Carvalho, 1999, p. 132).

Carvalho maintains that the bank liquidity preference approach, more than explaining individual asset and liability choices, is concerned to understand *balance-sheet strategy*, in keeping with banks' perceptions of risks and profit opportunities. In this way, credit supply is not determined passively by borrowers – as suggested by the horizontalist view; rather it would "depend on each bank's assessments not only of the specific credit risks each borrower represented, but also on the nature of the liabilities issued by the bank, the need to be ready to meet the contractual cash outflows even under adverse

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<sup>12</sup> The main contribution was made in Carvalho (1999). See also Carvalho (2015, Chapters 4 and 5).

conditions and the own-rates of interest of the other classes of assets” (Carvalho, 1999, p. 133).

## 7. The finance-investment-saving circuit

One last theoretical question that Carvalho devoted special attention to was *finance in the process of capital formation* or, more specifically, the *finance-funding circuit*. Although the subject had already appeared in Carvalho (1992), his first more mature work on the issue was Carvalho (1997). In the 2010s, returning more incisively to the subject (Carvalho, 2012; 2015; 2016), he produced a theoretical elaboration slightly different from his work of the 1990s, particularly in his final contribution on the matter (Carvalho, 2016). What these studies have in common is that they aimed to interpret and expand on Keynes’ discussions (1937a, 1937b) with Ohlin and other authors, including Robertson and Hawtrey, on the relation between saving and investment, during which Keynes drew an important distinction between saving and finance.

Carvalho opposed the *loanable funds theory* in the Stockholm School version developed by Ohlin (1937), which proposes that the interest rate should be seen as the price of credit (rather than the price of money, as argued by Keynes) and thus as being determined on the market of credit *flows* rather than on the market for *stocks* of liquid wealth. From that perspective, investment is assumed to be financed, from the outset, by prior saving, while the moving interest rate – understood as the “price” that balances the market for loanable funds – is seen to guarantee equality between saving and investment.

Carvalho (1997) showed that, to Keynes, goods purchases and investment, like any other act of expenditure, required *access to money*, to liquidity that could be afforded both, in the case where aggregate spending holds constant, by the existing stock of money circulating in the economy as a counterpart to the goods and services circulating (what Keynes called a “*revolving fund*”<sup>13</sup>) or, in the case where the rate of accumulation in the economy accelerates, by new money created by banks endogenously or by agents’ transferring inactive balances into active circulation (dishoarding in response to diminished liquidity preference). Thus, money can be provided by banks when agents

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<sup>13</sup> According to Carvalho (2016, p.294, italics in the original), “when money is spent (...) that amount of means of payment becomes available to be held by somebody else in advance of some other purchase. It works *like* a revolving fund, where money spent can now be used by somebody else to make a purchase as long as the value of the latter is the same as the value of the former”.

borrow or by using existing deposits (prior sales, asset liquidation, placing securities on the capitals market etc.). Therefore, *for investment to take place requires finance (liquidity), rather than saving*. As investment is performed, so revenue is generated and, as a result, as a fraction of revenue, savings are produced in the exact amount of investment expenditure.

In this regard, Carvalho (1997, p. 471) maintained that the problem to be addressed in monetary economies “is not how to generate saving, but how to make money available to investors, first, and, later, how to make the most of the resulting saving available to allow the funding of the investors’ debts”. The aggregate supply of finance in a monetary economy is determined primarily by banks’ wishing to create credit and the corresponding deposits and by the existing stock of money. Keynes (1937c) analysed the process of finance for capital formation, describing the process as having two stages: in the first, provision of money (*finance*) allows investment expenditures to be made, i.e., demand for money provided by the bank sector at the moment when the firm decides to invest; and in the second, *ex-post* saving is used to consolidate debts in order to spend on investment.

*Funding* is the process of converting short-term debts into long-term liabilities, in such a way as to make the maturities and amounts of the investing firm’s liabilities compatible with expected return on its investments. Keynes (1937b) suggested, in his analysis of the finance-investment-saving-funding circuit, in which obtaining finance (money) starts the capital formation process, that saving is produced from investment decisions, as a result of the revenue multiplier process, while *ex-post* saving can be channelled to the financial market to consolidate investor firms’ short-term debt.

Accordingly, the support necessary for investments to be made consists, firstly in the provision of money to enable the investment expenditure to be made and, secondly, in the opening up of channels through which saving can, directly or indirectly, fund the short-term debts incurred to finance the investment expenditure. Carvalho (1997, pp. 472-473) argued that sustained economic growth requires expansion of the money stock in order to finance the growing amount of investment expenditure, which can be met by banks as creators of money, involving an accounting operation with no need for real current funds and, particularly, with no need for prior saving. If banks refuse to accommodate the demand for liquidity, the interest rate may rise and investments may be rendered unfeasible, independently of the propensity for agents to save. In turn, *funding* depends on the existence of financial markets able to assure the conditions for channelling

saving into long-term finance and on the degree of agents' liquidity preference. Carvalho (1997, p. 472) concluded that an *efficient financial system* is one that can “provide an elastic supply of finance to accommodate growing investment expenditures, and it has to create the direct and indirect channels to allow their funding”.

Carvalho (2016) reviewed his previous interpretation of the *finance-funding* circuit, to maintain that, in Keynes' theory, financial systems deal only with liquidity and that liquidity has nothing to do with saving; adding, however, that they intermediate neither savings nor the surplus of revenues over expenditures. Thus, saving created instantly by investment decisions plays no role in the financial system. Note that in his previous interpretation, *funding* was a process by which saving (generated by revenue multiplication as a result of agents' expenditure decisions) was channelled into long-term finance. In this work Carvalho (2016, p.293, italics in the original) states that:

“In the interpretation offered by in this article, these are *not* sequential problems, as some authors have interpreted them, but in fact two different questions: the first deals with money circulation, how to accommodate a new use for money-in-circulation, and the second is what we could, in modern terms, a corporate finance problem, how to structure one's balance sheet between assets and liabilities to minimize financial costs and risks. *Finance* and *funding* are therefore not different steps in the same process, they are different concepts describing specific dimension of the same decision”.

His analysis of *finance* continued as described earlier; what was different now was the concept of *funding*, which he examined on an interpretation based on Minsky (1986), an author hitherto little used by Carvalho (2016, p. 295): “Funding a project is mostly a question of matching assets and liabilities, that is, accepting obligations that could ideally be settled with the revenues expected to be generated by the assets one is acquiring”. In this process of structuring their balance sheets, investor firms must meet the conditions of *liquidity* (of being able to make contractual payments by their due dates) and *solvency* (of having assets worth at least the current amount of their balance sheet liabilities). Therefore, firms' concern with *funding* relates to how liabilities are structured in line with the time profile of their asset purchases, as well as with the safety margins they maintain (payment commitments on liabilities relative to cash receipts and the ratio of liabilities to cash and liquid assets).



## 8. Conclusion

This paper examined Fernando Cardim de Carvalho's main theoretical contributions, for reformulating the Post-Keynesian paradigm. Specifically, those key contributions to theory were his elucidation of the fundamental principles that define the concept of monetary production economy; an analysis of decision-making under conditions of non-probabilistic uncertainty; development of a portfolio choice theory in which the decision to invest is regarded as one of various possible wealth accumulation strategies; his liquidity preference theory, including its application to banks' portfolio allocations under uncertainty; and his analysis of the *finance-funding* circuit and its implications for the functioning of monetary economies<sup>14</sup>.

In a talk given to the meeting that founded the Brazilian Keynesian Association (*Associação Keynesiana Brasileira*) in 2008, Carvalho (2008, p. 569) said that “for many years it has been noted with some surprise that Brazilian economic thinking is strongly influenced by the thinking of Keynes and his followers”, and that “without denying that a number of orthodox economists do accept academic pluralism, it is hard to deny that the preservation of freedom of academic thought in Brazil has always depended much more on the force of the practitioners of independent traditions than the intellectual openness of orthodox circles”. There can be no doubt that, in view of his wide-ranging theoretical contributions, intellectual leadership and active academic participation in teaching, supervision, congresses and meetings, it was Fernando Cardim de Carvalho who contributed most to that end!

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<sup>14</sup> Note that Carvalho made other important contributions to theory, with regard, for instance, to inflation, bank regulation and economic policy. See, for instance, Carvalho (1993b).

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