

The fourth dimension: derivatives as a form of capital

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Abstract

This paper discusses the role of derivatives in contemporary capitalism. Its analytical construction is based on a specific reading of Marx which features the constitution of four dimensions in the capitalist mode of production, highlighting derivatives markets as a development of fictitious capital: the fourth dimension. Therefore, derivatives are viewed not only as supporting the financial accumulation process, but also as playing a central role that affects the entire process.

Keywords: Derivatives; Marx; Capitalism; Financialization.

Resumo:

Esse artigo discute o papel dos derivativos no capitalismo contemporâneo. Sugere-se uma construção analítica a partir de uma leitura de Marx, onde se apresentam quatro dimensões do desenvolvimento do modo de produção capitalista, destacando os derivativos como um desdobramento do capital fictício: a quarta dimensão. Dessa forma, propõe-se que os derivativos não são apenas coadjuvantes no processo de acumulação financeira, mas desempenham um papel central que condiciona todo esse processo.

Palavras Chave: Derivativos; Marx; Capitalismo; Financerização.

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Introduction

The derivatives market is the most important financial market considering the volume of operations as a criterion. Despite the importance of this market, there is a dearth of studies that delve into the topic in the field of Political Economy; there is no set of detailed analyses about the nature of this instrument and its impact on the process of capital accumulation. However, some exploratory texts consider derivatives a central variable to economic dynamics, such as Bryan and Rafferty (2006), Lipuma and Lee (2005), Bryan and Rafferty (2006), Blackburn (2006) and McKenzie (2011).¹

This study aims to advance the discussion of derivatives from the Political Economy perspective in dialogue with the previously cited authors. For this, the paper analytically constructs four dimensions of capitalist accumulation. The purpose of this construction is to highlight the derivatives market as a development of fictitious capital and as a particular sphere of the financial accumulation. Three methodological axes are used to characterize each dimension. The first is the Marxist analysis of the forms of money circulation and the subordinate relations in the process of capitalist accumulation. The second axis comes from the Bryan and Rafferty (2006) analysis that identifies degrees of separation in the ownership of capital in the process of capitalist accumulation. And the third axis of analysis is the description of the system logic and changes in capitalism in each dimension.

This construction, although exploratory, points out important features of the logic of financial accumulation provided by derivatives. In derivatives markets without physical delivery, transactions are purely monetary; therefore, there is no change in ownership of the underlying assets. Given this and other characteristics of derivatives, which will be addressed in this paper, we argue that they become the locomotive of wealth appreciation when derivatives markets assume the prerogative of price formation. At this point, some of the major spot markets become dependent on the derivatives market and the forward price variation is transmitted by arbitrage in the “opposite” direction than usually expected. One can say, in a contradictory way, spot prices “derive” from forward prices.

This study also dialogues with the literature of “financialization” – represented by Chesnais (1995; 1996; 2003; 2004), Aglietta and Reberioux (2005), Aglietta (2006), Palley (2007), Guttmann (2008), among others. This literature indicates control over the property of companies, represented by share capital, as responsible for the spread of a financial logic between economic agents. It is argued that the fourth dimension exacerbates financial domination and gives it new contours. The core of contemporary finance is increasingly moving from property relations, represented by stock markets, or the bond market, to the derivatives market where agents who run the financial dynamics, such as large banks and hedge funds, operate.² In these terms, the derivatives market adjusts the sphere of property to its logic by controlling price dynamics, and it shifts the epicenter from the bond markets to the derivatives market.

In addition to this introduction and the concluding remarks, the paper is divided into four parts. In the following part, we discuss the nature of derivatives, an essential starting point, to the extent that derivatives are financial instruments subject to frequent misunderstandings. Section 2 describes the four dimensions of capitalism, highlighting the new form of accumulation provided by the derivatives market. Section 3 provides the microfoundations of the fourth dimension, and shows theoretically how future prices can continuously determine spot prices through the dynamic of speculation and arbitrage. Section 4 illustrates how the logic of derivatives can be observed in contemporary capitalism, particularly with regard to price determination issue.

¹ Blackburn (2006) inspired the use of the term “fourth dimension”, notwithstanding loading it with different meaning from that used in this text.

² “It is not household names like Nike or Coca-Cola that are the capstones of contemporary capitalism, but finance houses, hedge funds and private equity concerns, many of which are unknown to the general public. In the end even the largest and most famous of corporations have only a precarious and provisional autonomy within the new world of business – ultimately they are playthings of the capital markets” (BLACKBURN, 2006: 42).

1. On the nature of derivatives

Derivatives are not an invention of modern finance. Their origin dates back to pre-capitalist periods. According to Bryan and Rafferty (2006), there are records of forward contracts of rice in China in 2000 BC. The original function of these instruments was to protect farmers from fluctuations in agricultural prices. Derivatives are, therefore, instruments that emerge organically from the production process and are subsequently appropriated and refurbished by the financial system to enhance the process of capital accumulation. However, the speculative use of derivatives is also very ancient, as shown in the book *Politics*, by Aristotle. In the story of Thales of Miletus, a primitive use of an option contract can be identified. Thales, predicting an increase in the olive harvest, negotiated with owners of olive presses the right to rent machines during the harvest period in exchange of cash advance. When the bountiful harvest came, the olive growers sought the scarce machines on the market and Thales made a fortune.

The usual definition of derivatives, repeated in finance textbooks, states that these are financial contracts that establish future payments, whose value derives from an asset, financial instrument or event occurrence. This definition can be misleading as it suggests a causality that is not always true, i.e., it proposes that the price formation of derivative contracts depends on prices in the spot market.³ However, there are derivatives markets in which spot and future prices are defined simultaneously; and others where the *locus* of determination is the forward market as will be shown throughout this study.⁴ Thus, this study adopts the concept of derivatives as a bilateral contract that stipulates future payment and whose value is tied to the value of another asset, index or rate or, in some cases, depends on the occurrence of an event.⁵

An important characteristic of a derivative transaction is that, if considered in isolation, it represents a “zero sum game”, where earnings are equal to losses:

Virtual markets do not create wealth. They only redistribute it among the participants. In aggregate, one can only win the values lost by other participants in the derivatives markets. The only wealth created in these markets is made by the brokerage and emoluments to the Stock Markets paid by all participants, whether they won or lost money on their operations (FARHI, 1998: 7)

In order to better understand derivatives, one should be alert to the three motives that lead agents to operate with derivatives: hedge, arbitrage and speculation. The hedge agent is motivated by the coverage of risks of their activities on the spot market.⁶ For this agent, derivatives are compensatory because they cover losses or compensate gains from activities in the spot market. Meanwhile, speculative transactions with derivatives are those where the position assumed by an agent has no correspondence on the spot market, thus, they are exposed to risks of price variations or the occurrence of events.

As it is a bilateral contract, the common argument is that the speculator is essential for derivative trading as it takes the risks of productive enterprises and thus provides the hedge. This is not necessarily true, as the speculator may be dispensable in contracts where there are opposing interests of companies that require a hedge such as, for example, between an exporting company whose risk is the domestic currency appreciation and an importing company that fears depreciation of the domestic currency in relation to the foreign currency. In this case, the derivative exchange serves two agents with hedge motivations and provides a risk reduction for both by ensuring the future price of the exchange rate between two currencies. Finally, the arbitrage transaction is characterized by two simultaneous operations, one on the spot market and one in the derivatives market, where the motivation is to exploit

³ This causality is in the origin of the term “derivative”.

⁴ This question, repeated throughout the paper, is corroborated by Bryan and Rafferty (2006: 12): “Many empirical studies have shown that prices are first formed in derivatives markets (a process called price discovery) and are transmitted back to cash markets, while others have found that this process occurs more or less simultaneously.”

⁵ The Chicago stock market, for example, negotiates weather futures intended for protection against the occurrence of weather events.

⁶ “Hedge risk transactions consist, essentially, in assuming for a future time the opposite position that one has on the spot market” (FARHI, 1999: 94).

price differentials in these markets. This creates the opportunity of gains without risks.⁷ Unlike a speculative operation where the result of the operation is known *ex post*, in arbitrage, the gain is known *ex ante*. This operation is responsible for transmitting prices between the spot and future markets, as will be shown in section 3.

There are two forms of settlement for derivative contracts, which are: physical delivery of the underlying asset or cash settlement. Markets that operate exclusively with physical delivery require, from the counterparts, the delivery and receipt of the asset or good involved in the operation. For example, a forward contract with physical delivery of oil implies that, on a future date, one party will sell to the other a certain number of barrels of oil at a pre-agreed price. This type of market restricts the set of participants to those who work in production, which use the product as an input, or at least have the logistics required to transport and store the commodity. Therefore, price determination in this market reflects the interaction of these agents, which are somehow linked to production, processing or storage of the underlying assets.

Meanwhile, in the market with cash settlement there is no physical exchange, but an adjustment of margins on the financial difference, paid in cash. This factor allows the operation of agents unrelated neither to production nor to the use of the underlying assets, and opens a wide opportunity for speculators. For example, a Japanese investor can sell dollars against Brazilian reals with settlement in yen. In this case, he may not have the dollars nor want to get Brazilian reals, since he is only interested in the result in yen from the exchange rate fluctuations between the dollar and real.⁸ However, his operation potentially affects the dollar/real exchange rate.

Moreover, a derivative market with cash settlement grants participants in this market a tremendous leverage. Restrictions on the degree of leverage come down to a margin requirement that corresponds to a small percentage of notional value for the contract.⁹ In this context, McKenzie (2011) states the growth of markets with cash settlement enables a substantial increase in leverage of agents and a rise in trading volumes in derivatives markets, becoming a large space for financial speculation.

In these terms, the derivative contract makes it possible to separate the assets themselves and the volatility of their prices. It is a negotiation involving the attributes of assets and their risks, but not their ownership, or property. A stock is a contract that establishes ownership of part of a company; a debt security provides the right to ownership of an income flow; but derivatives do not imply any ownership (Bryan and Rafferty, 2006).¹⁰ The derivatives are priced, bought and sold without any change in ownership of the asset to which they relate. Thus, agents can “sell what they do not have or buy what they do not want to possess” (FARHI, 2010: 209).

A social – or macroeconomic – specific and extremely important function can be attributed to the derivatives market: the transfer of risks between agents. By pricing and providing risk transfer, derivatives become a useful tool for dealing with macro and microeconomic uncertainty. They play a role of stabilizing and coordinating the agents' expectations and can, in theory, reduce the spread of financial instability to the sphere of production. In this sense, although they do not directly create wealth, derivatives can generate positive indirect effects on the production of wealth that are consequences of how producers respond to uncertainty about prices.¹¹

Naturally, the more volatile the economic variables that affect the production of goods and services, the greater the importance of derivatives will be. However, an analysis of the importance of derivatives becomes more complex when one admits the possibility of the derivatives market itself increasing macroeconomic and price instability. In other words, they can solve problems of

⁷ Arbitrage can also be conceived in the same market, between two maturities or two different instruments.

⁸ The cash settlement also allows the development of index markets that, by nature, are non-deliverable.

⁹ The notional value corresponds to the face value of the derivative contract. As in most cases, contracts are settled by the financial difference, the amounts actually transferred are much smaller. In OTC markets, the margin requirement for security is at the discretion of parties involved in the contract; meanwhile, in the stock market, there are margin requirements since the settlement of the contract is guaranteed by a central counterparty.

¹⁰ This abstraction, promoted by derivatives, will be better qualified throughout the paper.

¹¹ “However, while such derivatives may be a zero sum in monetary terms, in a broader context, they can be seen to involve a positive sum. By permitting better planning and organization of production and trade, derivatives may generate positive effects on resource allocation and accumulation” (BRYAN AND RAFFERTY, 2006: 42).

microeconomic efficiency and aggravate problems of macroeconomic instability. Along these lines, Farhi (1998) argues that derivatives have a contradictory nature, where the initial logic becomes its opposite: they are at the same time essential mechanisms for hedging risks and privileged means of speculation that adds volatility to the markets:

The systematic analysis of the impact of financial derivatives shows the dual and, sometimes, ambiguous role of these instruments. They play a role of stabilizing and coordinating the agents' expectations and can strongly reduce the spread of financial instability to the sphere of production. At the same time, the extensive use made by economic agents of the mechanisms of derivatives, whether to hedge risks, or for use in arbitrage operations or even to speculate, together with the power of leverage present in these markets have the potential to exacerbate the volatility and instability of markets (FARHI, 1998: 262-263).

2. The four dimensions of capitalism

The four dimensions are analytical constructions that seek to describe the formation and development of the capitalist mode of production. The purpose of this construction is to highlight the derivatives market as a development of fictitious capital and as a particular sphere of financial accumulation. There are three methodological axes used to characterize each dimension. The first is a Marxist analysis of the forms of circulation of money and the subordinate relations in the process of capitalist accumulation. The second axis comes from the Bryan and Rafferty (2006) analysis that identifies degrees of change in the nature of capital ownership in the process of capitalist accumulation. And the third axis of analysis is a description of the logic of the system and changes in capitalism in each dimension.

The four dimensions presented are not necessarily associated with a specific historical context, but coexist historically. Analyzing the Marxist method, Belluzzo (1980) describes it as "eminently genetic" or "logical-genetic" where the most simple categories and concepts contains features of the more complex categories, while the latter contains in its genesis contradictions inscribed in the most elementary forms¹². That's exactly what the concept of "dimensions" seeks to capture: the transfiguration of the forms, that is, how the more complex forms of capital accumulation arise from the most elementary forms through their contradictions, to subordinate them and transform the dynamics of capitalism. Accordingly, the fourth dimension is presented as a theoretical development of a new form of capital as it appears: the "derivative form."

Also noteworthy is that the analytical separation of the spheres of accumulation does not imply independence between them. Neither does the subordination of production to finance imply absolute autonomy of the first in view of the second. That is, there is no self-referential appreciation process where finances limitlessly determine their own value. On the contrary, the hierarchical structure suggested does not relieve the dependence of the financial sphere on the sphere of production; these spheres are inter-conditioned. In this sense, potential detachments between the spheres are limited in time and will tend to be adjusted repeatedly through crises.

2.1. First three dimensions: spheres of commodities, production and ownership

The analytical category of the **first dimension** refers to the most primitive form of mercantile circulation, due to the nature of the occasional exchange whose objective is to obtain use values. This is what Marx (1985) called "the direct form of commodity circulation", an abstract type of commodity circulation. This means that Marx shows the way in which, in a (hypothetical) simple mercantile society – with the trading of commodities and where money has no role as capital –, the values, or the products of human labor, are exchanged according to the scheme: Commodity (C) – Money (M) – Commodity (C). In

¹² This means that the study of the simplest forms allows us to glimpse the more complex forms and its contradictions. As stated by Mazzucelli (1985), it is imperative for researchers the task to unravel and understand the "(...) fundamental transformations of the mode of production, in order to identify immanent tendencies of the mode of production that leads to the establishment of new structural forms of existence" (MAZZUCCELLI, 1985:10).

this sphere, money is a means of circulation and not an end of the process. It is important to highlight that in this sphere of circulation there is no separation between work and ownership of the means of production. Therefore, the ideas of social classes, extraction of surplus value, nor the idea of capital are built, at this stage of Marxist analysis. The logic of the process is to obtain a new good, i.e., the production of a commodity has use value as its end¹³

The **second dimension** is a sphere of productive accumulation where the aim is to begin with an amount of money and, through the M-C-M' process, end with an increase of ΔM , i.e., a $M' = M + \Delta M$, the latter generated in the sphere of production. The additional money from the second dimension is a profit obtained from the surplus value that results from the production process. A precondition for the second dimension is to have established capitalist relations of production. Bryan and Rafferty (2006) refer to the separation of the worker from his means of production as the “first level of separation of the ownership of capital”. This separation allows the formation of a class of owners, capitalists, and another one of “free” workers available on the market, so that the second dimension is marked by the subsumption of labor to capital, which in turn manifests itself in the wage relation. Furthermore, production decisions are individual and have as a goal the obtainment of additional money, and specifically, capital appreciation that, as we have seen, involves money, as an end, and wage labor.

Moreover, the constant need for capital appreciation is already manifested in the second dimension. The circulation of money as capital means that the goal is not to obtain use values, but to obtain profits, and the valorization process is an end in itself. In summary, in the second dimension, the process begins with an amount of money and ends with an increase to the original money, which is possible by subordinating labor to capital and by creating surplus value. Therefore, in the so-called second dimension, money becomes capital and accumulation is configured as a process of accumulation of abstract wealth, of money.¹⁴

The first element to form the **third dimension**, in turn, is the occurrence of capital appreciation without the mediation of production of commodities, so that circulation is reduced to the extremes M-M'. The M-M' way appears, within the second dimension, as a way to support the M-C-M' accumulation. This means that credit, understood as the temporary transfer of capital among capitalists, is born as a way to extend the ability to mobilize the workforce and means of production. In addition to interest-bearing capital, Marx (2001) brings the first elements for the understanding of “fictitious capital”. The constitution of tradable financial instruments, such as bonds, bills of exchange, stocks, are forms of fictitious capital, with an original face value but whose current value corresponds to expected income flows, discounted by an interest rate. Here the appreciation process of fictitious capital gains autonomy, apparently complete, in relation to productive appreciation.¹⁵ Therefore, the third dimension presents the “second level of separation of ownership of capital” (BRYAN & RAFFERTY, 2006), which is the separation of ownership and production (or management) – resulting from property in shares.

Extensive literature with theoretical foundation on the contributions of Marx and Keynes describes the dominance of finance in the economic process and the changes in contemporary capitalism. Author's such as Chesnais (1995; 1996; 2003; 2005), Epstein (2001), Belluzzo (1997), Tavares and Melin (1997), Plihon (2004), Aglietta and Rebérioux (2005), Aglietta (2006), Carneiro (2007), Palley (2007) and Guttmann (2008) promote the idea of financial dominance, capitalism dominated by finance, or simply “financialization”. This literature describes the main logic of the third dimension, which is asset valuation logic or fictitious appreciation. In general lines, the dynamics of capital gains impose its interests and

¹³ It is not the purpose of this paper to discuss Marx theory of value. It is assumed that the reader has a basic understanding on this issue.

¹⁴ Marx (2001, vol. I: 224) concludes: “Value therefore now becomes value in process, money in process, and, as such, capital. It comes out of circulation, enters into it again, preserves and multiplies itself within its circulation, enters into it again, preserves and multiplies itself within its circuit, comes back out of it with expanded bulk, and begins the same round ever afresh. M-M', money which begets money, such is the description of Capital from the mouths of its first interpreters, the Mercantilists”.

¹⁵ This appearance of complete autonomy is actually illusory in a sense that very rapid fictitious appreciation processes eventually end in financial crises, whose larger meaning is the return to a greater adherence to the productive sphere appreciation process.

controls the behavior of the M-C-M' process and, therefore, subordinates the sphere of production to its interests. This financial logic is imposed on the production system to the extent that stock market shares are controlled by financial agents.

“From the 80s, the shareholders owners expended considerable energy and legal means, or quasi-legal, to subordinate industrial managers and turn them into people who internalize the priorities and codes of conduct born of the power of the stock market”.(CHESNAIS, 2005: 36).

In most literature on financialization, derivatives appear tangentially illustrating the operating mode of firms whose centrality is in asset valuation logic represented by the stock market. Therefore, the debate is not centered in the derivatives market but rather in the realm of property where capitalism moves through the centralization of wealth, by mergers and acquisitions, the appreciation of shares etc. It is based on this point that this paper proposes a contribution, and argues that derivatives have a more structural role in the process of capital accumulation.

2.2. The fourth dimension: the sphere of derivatives

In physics, the discussion about the fourth dimension comes up as an attempt to use time in studies of natural phenomena. It is known that space has three dimensions, described by three orthogonal planes that make up a three-dimensional coordinate system. In modern physics, the concept of space-time became widely used with the elaboration of the theory of relativity. Time appears as an additional dimension to describe the movement of bodies and natural phenomena. In economics, derivatives refer to risks associated with the passage of time, or rather, they reduce economic uncertainty to probabilistic risks and negotiate these risks in a particular market. For the hedge agent, derivatives represent an attempt to eliminate uncertainty surrounding the process of reproduction of capital. They are, accordingly, a reduction of microeconomic Keynesian uncertainty. For those who speculate, time is a determining factor in obtaining gains or losses. The logic of speculation is a temporal logic in the sense of the anticipation of price movement or occurrence of future events.¹⁶

Derivatives are not exclusive to the fourth dimension of capitalism. These instruments, as conceptualized in section 1, organically emerge from the production process and can be observed in each of the four dimensions. In the first dimension, derivatives are inserted to ensure the circulation of commodities at a given price, that is, to ensure future sales (C-M) or a future purchases (M-C) at a pre-established price, guaranteeing protection against price variation in the exchange of commodities. Derivatives are also functional in the logic of productive accumulation, being characterized in this study as the second dimension. They can appear in various stages of production of commodities, such as to ensure the purchase price of raw materials and inputs, to buy insurance against events that interfere with the production process, or to ensure the final product price. These occurrences mitigate uncertainties associated with the production process and increase the predictability of earnings resulting from this process (ΔM).

In the third dimension, derivatives are used primarily to ensure the profitability of capital, because credit relations, bond and stock markets are permeated by the uncertainty related to interest rate changes

¹⁶ According to Schackle (1959, p. 285): “The mathematician treats time as a space, or as one dimension of a space, in which all points have an equal status or importance or validity together, within one and the same prospect of the world; they have, as I would paradoxically say, a simultaneous validity, each of them means the same to him when he thinks about them all in one thought.” The attempt of the derivative form is to treat time as the mathematician does, when derivatives quantify the uncertainty about price changes, or the uncertainty about the occurrence of any event, in a measured “risk”. The uncertainty is reduced to a supposedly known “risk”, as if it were predictable. This “contradiction” of the derivative form is precisely the reason why they are prone to make mistakes and amplify volatility. For the purposes of this paper, it is important to clearly explain the meaning of uncertainty, which cannot be confused with probabilistic risk. The uncertainty means that there are events in the course of economic activities in which there are no probabilistic knowledge of their results. There are events whose effects are simply not quantifiable, or even unknown, in a world where the past is not invariably repeated and the future is necessarily unknowable.

and compliance with credit agreements. However, from the development of fictitious capital and the consequent increase in the importance of secondary markets, arise the growth and the generalization of the speculative use of derivative markets. This generalization gives rise to the fourth dimension. In this sphere, the derivative transactions empower themselves as a new form of capital, with particularities discussed ahead. The derivative form, dialectically, depends on the circulation of fictitious capital, and at the same time denies it. Depends, because its form of gain is directly related to the price variation of fictitious capital, but it denies because derivatives exchange tend to be independent of changes in property rights. Finally, it reinforces the role of fictitious capital and amplifies its impact on the capital accumulation.

As developed in section 2.1, capital has the power to make profits through the production and appropriation of surplus value. In turn, money is crucial, because it moves the production process and generates additional wealth. That is, money goes into the circuit as capital, goes through the production process and returns to the capitalist in the form of money-capital at the end of the process. It is, therefore, the means and the goal of the process. With interest-bearing and fictitious capital, as described, capitalism assumes a more exterior and more fetishist form. Money-capital gains an apparent and relative autonomy to pursue its way to appreciation on its own. It may be interest-bearing capital, supported by the credit system, which apparently provides money with the ability to create wealth or add value to itself independently of production; or fictitious capital, in which stocks of wealth can apparently appreciate autonomously. So, financialization allows the M-M' form to subordinate production and labor.

Now, the new form of accumulation provided by derivatives markets has a fundamental characteristic: the appreciation process is independent of initial investment. At this stage, capital assumes its most abstract form. If, earlier, the formula for capital appreciation could be denoted by M-M', where $M' = M + \Delta M$, in the sphere of derivatives it is proposed that the form of capital appreciation can be simply denoted by ΔM^* . The notation ΔM^* proposes, on one hand, a lack of prior capital (M), and, on the other hand, the (*) form denotes a difference in the nature of the gain from the operation.

Unlike previous forms, ΔM^* “dispenses” the need for money as a means of appreciation, or its advance in the beginning of the process. This means that money is still an end to the process of valorization, but it apparently loses its relevance as a vehicle of valorization, as well as the credit system.¹⁷ Leverage, a feature of derivative markets, does not imply credit relations as such, but these are implicit in the concept of leverage. These relations, as well as the interest associated with the money form, are incorporated in the pricing of derivative contracts. As will be discussed in the next section, the future price of any asset is given not only by the agents' expectations regarding the price change of this asset, but by the credit market interest rate, which consists of a carrying cost of this contract.

In this new dimension, the process of capital accumulation transmutes from the ownership sphere. This is because an important feature of derivatives is the fact that operating with derivatives does not imply ownership of the underlying asset. Bryan and Rafferty (2006: 74) refer to this separation as the third degree of separation of ownership of capital, and thus define:

The third degree of separation of capital ownership involves the process by which capital ownership is separated from company ownership and capital competes as itself. We have already described this separation in its most obvious form: that ownership of a share derivative (option or futures contract) is different from ownership of a share itself. The share derivative (such as a futures contract on a firm or the market index) gives its owner exposure to the performance (price and profitability) of the company (or group of companies) in a form that is more flexible than direct share ownership.

Nevertheless, derivative instruments are capable of deepening the abstraction of social relations already present in fictitious and interest-bearing capital (typical of the third dimension).¹⁸ Hence, if the

¹⁷ That is to say that there is no need to transform money into capital for the process of valorization. Money, as well as ownership and credit relation, is concealed in derivative operations.

¹⁸ Blackburn (2006), by coining the term “gray capitalism” calls attention to this characteristic of dissociation of asset ownership from the negotiation of its price fluctuations, as well as the “opacity” (McKENZIE, 2011: 209) of social relations that are underlying each asset. That is, the relations of ownership and responsibility are “clouded” by the complexity of

third dimension is in accordance with the empowerment of financial accumulation with respect to real bases of capital appreciation, the fourth dimension advances in this process and consolidates the form of financial accumulation to look even more autonomous, abstract and, thus, fetishized. After all, derivatives are instruments that allow capital to reproduce by a process that “dispenses” asset property and money itself as a means. The fetish takes its most radical detachment from concrete forms, as derivative operations hide real assets behind the contract as well as the social relations arising therefrom.

However, this abstraction does not imply absolute autonomy of the derivatives markets. These markets facilitate movements in prices of economic fundamentals, both in times of boom and in times of crisis, which are transmitted to the real sphere and affect credit relations and property relations. The accumulation by derivatives finds its “limit” at critical moments, i.e., when changes in risk perception of agents generate price-adjusting in the market that take the form of inversion of bets and settlement of contracts. At this moment, the social relations of property and credit are again essential to ensure the liquidity and solvency of agents involved in these markets, revealing the real social relations of power, property and money that appeared previously only in a veiled manner.

The nature of earnings in the fourth dimension is different from that provided in previous dimensions. As seen, the gain obtained by the capitalist in the second dimension is the profit derived from surplus value, and the gain in the third dimension originates from the appreciation of assets or receipt of interest. Now, the gain in a derivative transaction can be considered a gain of “casino”,¹⁹ i.e., a gain arising from the mere bet on price movement by an asset that the betting agent does not own.²⁰ Gains in these markets are provided by speculation that, among the major players in the market, is manifested in the form of consolidated strategies that seek to manipulate information and form conventions that have the power to distort prices. Therefore, the fourth dimension is a sphere of accumulation inherently speculative. The empowerment of derivative market is also the autonomization of speculation on property rights. Thus, as proposed by Lipuma and Lee (2005), derivatives are a functional form of speculative capital *par excellence*.

Another central feature of the derivatives market is its transversality, understood as the ability to integrate diverse markets. The derivatives market seeks to transform economic uncertainty into a measurable probabilistic risk; price it; and turn into an interchangeable instrument. These tools enable different financial assets to be measured under the same unit of measure, “commoditizing” risks and integrating various markets.²¹ Thus, the derivatives market leads capital mobility to its limit and enables the exchange of profit on stocks of global wealth. Figure 1 illustrates the aforementioned process: in the derivatives market, one can change the profitability of a share by the interest rate variation in a country, bet on the appreciation of an exchange rate, on the sovereign debt default of another country etc.

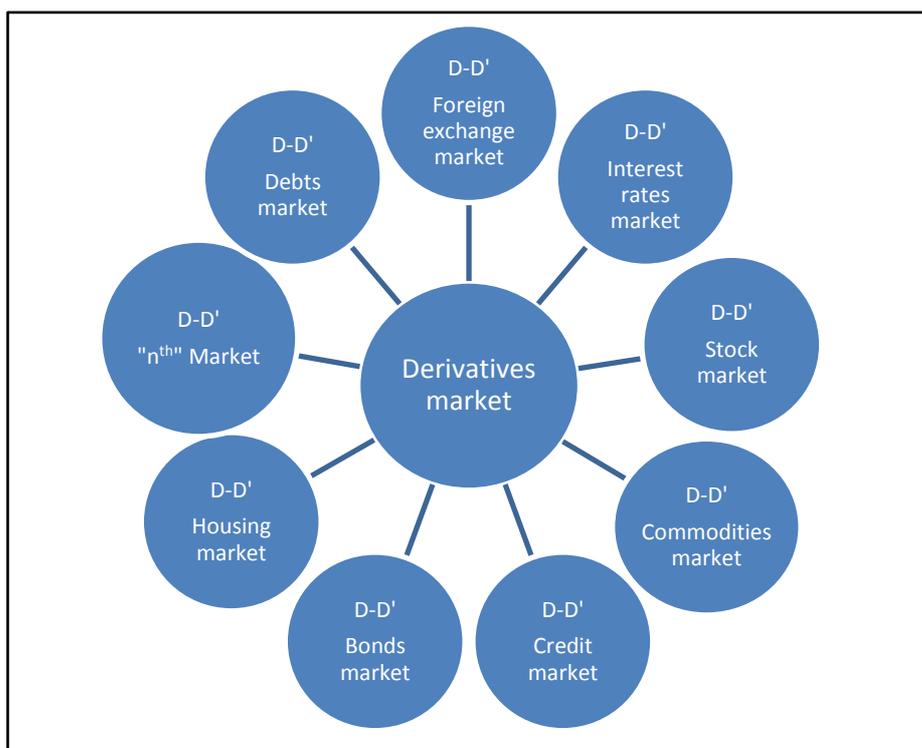
financial transactions.

¹⁹ Following here the nomenclature utilized by Strange (1986) and McKenzie (2011) that, when describing the current state of financial capitalism, name it Casino Capitalism.

²⁰ It is worth noting that the gain may result from the appreciation or devaluation of capital stocks, i.e., the falling price of the underlying asset can bring gains, provided that the bet has been made in the right direction.

²¹ This feature is called blending by Bryan and Rafferty (2006), bringing numerous aspects of the derivatives markets. The fact that derivatives are capable of commensurating different assets is directly related to the ability of derivatives to “commoditize the risks”, or, as stated by Lipuma and Lee (2005), “objectify the abstract risk”. Rotta (2008), by highlighting this issue as a social process of abstraction from the concrete, argue “the derivatives can only be priced if there is a process of real abstraction of the specific risks in an abstract risk” (ROTTA, 2008: 189).

Figure 1: The transversality and integration of markets through derivatives



Source: Prepared by the authors.

In these highly deregulated derivatives markets the need for previous capital is very low or nonexistent²². Thus, derivatives are instruments utilized to avoid prudential regulation once an outstanding derivative contract does not immediately affect the assets of firms; neither often appears in their balance sheet.²³ One can place bets without the need of guarantee deposits, which encourages agents to enter these highly leveraged markets. Moreover, as discussed in section 1, the growth of cash settlement markets allows for an increase in trading volumes in derivatives markets.

As a result of transversality – coupled with high leverage and increases in transaction volume – the dynamics of derivatives markets generates a constant repricing of stocks of financial assets and, therefore, of the fictitious wealth. The derivatives markets become the locomotive of wealth appreciation when they assume the prerogative of price formation. At this point, some of the major spot markets become dependent on derivatives markets and price variation is transmitted by arbitrage in the opposite direction than usual. One can say, in a contradictory way, that spot prices are “derived” from futures prices.

In conclusion, the fourth dimension is consolidated when the logic of profit by betting, on markets with high liquidity, high leverage and deep abstraction, is able to price goods and core assets. Thus, the derivatives market starts to increasingly take on the role of privileged *locus* of movement, pricing and appreciation of fictitious capital, subordinating the appreciation logic of the previous dimensions. The next session deepens the discussion around the pricing argument by presenting its microfoundations.

3. Derivatives beyond the zero sum game

²² While it is the case that many derivatives require very little money expended upfront, it is also the case that not just anyone can enter these markets without an initial amount of money. Individual investor access to these markets is common in some cases but requires collateral deposits. For example, the foreign exchange derivative market is supplied by on-line trading platforms offered by brokers to individual investors with widespread use in some countries. According to Terada (2008), individual investors accounted for 10% of foreign exchange trading in 2007 in Japan.

²³ Evidently, a bet that becomes erroneous will lead to the need to comply with the commitment made, which may require, for example, liquidation of assets.

The argument that derivatives market is a zero sum game is indubitable, since the sum gained by one agent corresponds precisely to the sum lost by another at the moment of liquidating the derivative contract. However, this truism could lead to the mistaken idea of market neutrality in face of wealth accumulation process. This section intends to deconstruct this idea by showing the importance this market can have in the capital accumulation process.²⁴ First, it intends to deal with the microeconomic aspects (such as the price transmission mechanisms from the derivatives markets to the spot markets) and to show the theoretical possibility of the market's operation in providing gains for all agents involved, while simultaneously conditioning spot market pricing so that, contradictorily, spot prices are derived from futures prices. It most specifically points out the special case when the market is dominated by speculation and arbitrage, which is characteristic of the fourth dimension. Then, it will be discussed the implications of this new logic of asset pricing in capital accumulation, and in the transfer of income to the financial sector that it provides.

Price formation in derivative market is directly related to arbitrage conditions established between this and the spot market. From a theoretical perspective, the price of an asset in the futures market should be equal to its spot price plus the asset carrying cost, and it should respect the following condition:

$$(1) \quad F_t = S_t + I_t - Q_t + C_t$$

Where F_t is the futures price in period t ; S_t is the spot price in period t ; Q_t is the yield of the underlying asset in period t ; I_t is the interest rate in period t and C_t is the carrying cost for the underlying asset in period t .²⁵ Depending on the nature of the asset, some parameters do not apply, such as a currency, the carrying cost equals zero. In this case, the futures price between two currencies will be the price of one currency in relation to another (spot exchange rate) plus the interest rate differential between the two currencies in question ($I_t - Q_t$)²⁶. In the case of a commodity future contract, the Q_t variable is null, since the underlying asset does not have yield as an attribute; however, the variable C_t is significant and it varies in accordance with the nature of the commodity and maturity t of the contract.²⁷ For the future price of a stock, besides the interest rate, which functions as an opportunity cost for carrying the stock, the variable Q_t is relevant and represents the expected dividend.

The basic idea behind the equation (1) is that market participants who want an asset at $t+1$ (or the earnings tied to it) can buy the asset at moment t in the spot market and incur the storage and opportunity costs or, alternatively, buy the asset in the futures market, forming a long position and receiving the asset (or the equivalent earnings) when the contract expires. When these two forms are not equivalent, there is room for agent arbitrage. Thus, the relationship of prices given by *equation 1* between the spot and futures market is a condition that makes agent arbitrage impossible. On the other hand, when there is disequilibrium and the futures price is higher than the spot prices and the other parameters, as in equation (2),

$$(2) \quad F_t > S_t + I_t - Q_t + C_t$$

²⁴ An initial criticism of the argument of neutrality, already well-disseminated, is based on the destabilizing potential of this market by financial fragility. Along this line, the concentration of risks in the derivatives market is said to deteriorate agents' financial balances. In other words, unsuccessful bets can compromise agent payment capacity and thus impact real economy and disseminate crises. This section will show that the impact of the derivatives markets goes far beyond the issue of financial fragility.

²⁵ The formula presented is a simplification of the one used in financial markets. In order to calculate arbitrage, which considers continuous time, the equivalent formula is $F_t = S_t e^{(I-Q+C)T}$, as elaborated in details by Hull (2006). Another implicit simplification in this formula is the absence of a risk element.

²⁶ Keynes (1924) was a pioneer in this type of analysis, describing price formation in London's exchange market. His analysis gave origin to the covered interest rate parity theory.

²⁷ In some markets, the presence of a convenience yield is admitted, which is a premium attributed to ownership of the physical good and varies inversely with the level of existing stocks. This premium would be an additional variable in equation (1). In Unctad (2011) there is an analysis of convenience yield for the commodities market.

the agents can take out loans at interest (I_t), buy the underlying asset in the spot market (storing it if needed) and simultaneously sell future contracts for the asset in the derivatives market with the same maturity as the loan. The final effect of this operation is an increase in spot price resulting from buyer pressure in this market and the reduction in the futures prices resulting from seller pressure in the futures market in the direction of equilibrium represented by equation (1). For the arbitrator, there is no price risk since the asset purchased in the spot market is hedged by the sale of the same asset in the futures market. In other words, the sale of the asset's futures contract compensates the gains or losses resulting from asset price variation in the spot market, gains from asset yields in the spot market (Q_t), interest rate (I_t) and carrying cost (C_t). And a gain from arbitrage results from this operation.²⁸ In the opposite case, with lower futures process, the arbitrators sell the asset in the spot market and buy futures contracts of the same. While disequilibrium remains, there will be the possibility of risk-free gains. Thus, the arbitrators can engage in this type of operation until disequilibrium is corrected and equation (1) is verified.²⁹

Given the conditions that establish the parameters for arbitrage, it is worth analyzing its "direction", that is, the market in which the disequilibrium presented in equation (2) originates and from which the arbitrage operation stems. In the case of asset pricing established in spot market, the pricing of derivative contracts will indeed derive from underlying asset prices. However, there is the possibility of a disequilibrium stemming from the derivatives market and, in this case, the direction of price determination is reversed. The analysis that follows explores an analytical case (stylized fact) where price formation occurs in the derivatives market.

First, the characteristic that makes the derivatives market a "zero sum game" is founded on the fact that derivatives are bilateral contracts where gains or losses must be adjusted between the parties involved in the operation. Considering the three typical motivations for derivatives market (hedging, arbitrage and speculation), these contracts can have a combination of agents with those motivations that share losses and gains. In this context, there are two contract cases where the hedge motivation is not present and that deserve special consideration.

The first analytical case involves contracts between two agents who intend to speculate in the derivatives market. These speculators make opposing bets and the result of this operation is the transfer of wealth between these two financial agents. In the hypothesis of speculation by equal forces, in opposing vectors, in which half of the speculators expect a price increase and the other half a drop in price, the final effect is neutral on prices, but increases liquidity.³⁰ However, the most relevant case for this study is when speculative demand by one of the ends of the contract is more important and the agent who intends to arbitrage occupies the opposing end of the operation. In this case, the effects can be extremely relevant in terms of price distortion and income transfer to the financial sector.

In his analysis of price formation in futures markets, Keynes (1924:129) points out the case where speculation keeps the spaces for arbitrage open in the forward exchange market.

"But there is a further contingency of considerable importance which occurs when speculation is exceptionally active and is all one way. It must be remembered that the floating capital normally available, and ready to move from center to center for the purpose of taking advantage of arbitrage profits between spot and forward exchange, is by no means unlimited in amount, and is not always adequate to the market's requirements."

Furthermore, Keynes (1924: 130) argues that single direction speculative pressure tends to provide gains for speculators:

²⁸ Observe that the arbitrage agent should have access to cheap interest rates in the market and in the case of assets with a carrying cost, as commodities, they should have storage capacity (or outsource this service) and be able to buy and sell the good on the spot market. The parameter for arbitrage shall be defined by the agents with best access to the credit market and, for some derivatives contracts, like commodities, with the capacity to store at lower cost.

²⁹ It should be underscored that there is no automatic tendency toward adjusting the prices in question. Situations of disequilibrium in equation (1) can be recurrent and more or less frequent, depending on the market.

³⁰ Here, speculation assumes its "positive characteristic" of providing liquidity to the market without generating price tendencies.

“It is interesting to notice that when the difference between forward and spot rates has become temporarily abnormal, thus indicating an exceptional pressure of speculative activity, the speculators have often turned out to be right.”

In this context, when speculation dominates the derivatives markets, and especially when most bets are made in the same direction, asset pricing in the spot market become dependent on the formation of trends in futures market. That is, the intensity of speculative demand by one end of the derivative contract moves prices and then causes the disequilibrium necessary for arbitrage, as pointed out in equation (2). For example, excess speculative demand purchasing future oil increases its futures price and creates a gap for arbitrators, who enter at the short end of the future contract and simultaneously buy the product in the spot market, thus transmitting the pressure for increasing prices in the spot market. Therefore, speculators shape the price tendencies in derivatives market and arbitrators are responsible for transmitting them to spot market. The situation described characterizes the emergence of disequilibrium in equation (1), and the transfer of speculative pressure from future market to spot market. In this context, in the logic of the fourth dimension, there may be long periods of a persistent single direction speculation and an uninterrupted arbitrage in time, what would lead to significant future and spot price changes.³¹

By commanding the asset pricing process, the derivative markets also command the fictitious appreciation of stocks of wealth traded in secondary markets. In other words, through buyer and seller pressure exercised in the futures markets and transmitted by arbitrage to the spot markets, the derivatives change prices and thus the expectations of earnings and the appreciation of securities as well, without necessarily corresponding to changes in the real conditions of capital production. These processes broaden the autonomy of finance in relation to the sphere of production described by financialization literature.

Besides the fictitious appreciation of wealth, the derivatives market also transfers income to the financial sector. Observe that throughout the asset appreciation process caused by the derivatives market, the result of derivatives contracts, when considered in isolation, provides systemic gains for the speculator who stays long while the assets appreciate and causes losses to the arbitrator who assumes a short position in the contract. However, it is worth remembering that arbitrator agents are those who conduct two simultaneous operations, one in the derivatives market and the other in the spot market. The gain or loss resulting from the derivatives market compensates the price variation of the asset bought in the spot market and provides a risk-free gain derived from the price distortion between the two markets.

In this sense, despite the zero sum game argument, when considering the derivative operation not as an isolated contract, but rather as a link within a bigger chain of operations that interconnect futures markets to spot markets, the price cycles resulting from speculation in the derivatives markets can provide gains to all financial agents involved.

If the speculator and the arbitrator appear as “winners” the same cannot be said of the agent who operated in the spot market as the arbitrator’s counterparty. By positioning himself in the opposite direction of the arbitrator, this agent incurs a loss resulting from an opportunity cost.³² This opportunity cost is equal to the arbitrator’s gain.³³

³¹ Different from the maxim that establishes that “good speculation is the kind that annuls itself, and arbitrage is the kind that ends in time”.

³² If the spot market’s “loser” agent is a direct producer of merchandise, it can be said that the arbitrator’s gain is the appropriation of added value produced by this agent. In Marxist terms, it could be said there is a sharing of added value produced in the productive sphere with the financial agents, which does not result purely from the productive capital vs. financial capital relation, but rather from a “mercantile gain” obtained by the financial sector to the detriment of the productive sector. When securities become commercial merchandise in different markets, the capital set aside for arbitrage acts in a manner analogous to mercantile capital in the production of real merchandise. Therefore, its profit comes from the commercial operation of buying and selling securities, exploring the price differential that momentarily occurs between two markets with diverse maturities.

³³ By “closing” the gaps for arbitrage, the arbitrator terminates the moment from which it stemmed, that is, the moment the law of equivalent exchange is momentarily invalid. However, this moment may remain open for a long period, even with action by the arbitrators, given the action by other agents who operate in the financial market.

4. The fourth dimension and contemporary capitalism

While in the previous section our main objective was to analytically deal with the price transmission mechanisms from derivative markets to spot markets and their consequences, this section aims at providing examples of the growing importance of derivative markets in contemporary capitalism and, in particular, in price determination for some of the international financial system's main markets. Among those markets dominated by the "logic of derivatives", some of the most important that stand out are analyzed separately in this section: foreign exchange market, commodity market, stock market, interest rate market and credit market.

A specific branch of financial literature called "price discovery" is concerned about unveiling the price formation process for assets in the different markets. This literature studies two or more markets for the same asset and it seeks to find out which is the primary *locus* of asset pricing.³⁴ For such, the authors mainly use causality tests on asset trading intra-day data. This method is used to study a broad range of markets: commodities, equities, bonds, exchange, interest or credit.³⁵ According to this literature, a fundamental aspect of the market in which price discovery occurs is its capacity to disseminate information. Several factors can influence the capacity of a market to generate and disseminate information, such as financial volume, liquidity, depth, volatility, trading frequency, among others.³⁶

Liquidity is one of the aspects that stand out in the price discovery process. It is not an intrinsic characteristic to derivatives markets, but rather an expression of trust by the financial community. It depends on trade volume and on participant diversity: the more diverse the motivations for operating in the market, the greater the possibilities will be of finding counterparts for purchase and sale orders.³⁷ Considering these aspects, the derivatives market is the most liquid market in the world. According to BIS, the notional value of derivatives in the over-the-counter market in December 2008 was around US\$ 600 trillion. This sum easily exceeds the economy's real needs: for comparison purposes, it corresponds to more or less 10 times global GDP and 35 times the stock of global shares.³⁸ This is a market that besides meeting the hedge demands of commerce and service flows, it negotiates the variation in the stock of global wealth, exchanging different forms of capital earnings and constantly changing its monetary denomination.

Accordingly, the centrality of derivative markets grows as its liquidity grows, in many cases exceeding the liquidity found in spot markets. Likewise, the advances in information technologies and telecommunications are also fundamental factors for understanding the growing importance of these markets, given that the online transaction platforms have greater capacity for processing, transmitting and disseminating new information for agents participating in the market. The analysis that follows panoramically deals with the importance of some derivative markets with the intent of illustrating the logic of the fourth dimension.

One of the most relevant aspects of the recent modifications in **commodities markets** has to do with the financialization of prices resulting from the importance of derivative markets. As discussed in

³⁴ It is worth noting that the price discovery problem would not be relevant in Walrasian models where perfect competition and perfect information are assumed.

³⁵ In accordance with this literature, price discovery is a relative concept once it is very rare for a price to be completely determined in one market and only absorbed by the other, without reverse influence. Therefore, To say that a market provides more price discovery (or more of an information share) does not necessarily mean that this market is the initial or the ultimate source of information." (TSE, FUNG, XIANG, 2006, pg. 13)

³⁶ Here there is a qualitative difference between formal exchanges and over-the-counter markets. The first, being more transparent and trading homogenous contracts, has a naturally developed information dimension, whereas over-the-counter markets are by definition more opaque. Nevertheless, many over-the-counter markets increasingly acquire exchange market features due to electronic trading platforms that promote the dissemination of information and a growing virtual centralization of the market by computer networks (SARNO and TAYLOR, 2001).

³⁷ It is worth noting there is a "carnal relation" between liquidity and speculation. For Aglietta (2001), financial market liquidity is the fruit of speculation, and more, the evaluation that there only is speculation in markets with some liquidity is a truism.

³⁸ The IMF's estimate, released in the World Economic Outlook of April 2010, for global GDP in 2010 is US\$ 61.7 trillion. For the stock market, the value of global stock was US\$ 17.1 trillion in 2007, falling to US\$ 9 trillion in 2008 with the financial crisis (data from CPIS, August 2010).

section 1, derivatives contracts permit access to the commodities markets of agents to production or processing of commodities and do not even have the capacity to transport or store products. The crucial aspect to underscore in this new form of market organization is its impact on the exacerbation of tendencies in commodity prices, their volatility and the increase in the positive correlation between prices of different types of commodities and those with other financial assets. Historically, this change supposedly consolidated in mid-2000 (CARNEIRO, 2011).³⁹

Commodities markets have the biggest number of studies in price discovery literature. In these studies are highlighted the role of future markets in the price formation process and in their capacity to disseminate important market information. Hernandez and Torero (2010) point to the predominance of futures markets in price discovery for agriculture commodities such as corn, wheat and soybean.⁴⁰ A similar conclusion is reached by Yang and Leatham (1999) for the wheat market and Zapata et al (2005) for sugar.⁴¹

For energy commodities, the analysis by Sander *et al.* (2004) shows there is a positive correlation between the increase in oil prices and the return of non-commercial agents in futures markets. In other words, agents not connected to the energy commodities market obtain systematic gains in these markets when prices rise. There is also ample literature that discusses the formation of a price bubble resulting from speculation in the oil derivatives market.⁴² For authors like Kahn (2009), “speculation on the future price of oil led to both overshooting of spot prices in the first half of 2008 and undershooting in the second half of the year”. This form of fictitious appreciation of wealth can also be accompanied by episodes of price manipulation such as that reported by the CFTC (Commodity Futures Trading Commission) in which the company Vitol held 11% of all oil contracts on the New York Mercantile Exchange (CHOO, 2008).

The **foreign exchange market** is one of the biggest in the world, mobilizing around US\$ 4.7 trillion per day in 2010, with 64% of all transactions conducted in derivatives markets, according to BIS data. This market is predominantly over-the-counter, but it is internationally connected by electronic platforms that permit futures operations between dozens of currencies.⁴³ These platforms are operated by large banks that work as brokers by meeting retail demands, form speculative positions and arbitrate between markets. For some currencies, the exchange derivative market is much more liquid and deeper than the spot market. Among the reasons for this asymmetry of liquidity is easy access, the lack of regulations and usually smaller operations costs (such as taxes, capital controls and operational costs).

The study by Rosenberg and Traub (2009) points to great influence in the Chicago futures market in exchange rate pricing for dollars, German Marks, Yens, Pounds and Swiss Francs for 1996. According to the author, this occurs despite greater spot market liquidity measured by the trade volume in currencies like the Mark. Price formation for the Brazilian Real exchange rate with the US Dollar is attributed to the futures market. Ventura and Garcia (2009) conclude that the exchange rate is first formed in the futures market, and it is then transmitted by arbitrage to the spot market, with 10 minute gaps. Rossi (2011) analyzes the relation between positions of different agents in the futures market and the exchange variation and it attributes the formation of tendencies in the futures exchange market to foreigners and

³⁹ Thus, there have recently been important modifications in these markets, as warned by UNCTAD (2011). In one hand, an important modification comes from the change in speculator profile and their normal form of investment. On the other hand, the market developed new instruments, significantly replacing futures and options of prices for specific products for those linked to aggregate indexes.

⁴⁰ “Provided that futures markets are generally considered to perform two major roles in commodity markets—a risk-transfer role and, in particular, an informative or price discovery role—we might be tempted to assume that futures markets dominate spot markets. (...) It can also be argued that physical traders use futures prices as a reference to price their commodities due to the greater transparency and (often) greater liquidity of commodity futures over physical commodities.” (HERNANDEZ AND TORERO, 2010: 2)

⁴¹ “It was found that the futures market for sugar leads the cash market in price discovery. However, we fail to find evidence that changes in the cash price cause changes in futures price, that is, causality is unidirectional from futures to cash.” (ZAPATA et al., 2005: 2)

⁴² For some examples of this discussion, see Wray (2008) and Khan (2009) .

⁴³ There are two main electronic trading and exchange brokerage platforms: Reuters 2002-2 Dealing System (Reuters) and Electronic Broking System Spot Dealing System (EBS).

institutional investors with the objective of obtaining speculative gains, and the realization of arbitrage gains to commercial banks, transmitting speculative pressure stemming from the futures market to the spot market. For the case of Brazilian currency, other authors sustain the position that the exchange rate is formed in the future, like Franco (2000) and Dodd and Griffith-Jones (2007), with the latter arguing based on financial agent interviews.

Besides the leading role in price formation in foreign exchange markets, derivatives are pointed out in literature as facilitators for speculator action in this market:

“Foreign exchange derivatives can also be used to improve the ability of speculators to mount an attack on a developing country’s exchange rate system. In 1997, speculators employed both foreign exchange derivatives and equity-linked derivatives on Hong Kong’s stock market in order to launch their attack on Hong Kong’s fixed exchange rate regime.” (DODD, 2001: 60)

Additionally, several studies point to speculation with exchange derivatives – called carry trade strategies – as being responsible for exchange rate misalignments in core and peripheral currencies, including UNCTAD (2007), Galati et al. (2007) and Flassbeck and La Marca (2007). These studies show the role of carry trade in exchange rate distortion due to interest rate differentials among currencies. Along this same line, Kregel (2010:1) argues that “derivatives contracts have been crucial in subverting the impact of exchange rates on the adjustment process and thus on the profitability of export firms in surplus countries.”

Recent studies show that index future markets have led pricing in **stock markets**. The index markets were created to guide the pricing of exchange-traded funds (ETF), which consist of investment funds in stocks. In many cases, the demand and supply for these funds became the leading factor for the price of stocks. The additional step, provided by index futures market, is the trading not only of stock funds, but also of the variations in those indexes used for pricing. Schlusche (2009) performs an ample literature review on price discovery in index markets and refers to several authors who, like him, point out the prevalence of futures markets in the price discovery function. Despite all methodological differences, the majority of studies have shown that the futures market leads the index market in price discovery.⁴⁴

Derivatives also play an important role on **interest rates market**. The yield curve – since it is the term structure of interest rates - is formed in the interest rate futures market, revealing the expectations of market agents for the evolution of various fundamental prices in the economy. Based on these expectations, some central banks make decisions on setting short term interest rates in a constant game of power and expectations with financial markets. Dodd and Griffith-Jones (2001: 2) underscore the importance of interest rate futures markets stating that “[interest rate futures markets] (...) play a leading role in the fixed income market by preceding the government bank market in lengthening of maturities of fixed interest rate contracts.” Based on reports by the Bank of England, Moessner (2001) attests this influence in future markets, affirming:

The Bank of England uses options to derive indicators of uncertainty about future interest rates, exchange rates and equity markets, in order to inform monetary policy and to identify potential financial stability risks. For example, the Inflation Report uses exchange-traded option prices to derive the probability distribution of market expectations of UK short-term interest rates. (MOESSNER, 2001: 52)

Therefore, derivatives become a pressure instrument before monetary authorities and thus have a political influence in determining interest rates, which is a key macroeconomic price that remunerates stocks of wealth and burdens the generation of income by the productive sector.

⁴⁴ “Stoll and Whaley (1990) and Chan (1992) for the S&P 500 index, and Tse (1999), Tse (2001), and Tse, Bandyopadhyay, and Shen (2006) for the DJIA index report the dominance of the futures market in price discovery. For the German market, Booth, So, and Tse (1999), who consider the DAX index, index futures and index options in their investigation on price leadership in the German market, show that index futures dominate in the process of price formation. Similarly, Theissen (2005) finds that the futures market leads the spot market in terms of relative contribution to price discovery.” (SCHLUSCHE, 2009: 2)

Additionally, the dynamic of the **credit market** is also affected by the logic of derivatives. The most notable example also stems from the conditions that pushed the American economy into the recent financial crisis. Although the role of derivatives have been widely discussed (its role on the credit bubble formation, increasing systemic risk, etc.⁴⁵), it is worth pointing out that the derivative credit markets also had a role on pricing securitized mortgages as shown by Levetin and Watcher (2012):

“CDS [credit default swap] spreads (the price of CDS protection) are linked to PLS [private-label mortgage-backed securities] spreads (the yield on PLS) via arbitrage. When CDS spreads tighten, it is cheaper to insure against PLS, which increases demand for PLS, thereby pushing down the yield on the PLS, which lowers the cost of borrowing.” (LEVETIN AND WATCHER, 2012: 1246).

The crisis is also illustrative of a more general process valid for all markets in which the derivatives do not provide absolute autonomy to finance. In other words, there is no self-referenced appreciation process where finances arbitrarily and unlimitedly determine their own value. Quite the contrary, the subordination suggested does not exempt the financial sphere’s dependence in relation to the production sphere; they are interdependent spheres. In this sense, the detachments driven by the derivatives market are limited and will be continuously adjusted through crises.

Concluding remarks

This paper sought to address the central role played by derivatives markets in contemporary capitalism. It argues that these financial instruments have added several implications to the dynamics of capitalist economies, so that it forms a new sphere of accumulation, here called the fourth dimension. In this new dimension, it is possible to observe three major changes compared to the previous dimensions. The first concerns the emergence of new property relations, marked by the separation between the ownership of assets and ownership of the rights on the performance of these assets, leading the abstraction of the appreciation of wealth to its maximum. The second change relates to the new nature of the gain obtained in derivative transactions, here termed as casino gain. Finally, these changes create the conditions to consider a relationship of subordination of prior dimensions to the fourth dimension, which is consolidated when derivatives markets become the central *locus* for determining spot prices in key markets. The table below seeks to synthesize the analytical reasoning developed throughout the text.

Table 1: The four dimensions of capitalism

	Circulation of money	Property relations	Subordination relations	Logic of the system
1 st DIMENSION Sphere of commodities	C-M-C	Producer owns the means of production	-	Subsistence
2 nd DIMENSION Sphere of production	M-C-M'	Separation between work and ownership of the means of production.	Subordination of labor to capital	Profit by the extraction of surplus value
3 rd DIMENSION Sphere of ownership	M-M'	Separation between company's ownership and management of the production	Subordination of the productive capital to the financial capital	asset appreciation
4 th DIMENSION Sphere of derivatives	ΔM^*	Separation between ownership of assets and the property of the performance of assets	Subordination of the sphere of ownership to the sphere of derivatives	Casino gains

⁴⁵ The process that caused the American crisis demonstrates the acute form of competition in the derivatives markets. Institutions that sold CDOs bought CDS at the same time to speculate against the instruments they recommended to their clients. In other words, they knew of the high probability of default and used that information to obtain gains to the detriment of others' losses. Furthermore, this process also included episodes of fraud, manipulation of information and the corruption of the regulatory agencies.

Understanding the importance of these financial instruments in contemporary capitalism allows the development of research in various fields of political economy, macroeconomics and development economics. The ideas mentioned here, far from being definitive, point to the need for further studies on the subject. The issue deserves deeper theoretical treatment, either inside the Marxist construction, to evaluate these financial instruments as a deployment of fictitious capital and a particular sphere of capital accumulation; or in the Keynesian/Minskyan framework, seeking to evaluate the impact of such instruments on volatility and instability of economic systems.

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