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COMPLEXITY, CONVENTIONS AND INSTABILITY: THE ROLE OF MONETARY POLICY

EMANUELE CITERA and LINO SAU

*Complexity, Conventions and Instability:
the role of monetary policy*

Emanuele Citera¹ and Lino Sau²

Abstract. Ever since the 2008 financial crisis, there has been both a widespread recognition that the mainstream approach on financial markets has failed to anticipate and to justify the crisis and on the need of *ex ante* and *ex post* adequate economic policies to cope with such phenomena. The aim of our paper is to provide a theoretical and methodological analysis of the role of conventions as emergent *phenomena* in financial markets, the latter being thought of as dynamically complex systems. Drawing upon the notion of ‘dynamic complexity’ and Keynes’ view of financial markets, we claim that social conventions can only provisionally stabilize the system, but they will eventually lead to financial instability and crisis. Then, we adopt this framework to investigate the implications for monetary policy to stabilize the system by virtue of the role of central bank to intervene, and thus shape, a convention. In this respect, we consider the credibility of the monetary authority and how it can be exerted through ‘moral suasion’ to control the financial fragility of investors’ balance-sheet positions as well as to affect the convention around the long-term interest rate.

Key words: Conventions; Complexity; Financial Markets; Financial Instability; Central Bank

JEL Codes: E12; E44; E58

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¹ Address for correspondence: Department of Economics, 6 East 16th Street, New York, The New School for Social Research, 10003, USA. Email: emanuelecitera@newschool.edu

² Address for correspondence: Department of Economics and Statistics, Lungo Dora Siena, 100, University of Torino, 10153, Italy. Email: lino.sau@unito.it

Complexity, Instability and Central Bank intervention:

a 'convention-based' approach to financial markets

Introduction

The role of social conventions represents a leading theme in the works of Keynes (1936, Chapter 12; 1937), who provides an analysis which properly suits the realm of financial markets as well as extends beyond it (e.g., the good market). Their centrality is also acknowledged in the pioneering contributions by Minsky (1977), Kindleberger (1978) and Galbraith (1988), where psychological tendencies and institutional factors are crucial to explain speculative bubbles and financial crisis. Indeed, in a context of fundamental uncertainty, to the extent that the basis upon which expectations are formed becomes ill-defined so that rational deduction finds itself without any solid ground upon which to stand, human behavior falls back on conventions which results from interactive processes that are anchored by shared beliefs but also exhibit an inherent tendency to drift. This is especially the case of financial markets, where agents, in order to enter into arrangements with terminal dates in the future, form expectations not simply acting in isolation but by looking at what the others are doing.

The complex, ever-changing patterns which emerge from these interactive processes, being the result of endogenous dynamics which unfold over time in an unpredictable manner, cannot be captured by the standard theoretical tools provided by the Efficient Market Hypothesis (Fama, 1970, hereafter, EMH). The latter, founded on an Arrow-Debreu type analytical context made of complete markets, perfect information and complete risk diversification, fails to explain the reasons why security markets do not allocate capital according to their returns as well as do not efficiently perform the ideal role of intermediaries between borrowers and lenders, as recurrent episodes of financial crises clearly revealed. For this reason, in order to explain and account for financial crises, a different theoretical approach has to be adopted. In our view, the insights provided by complexity economics paradigm can be usefully employed to achieve this goal.

According to Arthur (2014, p. 187), complexity economics portray the economy ‘not as deterministic, predictable, and mechanistic but as process dependent, organic, and always evolving’, wherein time becomes important and structures constantly form and re-form giving rise to a meso-layer between the micro- and the macro-structure, in which the emergence of unpredictable phenomena is considerably relevant due to network structures, feedback mechanisms and the heterogeneity of agents. As argued by Bookstaber (2017), given its ability to deal with four peculiar features that are endemic to financial crises, namely ‘emergent phenomena’, ‘non-ergodicity’, ‘radical uncertainty’ and ‘computational irreducibility’; the theory of complexity economics has made considerable progress in accounting for endogenous changes in agents’ expectational patterns within the realm of financial markets (Arthur, 2014, Chapter 3; Hommes, 2015; Hommes and in’t Veld, 2017; Hommes and Vroegop, 2019).

With this in mind, the aim of this paper is to provide a theoretical discussion which combines the theory of complexity economics with the insights provided by Keynes and Post-Keynesian scholars (see Rosser, 2001; Leijonhufvud, 2009; Rosser, Rosser, & Gallegati, 2012; Sau, 2013; Citera 2017; Davis, 2017) in a ‘convention-based’ framework which, by studying the generation and the evolution of conventions in financial markets, attempts to explain how they lead to financial instability and what the central monetary authority could do to prevent a crisis to occur. Among the three relevant approaches to complexity that are in contention in economics, namely the ‘general view’, the ‘dynamic view’ and the ‘computational view’ (Holt, Rosser, & Colander, 2011); in our analysis we stick to the dynamic definition (Day, 1994; Rosser 2004) which emphasizes the nonlinearity in feedbacks in the system generated by dispersed and interacting heterogenous agents.

The structure of the paper is the following. Section 2, relying upon Keynes’ (1936, 1937) treatment of conventions and the theory of reflexivity (Soros, 2013), provides an analysis Keynes’ ‘beauty contest’ through a complex-reflexive system perspective (Beinhocker, 2013) and show how this could lay alternative foundations for studying financial markets’ behavior. Section 3, drawing upon the idea of ‘conditional stability’ (Crotty, 1994), focuses on the destabilizing nature of conventions to show

how they can only temporarily stabilize the system but, through their evolution, they will eventually lead it to a state of crisis in financial market. In Section 4 we analyze which instruments allows the central bank to cope with financial instability by acting on the prevailing convention and discusses the extent to which monetary policy can effectively fulfill this role. Finally, concluding remarks are drawn in Section 5.

Complexity and Conventions in Financial Markets

Keynes's groundbreaking contribution to the analysis of financial markets lies in the understanding that the formation of individual expectations in making investment decision is inherently an interdependent and social process, which can only be understood by adopting an organic approach to the economy and the theory of it. In the notorious passage of Chapter 12 of *The General Theory*, Keynes (1936, p. 156) compares investors' behavior to a 'beauty contest' as follows:

[...] It is not a case of choosing those which, to the best of one's judgment, are really the prettiest [six faces from a hundred photographs], nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be.

It is particularly striking the way Keynes describes investors' behavior, by focusing on the subjective expectations of individuals who do not act independently but in relation to each other. This generates crucial issues with respect to the EMH as well as the Rational Expectation Hypothesis (Muth, 1961; Lucas, 1976; hereafter, REH). It suffices to stress, for the purpose of our analysis, two concepts.

Firstly, when agents need to form expectations of an outcome that is a function of these expectations, the formation of expectations is indeterminate¹ as it generates an infinite regress problem in decision-making which renders the law of iterated expectations inoperative with respect to stock

¹ As we will see later, the final outcome of this process can give rise to complex dynamics.

market returns (Allen, Morris, & Shin, 2006; Arthur, 2014, Chapters 3, 11). Secondly, according to the EMH and the REH, the actions undertaken by agents do not change the overall pattern of future forecasts. Accordingly, the path of the economy is entirely independent of the expectation formation process: the system inevitably moves towards an equilibrium position regardless of agents' subjective beliefs. Any potential endogenous pattern of instability is foreclosed by a predetermined, path-independent equilibrium.

Historically, the behavior of financial markets did not obey the theoretical precepts prescribed by the EMH. As an active participant of financial markets, Keynes (1936, p. 152, original emphasis) was perfectly aware of this and understood that agents, by virtue of the inextricable uncertainty surrounding the decision-making process, have 'to fall back on what is, in truth, a *convention*.' Later, Keynes (1937, p. 214, original emphasis) elaborates:

1. We assume that the present is a much more serviceable guide to the future than a candid examination of past experience would show it to have been hitherto. In other words, we largely ignore the prospect of future changes about the actual character of which we know nothing.
2. We assume that the *existing* state of opinion as expressed in prices and the character of existing output is based on a *correct* summing up of future prospects, so that we can accept it as such unless and until something new and relevant comes into the picture.
3. Knowing that our own individual judgement is worthless, we endeavour to fall back on the judgement of the rest of the world which is perhaps better informed. The psychology of a society of individuals each of whom is endeavouring to copy the others leads to what we may strictly term a *conventional* judgement.

In this respect, Keynes' analysis offers alternative theoretical foundations that, if combined with appropriate methodological tools, can provide a more realistic description of boom-bust cycles

experienced by modern economies. To clarify our position, let us go back to the passage of the ‘beauty contest’ and relates it to the third definition of convention above. However, before moving forward with our analysis, an important qualification is necessary.

The idea of convention that we have in mind is not exactly that of projecting the existing situation into the future, which corresponds to the first definition of convention provided above as well as to that one Keynes postulated in *The General Theory* (1936, p. 152), which consists of ‘assuming that the existing state of affairs will continue indefinitely, except in so far as we have specific reasons to expect a change.’ For this type of convention, as long as there is no ground to support an alteration of subjective beliefs, an adaptive/extrapolative expectation pattern would suffice to capture its essence (Dequech, 2011, p. 473; Lavoie, 2014, p. 91). But, if we think of conventions as ‘socially shared patterns of thought’² (Dequech, 2011, p. 481), then it requires to adopting a different theoretical approach to deal with. Nonetheless, to the extent that ‘[i]t is not obvious or inevitable that agents project the current situation and at the same time follow the average opinion’ (Dequech, 2011, p. 483), as long as the average opinion is reflected in the existing situation, we can treat the projection of the existing situation and the conformity with the average opinion as the same thing. This is exactly what Keynes (1936, p. 151, 152, original emphasis) argues when refers to ‘the average expectation of those who deal on the Stock Exchange as revealed in the price of shares’ as well as to the assumption ‘that the existing market valuation, however arrived at, is *uniquely* correct’.

In our opinion, a ‘complex reflexive system’ (Beinhocker, 2013, p. 334), which consists of a single-/multi-agent system that not only involves ‘changes in model parameters or weights in response to environmental feedbacks’—as in a ‘complex adaptive system’ (Arthur, Durlauf, & Lane, 1997; Farmer, 2002; Beinhocker, 2006; Miller & Page, 2007)—but also in the ‘rules and model structure’; seems to be a good candidate for this analysis. Indeed, according to Soros’ theory of reflexivity (2013), agents’ subjective beliefs influence the objective, directly observable, reality which, in turn, feeds back on the

² The Post-Keynesian literature has witnessed a heated debate around Keynes’ treatment of conventions—briefly summarized in Dequech (2011, pp. 478-481). Nonetheless, there is quite general agreement around the interpretation of conventions as interdependent structures of expectations emerging out of social interactions.

agents' mind³. Reflexivity, however, not only connects objective with subjective aspects of reality, by means of 'reflexive events', but also a multiplicity of subjective view, through 'reflexive relations' (Soros, 2013, p. 313)⁴. A complex-reflexive system allows us to account for both the expectation adjustment formulated 'at the *process* level' and the '*system* level source of complexity', which instead takes place in the aggregate (Davis, 2017, p. 61-62, emphasis added). With this in mind, how can we reconcile the complex-reflexive system perspective with Keynes' 'beauty contest' analysis and the role of conventions in financial markets? To address this question, let us consider what follows, which is represented in a stylized form in Figure 1.

Suppose the inherent beauty of a woman in the newspaper constitutes the 'fundamental' value of an asset, which originally informs agents' expectations. Initially, a 'reflexive event' ('RE1' in Figure 1) runs from the newspaper picture back to the individual level. Then a 'reflexive relation' ('RR1'), operating at the process level (in terms of the parts of the system), occurs between all competitors' beliefs. This generates a structure of interdependent beliefs which arises at the system level and can be associated to an emergent *phenomenon*, defined by Epstein and Axtell (1996, p. 35) as 'stable macroscopic patterns arising from local interaction of agents'⁵. This aggregate outcome is what we think of as a convention ('C')—a 'socially shared pattern of thought' or an 'ecology of expectations' (Arthur, 2014, Chapters 1-3, 10)—which provides the agents with a reference point (an 'anchor' à la Tversky and Kahneman (1974)) they can interface with to form expectations. By means of a new 'reflexive relation' ('RR2'), the emerging convention finally feeds back on the individual level giving rise to complex dynamics. Indeed, this recursive mechanism evolves through self-reinforcing patterns (positive feedbacks) that dominates self-defeating ones (negative feedbacks) until one of the competitors in the 'beauty contest' succeeds over the other and the process is consequently shut down.

[Figure 1 HERE]

³ Soros defines the causal relation going from the real world to the mind of the agents as 'cognitive function', whereas the inverse relation, which reflects the agents' thinking on the external environment, is called 'manipulative function'.

⁴ If only a single subjective aspect of reality feeds upon himself, we have 'self-reflexivity'.

⁵ The issue of the stability of the emerging convention is addressed in the next section.

In terms of economic theory this implies that, only under the fortuitous circumstances in which individual expectations are aligned with the objective reality, the system moves toward a stable equilibrium position. In all the other circumstances, the system is exposed to endogenous sources of structural instability which result from the continuous interactions between the micro- and the macro-structure and lead the system to out-of-equilibrium positions⁶.

If we shift our framework to the realm of financial markets, we can see that once a convention emerges it becomes self-referential (Orléan, 2005), in that it generates an imaginary scenario which becomes both the cause and the consequence of investors' decision. With reflexivity at work, for unreal or apparently real objects, when believed by the majority of the market, become real, a convention becomes self-fulfilling. Finally, it feeds back on the market valuation of the stock in a way that the latter does no longer accurately reflect its underlying fundamental. These two features of financial conventions suggest that, when group dynamics are at play, agents are more interested in the average level of 'sentiment' of the market than in the relation between the market price and the fundamental value of a stock. Accordingly, we can think of a convention as an alternative fundamental analysis that, by providing a vision of the future which does not merely reflect a specific economic trend but an imaginary, socially constructed reality, reassure investors' decisions.

Having clarified how conventions emerge in financial markets from a complex-reflexive system perspective, we now turn to analyze how they temporarily stabilize the system and how their continuous disruption creates periods of instability and financial crises.

From “Conditional Stability” to Financial Instability

According to Keynes (1936, p. 152, original emphasis), '*so long as we can rely on the maintenance of the convention*' the system finds itself in a stable position. Indeed, by acting as a gravitational center for the formation of individual expectations, conventions generate 'an illusion of continuity that can

⁶ As the formalization of the theory of reflexivity provided by Shaikh (2010) clearly reveals, the path-dependent nature of these dynamics is crucially determined by the overall expectation formation process.

contribute to the creation of stability when conditions are right' (Crotty, 1994, p. 124). This provisional state of rest, that Crotty (1994) terms 'conditional stability', is contingent upon 'a stable set of conventions' and 'a stable set of institutions'—the latter being created with the purpose of reducing uncertainty by constraining individual choices within a specific legal settings⁷. However, as Keynes (1937, pp. 214-215) acknowledges, a convention:

[B]eing based on so flimsy a foundation, it is subject to sudden and violent changes.

The practice of calmness and immobility, of certainty and security, suddenly breaks down. New fears and hopes will, without warning, take charge of human conduct.

The forces of disillusion may suddenly impose a new conventional basis of valuation.

To the extent that a convention stabilizes the system for a time span which does not extend beyond the duration of the convention itself, it can suddenly overturn the economy into a 'deviation amplifying system'—to borrow an expression from Minsky (1992). Whereas during periods of tranquility the process of expectations formation centered around the prevailing convention is stable—by virtue of the confidence that the future will resemble the past—as soon as the underlying structure of the economy changes, the confidence held by the majority of agents in the prevailing convention increasingly vanishes because fundamental uncertainty predominates. What makes a convention so precarious is in fact knowledge (Carabelli, 2002). As Keynes (1936, p. 152) explicitly writes, no one 'really believe that the existing state of affairs will continue indefinitely. We know from extensive experience that this is most unlikely.' Let us analyze this passage in more detail.

Financial markets are characterized by a multiplicity of participants with different degrees of knowledge. The belief that the others are better informed generates herd behavior, which allows individuals to conform with the prevailing convention. However, in order for transactions to take place, diversity of opinions around the prevailing convention is necessary. This does not seem to be a

⁷ In our analysis we mainly focusing on what Dequech (2011, p. 485) defines as 'informal' conventions, 'in the sense of not being ultimately enforced by the organizations of the legal system'. It is for this reason that they change more rapidly as compared to socially embedded institutions, that on the contrary change at a slower pace (Williamson, 2000, p. 596). However, we do not by any means contend that 'conditional stability' can be achieved without taking into account the function played by social institutions in the economic system (see Crotty (1994, pp. 132-136)).

particular issue if we consider that, according to Keynes (1936, p. 153) conventions are ‘in an absolute view of things so arbitrary’ that they are not unanimously adopted. In fact, to make money, the speculator has to foresee ‘changes in the conventional basis of valuation a short time ahead of the general public’ (Keynes, 1936, p. 154). To put it differently, the role of the speculator is to anticipate the convention that is expected to prevail in the near future by not conforming to it at time t but with the intention to agree at time $t+1$. This means that, what crucially distinguishes the speculator from the general public is the superior knowledge he disposes of with respect to that available in the market and the superior skills in forecasting changes in asset values.

To the extent that the knowledge of investors ‘correct the vagaries of the ignorant individual left to himself’ (Keynes, 1936, p. 154), the presence of divergent opinions plays a positive role and stabilizes the market. However, in highly liquid contexts as financial markets, whereby ‘enterprise becomes the bubble of a whirlpool of speculation’ (Keynes, 1936, p. 159), whoever attempts to undertake an investment activity based on long-term expectations is exposed to greater risks than the player who attempts to guess the average opinion. This means that there are positive information spillovers, and thus increasing monetary payoffs, associated to follow what the majority is doing (Sau, 2013, p. 510). It also shows that the interplay of herd behavior and the over-weight of public information as compared to private information in forming expectations on asset returns, a process which evolves by means of complex-reflexive dynamics, generates periods of crisis and instability⁹. The limited expertise of the general public in determining the relevance of specific pieces of public information further amplifies the self-reinforcing mechanisms of conforming to the prevailing convention, thereby increasing volatility of the market. To see how the system transitions from a state of ‘conditional stability’ to that of

⁸ Keynes (1936, p. 158) opposes speculation to ‘enterprise’, the latter defined as ‘the activity of forecasting the prospective yield of assets over their whole life’. However, both the short-term speculator and the long-term investor are characterized by the ability of forming expectations differently from the market (Keynes, 1910, p. 100).

⁹ Note that the destabilizing effect generated by the positive feedback mechanism is in sharp contrast with most information-based asset pricing models, in which the stability of the equilibrium imposes negative information spillovers.

instability, let us consider the evolution of the convention from the pre-crisis period (2000-2007) to the Lehman Brothers collapse, which paved the way to the Great Financial Crisis.

Let us start with the first ‘reflexive event’. Recent studies in behavioral finance and experimental economics reveal that the expectation formation process is ‘extrapolative’, in the sense that it extracts past information and projects them into the future (see Gennaioli and Shleifer, 2018). After several years of rapid price growth, the process becomes highly inflated in that agents overreact to future outcome that tends to be more likely in the light of incoming information¹⁰. From the early 2000s to the summer of 2007, the real estate market witnessed a rapid growth in house prices. As reported by the Case, Shiller, and Thompson (2012) survey on expectations on long-term price growth in four U.S. counties, despite them being in line with the preceding increasing trend of the housing market prior to the survey, they were unrealistic, given that historically house price growth has been strongly mean reverting (Gennaioli and Shleifer, 2018, p. 51). A savvy investor, we might think, would not have expected this bullish trend to go on forever. However, the opposite did happen¹¹. How can we explain this with our framework?

A combination of factors gave rise to an exaggerated perception of safety of the financial system. On the one hand, the creation of innovative financial instruments allowed investors, through securitization, to protect themselves from negative shocks by diversification and hedging. On the other hand, the significant availability of short-term borrowing which financed the majority of mortgages that were highly rated, further increased the confidence in the robustness of the system. It is within this framework that the convention according to which housing values would continue to increase, which

¹⁰ We cannot restrain ourselves from quoting at length Keynes (1936, p. 148), which reached the same conclusion ahead of time without conducting any direct experiment on investors’ behavior:

It would be foolish, in forming our expectations, to attach great weight to matters which are very uncertain. It is reasonable, therefore, to be guided to a considerable degree by the facts about which we feel somewhat confident, even though they may be less decisively relevant to the issue than other facts about which our knowledge is vague and scanty. For this reason the facts of the existing situation enter, in a sense disproportionately, into the formation of our long-term expectations [...]

¹¹ Evidence from Foote, Gerardi, & Willen (2012) concerning five scenarios for home price appreciation for a pool of subprime mortgages shows that by August 15, 2005 analysts at Lehman Brothers attached 95% probability to all scenario but the meltdown. Additional evidence from Cheng, Raina, & Xiong (2014) reveals that, with respect to home price expectations, securitization specialists, equity analysts and lawyers working at investment banks had no superior understanding of the risk involved with a decline in home prices than everybody else did.

generates waves of over-lending and over-borrowing, emerged from the first “reflexive relation” described in our analysis, in a context of group dynamics.

As Sau (2013, p. 506) argues, over-lending is the ‘consequence of the actions of lenders who, in a context of complex dynamics “hunt in herds”’ by conforming to the behavior of the majority. ‘[T]aking a conservative or contrarian position as a bubble builds up’, Sau (ibid.) continues, ‘should in fact result in performance unfavorable to peers [...] which might have affected the money managers’ employment and compensation’. The same mimetic behavior also explains over-indebtedness. The purchase of a security, in fact, can be regarded as a reasonable¹² decision given the conventional belief that prevail at a certain moment in the market. This means that, in contrast to the rationality required by the EMH, the act of buying a stock does not occur because its intrinsic value is higher than its price, but because everyone thinks, even though no single individual really believes this, that the market thinks the trend will continue. As a result, the self-referential nature of this convention makes the latter self-fulfilling, thus generating an increase in the house prices with pro-cyclical effects. Indeed, the higher the value of the house, the higher is the value of the collateral and the loan it secures and, in turn, both the borrower (firms and households) and the lender (banks, institutional investors and other financial intermediaries) are wealthier. This encourages speculative positions *à la* Minsky (1977), which increasingly rely upon indebtedness and the belief that the positive trend will continue indefinitely (see Sau, 2013, pp. 505-508).

Relying upon the above convention, the financial market, until the Summer of 2007, was in a state of ‘conditional stability’. In terms of our analysis, it is the second ‘reflexive relation’ which, by allowing the convention to inform individual expectations, prevents the entire system from collapsing. However, the recursive interactions between the objective reality and the subjective beliefs give rise to a ‘boom-bust process’, described by Soros (2013, p. 323) as a self-reinforcing process that ‘cannot go

¹² Following Carabelli (2002, p. 170), the idea of reasonableness, which comes from Keynes, can be interpreted as ‘having some grounds, some reasons, some evidence in favour of a solution [...] while arguing in a non-demonstrative way’. This idea of rationality, in contrast with that commonly adopted in orthodox economics, does not rely on the internal consistency of human reasoning as much as on heuristics and rule of thumbs (see Lavoie, 2014, 87-95).

on forever because eventually the participants' views would become so far removed from objective reality that the participants would have to recognize them as unrealistic'. If we relate this to the idea that 'conventional decision making can never sustain more than *conditional* stability' (Crotty, 1994, p. 127, original emphasis), we can understand that by the moment a convention is disrupted, a boom turns into a bust and the system breaks down. Let us see how this applies to the real estate market crash.

In August 2007, as investors became aware that home prices were falling and intermediaries suffer their first runs on short-term financing, the asset-backed commercial paper market came to a halt. Yet, the tail risk was still not fully appreciated by market participants, as well as policymakers, because effective mechanisms to address shortage of liquidity were put in place (e.g., the availability of short-term borrowing through lower interest rates and collateralized lending facilities from the Federal Reserve, such as the Primer Dealer Credit Facility and the Term Auction Facility). Therefore, despite the losses of financial institutions were remarkably increasing, liquidity interventions kept the markets under control and the system was perceived as stable. However, when Lehman Brothers declared bankruptcy, the decision made by the government not to rescue it was interpreted as a signal that the entire financial system was in danger. This generated a self-fulfilling systemic crisis, which can be explained in terms of complex-reflexive dynamics.

According to Soros (2013, p. 323), the real estate bubble can be decomposed into 'an underlying trend that prevails in reality', which corresponds to the easing of credit constraints, and 'a misconception relating to that trend', namely the assumption of independence between the value of the collateral and the availability of credit. When the feedback mechanism between these components ceases to be self-reinforcing, a bust suddenly occurs. Indeed, the rise in the cost of credit required financial institutions to raise their lending standards, causing households and businesses to deleverage. This made investors aware that their optimistic expectations were too detached from reality, thus causing confidence in the prevailing convention to be completely undermined. Therefore, as soon as agents realized that the time for loans to be repaid was come, the panic began to spread and both

households and firms were forced to liquidate their financial assets in order to meet their obligations. Real estate values suddenly dropped, and this caused the market to crash.

It is worth reminding us that, in and of itself, the act of selling a security is not a rational decision as much as a reasonable one. Indeed, in contrast to what the EMH prescribes, notwithstanding the market price of the asset falls far below its fundamental value, in order to avoid the risk of ending up with a worthless asset, investors are forced to liquidate their position. The final outcome, therefore, is not an orderly exit strategy as envisaged by the EMH, but a structural discontinuity within the system—a crisis—which arises because aggregate beliefs cease to bear a relation to the imaginary scenario created by means of conventional decision-making.

Based on the general agreement that financial stability plays a crucial role in the financial system, central authorities implement a gamut of solutions, such as a discrete financial policy or prudential financial regulation, which are aimed at maintaining stability. Financial markets are indeed being monitored in order to predict and identify possible risks. Banks, key players on the financial markets, are subjected to special supervision by national authorities due to the fact that irresponsible actions on their part may pose a great threat to the global economy. In what follows, we attempt to analyze the measures as well as the instruments available to central banks in order to take action against the prevailing convention before an asset bubble explodes and a financial crisis occurs.

The agenda of the Central Bank to cope with Financial Instability

The decades before the Great Recessions have been dominated by the view that monetary policy consisted of the manipulation of a single instrument, the overnight interbank interest rate, which is supposed to accomplish three different goals: full employment, maximum sustainable growth and stable inflation (Blanchard, 2016). However, after 2008, it became clear that these targets were impossible to achieve with a unique tool and, more importantly, that the action of central banks cannot be reduced to a unique goal, namely inflation targeting, and should instead be extended to financial

stability and macroprudential regulation¹³. The issue at stake then becomes how to implement policy measures that allow the central monetary authority to affect the behavior of financial markets before panic spreads and a crisis takes over.

According to the EMH, given that the rationality of agents allows the market price of a security to converge to its fundamental value, price misalignments can only occur because of the bad quality of information available in the system. Therefore, a central bank has no scope for intervention, unless it possesses relevant information to correct price misalignments. Its intervention is limited to indirectly promoting fundamental valuation and deregulation, so that the market can achieve an efficient allocation of resources. As Mishkin (2011, p. 60) explicitly points out:

[I]t is hard to believe that the central bank has such an informational advantage over private markets. If the central bank has no informational advantage, and if it knows that a bubble has developed, the market will almost surely know this too, and the bubble will burst.

In sharp contrast with this assertion, the asset mispricing caused by liquidity and collateral constraints shows that there is considerable ‘potential for and power in intervention than was dreamed of in efficient-market models.’ (Krugman, 2016). Therefore, a ‘convention-based’ approach leaves the central bank considerable room to act upon the prevailing convention which emerges in the market with the tools that we analyze in what follows. Before starting our discussion, we should note that type of financial markets we have in mind are those characterized by securitized stocks, where broad institutional investors play a crucial role and the investment horizon is not extremely short. A representative example is the real estate market, whereby we can virtually conceive of some room for policy intervention in that the bearish/bullish convention thus generated can last for longer. On the contrary, if we think of speculation on overnight interest rates, it would be hard to imagine a feasible

¹³ A recent report issued by the Independent Evaluation Office of the International Monetary Fund (Everaert, Levin, Semmler, Turner, Loungani & Pedraglio, 2019, p. 11) explicitly acknowledges that ‘while the debate continues about whether maintaining financial stability should be explicitly added to central bank mandates or become a shared mandate among a group of public institutions, central banks cannot avoid paying attention to financial stability issues.’

measure of intervention that the monetary authority could adopt to act upon such a short-lived convention¹⁴.

Following Tymoigne (2009, pp. 75-79), a policy instrument which allows a central bank to take action with respect to the convention is *asset-price management*, that operates on investors' balance sheets and cash-flow positions. Given that an increase in speculative activities alters investors' behavior, and this translates into changes in the balance sheet structure which becomes more leveraged and thus more sensitive to changes in asset prices, the central monetary authority can focus on those assets that are more prone to speculation so that their destabilizing effects on the other assets and the overall economic activity are limited. As Tymoigne (2009, p. 76) notes, 'this method of judging the sustainability of asset prices is more reliable and less subject to controversies' to the extent that 'it is possible to simulate, at least in theory, the impact of asset-price variations on balance sheets with different levels of fragility.' Monitoring the sensitivity of financial positions in this way requires to abandon those policies aimed at controlling the asset-price level/growth, for the latter continuously changes with agents' and market's expectations, and thus with the prevailing convention which justify them, rendering the task for central bank increasingly cumbersome. On the contrary, it calls for the adoption of a regulatory framework which promotes the stability of expectations to control the fragility of financial positions. To put this into practice, the 'moral suasion' channel (Romans, 1966) could be quite effective to the extent that the actions undertaken by the central bank are perceived as credible.

The central bank can make use of moral suasion, thus influencing the prevailing convention, by setting a threshold to asset prices, either a floor or a ceiling, and establishes that it will intervene only after asset prices exceeded that threshold. In doing this, however, it is crucial that the monetary authority, on the one hand, gives certainty to the private sector of its intervention and, on the other,

¹⁴ In the spirit of full disclosure, we should note that, according to Keynes' economics, it is not possible to directly transition from theory, an 'apparatus of thought', to policy recommendations, an 'apparatus of action' (Carabelli and Cedrini, 2015). Indeed, it is the specificity of the economic question under study which dictates shifts in theoretical arguments, which belongs to the realm of generality, as well as in policy suggestions, embedded in the realm of particularity. In line with this distinction, the analysis we propose in this section strongly relies on the generality of the theory, that is to say it is not intended to provide policy measures tailored to specific financial markets as much as to assess the potential strengths and weaknesses of the available policy instrument with respect to the framework we previously developed.

leaves some uncertainty around the level of the threshold (Tymoigne, 2009, p. 76). Indeed, as soon as a floor/ceiling are established and publicly announced, this generates a reference value—in the form of a convention—that investors factor into their expectations and make decisions on whether to buy/sell a security accordingly. However, given that asset-price inflation/deflation determines capital gains/losses, which in turn establishes the fragility of financial units, asset-price management becomes of crucial importance especially in periods of technological dynamism, when asset market inflation has a particular tendency to overshoot. Therefore, policy makers should tighten when they see credit expanding rapidly and asset-market conditions responding enthusiastically, even if doing so requires commodity-price inflation to remain subdued.

Certainly, there are limits to central bank intervention in stabilizing individual expectations. As acknowledged by Tymoigne (2009, pp. 77-78), the necessary condition to achieve this objective rests in the willingness of the central bank to intervene in a specific market. There might be cases in which the authority is reluctant or refuses to accept some assets as collateral or buy stocks with low liquidity and probability of repayment. Moreover, in presence of a solvency crisis, wherein investors' expectations are extremely depressed, a floor policy will only be effective if the central bank intervenes directly in the market, and not through market makers (this leaves room for government intervention to purchase the large amount of junk assets and restore investors' confidence).

Moral suasion can also be employed to alter the prevailing convention around the long-term interest rate. In Chapter 15 of *The General Theory*, Keynes (1936, p. 203) claims that the interest rate 'is a highly conventional, rather than a psychological, phenomenon. For its actual value is largely governed by the prevailing view as to what its value is expected to be.' According to the expectations hypothesis of the term structure of interest rates, the long-term interest rate is the weighted average of actual and future expected values of short-term interest rates. Furthermore, given that liquidity preference of agents requires the long-term interest rate to pay a liquidity premium over the short-term one due to the uncertainty associated with long-term securities, the long-term rate is not under the direct control of the central monetary authority but depends, instead, on the expectations about the future behavior of

monetary policy. Consequently, the central bank can influence the long-term rate if it is capable of inducing changes in expectations about the ‘safe’ rate of interest (Keynes, 1936, p. 201), the value of the interest rate that the public believes will prevail in the long run. On the contrary, if the central bank is not capable of modifying the convention around the ‘safe’ rate of interest, then the reduction of the short-term interest rate will produce an increase in the expectation of its value in the near future which will make the long-term rate unchanged. Taking this into account, how is it possible to affect the long-term interest rate?

According to Keynes (1936, p. 203):

[A] monetary policy which strikes public opinion as being experimental in character or easily liable to change may fail in its objective of greatly reducing the long-term interest rate. The same policy, on the other hand, may prove easily successful if it appeals to public opinion as being reasonable and practicable and in the public interest, rooted in strong conviction, and promoted by an authority unlikely to be superseded.

A credible monetary policy, following Keynes (1936, pp. 203-204, original emphasis) requires two necessary conditions to be satisfied. On the one hand, it should account for moderate and gradual changes in the short-term interest rate, so that the public become accustomed to new rates and thus the convention can be modified accordingly. On the other hand, given that ‘*any* level of interest which is accepted with sufficient conviction as *likely* to be durable *will* be durable’, the rate of interest established by the convention should be seen by the public as being based on the same objective grounds as the convention itself, the latter being based on extremely precarious knowledge¹⁵.

The above passage seems to properly fit the current state of monetary policy, which after the Great Financial Crisis has shifted to an unconventional toolkit, adopted in several countries, which combines forward guidance (FG) and quantitative easing. Indeed, if we consider FG, we can regard it as an

¹⁵ Modenesi, Modenesi, Oreiro, & Martins (2013, pp. 86-89) provide an account of the Brazilian economy in the mid-1990s which clearly reveals how conventions allowed the monetary authority to affect agents’ expectations on the value of the rate of interest.

instance of moral suasion to the extent that it places a strong emphasis on the credibility of the statements made by central banks on the future course of monetary policy. The effectiveness of this tool in affecting the state of expectations in financial markets, however, has been questioned by Konczal and Mason (2017) as well as by Everaert *et al.* (2019), who both argue that the main issue concerned with FG lies in the present commitment required by central banks to state either the potential ('Delphic' FG) or the exact ('Odyssean' FG) trajectory of future policy measures. In particular, Konczal and Mason (2017, p. 25), take a stronger stance and claim that '[e]mpirically, what central banks actually do appears to matter more than what they say they are going to do.', taking as example the successful decision of the Bank of England not to make any statements about future policy. This view is also shared by Everaert *et al.* (2019) who argue that, independent of whether it involves a policy commitment in terms of reaching a particular date ('time-based') or specific economic data outcomes ('data-based'), FG 'is most effective when it is state' (Coenen *et al.*, 2017, cited in Everaert *et al.*, 2019, p. 4).

In the current scenario, the credibility of central monetary authority intervention is further exacerbated by the negative level of interest rates (see Palley, 2019; Pressman, 2019), which if it lasts for a long time can raise several concerns in terms of financial instability¹⁶. This renders the effectiveness of monetary policy increasingly weaker thereby undermining the commitment of the central bank to affect market expectations. A solution to this problem suggested by Konczal and Mason (2017, pp. 30-34) is to complement short-term interest rate targeting with long-term interest rate setting. The latter should be accomplished by targeting the price of bonds—which ultimately achieves the same goal of targeting interest rate, given their inverse relation—instead of a quantity to be purchased¹⁷. Given that the link between short- and long-term interest rates is not as strong as the theory supposes, to the extent that long-term rates matter for aggregate demand (Stiglitz, 2013) it is

¹⁶ Even though does not yet seem to be significant evidence of excessive risk-taking on account of negative policy interest rates, some research finds that banks with ample deposits have started to lend to riskier borrowers after the European Central Bank adopted negative interest rates (Heider, Saidi, & Schepens, 2019).

¹⁷ This strategy was adopted by the Bank of Japan in 2016 under the name "yield curve control". In addition to reducing the volatility of the bond rates, it required a lower quantity of asset to be purchased to achieve the same rate reduction.

necessary to directly act on them. This measure seems to be somehow reminiscent of what Keynes (1973, p. 153) suggested: if ‘a central bank were able to apply open-market operations to long-dated securities, surely this might have a sufficient substantial effect’.

Despite the above concerns, there still seems to be some hope in the credibility of central banks in influencing markets’ expectations, as revealed by the famous ‘whatever it takes’ announced by the former president of the European Central Bank (Draghi, 2012) to save the Euro from a crisis. As a matter of fact, even though Outright Monetary Transactions were not activated, the effect of their announcement ‘was equivalent to that of a large-scale asset purchase programme’ (Draghi, 2019). That is to say, it acted as a self-fulfilling prophecy.

Our discussion on the policy instruments which can potentially affect the prevailing convention in the market shows that there are some possibilities for the central monetary authority to employ monetary policy to achieve this goal. However, even though financial market conditions are important, we believe that they are first and foremost the responsibility of financial market regulators. In the interwar period, regulators should have concerned themselves with conflicts of interest between the underwriting and advising activities of the investment banks before as well as after the fact. They should have engaged in closer supervision of financial institutions and contemplated increases in capital and liquidity requirements to prevent the credit boom from developing in ways that heightened the vulnerability of the economy and the financial system to a subsequent downturn. This seems to us the right lesson for policy to draw also from the experience of the 1990s. The problem, of course, is that such lessons are always more evident after the fact.

Conclusions

In the course of our analysis we attempted to build a ‘convention-based’ approach which combines relevant insights from Keynes’ thought and Post-Keynesian Economics with Complexity Economics. In doing this, we focused our attention to the analysis of financial markets, as we believe that a better understanding of the underlying mechanisms analyzed through the lenses of complex systems might be

of help to explain how financial crises endogenously arise because of the inherent instability of conventions which crucially shape the macroeconomy.

As we shown, a ‘convention-based’ approach can explain how herd behavior can fuel speculative bubbles in asset markets through a variety of complex-reflexive dynamics which, if considered along with the changes in borrowing and lending practices, lead the system to financial fragility and instability, eventually propelling a crash. To the extent that a financial complex system can be, in our view, at most temporarily stabilized by the confidence held by the agents in the prevailing convention, it is inherently unstable. This implies that ‘boom-bust’ cycles are the rule and not the exception, and certainly cannot be regarded as merely isolated events caused by exogenous shocks which randomly hit the economic system. For this reason, financial capitalism needs to be managed through the implementation of appropriate economic policies which are able to act *ex ante* the realization of a financial crisis. Despite after the Great Financial Crisis the policy toolkit has been revised and leading international institutions have been increasingly acknowledged the need to include financial stability and prudential regulation in their agenda, inflation targeting still remains the main concern.

In the light of these arguments, we believe that the framework we attempted to develop could have, on the one side, implications for macroeconomic theory and modeling, in that it calls for a shift from the notion of path-independent equilibrium to that of conditional equilibrium in financial markets, which has been advocated for decades by Post-Keynesian Economists. On the other, based on this theoretical perspective, it leaves considerably more room for the implementation and the adoption of policy measures which conceive central bank intervention in financial market as the *sine qua non*.

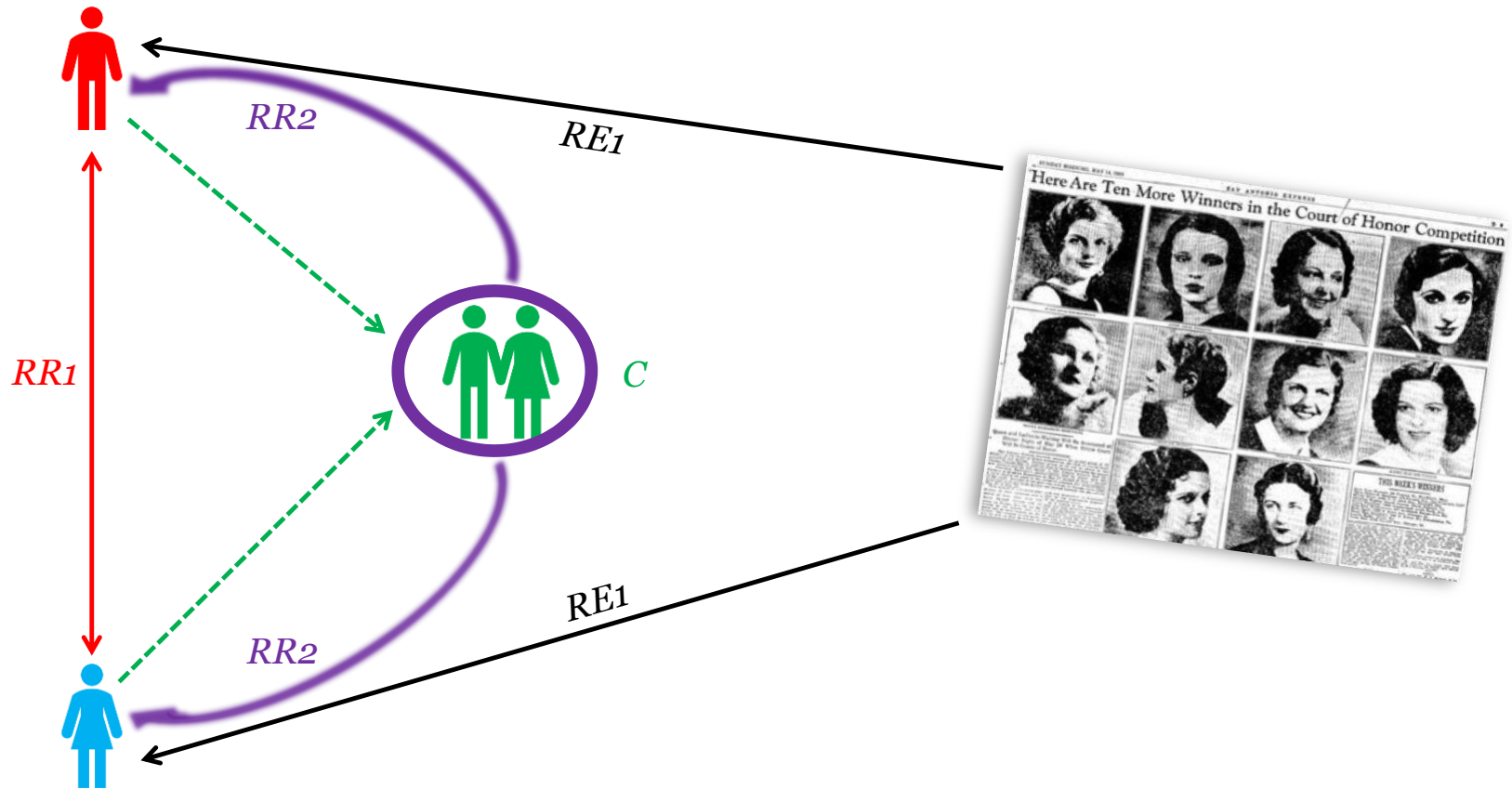
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Figure 1. Complex-reflexive dynamics of the “beauty contest”.



Source: authors' representation